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Prof. Sevilay Şenol Çelik
Koç University Faculty of Nursing, İstanbul, Türkiye
sevilaycelik@ku.edu.tr

Managing Director

Assoc. Prof. Pelin Karaçay
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pkaracay@ku.edu.tr

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abaygul@ku.edu.tr

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Director of Semahat Arsel Nursing Education, Paractice and Research Center,
İstanbul, Türkiye
pkaracay@ku.edu.tr
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rsemerci@ku.edu.tr
Section: Child Health and Disease Nursing

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Ege University Faculty of Nursing, İzmir, Türkiye
meryem.yavuz@ege.edu.tr
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esenyuva@iuc.edu.tr
Section: Nursing Education

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Department of Obstetrics and Gynecology Nursing, Hacettepe University
Faculty of Nursing, Ankara, Türkiye
gultenko@hacettepe.edu.tr
Section: Obstetrics, Women's Health and Diseases Nursing

Prof. Sevgisun Kapucu
Department of Internal Medicine Nursing, Hacettepe University
Faculty of Nursing, Ankara, Türkiye
sevgisunkapucu@gmail.com
Section: Internal Medicine Nursing

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Prof. Dr. Zehra Göçmen Baykara
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gocmenzehra@yahoo.com

Prof. Dr. Zeynep Canlı Özer
Akdeniz University Faculty of Nursing, Antalya, Türkiye
zeynepcanli@akdeniz.edu.tr



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Publication Coordinator
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Graphic Design
Duygu Şimşek

General Manager
Ali Cangül

Contact
KARE Publishing

Address: Göztepe Mah., Fahrettin Kerim Gökay Cad., No: 200, D: 2,
Göztepe, Kadıköy, İstanbul, Türkiye
Phone: +90 216 550 61 11
Web: www.karepb.com
E-mail: kare@karepb.com

AIM AND SCOPE

Journal of Education and Research in Nursing (J Educ Res Nurs) is an international, scientific, open access, online-only periodical published in accordance with independent, unbiased, and double-blinded peer-review principles. The journal is the official publication of Koç University Semahat Arsel Nursing Education, Practice and Research Center (SANERC), published quarterly in March, June, September, and December. The publication language of the journal is English and the journal accepts English manuscripts only.

All expenses of the journal are covered by SANERC. Processing and publication are free of charge with the journal. No fees are requested from the authors at any point throughout the evaluation and publication process. All manuscripts must be submitted via the online submission system, which is available at <http://jer-nursing.org/>. The journal guidelines, technical information, and the required forms are available on the journal's web page.

Journal of Education and Research in Nursing aims to share the experience and the knowledge from Türkiye and different cultures through original studies in nursing and healthcare as well as protect and improve the public health and strengthen the nursing profession by providing the opportunity to transfer current knowledge into practice. The journal contributes to the literature by publishing manuscripts at the highest scientific and clinical value in nursing research, practice, and education. The journal publishes original articles, reviews, case reports, and letters to the editors that are prepared in accordance with ethical guidelines. The journal also welcomes contributions from other healthcare professionals on issues that have a direct impact on nursing practice.

The target audience of the journal is primarily researchers, practitioners, educators and executive nurses as well as other healthcare professionals, policy makers and students of nursing and health.

Journal of Education and Research in Nursing currently indexed in GALE [2010], Tubitak Ulakbim Medicine [2012], EBSCO [2017], CINAHL [2017], DOAJ [2021], Research4Life [2021], Hinari [2021], SCILIT [2021], OUCI [2021], CNKI [2022], MIAR [2024], SUDOC [2024], Zeitschriften Datenbank [2024], Electronic Journal Library [2024], and EmCare [2025].

The editorial and publication processes of the journal are shaped in accordance with the guidelines of the International Committee of Medical Journal Editors [ICMJE], World Association of Medical Editors [WAME], Council of Science Editors [CSE], Committee on Publication Ethics [COPE], European Association of Science Editors [EASE], and National Information Standards Organization [NISO]. The journal is in conformity with the Principles of Transparency and Best Practice in Scholarly Publishing (doaj.org/bestpractice).

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Editor in Chief: Sevilay Şenol Çelik

Address: Koç University Faculty of Nursing, Sağlık Bilimleri Kampüsü, Davutpaşa Caddesi 34010 Topkapı, İstanbul, Türkiye

E-mail: sevilaycelik@ku.edu.tr

Publisher: Kare Media

Address: Göztepe Mah., Fahrettin Kerim Gökay Cad., No: 200 D: 2, Göztepe, Kadıköy, İstanbul, Türkiye

Phone: +90 216 550 61 11

E-mail: kare@karepb.com

Webpage: www.karepb.com

INSTRUCTIONS TO AUTHORS

Journal of Education and Research in Nursing [J Educ Res Nurs] is an international, scientific, open access, online-only periodical published in accordance with independent, unbiased, and double-blinded peer-review principles. The journal is the official publication of Koç University Semahat Arsel Nursing Education, Practice and Research Center (SANERC), published quarterly in March, June, September, and December. The publication language of the journal is English and the journal accepts English manuscripts only. The authors of the previously accepted Turkish articles are required to send English version of their articles when the publication process starts.

All expenses of the journal are covered by SANERC. Processing and publication are free of charge with the journal. No fees are requested from the authors at any point throughout the evaluation and publication process. All manuscripts must be submitted via the online submission system, which is available at <http://jer-nursing.org>. The journal guidelines, technical information, and the required forms are available on the journal's web page.

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Originality, high scientific quality, and citation potential are the most important criteria for a manuscript to be accepted for publication. Manuscripts submitted for evaluation should not have been previously presented or already published in an electronic or printed medium. The journal should be informed of manuscripts that have been submitted to another journal for evaluation and rejected for publication. The submission of previous reviewer reports will expedite the evaluation process. Manuscripts that have been presented in a meeting should be submitted with detailed information on the organization, including the name, date, and location of the organization.

PEER REVIEW PROCESS

Manuscripts submitted to Journal of Education and Research in Nursing will go through a double-blind peer-review process. Each submission will be reviewed by at least two external, independent peer reviewers who are experts in their fields in order to ensure an unbiased evaluation process.

The editorial board will invite an external and independent editor to manage the evaluation processes of manuscripts submitted by editors or by the editorial board members of the journal. The Editor in Chief is the final authority in the decision-making process for all submissions. Reviewers who seek assistance from a trainee or colleague in the performance of a review should acknowledge these individuals' contributions in the written comments submitted to the editor. Reviewers must maintain the confidentiality of the manuscript, which may prohibit the uploading of the manuscript to software or other AI technologies where confidentiality cannot be assured. Reviewers must request permission from the journal prior to using AI technology to facilitate their review.

ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

At submission, the journal should require authors to disclose whether they used artificial intelligence (AI)- assisted technologies (such as Large Language Models [LLMs], chatbots, or image creators) in the production of submitted work. Authors who use such technology should describe, in both the cover letter and the submitted work, how they used it. Use of AI for writing assistance should be reported in the acknowledgment section. Authors who used AI technology to conduct the study should describe its use in the methods section in sufficient detail to enable replication to the approach, including the tool used, version, and prompts where applicable. Chatbots (such as ChatGPT) should not be listed as authors because they cannot be responsible for the accuracy, integrity, and originality of the work, and these responsibilities are required for authorship. Therefore, humans are responsible for any submitted material that included the use of AI-assisted technologies. Authors should carefully review and edit the result because AI can generate authoritative-sounding output that can be incorrect, incomplete, or biased. Authors should not list AI and AI-assisted technologies as an author or co-author, nor cite AI as an author. Authors should be able to assert that there is no plagiarism in their paper, including in text and images produced by the AI. Humans must ensure there is appropriate attribution of all quoted material, including full citations.

ETHICAL GUIDELINES

An approval of research protocols by the Ethics Committee in accordance with international agreements (World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects," amended in October 2013, www.wma.net) is required for experimental, clinical, and drug studies and for some case reports. If required, ethics committee reports, or an equivalent official document will be requested from the authors. Submissions which do not have ethical approval will be reviewed according to COPE's Research, Audit and Service Evaluations guideline.

Such manuscripts can be rejected after editorial review due to the lack of ethics committee approval.

For manuscripts concerning experimental research on humans, a statement should be included that written informed consent of patients and volunteers was obtained following a detailed explanation of the procedures that they may undergo.

It is the authors' responsibility to protect the patients' anonymity carefully. For photographs that may reveal the identity of the patients, signed releases of the patient or their legal representative should be enclosed, and the publication approval must be provided in the Methods section.

For studies carried out on animals, an approval research protocols by the Ethics Committee in accordance with international agreements (Guide for the care and use of laboratory animals, 8th edition, 2011" and/or "Interna-

tional Guiding Principles for Biomedical Research Involving Animals, 2012”) is required. Also, the measures taken to prevent pain and suffering of the animals should be stated clearly in such studies.

Information on patient consent, the name of the ethics committee, and the ethics committee approval number and date should also be stated in the Methods section of the manuscript.

PLAGIARISM AND ETHICAL MISCONDUCT

Journal of Education and Research in Nursing is extremely sensitive about plagiarism. All submissions are screened by a similarity detection software (iThenticate by Cross-Check) at any point during the peer-review and/or production process.

When you are discussing others' (or your own) previous work, please make sure that you cite the material correctly in every instance.

Authors are strongly recommended to avoid any form plagiarism and ethical misconduct that are exemplified below.

Self-plagiarism (text-recycling): Overlapping sections or sentences with the author's previous publications without citing them. Even if you are the author of the phrases or sentences, the text should not have unacceptable similarity with the previously published data.

Salami slicing: Using the same data of a research into several different articles. Reporting the same hypotheses, population, and methods of a study is into different papers is not acceptable.

Data Fabrication: It is the addition of data that never occurred during the gathering of data or the experiments. Results and their interpretation must be based on the complete data sets and reported accordingly.

Data Manipulation/Falsification: It means manipulating research data with the intention of giving a false impression. This includes manipulating images (e.g. micrographs, gels, radiological images), removing outliers or 'inconvenient' results, changing data points, etc.

In the event of alleged or suspected research misconduct, e.g., plagiarism, citation manipulation, and data falsification/fabrication, the Editorial Board will follow and act according to COPE flowcharts.

PREPRINT

Journal of Education and Research in Nursing does not consider preprint publications as prior publication. In other words, authors are allowed to present and discuss their findings on a non-commercial preprint server before submission to a journal.

Authors must provide the journal with the pre-print server deposition of their article accompanying its DOI during initial submission.

If the article is published in the Journal of Education and Research in Nursing, it is the responsibility of the authors to update the archived preprint and link it to the published version of the article.

AUTHORSHIP

Each person listed as an author should fulfill the authorship criteria recommended by the International Committee of Medical Journal Editors (ICMJE - www.icmje.org). The ICMJE recommends that authorship is based on the following four criteria:

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND

2. Drafting the work or revising it critically for important intellectual content; AND

3. Final approval of the version to be published; AND

4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

In addition to being accountable for the parts of the work he/she has done, an author should be able to identify which co-authors are responsible for specific other parts of the work. Also, authors should have confidence in the integrity of the contributions of their co-authors.

All those designated as authors should meet all four criteria for authorship, and all who meet the four criteria should be identified as authors. Those who do not meet all four criteria should be acknowledged in the title page of the manuscript.

Journal of Education and Research in Nursing requires corresponding authors to submit a signed and scanned version of the Copyright Agreement and Acknowledgement of Authorship form (available for download at <http://jer-nursing.org>) during the initial submission process to act appropriately on authorship rights and to prevent ghost or honorary authorship. If the editorial board suspects a case of "gift authorship," the submission will be rejected without further review. As part of the submission of the manuscript, the corresponding author should also send a short statement declaring that he/she accepts to undertake all the responsibility for authorship during the submission and review stages of the manuscript.

CHANGE OF AUTHORSHIP

Journal of Education and Research in Nursing reviews the authorship according to the author's declaration in the Title Page, thus it is the authors responsibility to send the final order of the complete author names. Requests in the change of authorship (e.g. removal/addition of the authors, change in the order etc) after submission are subject to editorial approval. Editorial Board will investigate this kind of cases and act following COPE flowcharts.

Change of authorship requests should be submitted to the Editorial Office with an official letter stating the reasons of the change. The letter must be signed by all authors and include their approval on the change in authorship. If the request is approved by the Editorial Board, authors need to submit a new Copyright Agreement Form according to the final order list.

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Journal of Education and Research in Nursing requires and encourages the authors and the individuals involved in the evaluation process of submitted manuscripts to disclose any existing or potential conflicts of interests, including financial, consultant, and institutional, that might lead to potential bias or a conflict of interest. Any financial grants or other support received for a submitted study from individuals or institutions should be disclosed to the Editorial Board. To disclose a potential conflict of interest, the ICMJE Potential Conflict of Interest Disclosure Form should be filled in and submitted by all contributing authors. The journal's Editorial Board resolves cases of a potential conflict of interest of the editors, authors, or reviewers within the scope of COPE and ICMJE guidelines.

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The Editorial Board of the journal handles all appeal and complaint cases within the scope of COPE guidelines. In such cases, authors should get in direct contact with the editorial office regarding their appeals and com-

plaints. When needed, an ombudsperson may be assigned to resolve claims that cannot be resolved internally. The Editor in Chief is the final authority in the decision-making process for all appeals and complaints.

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In accordance with the publication policies of the Journal of Education and Research in Nursing, the duties and responsibilities of the author[s] and the editorial board during the withdrawal of an article are given below.

Responsibilities of the Authors

The author[s] has an obligation to cooperate with the journal editor in the withdrawal process if he/she notices an error or mistake in the pre-checking stage of the manuscript or in a published work. Withdrawal requests will not be considered for a manuscript in the review process or in the publication phase. Author[s] who wish to withdraw their study outside of the review process or the publication phase are obliged to fill out and send the Withdrawal Form via e-mail at kare@karepb.com. The Editorial Board will review the withdrawal notification and respond within 15 days at the latest. Authors cannot submit their manuscripts to another journal for evaluation unless the editorial board approves the withdrawal request for manuscripts whose copyrights have been transferred to the Journal of Education and Research in Nursing at the submission stage.

Responsibilities of the Editorial Board

The editorial board of the Journal of Education and Research in Nursing has the obligation to initiate an investigation into any suspected copyright infringement, ethical statement violation, or plagiarism regarding studies that are published ahead of print, or under review. If the editorial board determines that there is a violation of copyright, ethical statement, or plagiarism in the work under evaluation, it withdraws the work from the evaluation and returns it to the authors by citing the detected situations in detail. In the event that copyright infringement or plagiarism is determined to have occurred in a published work or a work in early view, the Editorial Board may recommend to the publishers or editorial boards, of which study was previously published, to ensure the validity and reliability of the published studies or to withdraw them.

MANUSCRIPT PREPARATION

The manuscripts should be prepared in accordance with ICM-JE-Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals [updated in December 2018 - <http://www.icmje.org/icmje-recommendations.pdf>]. Authors are required to prepare manuscripts in accordance with the CONSORT guidelines for randomized research studies, STROBE guidelines for observational original research studies, STARD guidelines for studies on diagnostic accuracy, PRISMA guidelines for systematic reviews and meta-analysis, ARRIVE guidelines for experimental animal studies, and TREND guidelines for non-randomized public behavior. To find the right guideline for your research, please complete the questionnaire by Equator Network [here](http://www.equator-network.org).

The style of the manuscripts should be prepared according to AMA Manual of Style 11th Edition.

Manuscripts can only be submitted through the journal's online manuscript submission and evaluation system, available at jern.manuscriptmanager.net. Manuscripts submitted via any other medium and submissions by anyone other than one of the authors will not be evaluated.

Manuscripts submitted to the journal will first go through a technical evaluation process where the editorial office staff will ensure that the manuscript has been prepared and submitted in accordance with the journal's guidelines. Submissions that do not conform to the journal's guidelines will be returned to the submitting author with technical correction requests.

Authors are required to submit the following:

- Copyright Agreement and Acknowledgement of Authorship Form, and
- ICMJE Potential Conflict of Interest Disclosure Form [should be filled in by all contributing authors] during the initial submission. These forms are available for download at <http://jer-nursing.org>.

Preparation of the Manuscript

Title page: A separate title page should be submitted with all submissions and this page should include:

- The full title of the manuscript as well as a short title (running head) of no more than 50 characters,
- Name[s], affiliations, highest academic degree[s], and ORCID IDs of the author[s],
- Grant information and detailed information on the other sources of support,
- Name, address, telephone (including the mobile phone number), and email address of the corresponding author,
- Acknowledgment of the individuals who contributed to the preparation of the manuscript but who do not fulfill the authorship criteria.

Abstract: An abstract should be submitted with all submissions except for Letters to the Editor. The abstract of Research Articles should be structured with subheadings [Background, Methods, Results, and Conclusion]. Please check Table 1 below for word count specifications.

Keywords: Each submission must be accompanied by a minimum of three to a maximum of five keywords for subject indexing at the end of the abstract. The keywords should be listed in full without abbreviations. The keywords should be selected from the National Library of Medicine, Medical Subject Headings database (<https://www.nlm.nih.gov/mesh/MBrowser.html>).

Manuscript Types

Research Articles: This is the most important type of article since it provides new information based on original research.

Acceptance of original papers will be based upon the originality and importance of the investigation. The main text of original articles should be structured with Introduction, Material and Methods, Results, and Discussion subheadings. Please check Table 1 for the limitations for Original Articles.

Clinical Trials

Journal of Education and Research in Nursing adopts the ICMJE's clinical trial registration policy, which requires that clinical trials must be registered in a publicly accessible registry that is a primary register of the WHO International Trials Registry Platform (ICTRP) or in ClinicalTrials.gov.

Instructions for the clinical trials are listed below.

- Clinical trial registry is only required for the prospective research projects that study the relationship between a health-related intervention and an outcome by assigning people.
- To have their manuscript evaluated in the journal, author should register their research to a public registry at or before the time of first patient enrollment.
- Based on most up to date ICMJE recommendations, Journal of Education and Research in Nursing accepts public registries that include minimum acceptable 24-item trial registration dataset.
- Authors are required to state a data sharing plan for the clinical trial registration. Please see details under "Data Sharing" section.
- For further details, please check ICMJE Clinical Trial Policy at <http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html>

Data Sharing

As of 1 January 2019, a data sharing statement is required for the registration of clinical trials. Authors are required to provide a data sharing statement for the articles that reports the results of a clinical trial. The data sharing statement should indicate the items below according to the ICMJE data sharing policy:

- Whether individual deidentified participant data will be shared,
- What data in particular will be shared,
- Whether additional, related documents will be available,
- When the data will be available and for how long,
- By what access criteria will be shared.

Authors are recommended to check the ICMJE data sharing examples at <http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html>

While submitting a clinical trial to Journal of Education and Research in Nursing,

- Authors are required to make registration to a publicly accessible registry according to ICMJE recommendations and the instructions above.
- The name of the registry and the registration number should be provided in the Title Page during the initial submission.
- Data sharing statement should also be stated in the Title Page even the authors do not plan to share it.

Clinical trial and data sharing policy of the journal will be valid for the articles submitted from 1 March 2021.

Reporting Statistical Analysis

Statistical analysis to support conclusions is usually necessary. Statistical analyses must be conducted in accordance with international statistical reporting standards [Altman DG, Gore SM, Gardner MJ, Pocock SJ. Statistical guidelines for contributors to medical journals. *Br Med J* 1983; 7; 1489-93]. Information on statistical analyses should be provided with a separate subheading under the Materials and Methods section and the statistical software that was used during the process must be specified.

Values for reporting statistical data, such as p values and CIs should be presented and rounded appropriately. P values should be expressed to 2 digits to the right of the decimal point unless the first 2 digits are zeros, in which case 3 digits to the right of the decimal place should be provided [eg, instead of $p < 0.01$, report as $p = 0.002$]. However, values close to 0.05 may be reported to 3 decimal places because the 0.05 is an arbitrary cut point for statistical significance [eg, $p = 0.053$]. P values less than 0.001 should be designated as $p < 0.001$ rather than exact values [eg, $p = 0.000006$].

Units should be prepared in accordance with the International System of Units (SI).

Editorial Comments: Invited brief editorial comments on selected articles are published in the Journal of Education and Research in Nursing. Editorials should not be longer than 1000 words excluding references. Editorial comments aim to provide a brief critical commentary by reviewers with expertise or with high reputation in the topic of the research article published in the journal. Authors are selected and invited by the journal to provide such comments. Abstract, Keywords, and Tables, Figures, Images, and other media are not included.

Review Articles: Reviews prepared by authors who have extensive knowledge on a particular field and whose scientific background has been translated into a high volume of publications with a high citation potential are welcomed. These authors may even be invited by the journal. Reviews should describe, discuss, and evaluate the current level of knowledge of a topic in clinical practice and should guide future studies. The subheadings of the review articles should be planned by the authors. However, each review article should include an "Introduction" and a "Conclusion" section. Please check Table 1 for the limitations for Review Articles.

Case Reports: There is limited space for case reports in the journal and reports on rare cases or conditions that constitute challenges in diagnosis and treatment, those offering new therapies or revealing knowledge not included in the literature, and interesting and educative case reports are accepted for publication. The text should include Introduction, Case Presentation, and Discussion with an unstructured abstract. Please check Table 1 for the limitations for Case Reports.

Letters to the Editor: This type of manuscript discusses important parts, overlooked aspects, or lacking parts of a previously published article. Articles on subjects within the scope of the journal that might attract the readers' attention, particularly educative cases, may also be submitted in the form of a "Letter to the Editor." Readers can also present their comments on the published manuscripts in the form of a "Letter to the Editor." Abstract, Keywords, and Tables, Figures, Images, and other media should not be included. The text should be unstructured. The manuscript that is being commented on must be properly cited within this manuscript.

Table 1. Limitations for each manuscript type

Type of manuscript	Word limit*	Abstract word limit	Reference limit	Table limit	Figure limit
Research Article	4000	250 (Structured)	35	5	10
Review Article	5000	250	50	5	10
Case Report	1200	200	15	No tables	5
Letter to the Editor	400	No abstract	5	No tables	No media

*: Word limit should not include the abstract, references, tables, and figure legends.

Tables

Tables should be included in the main document, presented after the reference list, and they should be numbered consecutively in the order they are referred to within the main text. A descriptive title must be placed above the tables. Abbreviations used in the tables should be defined below the tables by footnotes (even if they are defined within the main text). Tables should be created using the "insert table" command of the word processing software and they should be arranged clearly to provide easy reading. Data presented in the tables should not be a repetition of the data presented within the main text but should be supporting the main text.

Figures and Figure Legends

Figures, graphics, and photographs should be submitted as separate files (in TIFF or JPEG format) through the submission system. The files should not be embedded in a Word document or the main document. When there are figure subunits, the subunits should not be merged to form a single image. Each subunit should be submitted separately through the submission system. Images should not be labeled (a, b, c, etc.) to indicate figure subunits. Thick and thin arrows, arrowheads, stars, asterisks, and similar marks can be used on the images to support figure legends. Like the rest of the submission, the figures too should be blind. Any information within the images that may indicate an individual or institution should be blinded. The minimum resolution of each submitted figure should be 300 DPI. To prevent delays in the evaluation process, all submitted figures should be clear in resolution and large in size (minimum dimensions: 100 × 100 mm). Figure legends should be listed at the end of the main document.

All acronyms and abbreviations used in the manuscript should be defined at first use, both in the abstract and in the main text. The abbreviation should be provided in parentheses following the definition.

When a drug, product, hardware, or software program is mentioned within the main text, product information, including the name of the product, the producer of the product, and city and the country of the company (including the state if in USA), should be provided in parentheses in the following format: "Discovery St PET/CT scanner (General Electric, Milwaukee, WI, USA)"

All references, tables, and figures should be referred to within the main text, and they should be numbered consecutively in the order they are referred to within the main text.

Limitations, drawbacks, and the shortcomings of original articles should be mentioned in the Discussion section before the conclusion paragraph.

References

Both in-text citations and the reference list must be prepared according to the AMA Manual of Style, 11th Edition. All references cited in the text must

appear in the reference list, and all references included in the reference list must be cited in the text. References should be numbered and cited consecutively in the order in which they first appear in the manuscript.

While citing publications, preference should be given to the latest and most up-to-date sources. Authors are responsible for the accuracy and completeness of all references. Before submission, authors should carefully verify all reference details, including author names, journal or book titles, publication years, volume and issue numbers, page ranges, DOIs, and URLs. Incorrect or incomplete reference information may prevent proper indexing and reference linking.

Journal titles should be abbreviated according to the Index Medicus/MEDLINE/PubMed journal abbreviations. When there are six or fewer authors, all authors should be listed. If there are seven or more authors, the first three authors should be listed, followed by et al. In the main text, references should be cited using superscript numerals without brackets.

To enhance the discoverability and accessibility of published research, authors are strongly encouraged to provide a Digital Object Identifier (DOI) for all references. References without a DOI must include a direct, permanent, and publicly accessible URL. References lacking either a DOI or an accessible URL may be requested to be replaced with an alternative, verifiable source. Exceptions may be made for original resources, such as validated scales, official guidelines, or similar materials for which alternative links are not available.

The use of unpublished or difficult-to-access sources, such as theses, dissertations, and conference proceedings, is discouraged. Authors should cite peer-reviewed journal articles with valid DOIs.

Journal Article: Campbell MR, Fisher J, Anderson L, Kreppel E. Implementation of early exercise and progressive mobility: Step to success. *Crit Care Nurse*. 2015;35(1):82-88.

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REVISIONS

When submitting a revised version of a paper, the author must submit a detailed “Response to the reviewers” that states point by point how each issue raised by the reviewers has been covered and where it can be found (each reviewer’s comment, followed by the author’s reply and line numbers where the changes have been made) as well as an annotated copy of the main document. Revised manuscripts must be submitted within 30 days from the date of the decision letter. If the revised version of the manuscript is not submitted within the allocated time, the revision

option may be canceled. If the submitting author[s] believe that additional time is required, they should request this extension before the initial 30-day period is over.

Accepted manuscripts are copy-edited for grammar, punctuation, and format. Once the publication process of a manuscript is completed, it is published online on the journal’s webpage as an ahead-of-print publication before it is included in its scheduled issue. A PDF proof of the accepted manuscript is sent to the corresponding author and their publication approval is requested within 2 days of their receipt of the proof.

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EDITORIAL

Dear Readers,

We are pleased to present Volume 23, Issue 3 (September 2026) of the Journal of Education and Research in Nursing.

The studies featured in this issue address emerging priorities in nursing education, clinical practice, patient safety, public health, and sustainability. They examine nursing students' engagement with artificial intelligence, academic development, self-efficacy, psychological needs, and university adjustment, highlighting the importance of adaptable, ethically aware, and future-ready education. Clinical and organizational research focuses on professional self-efficacy, medical errors, early mobilization, operating room competency, medical waste management, and healthcare sustainability, underscoring the role of supportive systems in ensuring safe care. This issue also explores post-earthquake trauma, coping strategies, and adaptation to living with an ostomy, as well as diabetes risk, healthy eating, and the management of dinutuximab-related adverse effects. Together, these contributions demonstrate how evidence-based, compassionate, technologically informed, and sustainable nursing practices can respond to the changing needs of patients and society.

I am pleased to announce that our journal is indexed in Tubitak Ulakbim Medicine (2012), EBSCO (2017), CINAHL (2017), DOAJ (2021), Research4Life (2021), Hinari (2021), GALE (2022), CNKI (2022), SCILIT (2023), OUCI (2023), MIAR (2024), SUDOC (2024), Zeitschriften Datenbank (2024), Electronic Journal Library (2024), and EmCare (2025). We continue our efforts to publish the journal in accordance with international academic publishing standards. The high-quality, evidence-based studies submitted by our authors have been instrumental in achieving these goals. We also recognize the invaluable contributions of all our stakeholders, including our readers, editors, managing director, and advisory board members.

In our September 2026 issue, we present 13 original articles, one review article, and one letter to the editor. The titles of the contributions are as follows:

The original articles are titled "Optimists, Realists, and Traditionalists: Profiling Nursing Students' Engagement with Artificial Intelligence (AI) in Pediatric Nursing Education," "Academic Career Awareness and Attitudes Toward Graduate Education Among Nursing Students: A Cross-Sectional Study," "Nurses' Perceived Professional Self-Efficacy and Tendency Toward Medical Errors: A Correlational Study," "School Health Nurses' Attitudes and Behaviors Toward Medical Waste Management," "Personality Traits and Academic Self-Efficacy Among Nursing Students," "Cardiovascular Intensive Care Unit Nurses' Perceptions of the Factors Affecting, Barriers to, and Facilitators of Early Mobilization," "'I Had to Learn to Accept It': A Narrative Inquiry into a Young Woman's Experience of Living with an Ostomy Following the Kahramanmaraş Earthquakes," "Assessment of Post-Earthquake Trauma and Coping Strategies for Earthquake-Related Stress Among Midwifery Students," "Association Between Diabetes Risk and Attitudes Toward Healthy Eating Among Adults Visiting a Shopping Center in Istanbul," "Association Between Basic Psychological Needs and University Adjustment Among First-Year University Students," "Emerging Competency Expectations in Operating Room Nursing: A Qualitative Study of Surgeons' and Nurses' Perspectives," "'I Wish Waste Bins Would Sound an Alarm': A Qualitative Study of Head Nurses' Experiences and Perspectives on Sustainability in Healthcare," and "The Relationship Between Artificial Intelligence Literacy and Attitudes Toward Artificial Intelligence Among Nursing Students Pediatric Nursing Education."

The review article is titled "Nursing Management of Anti-GD2 Dinutuximab-Related Adverse Effects in Children with Neuroblastoma: A Scoping Review."

The letter to the editor is titled "Commentary on "Determining the Relationship Between Compassion Fatigue and Emotion Regulation Skills in Nurses."

I would like to express my sincere gratitude to our authors for sharing the current knowledge generated through their studies with our readers and thereby contributing to the provision of high-quality and safe nursing care. I would also like to thank the members of the editorial board for their contributions to the publication of our journal and the members of the advisory board for their careful evaluation of each article.

"Every year of her service, a good nurse will say, 'I learn something every day.'"

Florence Nightingale

Kind regards,

Prof. Sevilay Şenol Çelik, PhD, RN

Optimists, Realists, and Traditionalists: Profiling Nursing Students' Engagement with Artificial Intelligence (AI) in Pediatric Nursing Education

Pelin Karataş,¹ Demet Öztürk²¹Department of Pediatric Nursing, Aydın Adnan Menderes University Faculty of Nursing, Aydın, Türkiye²Department of Nursing, Graduate Program in Health Sciences, Institute of Health Sciences, Aydın Adnan Menderes University, Aydın, Türkiye

Abstract

Background: Artificial intelligence (AI) is increasingly integrated into nursing education; however, its use in pediatric nursing courses remains underexplored.

Aim: This study aimed to examine the use of AI tools among nursing students enrolled in a pediatric nursing course and to identify homogenous student profiles based on their usage characteristics and theoretical adoption patterns.

Methods: This cross-sectional study included 241 nursing students enrolled in a pediatric nursing course. Data were collected using the AI in Pediatric Nursing Course Questionnaire and the General Attitude Toward Artificial Intelligence Scale (GAAIS). K-means cluster analysis was conducted, guided by Rogers' Diffusion of Innovations Theory, to classify students into distinct profiles based on their GAAIS subscale scores, which were considered to reflect their fundamental attitudinal orientations toward AI.

Results: Cluster analysis identified three distinct student profiles: Optimists (n=95), Realists (n=102), and Traditionalists (n=44). Optimists demonstrated the highest levels of AI use, whereas Traditionalists demonstrated the lowest levels in both clinical practice (p=0.002) and preparation for clinical visits (p=0.039). Additionally, Optimists and Realists reported more positive perceptions of AI's impact on examination success (p=0.002) and learning (p=0.001), whereas Traditionalists expressed significantly more negative attitudes toward AI overall (p<0.001) and reported the lowest levels of trust in the technology (p=0.040).

Conclusion: Optimists and Realists appear to actively integrate AI tools into clinical practice and examination preparation and generally perceive them as beneficial for learning outcomes. These findings highlight the importance of adopting differentiated pedagogical approaches rather than a one-size-fits-all curriculum.

Keywords: Artificial intelligence, Diffusion of Innovations Theory, education, nursing practice, nursing, Optimists, pediatric, Realists, Traditionalists

Introduction

Artificial intelligence (AI) is a multidisciplinary field within computer science that aims to develop systems capable of performing tasks that typically require human intelligence, such as learning, reasoning, problem-solving, perception, and language understanding.¹ The use of AI is increasing rapidly, particularly among young adults. For example, a study conducted by Harvard University reported that half of young participants used AI,² while research by the Higher Education Policy Institute (HEPI) found usage rates as high as 88%,³ and another study reported a rate of 62%.⁴

The integration of AI into educational processes has become increasingly widespread. AI technologies can adapt to individual learning styles and needs,⁵ and tools such as chatbots can enhance students' motivation and confidence.⁶ Research indicates that students who use AI tend to perform better academically than those who do not, as AI can increase motivation and engagement in learning.^{5,7} Students frequently use AI tools to access information, brainstorm ideas, complete assignments, edit documents, draft emails, and summarize articles.²

However, the adoption of emerging technologies is not uniform across all students. According to Rogers' Diffusion of Innovations Theory, the adoption process is influenced by perceived attributes of the innovation, such as relative advantage, compatibility, and complexity, and individuals can be categorized into groups ranging from innovators to laggards based on their level of innovativeness.⁸ Similarly, the Technology Acceptance Model emphasizes perceived usefulness and ease of use as key determinants of behavioral intention.⁹ Given that nursing students may exhibit diverse levels of technological readiness and varying attitudes toward AI, it is important to move beyond average scores and identify distinct student profiles. Cluster analysis offers a statistical method for grouping heterogeneous individuals into homogenous categories (e.g., Optimists, Traditionalists),¹⁰ enabling a deeper understanding of their adoption patterns and education needs within the framework of diffusion theories.^{8,11}

Nursing education encompasses cognitive, affective, and psychomotor domains. Pediatric nursing education, in particular, integrates both theoretical knowledge and clinical practice. Various active learning

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Corresponding author: Pelin Karataş
E-mail: karatas.pelin@hotmail.com

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strategies are commonly used in nursing education, including case studies, problem-solving, collaborative learning, case analysis, simulation, demonstration, and concept mapping.⁸ AI has the potential to support pediatric nursing education by enhancing students' skills in patient monitoring, data collection, and analysis; enabling a deeper understanding of course content through personalized learning methods; providing access to up-to-date and relevant educational materials; and reducing the risk of medical errors. However, concerns regarding the possibility of AI-generated errors and the reliability of the information obtained remain significant challenges.¹²

AI technologies, which are widely used across various fields and provide rapid access to information, have increasingly been adopted by students. University nursing students use AI for case analysis, simulation design, research support, and examination preparation.^{13,14} Pediatric nursing is a specialized field focused on the care of children and their families and requires techniques that differ from those used in adult patient care.¹⁵ Given the critical nature of this field and variations in theoretical models of technology adoption, it is important to identify at which stages of their education students use AI and to examine their attitudes toward it. The aim of this study is to investigate the use of AI tools among nursing students enrolled in a pediatric nursing course and to identify homogenous student profiles (clusters) based on their usage characteristics and theoretical adoption patterns.

Study Questions

1. What are the levels of attitudes toward AI among nursing students enrolled in the pediatric nursing course?
2. Can distinct and homogenous student profiles (clusters) be identified based on students' attitudes and theoretical adoption patterns of AI?
3. Are there statistically significant differences among the identified student profiles (Optimists, Realists, Traditionalists) in terms of their purposes for using AI in the pediatric nursing course?

Materials and Methods

Type of Study

This study employed a cross-sectional research design and was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.¹⁶

Population and Sample

The study population consisted of 256 students. The sample size was calculated using the known population sample formula:

$$n = [N \times t^2 \times p \times q] / [(N-1) \times d^2 + t^2 \times p \times q]$$

Based on a 95% confidence level and a margin of error of 0.05, the required sample size was determined to be 154 students. After increasing this number by 10%, the target sample size was set at 169. The study was ultimately completed with 241 nursing students.

Inclusion Criteria

Participants were required to meet the following criteria:

1. Enrollment as a nursing student at the Faculty of Nursing
2. Third-year status during the 2024–2025 academic year
3. Willingness to participate in the study
4. Ability to access and complete the online questionnaire
5. Proficiency in written and spoken Turkish
6. Access to an internet-enabled device.

Data Collection Tools

Data were collected using a structured questionnaire consisting of three sections: (1) a sociodemographic data form, (2) questions regarding the use of AI in pediatric nursing courses, and (3) the General Attitude Toward Artificial Intelligence Scale.

Sociodemographic Data Collection Form: This section included four items assessing students' age, gender, marital status, and perceived income level.

Use of Artificial Intelligence in Pediatric Nursing Courses: This section consisted of 11 items developed by the researchers based on a review of the relevant literature on artificial intelligence use in higher education and nursing education (5–7). The items evaluated students' use of artificial intelligence, including frequency of use, perceptions and trust, impact on learning, use in theoretical and clinical components of the course, use during clinical placements, perceived advantages, use in examination preparation, and perceived effects on examination performance.

General Attitude Toward Artificial Intelligence Scale (GAAIS): The GAAIS was developed by Schepman and Rodway¹⁷ and adapted into Turkish by Kaya et al.¹⁸ The scale is a 5-point Likert-type instrument comprising 20 items and two subdimensions. It does not yield a total score; instead, it provides separate scores for Positive Attitude Toward Artificial Intelligence and Negative Attitude Toward Artificial Intelligence. High scores in each subdimension indicate stronger attitudes in the respective direction. The Cronbach's alpha coefficient was 0.82 for the positive attitude subdimension and 0.84 for the negative attitude subdimension, indicating good internal consistency.¹⁸

Data Collection Procedure

The study was conducted among nursing students enrolled in pediatric nursing courses at the Faculty of Nursing during the 2024–2025 academic year. Data collection took place after students had completed the 14-week pediatric nursing course. An online questionnaire was created using Google Forms (Google, Mountain View, California, USA). The survey link was distributed to students via WhatsApp (California, USA) through their class groups. The researchers sent three reminder messages to the groups. The first section of the questionnaire provided information about the purpose and significance of this study. Students who agreed to participate indicated their voluntary consent and proceeded to complete the questionnaire. The average completion time for the online survey was approximately 5–6 minutes.

Statistical Analysis

Data were analyzed using SPSS 25 (IBM Corporation, New York, USA). The normality of data distribution was assessed using the Shapiro–Wilk test. Descriptive statistics included mean, standard deviation, median, interquartile range, minimum, maximum, number, and percentage. The K-means clustering method was employed to identify natural and homogenous subgroups (profiles) of students based on their GAAIS subscale scores. As all GAAIS subscales were measured on the same Likert-type scale, standardization was not deemed necessary.

Multiple cluster solutions (two-, three-, and four-cluster models) were evaluated, and the three-cluster solution was selected based on conceptual interpretability and meaningful differentiation among student profiles. Accordingly, the clusters were labeled as "Optimists," "Realists," and "Traditionalists." Chi-square tests were used to examine differences between clusters in terms of categorical variables. Post hoc analyses were conducted to identify pairwise differences between groups. Additionally, descriptive statistics and reliability analyses of the scale were performed. A p value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from Aydın Adnan Menderes University Faculty of Nursing Non-Interventional Clinical Research Ethics Committee [Approval Number: 2025/453, Date: 04.08.2025]. The study was conducted in accordance with the principles of the Declaration of Helsinki. Written and verbal informed consent was obtained from all participants.

Results

The median age of the nursing students was 22 years. Of the participants, 79.3% (n=191) were female, 99.6% (n=240) were single, and 77.2% (n=186) reported a moderate income level [Table 1].

The median positive GAAIS score was 44, while the median negative GAAIS score was 24. These findings are presented alongside the mean, standard deviation, minimum and maximum values, and Cronbach's alpha coefficients for the scale [Table 2].

K-means cluster analysis identified three statistically significant and distinct student profiles based on GAAIS subscale scores. Differences between clusters were highly significant for both the Positive Attitude subscale (F(2, 238)=134.042, p<0.001) and the Negative Attitude subscale (F(2, 238)=153.710, p<0.001) [Table 3].

The clusters were categorized as follows:

Optimists (Cluster 1, n=95, 39.4%): This group demonstrated moderately high positive attitude scores (45.43) and the lowest negative attitude scores (18.91). These students primarily emphasized the benefits of AI with minimal concern regarding its risks or limitations (Table 3).

Realists (Cluster 2, n=102, 42.3%): The largest cluster, characterized by both the highest positive attitude scores (45.86) and the highest negative attitude scores (27.83). This dual perspective suggests that these students are pragmatic; they recognize the strong potential of AI in nursing while remaining critically aware of its limitations, including ethical concerns and issues related to reliability (Table 3).

Traditionalists (Cluster 3, n=44, 18.3%): Representing the smallest cluster, this group had the lowest mean positive attitude score (30.75) by a substantial margin. These

students appeared the least convinced of the utility and benefits of AI, reflecting a more resistant or hesitant stance toward its adoption in their education (Table 3).

No statistically significant difference was observed among the groups in terms of AI use in the theoretical component of the pediatric nursing course ($p=0.987$). However, significant differences were identified in practical applications. The Optimists group reported the highest frequency of AI use in clinical practice and patient-round preparation, whereas the Traditionalists group reported the lowest ($p=0.002$ and $p=0.039$, respectively). Additionally, both the Optimists and Realists groups perceived AI as positively influencing examination performance and learning outcomes ($p=0.002$ and $p=0.001$, respectively). In contrast, the Traditionalists group reported the lowest level of trust in AI and the most negative perceptions overall ($p<0.001$ and $p=0.040$, respectively) (Table 4).

Table 1. Sociodemographic characteristics of nursing students (n=241)

	n	%
Age	22	[20–27]
Gender		
Female	191	79.3
Male	50	20.7
Marital status		
Married	1	0.4
Single	240	99.6
Perceived income level		
High	20	8.3
Average	186	77.2
Low	35	14.5

min: Minimum, max: Maximum, n: Number, %: Percentage.

Table 2. Descriptive statistics and reliability of the General Attitudes Toward Artificial Intelligence Scale (GAAIS) subscales (n=241)

	Mean	Median (IQR)	Min–Max	Cronbach's α
Positive GAAIS	42.933	44 [7]; 12–66		0.842
Negative GAAIS	24.128	24 [8]; 8–40		0.871

IQR: Interquartile range, GAAIS: General Attitudes Toward Artificial Intelligence Scale.

Table 3. Distribution of student attitude profiles based on K-means cluster analysis [3-cluster solution] (n=241)

	Cluster 1 (n=95)	Cluster 2 (n=102)	Cluster 3 (n=44)	F	p
Positive GAAIS	45.43	45.86	30.75	134.042	<0.001
Negative GAAIS	18.91	27.83	26.82	153.710	<0.001

Clusters were identified using K-means cluster analysis. n: Number of participants in each cluster.

F: ANOVA test.

Table 4. Comparison of AI use and perceived effectiveness across student clusters (chi-square test results) (n=241)

	Cluster 1: Optimists (n=95)	Cluster 2: Realists (n=102)	Cluster 3: Traditionalists (n=44)	X ²	p
Use in theoretical lessons					
Yes	89 [93.7]	95 [93.1]	41 [93.2]	0.027	0.987
Use in clinical practice					
Yes	80 [84.2]	84 [82.4]	26 [59.1]	12.683	0.002
Use for visit preparation					
Yes	79 [83.2]	76 [74.5]	28 [63.6]	6.467	0.039
Use for examination preparation					
Yes	76 [80]	80 [78.4]	28 [63.6]	4.884	0.087
Impact on examination success					
Positive	74 [77.9]	77 [75.5]	22 [50]	12.752	0.002
Effect on learning					
Positive	93 [97.9]	99 [97.1]	36 [81.8]	19.670	0.001
Overall attitude toward AI					
Positive	82 [86.3]	78 [76.5]	21 [47.7]	29.923	<0.001
Trust in AI-generated information					
Always	7 [7.4]	1 [1]	4 [9.1]		
Mostly	59 [62.1]	53 [52]	27 [61.4]	11.937	0.040
Undecided	27 [28.4]	43 [42.2]	11 [25]		
Do not trust	2 [2.1]	5 [4.9]	2 [4.5]		
Frequency of AI use					
Daily	32 [33.7]	32 [31.4]	8 [18.2]	8.971	0.062

Clusters were identified using K-means cluster analysis. n: Number of participants in each cluster. Chi-square test was used.

Discussion

The present study provides important insights into the use of AI tools among nursing students enrolled in a pediatric nursing course and identifies distinct, homogeneous student profiles based on their AI usage patterns and attitudes. The findings indicate that students classified as Optimists and Realists reported more frequent use of AI in clinical practice and during patient-visit preparation, and they perceived AI as having a positive impact on learning and examination performance. Although both groups expressed positive attitudes toward AI, Realists demonstrated a greater tendency to critically evaluate and question AI-generated information. In contrast, Traditionalists reported lower levels of AI use in both coursework and clinical settings and expressed more negative attitudes toward AI.

Pediatric nursing education is a specialized field that prepares future nurses to provide care for children and their families. Compared with adult nursing, it emphasizes family-centered care, atraumatic care, developmental considerations, and effective communication with children. Within this context, AI tools may support students in interacting with virtual patients and analyzing clinical data, including symptoms, treatment options, and nursing care plans. In pediatric settings, AI-based simulations may offer safe environments for practicing sensitive skills such as age-appropriate communication, weight-based medication calculations, and family-centered care planning, without exposing real patients to potential risks. Additionally, AI tools may enhance decision-making processes and facilitate rapid access to information.^{12,6,19-21} Therefore, examining both AI use and student attitudes toward AI within pediatric nursing education is of particular importance. Previous studies have similarly reported high levels of awareness and willingness among nursing students to use AI technologies.^{12,22,23} The integration of AI into nursing education may thus contribute to improved learning outcomes, academic performance, and technological readiness.²⁴

Beyond general educational benefits, the findings suggest that AI use in pediatric nursing education may also contribute to the development of core pediatric nursing competencies. First, AI-supported learning environments may enhance clinical reasoning by enabling students to interpret patient data, compare care alternatives, and evaluate clinical scenarios systematically.^{12,24} Second, the use of AI in pediatric contexts requires heightened ethical awareness, particularly regarding data privacy, critical appraisal of AI-generated information, and responsible decision-making when caring for vulnerable populations such as children.^{22,24} Third, AI tools may support child-family communication by assisting in the preparation of age-appropriate explanations, educational materials, and family-centered care plans.^{6,19-21} In this sense, AI should be viewed not as a replacement for professional judgment but as a complementary tool that can enhance essential competencies in pediatric nursing practice.^{12,22-24}

Overall, nursing students in this study demonstrated generally favorable attitudes toward AI. Based on the scoring structure of the GAAIS, higher scores on the positive subscale indicate more favorable attitudes toward AI, whereas higher scores on the negative subscale reflect stronger negative attitudes.¹⁸ Previous studies involving nursing students have similarly reported high positive GAAIS scores and relatively low negative scores.^{24,25} These findings may be associated with the increasing integration of AI into both nursing education and clinical practice. Additionally, students who have grown up in digitally rich environments may be more likely to perceive AI-based tools as valuable resources for accessing academic information.

Cluster analysis was conducted to systematically categorize heterogeneity in students' attitudes and AI usage behaviors, identifying three distinct clusters. The first cluster, Optimists, consisted of students with relatively high positive GAAIS scores and the lowest negative GAAIS scores. This profile represents students who perceive the benefits of AI while expressing minimal concern about potential risks. The second cluster, Realists, included the largest number of students and demonstrated the highest positive GAAIS scores along with moderately elevated negative GAAIS scores. This pattern suggests that these students recognize the potential benefits of AI while maintaining concerns related to ethics, reliability, and the learning process. The third cluster, Traditionalists, represented the smallest group and exhibited the lowest positive GAAIS scores. These students appeared less convinced of the benefits of AI and demonstrated the greatest hesitation toward its use. The cluster labels were defined in accordance with Rogers' Diffusion of Innovations Theory⁸.

The results demonstrated clear differences in AI usage across clusters. Optimists and Realists reported frequent use of AI in clinical practice and visit preparation, whereas Traditionalists exhibited the lowest levels of use. Notably, only about half of the Traditionalists perceived AI as beneficial for examination success, compared with substantially higher proportions in the other clusters, suggesting that perceived effectiveness may be a key driver of AI adoption. Overall, these findings indicate that students with more favorable perceptions are more likely to use AI not only to support theoretical learning but also in practice-oriented contexts, such as clinical preparation.

The three-profile structure (positive, balanced/critical, and skeptical) closely parallels Rogers' Diffusion of Innovations Theory. Optimists resemble Innovators and Early Adopters, Realists resemble the Early Majority, and Traditionalists resemble Laggards.⁸ The lower perceived usefulness of AI among Traditionalists is also consistent with the concept of Perceived Usefulness described in Davis's Technology Acceptance Model.⁹ When a technology is not perceived as sufficiently useful or reliable in demanding contexts such as clinical preparation, adoption and usage remain limited. These findings suggest that not only attitudes but also perceived usefulness and trust in technology play important roles in determining usage differences, particularly in educational contexts involving clinical skill development. Current literature examining the integration of AI into health education has particularly emphasized the role of clinical decision-support and simulation tools.^{26,27} However, concerns related to transparency and explainability continue to influence acceptance among healthcare professionals.²⁸ The reservations observed among Realists regarding ethics and reliability despite their positive attitudes are consistent with studies showing that healthcare professionals may simultaneously recognize the potential of AI and critically evaluate its risks. Accordingly, educational strategies may benefit from addressing the needs of Traditionalists by emphasizing the reliability and demonstrated effectiveness of AI, particularly in relation to clinical decision-making and practice.

The distinct profiles identified in this study suggest that pediatric nursing education may benefit from moving beyond a uniform curriculum toward a more differentiated pedagogical approach. Educators should recognize that access to technology alone does not ensure effective learning across all student groups, highlighting the need for tailored educational interventions. For Optimists, who may be more susceptible to overreliance on technology, the primary pedagogical concern is the uncritical acceptance of AI-generated information, which may pose risks to clinical safety. Educational approaches for this group may emphasize verification skills, data privacy, and critical evaluation of AI outputs in relation to evidence-based pediatric nursing guidelines. For Realists, who combine active use with concerns about ethics and reliability, educational strategies should focus on strengthening ethical awareness and promoting transparency. Instruction that explains how AI systems function, particularly through the use of explainable AI approaches, may help reduce uncertainty and enhance confidence. Practice-based learning activities that demonstrate the direct clinical relevance of AI tools, such as simplifying complex care plans or supporting clinical documentation, may help reduce skepticism by making their benefits more observable.^{8,9,29}

Study Limitations

This study has several limitations. First, its cross-sectional design captures students' use of AI and their attitudes at a single point in time. This temporal constraint limits interpretation of the identified profiles as fixed categories and prevents examination of how adoption patterns may evolve with increasing clinical experience, an important dimension emphasized in diffusion theory. Consequently, the findings may not reflect longer-term changes in attitudes toward AI, and causal relationships cannot be established. Second, study was conducted with nursing students from a single university, which limits the generalizability of the findings to students in other institutions or disciplines. Additionally, the GAAIS scale assesses general attitudes toward AI and may not fully capture attitudes specific to pediatric nursing applications. Finally, the reliance on self-reported data may affect interpretation of findings related to clinical competence. Positive attitude scores reflect perceived confidence rather than objectively measured skills, and discrepancies may exist between reported confidence and actual competence in the ethical and safe use of AI in pediatric settings. Therefore, the high adoption rates observed among Optimists should be interpreted as an indication of willingness to use technology rather than as direct evidence of clinical competence or safe practice.

Conclusion

This study identified three distinct profiles among nursing students with respect to their attitudes toward and use of AI: Optimists, Realists, and Traditionalists. The findings indicate that a positive attitude toward AI does not necessarily translate into consistent use or trust, particularly among the Realists and Traditionalists. Although both Optimists and Realists demonstrate a general willingness to engage with new technologies, the resistance observed among Traditionalists suggests that perceived usefulness and reliability are significant barriers to adoption. These results imply that nursing education should not rely on a uniform approach to AI integration. Instead, a differentiated pedagogical strategy is needed—one that strengthens critical evaluation and verification skills among enthusiastic adopters while clearly demonstrating practical and tangible benefits to more skeptical students. Ultimately, integrating AI literacy with a strong emphasis on ethical awareness and patient safety will help ensure that future nurses are not only users of technology but also competent professionals capable of applying it effectively in pediatric care.

Ethics Committee Approval: The study was approved by the Aydın Adnan Menderes University Faculty of Nursing Non-Interventional Clinical Research Ethics Committee [Approval Number: 2025/453, Date: 04.08.2025].

Informed Consent: Verbal informed consent was obtained from the students.

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Academic Career Awareness and Attitudes Toward Graduate Education Among Nursing Students: A Cross-Sectional Study

Abstract

Background: Nursing students' awareness of academic career pathways and their attitudes toward graduate education are critical determinants shaping the future quality and sustainability of the nursing profession. Identifying these factors enables students to engage in informed career planning and to assume more active and effective roles in their professional lives.

Aim: This study aimed to examine nursing students' levels of academic career awareness and their attitudes toward graduate education.

Methods: This descriptive cross-sectional study was conducted with 473 students enrolled in a nursing faculty. Data were collected using the Student Information Form, the Academic Career Awareness Scale, and the Attitude Toward Graduate Education Scale. Independent samples t-tests, one-way analysis of variance (ANOVA), and Pearson correlation analysis were used for data analysis.

Results: The mean total score for academic career awareness among nursing students was 70.33 ± 19.57 . Subscale mean scores were as follows: becoming a faculty member and working conditions [29.17 ± 9.23], definition and purpose of graduate education [18.17 ± 4.33], graduation requirements for graduate education [14.17 ± 4.92], and application requirements for graduate education [8.81 ± 3.26]. The mean total score for attitudes toward graduate education was 53.58 ± 11.13 , with subscale scores of 34.31 ± 7.15 for functionality and 19.26 ± 5.59 for willingness. Positive and statistically significant correlations were identified between total academic career awareness scores and attitudes toward graduate education and its subdimensions [$r=0.142-0.372$; $p<0.05$].

Conclusion: Nursing students demonstrated moderate levels of academic career awareness and attitudes toward graduate education. These findings highlight the importance of strengthening academic career awareness through structured career guidance, mentoring, and greater exposure to graduate education opportunities to support informed career planning and encourage engagement in graduate education.

Keywords: Academic career, attitude, awareness, graduate education, nursing students

 Sema Kömürkara,¹  Züleyha Gürdap,²
 Zeliha Cengiz,²  Şerife Ince³

¹Department of Home Care Services, Health Care Services Program, Vocational School of Health Services, Inonu University, Malatya, Türkiye

²Department of Nursing Fundamentals, Inonu University Faculty of Nursing, Malatya, Türkiye

³Department of Nursing Fundamentals, Adıyaman University Faculty of Health Sciences, Adıyaman, Türkiye

Introduction

Global transformations in healthcare systems have led to substantial improvements in the quality of care while simultaneously requiring nurses to adopt a professional identity characterized by inquiry, engagement in research, and continuous self-development.¹ This evolving role underscores the importance of strengthening nursing not only in clinical practice but also within the academic domain. Scientific research and evidence-based practice have been consistently emphasized as fundamental drivers of professionalization in nursing.^{2,3} Ensuring the sustainability of academic advancement in nursing requires the early promotion of students' awareness of academic career pathways.

Academic career awareness extends beyond participation in graduate education; it encompasses individuals' knowledge of academic processes, their understanding of academic roles, and their motivation for scholarly development.^{4,5} Such awareness enables individuals to recognize their competencies, engage in informed career planning, and assume more active and influential roles in their professional lives.⁵ Previous studies have reported that academic career awareness among nursing students plays a significant role in professional development, academic motivation, and perceptions of self-efficacy.^{6,7} These findings suggest that fostering academic career awareness at an early stage is essential for strengthening students' attitudes toward graduate education.

The continuity of professional development in nursing highlights the critical importance of graduate education beyond undergraduate training in meeting society's evolving healthcare needs.⁸ Graduate education provides opportunities for specialization, sustained intellectual growth, and lifelong professional development.^{9,10} Moreover, it facilitates the development of academic competencies by offering experience in scientific research and supporting individual professional advancement.¹¹ At a broader level, educating specialized professionals in areas of national need contributes to the generation of evidence-based practices, clinically applicable outcomes, and innovative scientific projects.^{11,12}

Empirical evidence indicates that nursing students demonstrate a high level of interest in pursuing graduate education.^{7,8} In a study conducted by Kavurmacı et al.,¹³ 77.1% of nursing students reported considering

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Corresponding author: Sema Kömürkara
E-mail: sema.komurkara@inonu.edu.tr

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graduate education, while 45.3% indicated that they planned to pursue it with the intention of an academic career. Beyond academic advancement, graduate education contributes significantly to the development of professional self-confidence, specialization, and leadership capacity.¹⁴ These competencies may enhance individuals' ability to manage complex situations, participate effectively in decision-making processes, and demonstrate professional leadership.

Nursing is a multifaceted discipline in which theory and practice are closely intertwined. Therefore, high levels of academic career awareness among undergraduate nursing students are essential for successful progression in both academic and clinical contexts.⁶ However, studies directly examining academic career awareness among undergraduate nursing students remain limited; existing research has predominantly focused on general attitudes toward graduate education.^{4,15} Identifying students' levels of academic career awareness is nevertheless a critical approach to understanding their orientation toward graduate education.⁴

In conclusion, the concurrent evaluation of nursing students' academic career awareness and their attitudes toward graduate education is of considerable importance for both the future of the nursing profession and students' individual development.^{1,6} Given that most existing studies primarily focus on general attitudes toward graduate education, there is a clear need to conceptualize academic career awareness as a multidimensional construct. Furthermore, examining the relationships between students' sociodemographic and academic characteristics and their academic career awareness and attitudes may help identify groups requiring targeted support. In this respect, the present study provides evidence-based contributions to career counseling, mentoring initiatives, and strategies aimed at promoting graduate education within nursing education.

Research Questions

- What are the levels of academic career awareness and attitudes toward graduate education among nursing students?
- Do nursing students' academic career awareness levels and attitudes toward graduate education differ according to their sociodemographic characteristics?
- Is there a significant relationship between nursing students' academic career awareness levels and their attitudes toward graduate education?

Materials and Methods

Study Design

This study employed a descriptive cross-sectional design.

Study Setting and Sample

The study was conducted at the nursing faculty of a public university in Malatya, Türkiye. This setting was selected because the faculty implements a standardized national curriculum and attracts students from diverse geographic regions, thereby enhancing the representativeness of the findings. The study population consisted of 1,053 nursing students enrolled during the 2024–2025 academic year. The minimum required sample size was calculated using OpenEpi (Version 3), with a 99% confidence level and a 5% margin of error, resulting in a target sample of at least 408 participants. The study was completed with 473 nursing students who fully completed the data collection forms.

Data Collection Tools

Data were collected using the Student Information Form, the Academic Career Awareness Scale, and the Attitude Toward Graduate Education Scale.

Student Information Form: This form included items assessing students' demographic and academic characteristics, such as age, gender, grade point average (GPA), reasons for choosing the nursing program, year of study, foreign language proficiency, post-graduation career goals, perceived sufficiency of knowledge about graduate education, and intentions to pursue graduate education.¹⁷

Academic Career Awareness Scale: This scale was developed by Dağyar et al.,⁴ and its validity and reliability were established in 2021. The scale consists of 31 items rated on a four-point Likert scale and comprises four subdimensions: becoming a faculty member and working conditions (items 19–31), definition and purpose

of graduate education (items 1–7), graduation requirements for graduate education (items 8, 9, 10, 15, 16, 17, and 18), and application requirements for graduate education (items 11–14). The scale assesses students' awareness across these domains. Total scores are interpreted as follows: 0–31 indicate no or very low awareness, 32–62 low awareness, 63–93 moderate awareness, and 94–124 high awareness. The original Cronbach's alpha coefficient was reported as 0.974 while in the present study it was calculated as 0.96.

Attitude Toward Graduate Education Scale: Students' attitudes toward graduate education were assessed using the Attitude Toward Graduate Education Scale, developed by Ünal and İltir, with established validity and reliability in 2010.¹⁸ This scale consists of 15 items rated on a five-point Likert scale and includes two subdimensions: functionality (first 9 items) and willingness (last 6 items). Possible total scores range from 15 to 75. The scale can be interpreted using both total and sub-scale scores, with higher scores indicating more positive attitudes toward graduate education. The original Cronbach's alpha coefficient was reported as 0.95,¹⁸ while it was calculated as 0.93 in the present study.

Data Collection

Data were collected between November 2024 and February 2025. To uphold ethical standards and ensure the trustworthiness of the data, several measures were implemented to minimize any potential perceived pressure on participants. Students were clearly informed that participation was entirely voluntary and that refusal to participate would not affect their academic grades, examination results, or relationships with faculty members. To ensure anonymity and confidentiality, no personal identifiers, student numbers, or signatures were collected. Both written and verbal informed consent were obtained from all participants before data collection. The questionnaires were administered face-to-face in a classroom setting and required approximately 10 minutes to complete.

Data Analysis

Data were analyzed using SPSS (Statistical Package for the Social Sciences; IBM Corp., Armonk, NY, USA; released 2012), version 26.0. The distribution of scale scores was examined using skewness and kurtosis values, and the assumption of normality was satisfied (± 1.5).¹⁹ Descriptive statistics were reported as percentages, means, standard deviations, and minimum–maximum values. Differences between two groups were analyzed using independent samples t-tests, while differences among three or more groups were examined using one-way analysis of variance (ANOVA) with appropriate post hoc tests (Hochberg or Games–Howell). Homogeneity of variances was assessed using Levene's or Welch's tests. Relationships between academic career awareness and attitudes toward graduate education were evaluated using Pearson correlation analysis. The Pearson correlation coefficients were categorized into five levels of strength: very low (0.00–0.10), weak (0.10–0.30), moderate (0.30–0.50), strong (0.50–0.70), and very strong (0.70–1.00).²⁰ Internal consistency was assessed using Cronbach's alpha coefficients, and statistical significance was set at $p < 0.05$.

Ethical Considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki, and all necessary institutional permissions were obtained. Participants were informed about the purpose and content of the study prior to data collection, and both written and verbal informed consent were obtained from all participants on a voluntary basis before participation. Ethical approval was granted by Inonu University Scientific Research and Publication Ethics Committee (Approval Number: 2024/6609, Date: 05.11.2024).

Results

The mean age of the nursing students was 21.09 ± 2.40 years, and the majority were female (74.6%). Approximately half (50.1%) had a GPA between 2.50 and 2.99, and 30.2% were third-year students. More than half of the students (60.9%) reported choosing the nursing program due to employment opportunities. Regarding foreign language proficiency, 51.0% perceived their level as weak. Clinical nursing was identified as the primary career goal by 36.4% of the students. The majority (69.8%) reported having insufficient knowledge about graduate education, while 38.9% indicated that they intended to pursue graduate education (Table 1).

Table 1. Descriptive characteristics of the students (n=473)

Variables		
Age		
Mean±SD	21.09±2.40	
Min-Max	17-44	
	n	%
Gender		
Female	353	74.6
Male	120	25.4
GPA		
2.0-2.49	13	2.7
2.50-2.99	237	50.1
3.0-3.49	200	42.3
3.5-4.0	23	4.9
Year of study		
1 st year	125	26.4
2 nd year	112	23.7
3 rd year	143	30.2
4 th year	93	19.7
Reason for choosing nursing		
Entrance exam score	81	17.1
Employment opportunities	288	60.9
Family and social factors	43	9.1
Economic reasons	12	2.5
Other	49	10.4
Perceived foreign language proficiency		
Good	36	7.6
Moderate	196	41.4
Weak	241	51.0
Post-graduation career goal		
Academic career	126	26.6
Clinical nurse	172	36.4
Specialty nurse	73	15.4
Nurse manager	31	6.6
Other	71	15.0
Sufficient knowledge about graduate education		
Yes	143	30.2
No	330	69.8
Intention to pursue graduate education		
Yes	184	38.9
No	114	24.1
Undecided	175	37.0

SD: Standard deviation, Min: Minimum, Max: Maximum, GPA: Grade point average.

The mean total score on the Academic Career Awareness Scale was 70.33±19.57. Subdimension scores were as follows: becoming a faculty member and working conditions [29.17±9.23], definition and purpose of graduate education [18.17±4.33], graduation requirements for graduate education [14.17±4.92], and application requirements for graduate education [8.81±3.26]. The mean total score on the Attitude Toward Graduate Education Scale was 53.58±11.13. Subscale analyses indicated mean scores of 34.31±7.15 for functionality and 19.26±5.59 for willingness [Table 2].

Statistically significant differences were observed in the mean scores of the Academic Career Awareness Scale and the Attitude Toward Graduate Education Scale, as well as their subdimensions, according to gender, GPA, year of study, post-graduation career goals, level of knowledge about graduate education, and intention to pursue graduate education ($p<0.05$) [Appendix 1].

Positive and statistically significant correlations were identified between the total score of the Academic Career Awareness Scale and the total score of the Attitude Toward Graduate Education Scale, as well as its subdimensions ($p<0.05$). The strongest association was observed between awareness of the definition and purpose of graduate education and overall attitude scores ($r=0.372$, $p<0.01$). Correlation coefficients for the remaining subdimensions ranged from low to moderate, and all associations were statistically significant ($p<0.01$) [Table 3].

Discussion

The scientific and academic future of the nursing profession is closely linked to students' ability to recognize academic roles and evaluate graduate education opportunities during their undergraduate education. However, the existing literature indicates that nursing students generally have limited knowledge and experience regarding academic roles and graduate education.^{21,22} Previous studies have shown that many students do not regularly follow scientific journals, lack research experience, exhibit negative attitudes toward research, and experience motivational challenges.²¹⁻²³ These findings suggest that nursing education programs may provide insufficient guidance regarding academic career pathways and the scope of graduate education, highlighting the need for additional efforts to strengthen professional development and research culture. In contemporary healthcare systems, the importance of evidence-based practice and a well-qualified academic workforce continues to grow. Accordingly, the concurrent examination of nursing students' academic career awareness and their attitudes toward graduate education represents a critical need.

In the present study, nursing students' overall academic career awareness was found to be at a moderate level. Subdimension analyses revealed that awareness related to becoming a faculty member and working conditions, as well as the definition and purpose of graduate education, was moderate, whereas awareness regarding graduation and application requirements for graduate education was relatively lower. Although studies directly assessing academic career awareness among nursing students are limited, previous research has examined related constructs such as research attitudes, awareness of graduate education, and perceived research competence.^{7,24,25} Almarwani reported that nursing students exhibited positive attitudes toward research, influenced by factors such as participation in research activities, academic support, and satisfaction with research skills.²⁴ Similarly, Ersin found that students' attitudes toward research were moderate and associated with motivation, willingness to participate in research, and habits of reading scientific publications.²⁵ Other studies have emphasized that although awareness and attitudes are generally positive or moderate, deficiencies in academic skills, experience, and institutional support may constrain the development of academic career awareness.^{7,21,26,27} Consistent with these findings, the present study underscores the importance of structural supports such as mentoring, research-oriented coursework, and participation in academic activities to foster academic awareness. Strengthening academic skill development, experiential learning, and institutional support mechanisms in nursing may directly influence students' career development.

The results of this study indicated that nursing students' overall attitudes toward graduate education, as well as their subdimension scores, were at a moderate level. Previous studies similarly report that nursing students generally hold moderate to positive attitudes toward graduate education.^{7,8,28-30} This finding suggests that students possess a certain level of awareness regarding research activities and professional development and demonstrate a willingness to advance within their areas of specialization. Given the critical role of graduate education in the professionalization of nursing, the moderate to positive attitudes identified in this study may reflect an openness to research, practice, and professional growth that has not yet been fully consolidated due to various individual, institutional, or environmental factors. These may include insufficient knowledge about graduate education, limited academic self-confidence, economic and time-related constraints, demanding clinical working conditions, or a lack of strong encouragement for academic careers within nursing. Consequently, although students may recognize the importance of graduate education, their motivation to pursue it may remain limited.

In the present study, female students demonstrated significantly higher scores on the functionality and willingness subdimensions of attitudes toward graduate education compared with male students. Similar findings have been reported in the literature, indicating higher attitude scores among female students.^{28,29} This result may suggest

Table 2. Mean scores of students on the Academic Career Awareness Scale and Attitude Toward Graduate Education Scale and their subdimensions (n=473)

	Mean	SD	Min–Max	Cronbach's α
Academic Career Awareness Scale	70.33	19.57	31–124	0.96
Awareness of becoming a faculty member and working conditions	29.17	9.23	12–52	
Awareness of the definition and purpose of graduate education	18.17	4.33	7–28	
Awareness of graduation requirements for graduate education	14.17	4.92	7–31	
Awareness of application requirements for graduate education	8.81	3.26	4–16	
Attitude Toward Graduate Education Scale	53.58	11.13	15–75	0.93
Functionality subdimension	34.31	7.15	9–45	
Willingness subdimension	19.26	5.59	6–30	

SD: Standard deviation, Min: Minimum, Max: Maximum.

Table 3. Correlations between Academic Career Awareness Scale and Attitudes Toward Graduate Education Scale and their subdimensions

		Attitude Toward Graduate Education Scale	Functionality subdimension	Willingness subdimension
Academic Career Awareness Scale	r	0.266**	0.196**	0.279**
Awareness of becoming a faculty member and working conditions	r	0.212**	0.142**	0.239**
Awareness of the definition and purpose of graduate education	r	0.372**	0.341**	0.304**
Awareness of graduation requirements for graduate education	r	0.185**	0.112*	0.225**
Awareness of application requirements for graduate education	r	0.223**	0.151**	0.251**

*, p<0.05, **, p<0.01. r: Pearson correlation coefficient.

that female students place greater importance on graduate education in terms of professional specialization, career advancement, and academic development. Additionally, academic career awareness and attitudes toward graduate education increased significantly with higher GPA levels. Taşdemir and Taşdemir likewise reported that students' attitudes toward graduate education improved as academic achievement increased.²⁹ Previous research has also shown that students with higher academic performance tend to hold more positive perspectives toward advanced academic goals and demonstrate higher levels of motivation.³⁰ The association between GPA and career orientation, as well as expectations of professional success, has been well documented.³¹ These findings suggest that academic achievement is not merely an indicator of performance but also a key factor influencing students' career orientations, research interests, and awareness of graduate education.

Similarly, fourth-year students exhibited significantly higher academic career awareness and more positive attitudes toward graduate education compared with students in earlier years. Consistent with the literature, awareness of graduate education, professional expectations, and academic orientation appear to strengthen as students progress through their academic training.⁷ Proximity to graduation, intensified career planning, and increased exposure to information about graduate education may explain this finding. Furthermore, students who reported having sufficient knowledge about graduate education demonstrated significantly higher awareness and attitude scores than those who did not. Likewise, students who intended to pursue graduate education scored higher than those who were undecided or did not plan to do so. Yılmaz et al.⁷ reported that students who intended to pursue graduate education and who followed professional publications demonstrated more positive attitudes toward research and scientific developments. Similar findings have been reported by Bozkurt and by Satir and Murat, indicating that willingness to pursue graduate education significantly influences students' attitudes.^{8,26} These results suggest that nursing students perceive graduate education not merely as an academic option but as a critical step toward specialization, enhanced professional quality, and strengthened professional competence. As students' knowledge increases, they may develop more determined, goal-oriented, and motivated approaches to graduate education.

Finally, the present study identified positive and statistically significant relationships between nursing students' academic career awareness and their attitudes toward graduate education. Awareness related to the definition and purpose of graduate education demonstrated a stronger association with attitudes than other subdi-

mensions, whereas awareness of becoming a faculty member, working conditions, and graduation and application requirements showed low to moderate associations. These findings suggest that students' cognitive understanding of the content and objectives of graduate education plays a decisive role in shaping their attitudes. Consistent with this result, Yılmaz et al.⁷ reported a significant relationship between nursing students' awareness of research and scientific developments and their attitudes toward graduate education. In a study conducted with graduate nurses, İncesu and Sönmez found that higher levels of academic self-efficacy and more positive attitudes were associated with increased academic motivation.³⁰ The literature further suggests that awareness of professional roles and working conditions alone may not strongly influence attitudes unless accompanied by motivation, financial support, and academic self-efficacy.^{30,32} In this context, enhancing students' knowledge about the content of graduate education, while simultaneously supporting career planning and critical thinking skills, may strengthen their attitudes. The comprehensive promotion of graduate education opportunities and academic career pathways by educational institutions may also positively influence students' motivation and intention to pursue graduate education.

Limitations of the Study

This study has several limitations. Its cross-sectional design and implementation at a single university limit the ability to assess changes in students' awareness and attitudes over time and restrict the generalizability of the findings. Additionally, data were collected using self-report measures, which may have introduced social desirability bias. Therefore, the findings should be interpreted with caution. Future research should employ multicenter and longitudinal designs and include diverse student populations to provide a more comprehensive understanding of academic career awareness and attitudes toward graduate education.

Conclusion

This study highlights the importance of fostering academic career awareness among nursing students to support informed career planning and encourage engagement in graduate education. Strengthening academic career awareness through educational and institutional initiatives may contribute to students' academic and professional development and help prepare a future nursing workforce with stronger academic and research competencies.

Based on these findings, systematically planned, career-oriented activities related to graduate education and experience-based learning opportunities may contribute to enhancing students' academic career awareness. Furthermore, structured guidance from faculty members regarding graduate education and academic career opportunities, along with institutional initiatives aimed at strengthening mentoring relationships, may support nursing students' academic and professional development.

Ethics Committee Approval: The study was approved by the Inonu University Scientific Research and Publication Ethics Committee (Approval Number: 2024/6609, Date: 05.11.2024).

Informed Consent: Written informed consent was obtained from all participants.

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Appendix 1. Comparison of academic career awareness and attitudes toward graduate education by students' characteristics (n=473)

Variables Mean±SD									
	Academic Career Awareness Scale Mean±SD	Awareness of becoming a faculty member and working conditions Mean±SD	Awareness of the definition and purpose of graduate education Mean±SD	Awareness of graduation requirements for graduate education Mean±SD	Awareness of application requirements for graduate education Mean±SD	Attitude Toward Graduate Education Scale Mean±SD	Functionality subdimension Mean±SD	Willingness subdimension	
Gender									
Female	69.40±19.45	28.68±9.22	18.12±4.29	13.93±4.86	8.66±3.26	54.35±10.56	34.91±6.84	19.44±5.46	
Male	73.08±19.74	30.60±9.15	18.33±4.45	14.88±5.04	9.25±3.25	51.31±12.43	32.56±7.76	18.75±5.96	
t/p	-1.784/0.075	-1.976/ 0.049	-4.61/0.645	-1.827/0.068	-1.735/0.083	2.600/ 0.010	3.133/ 0.002	1.175/0.241	
GPA									
2.0-2.491	54.61±18.11	23.30±8.31	14.23±5.13	10.53±3.86	6.53±3.01	44.00±15.44	28.76±8.62	15.23±7.65	
2.50-2.992	69.19±19.02	28.60±9.07	17.86±4.17	14.19±5.00	8.52±3.17	52.37±11.32	33.69±7.21	18.68±5.74	
3.0-3.493	72.46±20.08	30.21±9.42	18.83±4.32	14.22±4.87	9.19±3.36	55.47±9.94	35.48±6.57	19.99±5.13	
3.5-4.04	72.47±17.45	29.30±9.23	17.86±4.34	15.56±4.38	9.73±2.76	55.04±12.42	33.78±8.50	21.26±5.02	
F/p	4.020/ 0.008*	2.934/0.033	5.707/ 0.001*	3.019/ 0.030*	4.332/ 0.005*	6.394/ 0.000*	5.150/ 0.002*	4.287/0.010 [#]	
	3, 4>1		2, 3>1	4>1	3, 4>1	2, 3, 4>1; 3>2	3>1		
Year of study									
1 st year	65.14±20.35	27.21±9.43	16.81±4.46	13.24±5.37	7.87±3.22	52.46±13.13	33.46±8.84	19.00±5.72	
2 nd year	69.55±18.02	28.86±8.59	18.08±4.04	14.08±4.55	8.50±3.12	54.50±10.80	34.92±6.42	19.58±5.79	
3 rd year	70.66±18.70	29.35±9.17	18.48±4.18	14.06±4.70	8.75±3.04	52.17±9.91	33.87±6.58	18.30±5.34	
4 th year	77.75±19.53	31.89±9.26	19.62±4.33	15.70±4.76	10.52±3.23	56.15±9.91	35.40±6.10	20.74±5.30	
F/p	7.777/ 0.000*	4.728/ 0.003*	8.181/ 0.000*	4.652/ 0.003*	13.265/ 0.000*	3.582/ 0.014*	1.843/0.140	4.133/ 0.007*	
	4>1, 2, 3	4>1	3, 4>1	4>1	4>1, 2, 3	4>3		4>3	
Reason for choosing nursing									
Entrance exam score	68.38±21.70	28.19±9.82	17.91±4.84	13.92±5.26	8.34±3.61	53.54±11.27	34.19±6.74	19.34±6.03	
Employment opportunities	70.02±18.82	29.07±8.86	18.15±4.28	13.95±4.65	8.84±3.22	53.25±10.54	34.16±7.02	19.08±5.35	
Family and social factors	72.34±18.77	30.04±9.27	18.41±3.36	14.95±5.24	8.93±3.06	53.90±11.75	34.55±7.73	19.34±5.64	
Economic reasons	76.50±18.54	31.83±8.77	18.83±3.63	16.50±5.38	9.33±3.36	58.66±9.94	37.50±5.45	21.16±5.21	
Other	72.10±21.29	29.95±10.51	18.34±4.76	14.65±5.45	9.14±3.12	54.08±13.80	34.40±8.36	19.67±6.39	
F/p	0.729/0.573	0.666/0.616	0.196/0.940	1.255/0.287	0.634/0.638	0.721/0.578	0.644/0.631	0.489/0.744	
Perceived foreign language proficiency									
Good	75.80±21.00	31.55±9.83	18.44±4.59	15.83±5.89	9.97±3.47	53.08±13.60	33.33±7.99	19.75±7.02	
Moderate	70.59±19.69	29.37±9.31	18.27±4.49	14.20±4.70	8.74±3.27	53.81±10.71	34.21±6.76	19.59±5.35	
Weak	69.30±19.19	28.65±9.05	18.05±4.17	13.90±4.91	8.69±3.21	53.47±11.10	34.54±7.33	18.93±5.55	
F/p	1.762/0.173	1.635/0.196	0.204/0.816	2.421/0.090	2.483/0.085	0.088/0.916	0.479/0.620	0.891/0.411	
Post-graduation career goal									
Academic career ¹	77.26±18.74	32.25±9.24	19.75±3.99	15.15±4.62	10.11±3.19	59.99±9.63	36.87±5.90	23.11±4.48	
Clinical nurse ²	70.65±17.21	29.22±8.42	18.28±3.61	14.44±4.64	8.70±2.97	51.56±9.77	33.77±7.02	17.78±5.11	
Specialty nurse ³	63.89±19.09	26.63±8.87	16.78±4.46	12.76±4.73	7.71±3.11	50.52±9.62	32.69±6.57	17.82±4.77	
Nurse manager ⁴	68.64±23.47	28.93±7.81	17.64±4.23	14.06±4.87	8.00±3.11	51.32±10.33	30.03±7.30	19.29±4.85	
Other ⁵	64.61±23.47	26.30±10.46	16.77±5.41	13.29±5.89	8.23±3.63	51.25±13.93	33.74±8.76	17.50±6.37	
F/p	7.958/ 0.000*	6.933/ 0.000*	7.757/ 0.000*	3.481/ 0.010*	8.400/ 0.000*	18.162/ 0.000*	7.796/ 0.000*	28.909/ 0.000*	
	1>2, 3, 5	1>2, 3, 5	1>2, 3, 5	1>3	1>2, 3, 4, 5	1>2, 3, 4, 5	1>2, 3, 4	1>2, 3, 4, 5	

Appendix 1. Cont.

Variables	Mean±SD	Academic Career Awareness Scale Mean±SD	Awareness of becoming a faculty member and working conditions Mean±SD	Awareness of the definition and purpose of graduate education Mean±SD	Awareness of graduation requirements for graduate education Mean±SD	Awareness of application requirements for graduate education Mean±SD	Attitude Toward Graduate Education Scale Mean±SD	Functionality subdimension Mean±SD	Willingness subdimension
Sufficient knowledge about graduate education									
Yes		79.67±20.00	33.00±9.54	19.98±4.27	16.31±5.10	10.36±3.42	55.79±11.83	35.38±6.94	20.41±6.09
No		66.29±17.96	27.51±8.59	17.39±4.12	13.24±4.55	8.13±2.96	52.62±10.69	33.85±7.20	18.77±5.30
t/p		7.185/ 0.000	6.172/ 0.000	6.214/ 0.000	6.482/ 0.000	6.752/ 0.000	2.866/ 0.004	2.145/ 0.032	2.792/ 0.006
Intention to pursue graduate education									
Yes ¹		73.95±21.39	30.61±10.21	19.06±4.63	14.84±5.16	9.43±3.53	59.56±9.93	36.74±6.26	22.82±4.59
No ²		69.41±17.68	28.96±8.13	17.35±3.94	14.28±4.69	8.81±2.83	47.21±11.03	31.44±7.44	15.77±5.94
Undecided ³		67.13±18.17	27.79±8.63	17.77±4.10	13.40±4.72	8.15±3.12	51.44±9.18	33.63±7.02	17.81±4.04
F/p		5.370/ 0.005 [#]	3.995/ 0.019 [#]	6.572/ 0.002 [#]	3.853/ 0.022 [#]	7.055/ 0.001 [*]	56.865/ 0.000 [#]	22.447/ 0.000 [*]	89.677/ 0.000 [*]
		1>3	1>3	1>2, 3	1>3	1>3	1>2, 3; 3>2	1>2, 3; 3>2	1>2, 3; 3>2

¹⁻⁵: Represent subgroup categories used for post hoc multiple comparisons between groups, ^{*}: Post hoc Hochberg test, [#]: Games-Howell post hoc test or Welch test. GPA: Grade point average, SD: Standard deviation, t: Independent samples t-test, F: One-way ANOVA, KW: Kruskal-Wallis test,

Nurses' Perceived Professional Self-Efficacy and Tendency Toward Medical Errors: A Correlational Study

Abstract

Background: Professional self-efficacy influences nurses' clinical performance and the safety of care. Examining its relationship with the tendency toward medical errors is essential for informing strategies to improve patient safety.

Aim: This study aimed to examine the relationship between nurses' perceived professional self-efficacy and their tendency toward medical errors.

Methods: This descriptive and correlational study was conducted with 200 nurses working in a training and research hospital between October 15 and November 5, 2025. Data were collected using the Nurse Descriptive Information Form, the Nursing Profession Self-Efficacy Scale, and the Tendency Toward Medical Errors Scale. Data were analyzed using descriptive statistics, normality testing (skewness and kurtosis), the Mann-Whitney U test, the Kruskal-Wallis test, and Spearman correlation analysis.

Results: Among the participants, 54.5% were female, 83.5% held a bachelor's degree, and the mean age was 29.62 ± 5.29 years. Nurses demonstrated high levels of professional self-efficacy (68.61 ± 8.97) and low levels of tendency toward medical errors (228.00 ± 19.79). A statistically significant, moderate positive correlation was found between the total scores of the Nursing Profession Self-Efficacy Scale and the Tendency Toward Medical Errors Scale ($r=0.454$, $p<0.001$).

Conclusion: These findings suggest that professional self-efficacy is a meaningful individual-level correlate of nurses' self-reported safety-related practices. Considering the scoring direction of the medical error tendency scale, nurses with stronger professional self-efficacy reported lower error propensity. However, this relationship should be interpreted cautiously because the study was correlational and did not test the effects of any intervention.

Keywords: Medical error, nursing, patient safety, self-efficacy

İ Sümeyye Akçoban,^{1*} İ İsmail Dusak,^{2*}
İ Fatma Aslan³

¹Department of Health Services, Hatay Mustafa Kemal University, Kırıkhan Vocational School, Hatay, Türkiye

²Palliative Care Unit, Şanlıurfa Mehmet Akif Inan Training and Research Hospital, Şanlıurfa, Türkiye

³Department of Nursing, Hasan Kalyoncu University Faculty of Health Sciences, Gaziantep, Türkiye

Introduction

Professional self-efficacy, considered a fundamental component of the nursing profession, refers to an individual's capacity to provide safe and effective care through the integration of knowledge, skills, attitudes, and professional values.¹ Nurses' level of professional self-efficacy directly influences not only clinical decision-making processes but also patient safety, quality of care, and job satisfaction.² Nurses with high levels of perceived professional self-efficacy tend to act more decisively, responsibly, and in accordance with ethical principles in clinical practice.³ Conversely, nurses with low perceived self-efficacy may experience lack of confidence, increased stress, fear of making errors, and communication difficulties, all of which can negatively affect patient care processes.⁴

The tendency toward medical errors refers to the likelihood that healthcare professionals may make mistakes due to various factors, including insufficient knowledge, excessive workload, inattention, and communication deficiencies. This issue has become increasingly important in patient safety research. Medical errors are not solely the result of individual shortcomings; they are also associated with limited systemic support, inadequate education, and insufficient opportunities for professional development.⁵ In nursing practice, a substantial proportion of errors includes medication errors, delays in diagnosis, and mistakes during invasive procedures.⁶ Nurses with low levels of professional self-efficacy are at greater risk of committing such errors. Factors such as time management, attention, access to information, and accurate decision-making play critical roles in this process.⁷ In this context, developing strategies to enhance nurses' professional self-efficacy is considered a sustainable approach not only to improving individual performance but also to strengthening the culture of patient safety.⁸

A review of the literature reveals separate studies examining nurses' professional self-efficacy and their tendency toward medical errors.⁹⁻¹¹ For example, Moran et al.⁹ reported that nurses' self-efficacy levels were high. A study conducted with Italian nurses found that as the importance attributed to professional values increased, nurses' levels of professional self-efficacy also increased.¹⁰ Another study evaluating nurses' tendency toward medical errors found that nurses had a low tendency to commit such errors.¹¹ However, no study has specifically investigated the relationship between nurses' perceived professional self-efficacy and their tendency toward medical errors. Therefore, this study aimed to examine this relationship.

In line with this aim, the study addressed the following research questions:

1. What is the level of perceived professional self-efficacy among nurses?
2. What is the level of nurses' tendency toward medical errors?
3. Is there a relationship between nurses' perceived professional self-efficacy and their tendency toward medical errors?

**These authors contributed equally to this work and share first authorship.*

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Corresponding author: Sümeyye Akçoban
E-mail: sumeyyea2016@gmail.com

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Materials and Methods

Type of the Study

This study employed a descriptive and correlational design. The STROBE checklist (Strengthening the Reporting of Observational Studies in Epidemiology) was used to guide the reporting of the study.¹²

Study Setting and Time Frame

The study was conducted between October 15 and November 5, 2025, with nurses working at a training and research hospital located in Şanlıurfa, southeastern Türkiye.

Population and Sample of the Study

The target population of the study consisted of nurses actively working at a training and research hospital (N=400). The study sample comprised nurses employed in nursing care services at the same hospital. Prior to data collection, the required sample size was calculated using G*Power 3.1.9.7. Because no previous study had directly examined the relationship between nurses' professional self-efficacy and their tendency toward medical errors, a conservative small-to-moderate effect size was adopted for the correlation analysis. Accordingly, the effect size was set at $r=0.20$. With a two-tailed significance level of $\alpha=0.05$, 80% statistical power, and 95% confidence level, the minimum required sample size was calculated as approximately 194 nurses. To strengthen the statistical power and account for possible incomplete responses, the study was completed with 200 nurses.

Inclusion Criteria: Nurses who were actively working during the data collection period and available at the hospital were invited to participate. Those not on annual leave, actively working in hospital units, and who voluntarily agreed to participate were included in the study. Additionally, only nurses without any limitations

that could interfere with completing the study instruments were enrolled, ensuring accurate and complete data collection.

Data Collection Tools

The following instruments were used to collect the study data:

Descriptive Nurse Information Form: Developed based on the literature, this form consists of 16 items addressing nurses' age, gender, marital status, years of professional experience, current unit of employment, and perceptions related to professional self-efficacy and medical errors.^{5,9-11}

Nursing Profession Self-Efficacy Scale: Developed by Caruso et al. [2016], this scale was used to assess nurses' professional self-efficacy.¹³ The Turkish validity and reliability study was conducted by Vicdan and Taştekin [2019].¹⁴ The Turkish version consists of 16 items and two subdimensions: Quality of Nursing Care [items 1-9] and Professional Situations [items 10-16]. The scale is a 5-point Likert-type instrument (5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree). Total scores range from 16 to 80, with subscale score ranges of 1-45 for Quality of Nursing Care and 1-35 for Professional Situations. In the original study, Cronbach's alpha coefficients were 0.82 for both subscales and 0.87 for the total scale. In the present study, Cronbach's alpha values were 0.90 for the total scale, 0.88 for the Quality of Nursing Care subscale, and 0.85 for the Professional Situations subscale.

Tendency Toward Medical Errors Scale: This scale was developed by Özata and Altunkan [2010]. It consists of 49 items and five subdimensions reflecting routine nursing care activities: Medication and Transfusion Practices (18 items), Hospital Infections (12 items), Patient Monitoring and Material Safety (9 items), Falls (5 items), and Communication (5 items). Responses are scored on a 5-point Likert scale (1=never, 2=very rarely, 3=sometimes, 4=generally, 5=always). Higher scores indicate a lower tendency to commit medical errors, whereas lower scores indicate a higher tendency. Total scores range

Table 1. Descriptive characteristics of nurses (n=200)				
Variables	Mean±SD (min-max)		n	%
Age	29.62±5.29 [22-47]			
	n	%		
Gender				
Female	109	54.5		
Male	91	45.5		
Educational status				
Secondary education	7	3.5		
Associate degree	19	9.5		
Bachelor's degree	167	83.5		
Postgraduate degree	7	3.5		
Length of professional experience (years)				
1-5	85	42.5		
6-10	81	40.5		
11-15	25	12.5		
≥16	9	4.5		
Current work unit				
Internal medicine clinics	51	25.5		
Surgical clinics	34	17.0		
Intensive care units	102	51.0		
Pediatric clinics	8	4.0		
Emergency department	5	2.5		
Working schedule				
Day shift			43	21.5
Shift work			157	78.5
Shift duration				
8 hours			45	22.5
16 hours			8.0	4.0
24 hours			147	73.5
Do you consider your level of professional self-efficacy to be high?				
Yes			168	84.0
No			32	16.0
Have you ever reported a medication error?				
Yes			15	7.5
No			185	92.5
Have you experienced any sanctions following the error you reported? (n=15)				
Yes			9	60.0
No			6	40.0
Do you think your level of professional self-efficacy affects your likelihood of making medical errors?				
Yes			87	43.5
Partially			81	40.5
No			32	16.0

SD: Standard deviation.

Table 2. Comparison of Nursing Profession Self-Efficacy Scale scores by selected variables (n=200)

Variables	Quality of nursing care median (IQR) [min-max]	Professional situations median (IQR) [min-max]	Total score median (IQR) [min-max]
Gender			
Female	41.0 [6.50] [19.0-45.0]	29.0 [5.50] [9.0-35.0]	71.0 [12.50] [35.0-80.0]
Male	41.0 [7.0] [15.0-45.0]	29.0 [6.0] [9.0-35.0]	71.0 [10.0] [29.0-80.0]
p	0.228	0.784	0.521
z	-1.205	-0.275	-0.641
Length of professional experience [years]			
1-5	41.0 [6.0] [21.0-45.0]	29.0 [7.50] [9.0-35.0]	70.0 [11.50] [42.0-80.0]
6-10	40.0 [6.50] [19.0-45.0]	29.0 [5.0] [16.0-35.0]	70.0 [9.0] [35.0-80.0]
11-15	43.0 [7.05] [15.0-45.0]	30.0 [6.50] [9.0-35.0]	72.0 [10.50] [29.0-80.0]
≥16	43.0 [4.50] [38.0-45.0]	31.0 [5.50] [23.0-35.0]	74.0 [10.0] [64.0-80.0]
p	0.067	0.204	0.122
X ²	7.164	4.589	5.790
Educational status			
Secondary education	38.0 [9.0] [33.0-45.0]	24.0 [10.0] [17.0-35.0]	61.0 [22.0] [55.0-80.0]
Associate degree	41.0 [4.0] [15.0-45.0]	29.0 [6.0] [14.0-35.0]	73.0 [9.0] [29.0-80.0]
Bachelor's degree	41.0 [6.0] [19.0-45.0]	29.0 [5.0] [9.0-35.0]	70.0 [11.0] [35.0-80.0]
Postgraduate degree	42.0 [5.0] [35.0-45.0]	30.0 [8.0] [26.0-35.0]	72.0 [13.0] [61.0-80.0]
p*	0.574	0.663	0.517
X ²	1.994	1.585	2.277
Shift duration [hours]			
8 ^a	42.0 [5.50] [15.0-45.0]	30.0 [6.50] [14.0-35.0]	73.0 [10.0] [29.0-80.0]
16 ^b	39.0 [7.0] [33.0-44.0]	26.0 [3.25] [23.0-31.0]	65.0 [6.25] [56.0-71.0]
24 ^c	41.0 [6.0] [19.0-45.0]	29.0 [6.0] [9.0-35.0]	70.0 [12.0] [35.0-80.0]
p	0.287	7.407	6.485
X ²	2.495	0.025*; a>b	0.039*; a>b
	Mean±SD (min-max)	Mean±SD (min-max)	Mean±SD (min-max)
	39.98±5.0 [15.0-45.0]	28.63±4.92 [9.0-35.0]	68.61±8.97 [29.0-80.0]

z: Mann Whitney U test, X²: Kruskal-Wallis test, ^{a,b,c}: Bonferroni Test statistics, *: p<0.05. IQR: Interquartile range, SD: Standard deviation.

from 49 to 245. Subscale score ranges are as follows: Medication and Transfusion Practices (1-90), Hospital Infections (1-60), Patient Monitoring and Material Safety (1-45), Falls (1-25), and Communication (1-25). In the original study, Cronbach's alpha for the total scale was reported as 0.95.¹⁵ In the present study, Cronbach's alpha values were 0.94, 0.92, 0.89, 0.85, and 0.85 for the respective subscales, and 0.97 for the total scale.

Data Collection

Study data were collected after obtaining ethical approval and institutional permission. Data collection was conducted through face-to-face surveys administered to nurses who voluntarily agreed to participate. Data were gathered within a specified timeframe through direct interaction with participants. Nurses were provided with the Nurse Descriptive Information Form, the Nursing Profession Self-Efficacy Scale, and the Tendency Toward Medical Errors Scale. The questionnaire was designed to be clear and easy to understand and required approximately 10-15 minutes to complete. Confidentiality and anonymity were ensured, and participants were provided with the necessary information prior to completing the forms. Data collection was conducted at times convenient to the nurses, taking their clinical workload into account, and participation was entirely voluntary.

Ethical Considerations

Ethical approval was obtained from Hatay Mustafa Kemal University Non-Invasive Research Ethics Committee [Date: 08.10.2025; Meeting Number: 13; Approval Number: 30]. Institutional permission was also obtained from the hospital where the study was conducted. Written informed consent was obtained from all participating nurses after they were informed about the study. The research was conducted in

accordance with the principles of the Declaration of Helsinki. Additionally, permission to use the Turkish versions of the scales was obtained via email from the authors who conducted their validity and reliability studies.

Data Analysis

Data were analyzed using SPSS 25.0 (Statistical Package for the Social Sciences). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize sample characteristics and scale scores. The normality of continuous variables was assessed using skewness and kurtosis values, with values between -1.5 and +1.5 considered indicative of approximate normal distribution.¹⁶ As several variables did not meet parametric assumptions, non-parametric tests were employed. The Mann-Whitney U test was used for comparisons between two independent groups, while the Kruskal-Wallis test was used for comparisons involving three or more groups. The relationship between the two scales was evaluated using Spearman's rank correlation analysis due to the non-normal distribution and the ordinal nature of the data. Correlation effect sizes were interpreted as follows: negligible [0.00-±0.10], small [0.10-±0.30], moderate [0.30-±0.50], strong [0.50-±0.80], and very strong [±0.80].¹⁷ A significance level of p<0.05 and a 95% confidence interval were adopted for all analyses.

Results

The mean age of the nurses was 29.62±5.29 years. Of the participants, 54.5% were female and 45.5% were male; 83.5% held a bachelor's degree, and 3.5% had a postgraduate degree. Nurses with one to five years of professional experience constituted 42.5% of the sample. More than half of the nurses (51.0%) worked in

Table 3. Comparison of Tendency Toward Medical Errors Scale scores by selected variables (n=200)

Variables	Tendency toward medical errors scale					
	Medication and transfusion practices median (IQR) [min-max]	Hospital Infections median (IQR) [min-max]	Falls median (IQR) [min-max]	Patient monitoring and material safety median (IQR) [min-max]	Communication median (IQR) [min-max]	Total score median (IQR) [min-max]
Gender						
Female	89.0 [4.0] [51.0-90.0]	59.0 [6.0] [29.0-60.0]	23.0 [3.0] [12.0-25.0]	42.0 [8.50] [22.0-45.0]	25.0 [3.0] [12.0-25.0]	235.0 [22.50] [126.0-245.0]
Male	89.0 [5.0] [49.0-90.0]	58.0 [7.0] [30.0-60.0]	23.0 [3.0] [8.0-25.0]	42.0 [6.0] [23.0-45.0]	24.0 [3.0] [11.0-25.0]	234.0 [21.0] [121.0-245.0]
p	0.405	0.284	0.949	0.740	0.457	0.666
z	-0.833	-1.070	-0.064	-0.332	-0.744	-0.431
Professional experience (years)						
1-5 ^a	88.0 [6.0] [49.0-90.0]	58.0 [7.0] [29.0-60.0]	23.0 [3.0] [8.0-25.0]	42.0 [8.50] [22.0-45.0]	24.0 [3.50] [11.0-25.0]	234.0 [22.50] [121.0-245.0]
6-10 ^b	89.0 [5.0] [66.0-90.0]	57.0 [6.50] [34.0-60.0]	23.0 [4.0] [12.0-25.0]	42.0 [8.50] [24.0-45.0]	24.0 [3.0] [12.0-25.0]	232.0 [21.50] [166.0-245.0]
11-16 ^c	90.0 [2.50] [75.0-90.0]	60.0 [3.50] [46.0-60.0]	24.0 [3.0] [17.0-25.0]	45.0 [5.0] [30.0-45.0]	25.0 [3.50] [17.0-25.0]	242.0 [20.0] [201.0-245.0]
≥16 ^d	90.0 [1.50] [86.0-90.0]	60.0 [7.0] [48.0-60.0]	24.0 [4.0] [20.0-25.0]	44.0 [3.0] [36.0-45.0]	25.0 [3.50] [20.0-25.0]	239.0 [9.50] [214.0-245.0]
p	0.071	0.030*; c=d	0.496	0.080	0.674	0.091
χ ²	7.044	8.951	2.385	6.763	1.535	6.455
Educational status						
Secondary education ^a	90.0 [15.0] [75.0-90.0]	60.0 [11.0] [47.0-60.0]	23.0 [4.0] [17.0-24.0]	43.0 [8.0] [26.0-45.0]	23.0 [5.0] [19.0-25.0]	235.0 [37.0] [201.0-242.0]
Associate degree ^b	89.0 [3.0] [72.0-90.0]	59.0 [7.0] [48.0-60.0]	22.0 [4.0] [15.0-25.0]	42.0 [6.0] [33.0-45.0]	23.0 [5.0] [16.0-25.0]	234.0 [26.0] [191.0-245.0]
Bachelor's degree ^c	89.0 [5.0] [49.0-90.0]	58.0 [6.0] [29.0-60.0]	23.0 [3.0] [8.0-25.0]	42.0 [8.0] [22.0-45.0]	25.0 [3.0] [11.0-25.0]	234.0 [22.0] [121.0-245.0]
Postgraduate degree ^d	90.0 [3.0] [84.0-90.0]	60.0 [2.0] [53.0-60.0]	23.0 [2.0] [22.0-25.0]	45.0 [2.0] [40.0-45.0]	25.0 [0.0] [20.0-25.0]	239.0 [8.0] [225.0-245.0]
p	0.816	0.584	0.069	0.320	0.123	0.405
χ ²	0.960	1.947	7.107	3.508	5.769	2.917
Shift duration						
8 hours ^a	90.0 [3.50] [65.0-90.0]	59.0 [6.0] [46.0-60.0]	23.0 [3.0] [15.0-25.0]	43.0 [5.0] [26.0-45.0]	25.0 [3.50] [16.0-25.0]	236.0 [21.0] [182.0-245.0]
16 hours ^b	89.0 [5.0] [75.0-90.0]	59.0 [11.75] [34.0-60.0]	25.0 [7.0] [12.0-25.0]	42.0 [8.0] [24.0-45.0]	25.0 [5.0] [12.0-25.0]	239.0 [40.50] [166.0-245.0]
24 hours ^c	89.0 [6.0] [49.0-90.0]	58.0 [6.0] [29.0-60.0]	23.0 [3.0] [8.0-25.0]	42.0 [8.0] [22.0-45.0]	24.0 [3.0] [11.0-25.0]	234.0 [22.0] [121.0-245.0]
p	0.360	0.465	0.795	0.726	0.989	0.487
χ ²	2.044	1.533	0.460	0.641	0.022	1.439
	Mean±SD (min-max)	Mean±SD (min-max)	Mean±SD (min-max)	Mean±SD (min-max)	Mean±SD (min-max)	Mean±SD (min-max)
	86.31±6.42 [49-90]	55.93±5.63 [29-60]	22.65±2.68 [8-25]	40.70±5.02 [22-45]	23.05±2.80 [11-25]	228±19.79 [121-245]

*: p<0.05, ^{a-d}: Bonferroni test statistics. z: Mann-Whitney U test, χ²: Kruskal-Wallis test, IQR: Interquartile range, SD: Standard deviation.

intensive care units, 78.5% were employed in a shift system, and 73.5% worked 24-hour shifts. While 84.0% of nurses reported high levels of perceived professional self-efficacy, 92.5% stated that they had never reported medication errors. Additionally, 43.5% believed that their professional self-efficacy influenced their likelihood of making medical errors (Table 1).

The mean total score on the Nursing Professional Self-Efficacy Scale was 68.61±8.97. Subdimension mean scores were 39.98±5.00 for Quality of Nursing Care and 28.63±4.92 for Professional Situations. No significant differences were found in total or subdimension scores based on gender, educational level, or years of professional experience (p>0.05). However, a statistically significant difference

Table 4. Correlation between nursing profession self-efficacy scale and tendency toward medical errors scale scores (n=200)

Subscale and total scores of the tendency toward medical errors scale						
NPSES subdimensions and total score	Medication and transfusion practices	Prevention of infections	Prevention of falls	Patient monitoring and material safety	Communication	Total score
Quality of nursing care						
r	0.385	0.365	0.352	0.343	0.338	0.411
p	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*
Professional Situations						
r	0.316	0.366	0.313	0.411	0.277	0.409
p	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*
Total Score						
r	0.392	0.404	0.369	0.418	0.326	0.454
p	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*

*: p<0.001. NPSES: Nursing Profession Self-Efficacy Scale, r: Spearman correlation coefficient.

was observed in the Professional Situations subdimension based on shift duration ($p=0.025$). Post hoc analysis indicated that nurses working 8-hour shifts had higher self-efficacy scores than those working 16-hour shifts (Table 2).

The mean total score on the Tendency Toward Medical Errors Scale was 228.00 ± 19.79 . Subdimension mean scores were as follows: Medication and Transfusion Practices [86.31 ± 6.42], Prevention of Infections [55.93 ± 5.63], Prevention of Falls [22.65 ± 2.68], Patient Monitoring and Material Safety [40.70 ± 5.02], and Communication [23.05 ± 2.80]. No significant differences were found in total scale scores based on gender, education level, professional experience, or shift duration. However, a significant difference was observed in the Prevention of Infections subdimension according to professional experience ($p=0.030$), with the highest scores among nurses with 11 or more years of experience (Table 3).

According to Spearman correlation analysis, a statistically significant and moderate positive correlation was found between the total scores on the Nursing Profession Self-Efficacy Scale and the Tendency Toward Medical Errors Scale ($r=0.454$, $p<0.001$). This finding indicates that as nurses' professional self-efficacy increases, their tendency to commit medical errors decreases. Additionally, moderate positive correlations were found between the Quality of Nursing Care and all subdimensions of the Tendency Toward Medical Errors Scale ($r=0.338-0.385$, $p<0.001$). Significant moderate correlations were also observed between the Professional Situations subdimension and both the Patient Monitoring and Material Safety ($r=0.411$, $p<0.001$) and Prevention of Infections ($r=0.366$, $p<0.001$) subdimensions. Overall, these results suggest that higher levels of professional self-efficacy among nurses are associated with lower tendencies toward clinical errors (Table 4).

Discussion

In this study, nurses demonstrated generally high levels of professional self-efficacy. No significant differences were observed across demographic variables, whereas shift duration was associated with differences in the Professional Situations subdimension. This finding suggests that professional self-efficacy may be more closely related to working conditions than to demographic characteristics. Recent studies have similarly reported relatively high levels of professional self-efficacy among practicing nurses.^{18,19} However, workload and extended working hours have been identified as contextual factors that influence perceptions of professional competence.²⁰ Accordingly, higher self-efficacy among nurses working shorter shifts may be associated with reduced cognitive strain and more sustainable attentional resources in clinical practice.

The generally low tendency toward medical errors observed in this study is consistent with previous findings. While no demographic differences were identified, professional experience was associated with differences in infection prevention practices. This suggests that accumulated clinical experience may enhance safety-related competencies in specific domains. Prior studies have likewise reported low levels of medical error tendency among nurses.^{21,22} Nevertheless, research conducted in high-risk environments, such as intensive care units, indicates that factors such as alarm burden and workload may increase the risk of errors.²³ Despite the substantial proportion of intensive care nurses in the present sample,

the tendency toward medical errors remained low, which may reflect effective institutional safety protocols. Recent evidence also highlights the protective role of a strong patient safety culture in reducing clinical errors.^{24,25}

The principal finding of this study was the identification of a statistically significant, moderate association between professional self-efficacy and medical error tendency. Considering the scoring direction of the error tendency scale, this relationship indicates that higher self-efficacy is associated with lower error propensity. Although no prior research has directly examined these variables together among practicing nurses, previous studies have identified associations between self-efficacy and related constructs such as patient safety competence and error orientation.²⁶⁻²⁸ By directly investigating this relationship within an active clinical workforce, the present study extends existing knowledge and provides novel empirical evidence suggesting that professional self-efficacy may serve as an important psychological factor associated with safety-oriented behaviors in real-world nursing practice. The magnitude of the observed association indicates that professional self-efficacy is a meaningful, though not exclusive, factor in understanding nurses' safety-related behaviors, and that additional contextual and organizational factors may also contribute to error propensity.

Limitations

From a patient safety perspective, the relationship between professional self-efficacy and tendency toward medical errors may be understood within the broader framework of nurses' confidence in clinical judgment, attention to care procedures, and perceived ability to manage complex clinical situations. Nurses with stronger professional self-efficacy may be more likely to act systematically, communicate effectively, and adhere to safety-related care standards, which may help explain their lower self-reported error propensity. This interpretation is consistent with previous studies showing that self-efficacy-related constructs are associated with medication safety competence, patient safety engagement, patient safety outcomes, resilience, and safety competence in nursing and healthcare contexts.^{7,18,26-28}

However, the moderate magnitude of the relationship also indicates that professional self-efficacy alone cannot fully explain nurses' tendency toward medical errors. Medical errors are multifactorial and may be influenced by organizational and contextual factors such as workload, alarm burden, staffing conditions, communication processes, managerial support, and institutional patient safety culture.^{20,23-25} Therefore, professional self-efficacy should be considered an important individual-level factor related to safer nursing practice, but not an isolated determinant of error prevention. Future studies should examine this relationship together with organizational safety climate, workload, staffing adequacy, and objective error indicators to provide a more comprehensive understanding of medical error tendency among nurses.

Conclusion

This study suggests that nurses with stronger perceived professional self-efficacy tend to report safer practice patterns, as reflected by a lower tendency toward medical errors. The moderate level of association indicates that professional self-efficacy is meaningfully related to medical error tendency, but it is not the only factor explain-

ing this issue. Therefore, nurses' professional self-efficacy should be considered as an important individual-level factor within the broader patient safety context. However, because this study used a descriptive and correlational design, the findings should not be interpreted as evidence of causality. In other words, the results do not show that increasing professional self-efficacy directly reduces medical errors. Rather, they indicate that professional self-efficacy is associated with nurses' self-reported safety-related practices. Medical error tendency is likely influenced by multiple individual, clinical, and organizational factors, including workload, staffing conditions, communication processes, managerial support, and institutional patient safety culture.

Future studies should examine this relationship using longitudinal, multi-center, and intervention-based designs. In particular, research is needed to determine whether interventions aimed at strengthening nurses' professional self-efficacy can contribute to reducing medical error tendency and improving patient safety outcomes in clinical settings.

Ethics Committee Approval: The study was approved by the Hatay Mustafa Kemal University Non-Invasive Research Ethics Committee (Approval Number: 30, Date: 08.10.2025).

Informed Consent: Written informed consent was obtained from the nurses.

Conflict of Interest: The authors have no conflicts of interest to declare.

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School Health Nurses' Attitudes and Behaviors Toward Medical Waste Management

Emine Ekici,¹ Ozan Özkoç,¹ Kamer Gür²¹Maltepe University School of Nursing, İstanbul, Türkiye²Department of Public Health Nursing, Marmara University Faculty of Health Sciences, İstanbul, Türkiye

Abstract

Background: Within the scope of health services provided in school settings, medical waste management is crucial for both environmental health and student safety.

Aim: This study aimed to determine the attitudes and behaviors of school health nurses in Türkiye toward medical waste.

Methods: This descriptive study was conducted between February and April 2025. Data were collected via Google Forms using the Demographic Information Form and the Medical Waste Attitudes and Behaviour Scale (MWABS). A total of 158 participants were recruited for the study using snowball sampling, after reaching out to school health nurses working in Türkiye via social media. The data were analysed using the Mann-Whitney U test and the Kruskal-Wallis test.

Results: Of the participants, 90.5% were female, and the mean age was 31.98±9.47 years. Additionally, 57.6% were employed in the public sector, 46.8% reported that their institutions did not have a medical waste management plan, and 68.4% had not received training on medical waste management. Nurses working in private schools, those who had received medical waste management training, and those familiar with waste management procedures had higher MWABS scores ($p<0.05$). The mean MWABS score was 94.06±28.77.

Conclusion: School health nurses demonstrated moderate attitudes toward medical waste management. Nearly half of the schools lacked a formal management plan. Strengthening training programs and implementing waste management plans are recommended.

Keywords: Attitude, behavior, medical waste, nurses, school health

Introduction

Waste management is a critical process in healthcare settings.¹ Disruptions in this process can harm public health in multiple ways.² Improper management of medical waste, in particular, may lead to serious risks, including the spread of infections and environmental contamination.³ Medical waste refers to materials generated during healthcare delivery, such as used needles, blood and body fluids, contaminated syringes, and soiled dressings.¹ In Türkiye, more than 135,000 tons of medical waste were generated in 2021 alone.⁴ Between 2018 and 2020, the country's total waste volume increased, with hazardous waste nearly doubling during this period.⁵ This trend is especially concerning because medical waste, as a category of hazardous waste, poses significant threats to environmental sustainability.¹ Inadequate management of medical waste not only endangers environmental sustainability and public health but also negatively affects healthcare workers.^{6,7} Failures in waste management processes can lead to occupational injuries and the spread of infectious diseases within communities. Such negligence threatens both individual and public health,⁸ as well as environmental well-being.¹

In 2017, Türkiye introduced regulations to control and reduce the risks associated with medical waste. According to these regulations, any unit that generates medical waste through its activities is classified as a "waste generator."⁹ In addition to hospitals, medical centers, and laboratories, infirmaries are also recognized as sources of medical waste. School health nurses working in infirmaries in Türkiye may generate medical waste through emergency interventions, care, treatment, and immunization practices.¹⁰

An organization that generates medical waste must establish a medical waste management plan. This plan should encompass the processes of generation, collection, transportation, treatment, and disposal of medical waste.¹¹ Medical waste should be transported, stored, and disposed of appropriately according to its quantity.⁹ Nurses' attitudes play a critical role in the proper and safe segregation of medical waste. Previous studies have examined the attitudes of nurses working in hospitals toward medical waste management.¹²⁻¹⁹ However, the role of nurses in medical waste management extends beyond hospital settings. In school health services, nurses are responsible for key activities such as conducting health screenings, monitoring chronic conditions, providing first aid, preventing communicable diseases, and delivering health education. In Türkiye, there are no up-to-date official data on the exact number of school nurses nationwide, and their roles may vary across institutions. Moreover, school nurses contribute to the continuity of care for school-aged children by facilitating coordination among schools, families, and healthcare institutions. This highlights their potential responsibility

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Corresponding author: Emine Ekici
E-mail: emineekici@maltepe.edu.tr

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in ensuring proper medical waste management in educational settings. This study is expected to address a gap in the literature by examining school health nurses' attitudes and behaviors toward medical waste. Accordingly, the aim of this study was to investigate these attitudes and behaviors.

Research Questions

1. What are the Medical Waste Attitude and Behavior Scale (MWABS) scores of school health nurses?
2. Do MWABS scores differ according to the descriptive characteristics of school health nurses?

Materials and Methods

Study Design

The study employed a descriptive design.

Sample

The sample size was calculated using G*Power 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) for an independent samples t-test. Based on the study by Asadullah et al.,²⁰ an effect size of 0.58 was used, with a 5% margin of error and 95% power, yielding a required sample size of 158. A total of 158 participants who consented to participate were included in the study. Participants ranged in age from 23 to 63 years. The inclusion criteria were: (1) having at least two months of professional experience, (2) working in Türkiye, and (3) being employed in a school with an infirmary. The exclusion criteria were: (1) not being a nurse, (2) working in a school without an infirmary, and (3) having less than two months of experience.

Data Collection Tools

Data were collected using the Descriptive Information Form and the Medical Waste Attitude and Behavior Scale.

Descriptive Information Form: This form was developed by the researchers based on the literature and consists of 10 items, including age, gender, educational status, clinical practices (e.g., blood glucose measurement, dressing), years

of professional experience, duration of employment in the school setting, type of school, receipt of training on medical waste management, and knowledge of the medical waste management process.²⁰

Medical Waste Attitude and Behavior Scale: This scale was developed by Uskun et al.²¹ in 2023. It is a 5-point Likert-type scale consisting of 24 items rated from *Strongly Agree* (5) to *Strongly Disagree* (1). The scale includes four subdimensions: awareness (items 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13), behavior (items 14, 15, 16, 17, 18), cognitive (items 5, 6, 19, 20, 21), and attention (items 22, 23, 24). Total scores range from 24 to 120. In the original study by Uskun et al.,²¹ the Cronbach's alpha reliability coefficient was 0.94. In the present study, the Cronbach's alpha coefficient was calculated as 0.98. A higher score on the scale indicates more positive attitudes and behaviors toward medical waste.

Data Collection

Data were collected between February and April 2025. Participants were reached through social media platforms (LinkedIn, Instagram, Facebook) by searching the keywords "school nurse" and "school health nursing." Invitations and informational messages were sent to users identified as school health nurses. Since paramedics may also work in private schools in Türkiye, individuals who identified themselves as paramedics were excluded from the study. School health nurses who met the inclusion criteria and agreed to participate were included in the sample. The data collection instruments were transferred to Google Forms (Google LLC, Mountain View, CA, USA) and distributed to participants via direct messaging. Using the snowball sampling method, participants referred other school health nurses they knew to the researchers. Participation was voluntary and anonymous. Data were stored in a password-protected digital folder accessible only to the researchers via a secure email account. Each participant was allowed to complete the survey only once, ensuring data integrity and security.

Data Analysis

Data analysis was conducted using IBM SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as numbers, percentages, means, and standard deviations. Normality was assessed using skewness and kurtosis values,

Table 1. Descriptive characteristics and medical waste practices of school health nurses (n=158)

	Mean±SD	Range		n	%
Age [years]	31.98±9.47	23–63	Do you perform clinical procedures such as blood glucose measurement and wound dressing?		
	n	%	Yes	154	97.5
Gender			No	4	2.5
Female	143	90.5	Does your school have a medical waste management plan in place?		
Male	15	9.5	Yes	71	44.9
Educational level			No	74	46.8
High school	4	2.5	Do not know	13	8.3
Associate degree	29	18.4	Have you received training on medical waste management?		
Bachelor's degree	99	62.6	Yes	50	31.6
Master's degree	26	16.5	No	108	68.4
Work experience in school setting			Are you familiar with the medical waste management process?		
<3 years	92	58.2	Yes	76	48.1
≥3 years	66	41.8	No	82	51.9
Clinical experience			How frequently is medical waste collected at your institution?		
<3 years	61	38.6	Not collected	61	38.6
≥3 years	97	61.4	Do not know	14	10.8
Type of school			Daily	17	8.9
Public (state)	91	57.6	As needed	56	35.4
Private	67	42.4	Weekly	10	6.3

SD: Standard deviation.

Table 2. Medical Waste Attitude and Behavior Scale [MWABS] scores according to nurses' descriptive characteristics (n=158)

Characteristics	n	%	Mean rank	Z/H	p
Gender					
Female	143	90.5	79.58	-0.650	0.948
Male	15	9.5	78.77		
Educational level					
High school	4	2.5	59.88	6.263	0.099
Associate degree	29	18.4	78.00		
Bachelor's degree	99	62.6	75.59		
Master's degree	26	16.5	99.08		
Type of school					
Public (state)	67	42.4	93.26	-3.247	0.001
Private	91	57.6	69.37		
Work experience in school setting					
<3 years	92	58.2	76.64	-0.930	0.352
≥3 years	66	41.8	83.49		
Clinical experience					
<3 years	61	38.6	72.83	-1.455	0.146
≥3 years	97	61.4	83.70		
Have you received training on medical waste management?					
Yes	50	31.6	86.40	-2.790	0.005
No	108	68.4	64.59		
Are you familiar with the medical waste management process?					
Yes	76	48.1	100.06	-5.444	0.000
No	82	51.9	60.45		
Do you perform clinical procedures such as blood glucose measurement and wound dressing?					
Yes	154	97.5	79.52	-0.033	0.973
No	4	2.5	78.75		

Bold values indicate statistical significance. Z: Mann-Whitney U test, H: Kruskal-Wallis test.

with values between +1.5 and -1.5 considered indicative of a normal distribution. Since MWABS scores did not meet the assumption of normality, non-parametric tests were applied. The Mann-Whitney U test was used to compare two independent groups, while the Kruskal-Wallis test was used for comparisons involving three or more groups.²² Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from Maltepe University Non-Interventional Research Ethics Committee [Approval Number: 2024/22-15, Date: 28.11.2024]. Permission to use the MWABS was obtained via email from the corresponding author. Participants were informed about the study, and informed consent was obtained prior to participation. Any questions or concerns raised by participants were addressed. The study was conducted in accordance with the 2013 revision of the Declaration of Helsinki.

Results

Table 1 presents the descriptive characteristics of the participants and information related to medical waste practices. The mean age of participants was 31.98 ± 9.47 years [range: 23–63 years]. Of the participants, 90.5% were female, 62.6% held a bachelor's degree, and 41.8% had been working in their current school for more than three years. Additionally, 38.6% had less than three years of clinical experience, and 42.4% were employed in private schools. The majority of participants (97.5%) reported performing invasive procedures such as blood glucose measurement. It was found that 46.8% of the schools did not have a medical waste management plan, and 68.4% of participants had not received training on medical waste management.

Table 3. Subscale scores of the Medical Waste Attitude and Behavior Scale [MWABS] among nurses (n=158)

Scale/subdimension	Mean±SD	Score range
Awareness	44.84±13.90	11–55
Behavioral	19.29±6.18	5–25
Cognitive	18.12±5.88	5–25
Attention	11.81±3.96	3–15
MWABS	94.06±28.77	24–120

SD: Standard deviation.

Furthermore, 51.9 reported not knowing the medical waste management process, and 38.6% stated that medical waste was not collected in their institutions [Table 1].

Table 2 presents MWABS scores according to participants' descriptive characteristics. No statistically significant differences were found in terms of gender, education level, years of school or clinical experience, or performance of procedures ($p > 0.05$). However, significant differences were observed based on school type, receipt of medical waste management training, and knowledge of the medical waste management process ($p < 0.05$) [Table 2].

Table 3 and Figure 1 present the MWABS scores and their distribution. The highest mean score was observed in the Awareness subscale [44.84±13.90], while the

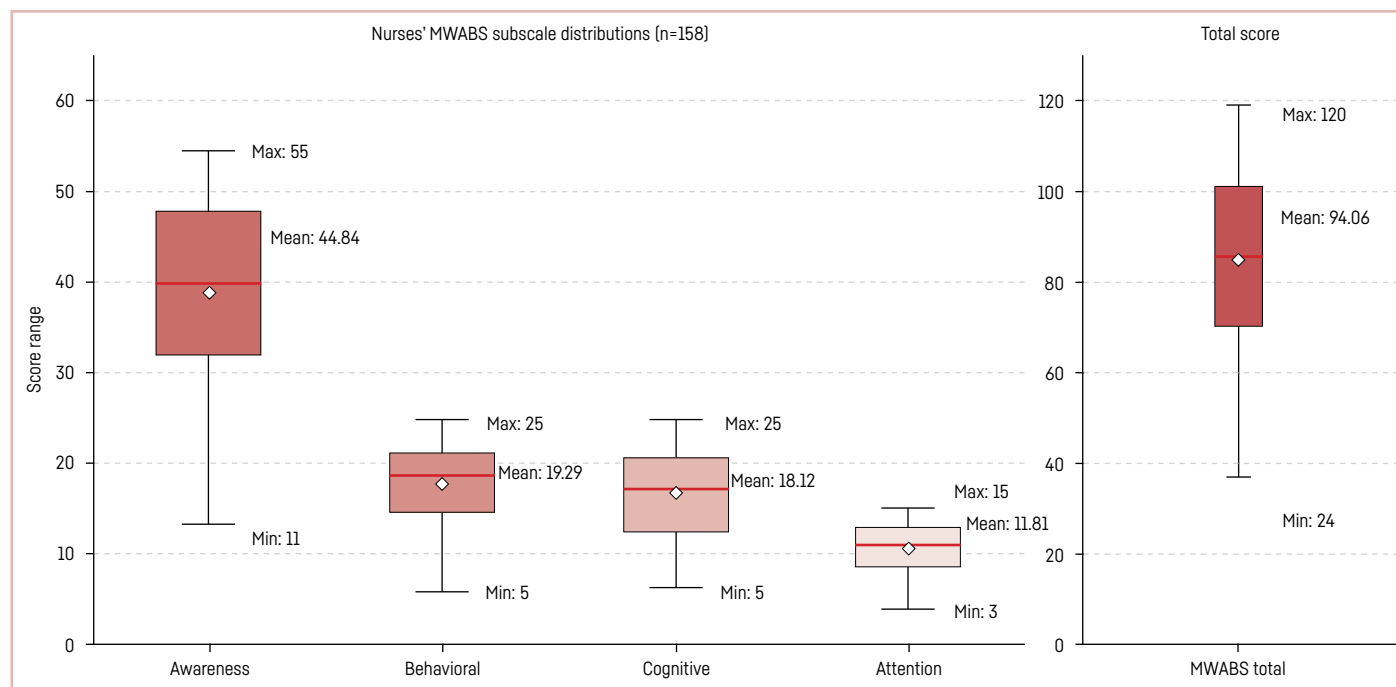


Figure 1. Distribution of Medical Waste Attitude and Behavior Scale (MWABS) subscale scores among nurses.

lowest was in the Attention subscale [11.81±3.96]. The Behavioral [19.29±6.18] and Cognitive [18.12±5.88] subscales indicated moderate levels. The overall MWABS mean score was 94.06±28.77, suggesting that participants' awareness, behaviors, cognitive understanding, and attention regarding medical waste management were at a moderate level (Table 3).

Discussion

Medical waste management is a critical issue in healthcare. School health nurses may act as generators of medical waste due to certain clinical practices performed in school settings. However, studies examining the attitudes and behaviors of school health nurses regarding medical waste are limited.

This study examined the practices, attitudes, and behaviors of school health nurses toward medical waste. Based on the scale score range, it can be concluded that their attitudes and behaviors are at a moderate level. Previous studies have also reported moderately positive attitudes among nurses toward medical waste.²³⁻²⁵ However, some studies have identified lower levels of positive attitudes.²⁶⁻²⁸ Overall, it can be stated that school health nurses' attitudes toward medical waste range from low to moderate.

A considerable proportion of participants reported not receiving training on medical waste management, and approximately half indicated that they were unfamiliar with the process. This finding is consistent with previous studies, which have highlighted knowledge gaps and practice errors among healthcare workers regarding medical waste management.^{12-14,17,18} These results suggest that school health nurses may lack sufficient knowledge, which could negatively affect proper waste management practices.

In this study, school health nurses working in private schools demonstrated more positive attitudes toward medical waste compared to those in other settings. This difference may be attributed to better access to resources in private institutions. Similarly, Thirunavukkarasu et al.¹⁵ reported that organizational support positively influences medical waste management practices.

Furthermore, nurses who had received training on medical waste management exhibited more positive attitudes than those who had not, indicating that training plays a significant role in improving attitudes and behaviors. Other studies in the literature have also demonstrated that training positively influences knowledge, attitudes, and practices related to medical waste management.¹³⁻¹⁹

Another notable finding of our study was that approximately half of the schools did not have a medical waste management plan. This suggests that even when school nurses possess individual awareness, deficiencies in organizational structures may hinder effective implementation. Similarly, Sürme and Maraş¹⁶ reported that despite nurses' individual efforts, the absence of systematic planning and institutional support negatively affected waste management practices.

In this study, no differences were found between attitudes and variables such as clinical experience, length of employment in schools, gender, or educational level. However, previous studies have reported that healthcare workers with greater experience tend to demonstrate more positive attitudes toward medical waste management.^{15,18}

Limitations

This study has several limitations. First, as the data were collected through self-report measures, responses may have been influenced by social desirability bias. Second, the sample consisted of school health nurses who were accessible via social media, limiting the generalizability of the findings to the broader population in Türkiye. Additionally, the lack of up-to-date official data on the number of school health nurses in Türkiye made it difficult to clearly define the study population, representing another limitation.

Conclusion

School health nurses have moderately positive attitudes and behaviors toward medical waste management; however, gaps remain in training and the implementation of medical waste management plans. Based on these findings, periodic and mandatory medical waste management training programs should be established for school health nurses. The results underscore the importance of regular and systematic training tailored to the type of school in which nurses are employed. Accordingly, it is recommended that nurses receive training specific to their institutional context. Furthermore, the development and implementation of medical waste management plans in schools should be mandated by regulation. Administrators in both public and private schools should provide adequate training and resources to support school health nurses in this regard. Future studies should incorporate observational methods to evaluate medical waste management practices. Overall, these findings may inform policy development and improvements in medical waste management within school health services.

Ethics Committee Approval: The study was approved by the Maltepe University Non-Interventional Research Ethics Committee [Approval Number: 2024/22-15, Date: 28.11.2024].

Informed Consent: Written informed consent was obtained from all participants.

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Personality Traits and Academic Self-Efficacy Among Nursing Students

Abstract

Background: Personality traits distinguish individuals from one another and provide a basis for predicting future behavior. Nursing students' confidence in managing academic challenges plays a crucial role in their academic success and professional development.

Aim: This study aimed to examine the relationship between personality traits and academic self-efficacy (SE) among nursing students.

Methods: This correlational study included 281 nursing students. Data were collected using an Information Form, the Academic Self-Efficacy Scale (ASES), and the Five-Factor Personality Scale. Descriptive statistics, the Kolmogorov-Smirnov test, and Spearman correlation analysis were used to analyze the data.

Results: The students' grade point averages ranged from 0.90 to 3.91, with a mean of 2.81 ± 0.48 . The study revealed a relationship between nursing students' personality traits and their academic SE. The mean ASES total score was 19.15 ± 3.33 . Students who perceived their academic achievement as high had higher ASES scores compared to those who perceived their achievement as moderate or low.

Conclusion: The findings suggest that educators should consider individual differences in personality traits and provide support to enhance students' academic success and SE.

Keywords: Academic self-efficacy, nursing student, personality traits

 Figen Çalışkan,  Nihan Altan Sarıkaya,
 Manar Aslan

¹Department of Nursing Education, Trakya University
Faculty of Health Sciences, Edirne, Türkiye

²Department of Mental Health and Disease Nursing,
Trakya University Faculty of Health Sciences, Edirne,
Türkiye

³Department of Nursing Management, Trakya University
Faculty of Health Sciences, Edirne, Türkiye

Introduction

Personality development occurs through the interaction of maturation, individuation, and socialization processes. Maturation is independent of learning and refers to the spontaneous development of innate abilities, whereas individuation and socialization involve the formation of individual behaviors and social behavior patterns through education and life experiences.¹ Personality plays an important role in understanding both oneself and others and encompasses an individual's emotional, physical, and cognitive characteristics, as reflected in their behaviors, attitudes, and actions. Personality traits are unique characteristics that differentiate individuals and help predict future behavior.² Although personality traits have been conceptualized differently by researchers, Goldberg's Five-Factor Model of Personality Traits is one of the most widely used frameworks.³⁻⁶ This model describes personality in terms of extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience.³ In nursing, a profession centered on human interaction, not only professional knowledge, attitudes, and skills but also personality traits are important for effective practice.⁷ Studies have shown that positive personality traits such as extraversion, conscientiousness, and openness to experience are associated with higher nursing competence and greater job satisfaction.^{8,9} Additionally, Xu et al.¹⁰ found that personality traits influence anxiety, stress, and clinical decision-making among nursing students.

The concept of academic self-efficacy (SE) is grounded in Bandura's social cognitive theory.¹¹ SE is a key construct that influences and regulates behavior.¹² It refers to an individual's perceived capability to successfully perform tasks, encompassing their behaviors, aspirations, and circumstances.¹³ When applied within an educational context, this construct is defined as academic SE. Specifically, academic SE describes a student's perceived ability to successfully complete academic tasks.¹¹ This perception plays a critical role in determining university students' academic performance and serves as a predictor of their future achievements.^{12,14} From this perspective, nursing students' self-confidence in managing academic challenges contributes to both their academic success and professional development. Previous studies involving nursing students have demonstrated that factors such as ethnicity, age, socioeconomic status, self-awareness, and social support influence academic performance.^{15,16} This study aimed to identify nursing students' personality tendencies, assess their levels of academic SE, and examine the relationship between personality traits and academic SE. Considering personality traits within nursing education is important for developing supportive educational strategies that enhance students' academic SE. Such strategies can help ensure that nursing students receive the support needed to improve academic performance, strengthen self-confidence, and prepare effectively for the nursing profession.

Study Question

1. Is there a relationship between nursing students' personality traits and their academic SE?

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Corresponding author: Figen Çalışkan
E-mail: figencaliskan@trakya.edu.tr

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Materials and Methods

Type of the Study

This study employed a correlational design.

Participants

The study population consisted of 767 nursing students enrolled in a state university's nursing department. With a 5% margin of error and a 95% confidence interval, the required sample size was calculated as 257 students. A stratified sampling technique was used to select participants, and 281 volunteer nursing students were ultimately included in the analysis. Stratified groups were formed by selecting a proportional number of students from each class. Accordingly, 60 students were selected from the first year, 63 from the second year, 85 from the third year, and 73 from the fourth year. Inclusion criteria were being a nursing student aged 18 years or older and volunteering to participate in the study. Students younger than 18 years, those not enrolled in nursing, and those who did not consent to participate were excluded.

Data Collection Tools

Information Form: The Information Form was developed by the researchers based on literature and consisted of five questions assessing nursing students' age, gender, academic year, grade point average, and perceived academic success (good, average, or poor).^{12,17}

Five-Factor Personality Scale: The Five-Factor Personality Scale was developed by Rammstedt and John¹⁸ and adapted into Turkish by Horzum et al.¹⁹ It is a 10-item instrument using a 5-point Likert scale ranging from 1 (never) to 5 (always), designed to assess five personality dimensions. The Cronbach's alpha values for the sub-dimensions ranged from 0.81 to 0.90.¹⁹ In the present study, the Cronbach's alpha coefficient for the overall scale was 0.70. Five items (1, 3, 4, 5, and 7) are reverse-scored. Total scores range from 10 to 50.

Academic Self-Efficacy Scale (ASES): The Academic Self-Efficacy Scale was originally developed by Jerusalem and Schwarzer²⁰ and later adapted into Turkish by Yilmaz et al.²¹ It is a one-dimensional, 7-item scale using a 4-point Likert format (1=does not fit me at all; 4=fits me completely). The original scale reported a Cronbach's alpha of 0.87, while the Turkish adaptation reported 0.79.²¹ In this study, the Cronbach's alpha coefficient was 0.73. Item 7 is reverse-scored. Total scores range from 7 to 28.

Data Collection

Data were collected between March 3, 2025 and April 25, 2025. Nursing students were informed about the study, and verbal consent was obtained prior to participation, followed by written informed consent from those who agreed to participate. Data collection tools were administered through face-to-face interviews to students who volunteered. The researchers had no role in students' course evaluations. Students completed the forms outside of class time and were instructed to read each item carefully, select the appropriate response, and complete all items. The average completion time for the instruments was approximately 15 minutes.

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences version 22.0 (IBM, Armonk, NY, USA). Descriptive statistics were calculated using means, percentages, frequencies, standard deviations, and minimum and maximum values. The Kolmogorov-Smirnov test was used to assess normality. Bonferroni correction was applied to control for Type I error in multiple comparisons. Spearman correlation analysis was used to examine relationships between quantitative variables. Statistical significance was set at $p < 0.05$.²²

Ethical Considerations

Prior to the commencement of the study, ethical approval was obtained from Trakya University Social and Human Sciences Research Ethics Committee (Approval Number: 02/19, Date: 05.02.2025). Permission to use the measurement tools was obtained from the relevant institution and the authors who conducted the Turkish validity and reliability studies. The study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants both verbally and in writing prior to data collection.

Results

According to the findings on the sociodemographic characteristics of the nursing students (not presented in table form), participants ranged in age from 18 to 27 years, with a mean age of 20.74 ± 1.75 years. Of the participants, 81.5% ($n=229$) were female and 18.5% ($n=52$) were male. Regarding the academic year, 21.4% ($n=60$) were first-year students, 22.4% ($n=63$) were second-year students, 30.2% ($n=85$) were third-year students, and 26.0% ($n=73$) were fourth-year students. The nursing students' grade point averages ranged from 0.90 to 3.91, with a mean of 2.81 ± 0.48 . Additionally, 24.9% ($n=70$) of the students perceived their academic performance as good, 68.3% ($n=192$) as average, and 6.8% ($n=19$) as poor.

The mean scores of the nursing students on the ASES and the Five-Factor Personality Scale sub-dimensions are presented in Table 1. The mean ASES total score was 19.15 ± 3.33 . For the Five-Factor Personality Scale, the mean scores were 7.11 ± 1.82

Table 1. Mean scores of the Academic Self-Efficacy Scale and Five-Factor Personality Traits ($n=281$)

Scale	Min	Max	Mean	SD
Academic Self-Efficacy Scale (Total)	10	28	19.15	3.33
Extraversion	2	10	7.11	1.82
Agreeableness	3	10	7.88	1.44
Conscientiousness	4	10	7.43	1.59
Neuroticism	2	10	6.16	1.49
Openness to Experience	2	10	6.95	1.74

SD: Standard deviation.

Table 2. Relationship between participants' characteristics and Academic Self-Efficacy Scale scores ($n=281$)

	Academic Self-Efficacy Scale	
	Mean $\pm$ SD	Median (Min–Max)
Gender		
Female	18.97 $\pm$ 3.18	19 (10–27)
Male	19.94 $\pm$ 3.85	20 (10–28)
Test statistic	U=5052.000	p=0.08
Year of study		
First year	18.70 $\pm$ 2.86	18.5 (10–25)
Second year	18.98 $\pm$ 3.70	19 (10–28)
Third year	19.14 $\pm$ 3.52	19 (10–27)
Fourth year	19.68 $\pm$ 3.10	20 (11–28)
Test statistic	$\chi^2=3.106$	p=0.37
Grade point average		
≤ 2.00	18.56 $\pm$ 2.38	18 (14–23)
2.01–2.5	18.59 $\pm$ 4.24	19.5 (10–28)
2.51–3	18.96 $\pm$ 3.34	19 (10–28)
3.01–4	19.64 $\pm$ 3.17	19.5 (12–28)
Test statistic	$\chi^2=3.606$	p=0.30
Self-perceived academic achievement		
Good ^a	20.37 $\pm$ 3.24	20 (14–28)
Average ^b	18.93 $\pm$ 3.24	19 (10–28)
Poor ^c	16.89 $\pm$ 3.03	17 (10–23)
Test statistic	$\chi^2=18.718$	p=0.00*
Bonferroni-corrected Mann-Whitney U test	p=0.003*, a>b p=0.000*, a>c	p=0.007*, b>c

χ^2 : Kruskal-Wallis test, U: Mann-Whitney U test, *: $p < 0.05$. ^a: Good, ^b: Average, ^c: Poor.

Table 3. Correlation between Academic Self-Efficacy Scale and Five-Factor Personality Traits (n=281)

Five-Factor Personality Traits	Academic Self-Efficacy Scale
Extraversion	
r	0.127
p	0.033*
Agreeableness	
r	0.060
p	0.315
Conscientiousness	
r	0.298
p	0.000*
Neuroticism	
r	-0.103
p	0.084
Openness to experience	
r	0.214
p	0.000*

*: $p < 0.05$. r: Spearman's correlation analysis.

for extraversion, 7.88 ± 1.44 for agreeableness, 7.43 ± 1.59 for conscientiousness, 6.16 ± 1.49 for neuroticism, and 6.95 ± 1.74 for openness to experience (Table 1).

In this study, nursing students who perceived their academic achievement as good had higher ASES scores than those who perceived it as moderate or low. Similarly, students who perceived their academic achievement as moderate had higher ASES scores than those who perceived it as low ($p < 0.05$). However, no statistically significant differences were found between ASES scores and students' gender, academic year, or grade point average ($p > 0.05$) (Table 2).

A weak but statistically significant positive correlation was found between ASES total scores and the personality traits of extraversion ($r = 0.127$), conscientiousness ($r = 0.298$), and openness to experience ($r = 0.214$) (Table 3).

Discussion

Academic performance is influenced by multiple factors, one of which is academic SE. Identifying nursing students' academic SE and implementing strategies to enhance it may contribute to improved academic performance and success.²³ This study, which examined the relationship between nursing students' personality traits and academic SE, found that students' grade point averages and their perceptions of academic performance were at a moderate level. Notably, their academic SE levels were above average. These findings are consistent with those reported by Yiğit et al.,²⁴ Yüzer Alsaç et al.,²⁵ and Kocaaslan et al.²⁶ Academic SE reflects students' beliefs in their ability to successfully perform academic tasks. In line with the findings of this study, nursing students' beliefs about their ability to accomplish academic tasks were above average. This result indicates that they have relatively strong confidence in their capacity to fulfill academic requirements and achieve success, highlighting the importance of SE and self-confidence in academic achievement.

The findings of this study revealed a relationship between nursing students' perceptions of academic achievement and their academic SE, while no relationship was found with gender, academic year, or grade point average. Similarly, Zysberg and Schwabsky²⁷ reported no association between gender and academic SE, but did find a relationship with academic achievement. Students with high academic SE are better able to focus on and organize course content. Moreover, those who perceive themselves as capable learners are more likely to persist in overcoming challenges encountered during the educational process and to exert greater effort to succeed.²⁸ These findings suggest that students with higher academic SE are more likely to demonstrate the performance required for success and effectively cope with learning-related difficulties.

When examining the mean scores of personality traits among participating nursing students, agreeableness, conscientiousness, extraversion, and openness to experience were found to be above average, while neuroticism was at a moderate level.

The highest mean score was observed from agreeableness, whereas the lowest was for neuroticism. Similar findings were reported by Ibrahim and Elhabashy in a study of Egyptian undergraduate nursing students.²⁹ Likewise, Abouzeid et al.³⁰ found that agreeableness had the highest mean score among personality traits. These findings suggest that nursing students are generally well-adapted to teamwork and tend to demonstrate sensitivity, understanding, and compassion in their interactions with patients. At the same time, nursing students appear to regulate negative emotions such as anxiety, stress, and anger at a moderate level, and they may occasionally experience difficulties in stressful environments. Therefore, providing support in these areas may be beneficial for their professional development.

In the present study, a positive relationship was found between nursing students' academic SE and the personality traits of extraversion, conscientiousness, and openness to experience. Similarly, Abood et al.³¹ reported a positive association between openness to experience and academic SE in a study conducted in Jordan. Additionally, Mammadov, in a meta-analysis examining the Big Five personality traits and academic performance, emphasized that conscientiousness and openness to experience are key determinants of student performance.³² Students who are open to learning and capable of self-regulation tend to exhibit greater academic confidence, curiosity, and motivation. They are also more likely to take responsibility, work in a planned and goal-oriented manner, and demonstrate effective time management skills.³³ These characteristics appear to contribute positively to their academic SE. Overall, the findings of this study are consistent with the literature and highlight the important role of conscientiousness and openness to experience in academic SE. Accordingly, it is recommended that educational strategies aimed at enhancing nursing students' academic SE take these personality traits into account.

Extraversion and agreeableness, as personality traits, are associated with students' social relationships and reflect characteristics such as warmth, closeness, and reliability in interpersonal interactions. Limited studies in the literature on university students have emphasized that extraversion may play a role in academic SE.^{31,34} The findings of this study suggest that students with stronger social characteristics may exhibit a weak but significant relationship with academic SE, and that academic SE, as a multifaceted construct, may be influenced by various factors.

Study Limitations

This study was conducted only with students enrolled in the nursing department of a single university; therefore, the findings cannot be directly generalized. It is recommended that future studies be conducted across different universities with larger sample sizes and include mixed-method designs incorporating qualitative approaches. Additional limitations include the cross-sectional design, the reliance on self-reported data, data collection from a single institution, the potential for volunteer bias, and the lack of control for possible confounding variables (e.g., mental health, workload, socioeconomic factors, etc.).

Conclusion

This study has shown that nursing students' personality traits are associated with their academic SE. In addition, the study results revealed a relationship between nursing students' self-perceived academic achievement and their academic SE. In addition, the study results revealed a relationship between nursing students' self-perceived academic achievement and their academic SE. Furthermore, developing educational approaches tailored to students' personality traits, strengthening emotion regulation and stress management skills, enhancing academic SE and self-regulation, and offering guidance and counseling services may contribute to improved academic SE.

Ethics Committee Approval: The study was approved by the Trakya University Social and Human Sciences Research Ethics Committee [Approval Number: 02/19, Date: 05.02.2025].

Informed Consent: Written informed consent was obtained from the participants.

Conflict of Interest: The authors have no conflicts of interest to declare.

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Cardiovascular Intensive Care Unit Nurses' Perceptions of the Factors Affecting, Barriers to, and Facilitators of Early Mobilization

Abstract

Background: Although early mobilization has well-documented benefits for patients in intensive care units, it is not implemented as frequently as recommended. Previous studies have identified patient-related factors, time constraints, and inadequate staffing as barriers to the early mobilization of cardiovascular intensive care unit (CICU) patients.

Aim: This study aimed to explore CICU nurses' perceptions of the factors affecting, barriers to, and facilitators of early mobilization in CICU patients.

Methods: A descriptive qualitative study design was employed. Seven CICU nurses were recruited using purposive sampling. Data were collected through semi-structured interviews. Audio-recorded interviews were transcribed verbatim and analyzed using qualitative content analysis. Codes were generated from the transcripts and subsequently organized into categories and themes.

Results: Participants reported that early mobilization is beneficial for CICU patients and should be prioritized according to each patient's clinical condition. Three themes and seven categories emerged: factors affecting early mobilization, barriers to early mobilization, and facilitators of early mobilization. Factors affecting mobilization included patient-related factors (hemodynamic stability, pain, fear, and muscle strength), environmental factors (limited space and medical equipment), and personnel-related factors (staff shortages and lack of experience). Barriers were categorized as physical (e.g., hemodynamic instability and pain) and psychological (e.g., fear and lack of self-confidence). Facilitators included preoperative education and adequate staffing support.

Conclusion: The findings suggest that CICU nurses perceive patient-related factors, environmental conditions, and staffing issues as key influences on early mobilization. Improving staffing support, developing written protocols, and providing education may facilitate the implementation of early mobilization in CICUs.

Keywords: Barriers, cardiovascular surgery, early mobilization, facilitators, intensive care unit, qualitative study

Hülya Bulut,¹ Belma Ay Kılıçaslan,²
Nihal Yıldız Emre,³ Sevil Güler⁴

¹Department of Surgical Nursing, Gazi University Faculty of Nursing, Ankara, Türkiye

²Vocational School of Health Services, Lokman Hekim University, Ankara, Türkiye

³Department of Nursing, Kırıkkale University Faculty of Health Sciences, Kırıkkale, Türkiye

⁴Department of Surgical Diseases Nursing, Gazi University Faculty of Nursing, Ankara, Türkiye

Introduction

Although early mobilization of intensive care unit (ICU) patients is considered safe, feasible, and beneficial, it is not implemented as frequently as recommended.¹⁻³ Prolonged immobilization is associated with reduced joint mobility, muscle weakness, pressure injuries, deep vein thrombosis (DVT), prolonged mechanical ventilation, cognitive impairment, and psychological disorders. In the cardiovascular system, these changes may manifest as tachycardia, orthostatic hypotension, reduced oxygen uptake, and decreased cardiac output. Reduced respiratory volume and impaired secretion clearance resulting from prolonged supine positioning increase the risk of atelectasis and pneumonia. Furthermore, decreased physical function and reduced quality of life are commonly experienced following an ICU stay.^{2,3}

Previous studies have demonstrated the benefits of early mobilization in mechanically ventilated patients.⁴⁻⁷ The literature recommends mobilizing ICU patients within the first 24 hours after surgery, provided that their vital signs are stable.⁸⁻¹⁰ However, some studies have reported that patients receiving mechanical ventilation are rarely mobilized, whereas patients who are not mechanically ventilated are still mobilized less frequently than recommended.¹¹⁻¹³ Reported barriers to early mobilization include patient-related factors (e.g., mechanical ventilation, sedation, vasopressor use, patient reluctance, and invasive interventions), insufficient time, inadequate staffing, poor communication among healthcare professionals, stress, and the absence of clear protocols.^{1,3,11,13}

Early mobilization is recognized as a key intervention in the care of critically ill patients because it reduces muscle weakness, shortens the duration of mechanical ventilation, promotes functional recovery, and decreases the length of hospital stay.¹⁴ In patients undergoing cardiovascular surgery, early mobilization is particularly important for preventing pulmonary complications, supporting cardiovascular function, and accelerating postoperative recovery.¹⁵ Despite its well-established clinical benefits, the implementation of early mobilization in intensive care units remains suboptimal.^{16,17} The literature indicates that several factors hinder its implementation, including concerns about hemodynamic instability, inadequate staffing, excessive workload, poor interdisciplinary communication, and the lack of standardized protocols.^{2,18}

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Corresponding author: Belma Ay Kılıçaslan
E-mail: belma.ay@lokmanhekim.edu.tr

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Although barriers to early mobilization have been investigated in various intensive care populations, evidence specific to patients undergoing cardiovascular surgery remains limited. The complex clinical characteristics of these patients, including invasive monitoring, vasoactive medication use, postoperative pain, and hemodynamic instability, may present unique challenges to early mobilization.¹⁹ Therefore, a better understanding of the factors influencing mobilization in this population is needed.

Although the benefits and safety of early mobilization have been well documented,^{20,21} studies examining barriers to its implementation in intensive care units are limited. Furthermore, most existing studies have employed descriptive or cross-sectional designs and have primarily focused on healthcare professionals' knowledge, attitudes, beliefs, and experiences.^{13,18–24} Consequently, there is a lack of qualitative evidence providing an in-depth understanding of the perceptions and factors influencing barriers to and facilitators of early mobilization.

Nurses play a central role in planning and implementing early mobilization; however, qualitative research examining the barriers and facilitators encountered by cardiovascular intensive care nurses remains scarce. To our knowledge, few qualitative studies have explored this issue in the Turkish context. Therefore, exploring nurses' clinical experiences and perceptions is essential for gaining a deeper understanding of the factors influencing early mobilization practices. Such knowledge may contribute to the development of targeted strategies and support the evidence-based implementation of early mobilization in cardiovascular intensive care units (CICUs).

Accordingly, this study aimed to explore CICU nurses' perceptions of the barriers to and facilitators of early mobilization in patients undergoing cardiovascular surgery.

Research Questions

The study addressed the following research questions:

1. What are the barriers to early mobilization of CICU patients as perceived by CICU nurses?
2. What are the facilitators of early mobilization of CICU patients as perceived by CICU nurses?

Materials and Methods

Research Design

This study employed a descriptive qualitative research design. A descriptive qualitative approach was selected because it enables the exploration of participants' perceptions and experiences within their natural settings.²⁵ Qualitative descriptive studies aim to provide a rich and straightforward description of a phenomenon as perceived by those experiencing it.²⁶ Therefore, this design was considered appropriate for exploring CICU nurses' perceptions of the barriers to and facilitators of the early mobilization of patients undergoing cardiovascular surgery and for gaining a deeper understanding of these factors. The study findings are reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ).²⁷

Research Team

All researchers specialized in surgical nursing. The first and fourth researchers were professors of surgical nursing. The second and third researchers were PhD. All researchers had received training in or had prior experience with qualitative research methods. The qualitative interviews were conducted by the second and third researchers. Participants were provided with general information about the researchers, including their professional experience and educational backgrounds.

Participants

The study included seven CICU nurses from a single center who were recruited using purposive sampling. Consistent with the principles of qualitative research, purposive sampling, a non-probability sampling technique, was used to recruit participants who could provide rich and relevant information regarding the phenomenon under investigation.²⁸ The inclusion criteria were: [1] working in the CICUs; [2] having at least one year of experience caring for patients undergoing cardiovascular surgery; [3] being directly involved in the early mobilization of these patients; and [4] voluntarily agreeing to participate in the study. The exclusion criteria were: [1] having less than one year of CICU experience; [2] not being directly involved in the care and mobilization of patients undergoing cardiovascular surgery; [3] being on leave during the data collection period; or [4] declining to participate in the study.

Data collection continued until data saturation was achieved, defined as the point at which no new themes, categories, or insights emerged from the interviews.^{29,30} Interview transcription and preliminary coding were conducted concurrently with data collection. Data saturation was reached after the sixth interview, when recurring codes and themes began to emerge. One additional interview was conducted to confirm data saturation, resulting in a final sample of seven participants.

Data Collection Tools

The data collection form was developed by the researchers based on the relevant literature.^{1,2,3,18} It consisted of two sections: a personal information form and a semi-structured interview guide. The personal information form included five questions regarding participants' gender, age, educational level, years of professional experience, and years of experience in the CICU. The semi-structured interview guide included the following four questions to explore CICU nurses' perceptions of the barriers to and facilitators of the early mobilization of patients undergoing cardiovascular surgery:

1. Do you think that early mobilization after cardiovascular surgery is beneficial? If yes, what are these benefits?
2. Do you think there are factors that influence early mobilization after cardiovascular surgery? If yes, what are these factors?
3. In your opinion, what is the main barrier to the early mobilization of patients in the CICU?
4. If you could do something to facilitate the early mobilization process in your ICU, what would you do?

Procedures

Data were collected in December 2021. Nurses who agreed to participate were informed about the study and provided written informed consent. Following consent, participants received a data collection form containing four open-ended questions and were given one day to complete the form in writing. The researchers reviewed the written responses before conducting the interviews.

Subsequently, individual online semi-structured interviews were conducted based on the participants' written responses. During the interviews, participants were invited to elaborate on, clarify, and expand upon their written answers. Additional probing questions were used to explore emerging issues in greater depth and to obtain a more comprehensive understanding of participants' perceptions of the barriers to and facilitators of early mobilization. Each interview lasted approximately 20–30 minutes and was audio-recorded with the participants' permission. To ensure confidentiality, participants were assigned identification numbers ranging from N1 to N7. All interviews were conducted in Turkish to allow participants to express their views more comfortably and comprehensively.

Data Analysis

Data were analyzed using qualitative content analysis. Qualitative content analysis is an iterative process involving the concurrent collection and analysis of data and includes coding the data, developing categories and themes, organizing codes and themes, and interpreting the findings.^{31,32}

The interviews were conducted by the second and third researchers. Data analysis began by assigning a unique identification number to each participant to ensure confidentiality. Written responses to the open-ended questions and the verbatim interview transcripts were read repeatedly by the researchers to gain a comprehensive understanding of the data. Meaningful statements relevant to the study aim were identified and assigned initial codes. Coding was performed independently by all four researchers, and the resulting codes were compared and discussed throughout the analysis. Any discrepancies in coding or interpretation were resolved through discussion until consensus was reached.

Following the initial coding process, conceptually similar codes were grouped into subcategories and categories. The researchers then examined the relationships among the categories and developed broader themes reflecting CICU nurses' perceptions of the barriers to and facilitators of the early mobilization of patients undergoing cardiovascular surgery. Themes and categories were continuously reviewed, refined, and compared with the original data to ensure that they accurately represented participants' experiences and perceptions.

Table 1. Demographic characteristics of the participants

Participant	Gender	Age	Education	Professional experience (years)	CICU experience (years)
Nurse 1	Female	27	Bachelor's	4	4
Nurse 2	Female	24	Bachelor's	2	1.5
Nurse 3	Female	30	Associate degree	12	3
Nurse 4	Female	37	Bachelor's	14	14
Nurse 5	Female	27	Bachelor's	3.5	3
Nurse 6	Female	36	Bachelor's	15	7
Nurse 7	Male	26	Bachelor's	1.7	1.7

The interview transcripts were returned to the participants for member checking, and participants were asked to verify the accuracy of their statements. Throughout the analysis, participants' perspectives were carefully considered, and representative quotations were selected to illustrate the identified themes.

Reliability and Validity

The reliability and validity of the study were established by ensuring an adequate sample, involving multiple researchers in the coding process, clearly describing the research setting and the researchers' roles, maintaining impartiality throughout the study, consulting relevant literature and expert opinion, and providing a detailed description of the data collection and analysis procedures.³³⁻³⁵

Reliability was enhanced through independent analysis by all four researchers. Transferability was supported by providing a clear description of the data collection procedures, participant characteristics, and data analysis process. Dependability was strengthened by supporting each theme and category with representative participant quotations. Confirmability was achieved through independent coding by all researchers and repeated discussions until consensus was reached. The use of purposive sampling and the opportunity for participants to express their views freely further strengthened the authenticity of the findings.

Ethical Considerations

Ethical approval was obtained from Lokman Hekim Non-interventional Clinical Research Ethics Committee (Approval Number: 2021/118, Date: 23.09.2021). Participants were informed about the purpose of the study, and both written and verbal informed consent were obtained prior to data collection. Confidentiality was maintained throughout the study. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

The mean age of the participants was 29.57±5.06 years. Most participants were female (85%) and held a bachelor's degree. The mean duration of professional experience and CICU experience was 7.45±5.92 and 4.88±4.41 years, respectively (Table 1). All participants agreed that early postoperative mobilization should be a priority for patients in the CICU.

Analysis of the interview data revealed three overarching themes: factors affecting early mobilization, barriers to early mobilization, and facilitators of early mobilization. These themes comprised seven subthemes: patient-related factors, environmental factors, personnel-related factors, physical barriers, psychological barriers, healthcare personnel-related facilitators, and education-related facilitators (Table 2).

Theme 1. Factors Affecting Early Mobilization

Analysis of the interview data revealed that nurses perceived the mobilization process to be influenced by patient-related factors, environmental conditions, and the availability of healthcare personnel. Among the patient-related factors, hemodynamic stability, pain, fear, disorientation, muscle strength, and the need for inotropic support were frequently identified. Participants emphasized that patients should undergo a comprehensive assessment before mobilization, particularly with respect to vital signs, oxygenation status, and mental status. Pain associated with major cardiac surgery and reduced physical strength were also perceived as important factors influencing successful mobilization.

Environmental conditions were identified as another important influence on the mobilization process. Participants reported that limited space for mobilization, unsuitable physical conditions within the unit, and the presence of multiple monitoring devices and drains often complicated mobilization efforts. In addition, personnel-related factors, including inadequate staffing levels and limited clinical experience among healthcare professionals, were perceived to negatively affect the planning and implementation of early mobilization.

"Disorientation, low pain tolerance, fear of adverse events, and unsuitable or inadequate space for mobilization may be factors affecting mobilization." (N1)

"When the number of patients is high and there is a shortage of nurses, mobilization remains a priority. A lack of support staff is also common and can prolong the process." (N5)

"The presence of multiple devices attached to the patient (e.g., drains)..." (N2)

"...the demand for rapid mobilization within a limited intensive care unit environment..." (N4)

Theme 2. Barriers to Early Mobilization

Participants identified both physical and psychological barriers to early mobilization in the CICU. Physical barriers primarily included hemodynamic instability, impaired oxygenation, postoperative pain, and the physiological consequences of major cardiovascular surgery. Participants emphasized that unstable vital signs and delayed clinical recovery frequently postponed mobilization, while severe pain associated with sternotomy and extensive surgical incisions reduced patients' ability and willingness to mobilize.

Psychological barriers were also perceived as important obstacles to mobilization. Participants reported that some patients were reluctant to participate in mobilization because of fear, low self-confidence, and concerns about their ability to perform physical activities safely. These psychological barriers often interacted with physical symptoms, further reducing patients' readiness and motivation for mobilization.

"Postoperative pain and patients' reluctance to participate in mobilization are the primary barriers to mobilization in CICU patients." (N2)

"A lack of self-confidence and the belief that they are unable to perform the activity may negatively affect the patient's mobilization process." (N3)

"Cardiovascular surgery, postoperative vital signs, and low cardiac output are the main obstacles." (N6)

"The main barrier is the severe pain associated with the surgical site (sternum), which is highly pain-sensitive, as well as the significant pain resulting from large surgical incisions." (N7)

Theme 3. Facilitators of Early Mobilization

Participants identified adequate staffing and preoperative education as the primary facilitators of early mobilization. Many participants suggested increasing the num-

Table 2. Representative participant quotations regarding the barriers to and facilitators of early mobilization in patients in the cardiovascular intensive care unit (CICU)

Theme	Subthemes	Codes	Representative participant quotations
Factors affecting early mobilization	Patient-related factors	Fear	<i>"Disorientation, low pain tolerance, fear of adverse events, and unsuitable or inadequate space for mobilization may be factors affecting mobilization."</i> [N1] <i>"The patient can be mobilized to a standing position once blood pressure, heart rate, and oxygen saturation return to normal levels."</i> [N4] <i>"If the patient requires inotropic support after surgery... mobility may be restricted because of severe pain associated with the location and extent of the surgical incision."</i> [N2] <i>"A low pain threshold and insufficient physical strength may hinder the patient's mobilization process."</i> [N5] <i>"The patient's overall condition following cardiac surgery provides important insight into readiness for early mobilization. In particular, vital signs and mental status should be carefully assessed before assisting the patient to stand."</i> [N7]
		Pain	
		Hemodynamic status	
		Disorientation	
		Inotropic support	
		Major surgery	
		Muscle strength	
	Environmental factors	Limited mobilization space	<i>"An unsuitable floor surface and inadequate space for mobilization..."</i> [N1] <i>"The presence of multiple devices attached to the patient (e.g., drains)..."</i> [N2] <i>"...the demand for rapid mobilization within a limited intensive care unit environment..."</i> [N4] <i>"...for example, the floor should be dry, clean, and non-slip, and adequate lighting should be provided..."</i> [N7]
		Unsuitable floor conditions	
		Attached monitoring devices	
Personnel-related factors	Inadequate staffing	<i>"...an insufficient number of healthcare personnel..."</i> [N1] <i>"When the number of patients is high and there is a shortage of nurses, mobilization remains a priority. A lack of support staff can also prolong the process."</i> [N5] <i>"...the experience of healthcare personnel is very important because planning errors may occur..."</i> [N2] <i>"...inexperienced healthcare personnel are an important concern..."</i> [N3]	
	Inexperienced and inadequately trained healthcare personnel		
Barriers to early mobilization	Physical barriers	Hemodynamic instability	<i>"Cardiovascular surgery, postoperative vital signs, and low cardiac output are the main obstacles."</i> [N6] <i>"The main barrier is the severe pain associated with the sternotomy site, which is highly sensitive, as well as the significant pain caused by the large surgical incision."</i> [N7] <i>"...the patient's unsuitability for mobilization (hypotension, poor oxygenation, pain)..."</i> [N5]
		Pain	
	Psychological barriers	Patient reluctance	<i>"Postoperative pain and patients' reluctance to participate in mobilization are the primary barriers to mobilization in CICU patients."</i> [N2] <i>"A lack of self-confidence and the belief that they are unable to perform the activity may negatively affect the patient's mobilization process."</i> [N3] <i>"If the patient is unwilling to stand up, successful mobilization cannot be achieved."</i> [N4]
Facilitators of early mobilization	Healthcare personnel-related facilitators	Improved nurse-to-patient ratio	<i>"...I would like to increase the number of healthcare personnel..."</i> [N1] <i>"...I would increase the number of healthcare personnel on each shift..."</i> [N4] <i>"I would like to ensure adequate nursing and support staff for the mobilization process in the intensive care unit where I work."</i> [N5] <i>"...I would reduce the number of patients assigned to each nurse and increase the number of support personnel..."</i> [N6]
		Increasing the number of nursing and support staff	
	Education-related facilitators	Preoperative education on mobilization	<i>"...I think patients do not have sufficient knowledge about mobilization. Effective preoperative education is one of the things I would like to improve."</i> [N2] <i>"Patients should receive preoperative education and follow-up from a healthcare professional specialized in cardiovascular surgery, such as a nurse or physiotherapist..."</i> [N4]

ber of healthcare professionals involved in patient care, improving nurse-to-patient ratios, and providing greater support from auxiliary personnel. They believed that adequate staffing would enable safer and more timely mobilization while reducing delays associated with heavy workloads and time constraints.

Preoperative education was also viewed as an important facilitator. Participants reported that patients often lacked sufficient knowledge about mobilization and suggested that structured education before surgery could improve patient cooperation and readiness. Some participants further recommended that preoperative education and postoperative follow-up should be provided by healthcare professionals with expertise in cardiovascular surgery, such as nurses or physiotherapists.

"...I think patients do not have sufficient knowledge about mobilization. Effective education before surgery is one of the things that I would like to improve." [N2]

"I would like to provide adequate nurse and support staff for the mobilization process in the intensive care unit where I work." [N5]

"...I would reduce the number of patients assigned to each nurse and increase the number of support personnel..." [N6]

Discussion

This qualitative study explored CICU nurses' perceptions of the factors affecting, barriers to, and facilitators of early mobilization in patients undergoing cardiovascular surgery. Previous studies have demonstrated the beneficial effects of early mobilization on respiratory, cardiovascular, musculoskeletal, and psychological outcomes.⁴⁻⁷ Despite the growing body of evidence supporting the safety, feasibility, and effectiveness of early mobilization, its implementation in intensive care settings remains suboptimal.¹³ Previous studies investigating barriers and facilitators to early mobilization have primarily focused on patient-related factors.^{2,3} According to the literature, mechanical ventilation, sedation, vasoactive medication use, and hemodynamic instability are among the most frequently reported patient-related barriers.³⁶ Consistent with these findings, CICU nurses in the present study identified patient-related factors, particularly pain, fear, and hemodynamic instability, as the primary barriers to early mobilization. Patients in CICUs commonly experience hemodynamic fluctuations,

cardiac rhythm disturbances, and require multiple invasive monitoring devices during the early postoperative period. Consequently, nurses tend to exercise greater caution regarding potential cardiovascular complications during mobilization.

Pain was another major barrier identified by the participants, which is consistent with the nature of cardiovascular surgery.³⁷ Median sternotomy and the presence of chest tubes can substantially limit physical movement and increase discomfort.³⁸ In addition to restricting movement physically, sternotomy incisions and chest tubes may also contribute to psychological fear and insecurity. Such fears may reduce patients' willingness to participate in mobilization and, when combined with concerns about postoperative complications, may lead to prolonged inactivity.³⁹ Furthermore, patients' confidence in their own abilities, as well as their trust in healthcare professionals, may directly influence their willingness to participate in mobilization. Consequently, even patients who are physiologically ready for mobilization may be reluctant to engage in physical activity.

In addition to patient-related barriers, participants identified several organizational barriers that hinder early mobilization. These included inadequate staffing, the absence of structured early mobilization programs, and insufficient training of healthcare professionals.² Previous studies have similarly reported limited time and inadequate staffing as major barriers to early mobilization in intensive care units.^{11,22} Heavy nursing workloads often reduce the time available for mobilization activities.⁴⁰ This finding may reflect both a limited organizational emphasis on early mobilization and insufficient institutional support. Furthermore, inadequate education regarding early mobilization may prevent healthcare professionals from developing the knowledge and confidence required for effective implementation.⁴¹ As a result, mobilization may be delayed because of uncertainty and concerns about patient safety. These findings suggest that improving staffing levels, providing competency-based education, and promoting interdisciplinary collaboration are essential organizational strategies for enhancing early mobilization practices in intensive care settings.

Another important factor influencing mobilization is organizational culture. Institutions that do not prioritize or actively support early mobilization may negatively influence both healthcare professionals' attitudes and patients' participation.² Without a shared understanding of the importance of early mobilization, interdisciplinary collaboration may be weakened. Likewise, when patients are not encouraged to participate actively in the mobilization process, their motivation may decline, adversely affecting rehabilitation outcomes. Therefore, organizational commitment, supportive leadership, and effective education programs are critical components for fostering a culture that promotes early mobilization.

Successful implementation of early mobilization requires a comprehensive, multidisciplinary approach. Key strategies include improving interdisciplinary collaboration, developing and implementing standardized protocols, and establishing clear inclusion and exclusion criteria for mobilization.² Improving nurse-to-patient ratios would allow healthcare professionals sufficient time and resources to perform mobilization safely. Additionally, healthcare professionals should receive systematic education on the principles of early mobilization, mobilization techniques, and patient safety.³⁶ Standardized protocols and effective interdisciplinary teamwork may improve consistency and quality of care. Providing patients with preoperative education about the mobilization process and offering psychological support may help reduce fear and anxiety. Finally, regular assessment of patients' readiness for mobilization would facilitate individualized care plans and may enhance the effectiveness of mobilization interventions.

Overall, the findings indicate that barriers to early mobilization extend beyond individual patient characteristics and encompass broader organizational factors, including institutional culture, staffing, education, and resource management. Therefore, improving early mobilization requires not only increasing staffing levels but also implementing comprehensive organizational policies that promote cultural and structural change.

Limitations

This study has several limitations. First, participants may not have recalled or reported all of their experiences during the interviews, and additional perspectives may therefore remain unexplored. Second, the study was conducted at a single center, which may limit the transferability of the findings to other CICU settings. Third, the relatively small sample size limits the representativeness of the findings and restricts their generalizability.

Conclusion

Although CICU nurses recognized the importance and benefits of early mobilization, they identified several patient-, nurse-, and organizational-level barriers that limited its routine implementation. Hemodynamic instability, safety concerns, insufficient staffing, heavy workloads, and the lack of standardized mobilization protocols were the most frequently reported challenges. Participants also emphasized that multidisciplinary collaboration, evidence-based written protocols, adequate staffing, and regular education and training would facilitate the successful implementation of early mobilization. Addressing these barriers may improve the consistency and safety of early mobilization practices and contribute to better postoperative recovery and patient outcomes in CICUs.

Ethics Committee Approval: The study was approved by the Lokman Hekim Non-interventional Clinical Research Ethics Committee [Approval Number: 2021/118, Date: 23.09.2021].

Informed Consent: Written informed consent was obtained from the participants.

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"I Had to Learn to Accept It": A Narrative Inquiry into a Young Woman's Experience of Living with an Ostomy Following the Kahramanmaraş Earthquakes

Abstract

Background: This single-case study explores the experience of a young woman who underwent ostomy surgery following the Kahramanmaraş earthquakes, providing an in-depth understanding of the physical and psychosocial adaptation process.

Aim: The aim of this study was to explore the lived experience of a young woman who underwent an intestinal ostomy following the Kahramanmaraş earthquakes through a single-case narrative inquiry.

Methods: This study employed a single-case narrative inquiry design. An in-depth interview was conducted on March 1, 2024 with a young woman who underwent ostomy surgery as a result of injuries sustained during the Kahramanmaraş earthquakes. Data from the in-depth interview were analyzed using Malterud's systematic text condensation method with the support of MAXQDA (Version 24, VERBI GmbH, Berlin, Germany). The study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.

Results: Analysis of the participant's narrative yielded four themes: (1) ostomy-related experiences; (2) challenges following ostomy; (3) factors facilitating coping with post-ostomy difficulties; and (4) recommendations for improving ostomy management.

Conclusion: This single-case study suggests that the physical and emotional losses associated with a major earthquake may complicate adaptation to living with an ostomy. Understanding the challenges encountered by individuals in similar circumstances and the coping strategies they develop may help nurses and other healthcare professionals provide more effective support in post-disaster settings.

Keywords: Earthquakes, nursing care, ostomy, qualitative research, young adult

Elif Budak Ertürk,¹ Sevcan Avcı Işık,¹
Azize Karahan,² Ebru Akgün Çıtak,¹
Mehmet Ali Koç,³ Serpil Uçar,⁴ Durucan Aydın⁴

¹Department of Nursing, Başkent University Faculty of Health Sciences, Ankara, Türkiye

²Department of Surgical Nursing, Gazi University Faculty of Nursing, Ankara, Türkiye

³Department of General Surgery, Ankara University, İbn-i Sina Hospital, Ankara, Türkiye

⁴Stomatherapy Unit, Ankara University, İbn-i Sina Hospital, Ankara, Türkiye

Introduction

Türkiye is located on the Mediterranean-Alpine-Himalayan seismic belt and is highly susceptible to earthquakes. On February 6, 2023, two major earthquakes measuring Mw 7.8 and Mw 7.5 struck Kahramanmaraş, followed by a Mw 6.4 earthquake in Hatay on February 20. These disasters caused widespread destruction and claimed 47,932 lives.¹ Earthquakes have profound physical and psychosocial consequences. Post-traumatic stress disorder is common among survivors and frequently coexists with injuries such as fractures, crush syndrome, and infections.² Previous disasters, including the Marmara earthquakes, have been associated with high mortality among patients with crush syndrome affecting critical body regions.³ Individuals trapped under collapsed buildings often sustain multiple traumatic injuries, with pelvic fractures being a frequent consequence of crush injuries and commonly accompanied by severe abdominal, thoracic, or pelvic hemorrhage.⁴ In cases of severe abdominal trauma or ischemia, ostomy may be required as a life-saving emergency intervention to control sepsis.⁵ Similarly, ostomy formation may be necessary following anorectal injuries until complete healing is achieved.

Preoperative preparation for emergency ostomy surgery is often limited.⁵ Qualitative evidence indicates that individuals undergoing emergency intestinal ostomy experience unexpected physical changes, emotional vulnerability, fragmented care, and a lack of continuity associated with multiple caregivers.⁶ These findings suggest that emergency ostomy formation imposes substantial physical and psychosocial burdens. However, little is known about how these challenges are experienced in disaster settings, where healthcare systems, social support networks, and living conditions may be severely disrupted. Existing research on disaster-related surgical care has primarily focused on the management of acute injuries and trauma,⁶ with limited attention given to individuals living with an ostomy following disaster-related injuries.⁷ Although the psychosocial consequences of ostomy, including altered body image, sexuality, and social reintegration, are well documented,⁸⁻¹² these studies have largely been conducted in non-disaster settings. Likewise, disaster-related psychosocial research has primarily focused on the general population or trauma survivors without chronic or post-surgical care needs.¹³ Consequently, there remains a significant gap in understanding how disaster-related disruptions interact with the complex demands of ostomy care.^{7,14}

For young adults, living with an ostomy presents unique psychosocial challenges, including altered body image, diminished self-esteem, disruptions in social participation, and concerns regarding intimate relationships, and employ-

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Corresponding author: Elif Budak Ertürk
E-mail: ebudak@baskent.edu.tr

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ment.^{11,12} When compounded by the consequences of a major earthquake, such as displacement, loss of housing, restricted access to healthcare, and reduced social support, these challenges may become even more pronounced, increasing both physical and psychological vulnerability.¹⁵ Understanding this intersection is essential for advancing disaster nursing practice, surgical care planning, and psychosocial rehabilitation.

Holistic nursing frameworks, such as the Roy Adaptation Model, provide a useful perspective for understanding these adaptation processes. The model conceptualizes individuals' responses to internal and external stimuli across four adaptive modes: physiological function, self-concept, role function, and interdependence.¹⁶ It provides a useful framework for understanding how individuals adapt to the combined challenges of living with an ostomy and earthquake-related trauma.¹⁷

Understanding the experiences of young people living with an ostomy following a major earthquake may help identify unmet care needs and inform targeted nursing and psychosocial interventions. Evidence regarding the experiences of individuals who undergo intestinal ostomy following earthquake- or disaster-related trauma remains scarce.⁷ To address this knowledge gap, the present study explores the lived experience of a young woman who underwent intestinal ostomy following the Kahramanmaraş earthquakes through a single-case narrative inquiry.

Research Questions

1. What are the experiences of a young woman living with an intestinal ostomy following the Kahramanmaraş earthquakes?
2. How has living with an intestinal ostomy affected her daily life?
3. What challenges has she experienced following ostomy surgery?
4. What coping strategies has she used to manage these challenges?

Materials and Methods

Study Design

This study employed a single-case narrative inquiry design, a methodology grounded in phenomenology and interpretive hermeneutics.¹⁸ Narrative inquiry explores how individuals experience and make sense of the world¹⁹ through the examination of personal stories and lived experiences.²⁰ By focusing on the meanings individuals assign to their experiences, this approach can generate rich contextual insights, even from a single case.²⁰ Therefore, it was considered appropriate for examining the experience of a young woman living with an intestinal ostomy following the Kahramanmaraş-centered earthquakes.²¹ The study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.²²

Participant

The study was conducted on March 1, 2024, at a university hospital in the capital of Türkiye. The hospital has an advanced stoma and wound care unit and was selected because it provided care for patients affected by the earthquakes. The inclusion criteria were: (1) having undergone ostomy surgery directly related to the Kahramanmaraş-centered earthquakes; (2) having unique clinical and demographic characteristics relevant to the research question, including young age and bilateral lower-extremity amputation following the earthquake; (3) being clinically stable enough to participate in an in-depth interview; and (4) providing voluntary informed consent. The participant was the only individual who met the inclusion criteria during the study period; therefore, no other eligible participants were identified. A single case was purposively selected because of its relevance to the research question and its potential to provide in-depth insight into the phenomenon, consistent with narrative inquiry's emphasis on depth rather than breadth. The case was considered unique because the participant was a young woman who underwent both ostomy surgery and bilateral lower-extremity amputation following the earthquake and demonstrated notable resilience. The participant's treatment was ongoing at the time of the study, and she consented to participate in an in-depth qualitative interview. Her descriptive and clinical characteristics are presented in Table 1.

Data Collection Tools

Data were collected using descriptive characteristics form and a semi-structured interview guide. The descriptive characteristics form included sociodemographic information, including age, sex, education, marital status, employment status, income, and city of residence, as well as trauma-related information, ostomy characteristics, and health-related experiences.

The semi-structured interview guide consisted of open-ended questions that allowed the participant to describe experiences in detail (Table 2).²³ The interview guide was developed based on relevant literature^{3,5,8} and reviewed by three qualitative research experts to ensure clarity and relevance. Following expert feedback, revisions were made, and the guide was pilot tested with two individuals with similar characteristics. The final version included seven open-ended questions.

Data Collection

Data were collected after ethics committee approval, institutional permission, and participant consent had been obtained. The interview was conducted after the participant had largely completed the treatment process and was physically and psychologically ready to reflect on her experiences. Therefore, the data reflect her experiences during the year following ostomy surgery after the earthquake, during which she also received psychiatric support.

The participant was a 19-year-old woman who was rescued from the rubble four days after the earthquake with severe injuries. She developed necrotizing fasciitis in the sacral region, requiring surgical debridement and colostomy formation to support wound healing. She also lost her mother and brother in the earthquake and underwent bilateral lower-extremity amputation. Her demographic and clinical characteristics are presented in Table 1.

A face-to-face semi-structured interview was conducted in a private room and audio-recorded with the participant's consent. The interview was conducted by a female professor of psychiatric nursing with experience in qualitative research. The primary researcher, a nurse experienced in stoma and wound care, used reflexive practices, including journaling, field notes, and peer discussions, to minimize potential bias.

Both verbal responses and non-verbal cues were considered during the interview. Field notes documenting the interview context and participant reactions were recorded to complement the audio data. The interview lasted approximately 73 minutes.

Study Rigor

Credibility, dependability, confirmability, and transferability are key criteria for establishing trustworthiness in qualitative research,²⁴ and all were addressed in this study. A face-to-face interview lasting approximately 73 minutes was conducted by three researchers. Credibility was enhanced through participant review of the interview notes before the interview concluded and by member checking, during which the emerging themes were shared with the participant and her feedback was incorporated into the analysis. Researcher triangulation, achieved through the involvement of multiple researchers in data collection and analysis, strengthened dependability. Confirmability was supported through the inclusion of direct participant quotations that reflected the study findings. Transferability was strengthened

Table 1. Participant's demographic and clinical characteristics

Characteristic	
Age	19 years
Sex	Female
Education	High school
Marital status	Single
Living arrangements	Living with family
City of residence	Hatay
Length of hospital stay	1 year
Chronic disease	None
Duration trapped under rubble	96 hours
Injured body regions	Pelvic and iliac regions; bilateral lower extremities
Type of ostomy	Temporary colostomy
Date of ostomy creation	February 18, 2023
Ostomy caregiver	Family members [older sister and brother, with support from stoma care nurses during the first two months after ostomy creation]; self-care thereafter

Table 2. Semi-structured interview guide

1. Can you describe what having an intestinal ostomy following the earthquake has meant to you?
2. How has living with an intestinal ostomy following the earthquake affected your daily life?
3. Can you describe your experiences with ostomy care after the earthquake?
4. What challenges have you encountered while managing your ostomy after the earthquake?
5. What factors have helped you adapt to and manage your ostomy?
6. Based on your experiences, what recommendations would you offer to healthcare professionals caring for individuals with an ostomy after an earthquake?
7. What advice would you give to someone who undergoes ostomy surgery following an earthquake?

through detailed descriptions of the sampling strategy, participant characteristics, and study setting, and data collection process.

Data Analysis

Data were analyzed thematically to identify patterns and meanings in the participant's narrative.²⁰ Analysis followed Malterud's systematic text condensation method using MAXQDA software [Version 24, VERBI GmbH, Berlin, Germany].²⁵ The interview was transcribed verbatim and imported into MAXQDA for analysis.

The analysis involved four steps: [1] repeated reading of the transcript to gain an overall understanding; [2] identification and coding of meaning units; [3] condensation of codes into categories and themes; and [4] selection of representative quotations to illustrate subthemes.

Four researchers independently reviewed and coded the transcript, and discrepancies were discussed until consensus was reached. This process enhanced credibility. The resulting codebook, including themes, codes, definitions, and example quotations, is presented in Table 3.

Ethical Considerations

Ethical approval was obtained Başkent University Non-interventional Clinical Research Ethics Committee [Approval Number: 23/127, Date: 02.08.2023], and the Chief Physician's Office. Written informed consent was obtained from the participant before the interview and audio recording. The study purpose and procedures were explained, and voluntary participation was emphasized. Participant confidentiality was protected by removing identifiable information and assigning a code number during analysis. The study followed the principles of the Declaration of Helsinki and publication ethics guidelines. No artificial intelligence-supported technologies were used in the preparation of this study.

Results

The analysis yielded four themes and seven categories describing the participant's experience of living with an ostomy following the earthquake. The themes were: [1] ostomy-related experiences; [2] challenges following ostomy; [3] factors facilitating coping with post-ostomy difficulties; and [4] recommendations for improving ostomy management. Representative quotations illustrating each theme and category are presented in Table 1.

Theme 1: Ostomy-Related Experiences

Category 1.1. Feelings Following Ostomy

The first category captured the participant's initial emotional reactions to the ostomy, including fear of the ostomy bag bursting, unfamiliar sounds and odors, and uncertainty resulting from limited prior knowledge [Fig. 1]. She described these early experiences as follows:

"... I felt fear, and I wondered whether this would always be with me..."
"... There was a bag, and they kept asking if I had passed stool... it was surprising."

Category 1.2. Effects of Ostomy on Daily Life

The second category described the impact of the ostomy on daily life, including sleep disturbances and dietary modifications made to prevent discomfort and complications [Fig. 1]. The participant stated:

"... I wake up in my sleep... I say, 'Why don't you [ostomy] leave me alone?'"

"... I couldn't eat my favorite foods...I couldn't eat spicy food, and they told me dried beans were forbidden...."

Category 1.3. Experiences with Ostomy Care

The third category described the participant's early reluctance to change the ostomy bag and her ongoing concerns about odor, despite repeated reassurance from others [Fig. 1]. She explained:

"... At first, I was terrified. I said, 'Is this my intestine? How can we touch it?'"
"...I always felt there was a smell, especially when I went to the toilet. I kept wondering why it was there and whether it would bother people, so I carried baby cologne with me and sprayed it before walking around."

Theme 2: Challenges Following Ostomy

Category 2.1. Social and Psychological Challenges

The participant described multiple social and psychological challenges, which were organized into five codes: [1] difficulty accepting the process; [2] alienation from the body; [3] earthquake-related losses; [4] maintaining psychological resilience; and [5] perceived and experienced social rejection [Fig. 2]. These experiences are exemplified by the following quotations:

"... Accepting it is brutal; not accepting it is even harder."
"...I still can't accept the earthquake, I can't accept it. I've tried to cover it up, but it's like a wound I still can't heal. As I said, sometimes you just have to bow your head because it's my fate..."
"...Exactly, I am fighting. My mind and my heart are fighting each other the most. My mind says, 'Stop,' but my heart says, 'No, you have to live with this.' Some of my emotions are frozen..."

Category 2.2: Physical Challenges

Physical challenges included four codes: [1] comorbid health problems; [2] uncontrolled gas passage; [3] dietary restrictions; and [4] physical dependence [Fig. 2]. Illustrative quotations for this category include:

"...My feet... I was a national athlete. When I lost my feet, I felt like my life had stopped. I said to myself, 'My life is over. I'll be dependent on this bed.' I had always been an active person. I was a karate athlete... Losing my feet affected me the most, and then I also had a colostomy."
"...Passing gas for the first time was very strange... I was very scared when it first happened."

Theme 3: Factors Facilitating Coping with Post-Ostomy Difficulties

The participant identified several factors that helped her adapt to life with an ostomy. These were organized into ten codes: [1] supporting other individuals with ostomies; [2] accepting the process; [3] talking to her stoma; [4] developing a positive outlook; [5] taking an active role in managing her health; [6] carrying perfume to reduce concerns about odor; [7] striving to regain independence; [8] family support; [9] learning about ostomy care; and [10] encouraging adaptation among other individuals with ostomies [Fig. 3]. The following quotations illustrate these experiences:

"...There was a new boy here...He was terrified too. I told him, 'Look, I can support you. I can come and help you if you have problems"

Table 3. Codebook: Themes, codes, definitions, and example quotes

Name of Code	Definition	Category	Theme	Example
Fear	The participant is coded when they share the positive or negative feelings they experience after ostomy.	Feelings after ostomy	Ostomy-related experiences	<i>"...I felt fear, and now I wondered if this will always live with me..."</i>
Bewilderment				<i>"...I was shocked; how could they take my intestine out? I felt confused..."</i>
Anxiety				<i>"...Whenever I used the toilet, I could sense a smell... I still wonder sometimes if it bothers people."</i>
Change in sleep pattern	The participant is coded when she mentions changes in daily life routines after ostomy.	The effects of ostomy on daily life	Ostomy-related experiences	<i>"...Sometimes it doesn't let me sleep; I can't turn onto my left side..."</i>
Changing dietary habits				<i>"...but I couldn't eat my favourite things...I couldn't eat spicy food, they said dried beans were forbidden..."</i>
Reluctance to exchange bags	The participant is coded when she talks about her experiences with post-ostomy care.	Experiences with ostomy care	Ostomy-related experiences	<i>"...The moment I touched it, I remember my hand trembling... At first, I was terrified; I said, 'Is this my intestine? How can we touch it?'"</i>
Worried about bad odor spread around				<i>"...I always felt there was a smell... I carried baby cologne with me."</i>
Accepting the process				<i>"...Accepting is brutal; not accepting is harder." "...My mind says stop, my heart says no... I've accepted everything, but some emotions are frozen."</i>
Alienating your body	The participant is coded when sharing the difficulties encountered in their social life and psychologically after ostomy.	Social and psychological challenges	Challenges after ostomy	<i>"At first, I felt like they had attached something other than my bowel because I didn't know how the bowel worked or that this could happen."</i>
Existence of losses due to earthquake				<i>"...I wanted those I lost to be with me, but they could not." "...I still can't accept the earthquake. It's like a wound that hasn't healed. Sometimes you just have to accept it because it's my fate..."</i>
Difficulty maintaining psychological resilience				<i>"...I am fighting. My mind says stop, my heart says no, you must live with this... Some of my emotions are frozen..."</i>
Perceived and experienced social rejection				<i>"...healthy older women pass by, looking at me and saying, 'tsk tsk, poor girl.' "...because no one else had their bowel on the outside, I thought, 'Would they see me as strange?'"</i>
Presence of other comorbid health problems				<i>"...My feet, I am normally a national athlete. I lost my feet, and I said life stopped. I said to myself, your life is over here. You will be dependent on this bed... it was my feet that affected me the most, then I already had a colostomy."</i>
Uncontrolled exhalation of gas	The participant is coded when describing the physical difficulties encountered after ostomy.	Physical Challenges	Challenges After Ostomy	<i>"...Passing gas for the first time was very strange... I was very scared when it first happened."</i>
Not consuming favorite foods				<i>"...I couldn't eat my favourite things. I loved chilli. I couldn't eat chilli. They said no baked beans, and they said no bananas."</i>
Physical dependence				<i>"...it's tough to live dependent on one side... I could never get out of bed. My brother changed my colostomy, changed my urine bag, and fed me..."</i>
Helping other ostomy patients	Coding is performed when the participant mentions factors that make it easier to cope with the difficulties experienced due to ostomy.	-	Factors that facilitate coping with post-ostomy difficulties	<i>"...There was a new boy here... He was also terrified. I told him, 'I can support you and help you because I change my stoma.' I supported the new patient, and he got used to it more easily than me..."</i>
Accepting the process				<i>"...I accepted everything, I accepted my foot, I accepted my intestine... I wanted to do it myself, used my strength, and started to get stronger."</i>
Talking to her stoma				<i>"Now I'm comfortable, I've gotten used to it (stoma). I think it's gotten used to me too—like a partner, it listens to me. Sometimes I get angry and say, 'Don't do that, we're in public.' You know how they say stomatherapy? We really do therapy with it."</i>
Developing a positive perspective				<i>"...This is a part of me. It is a gift that Allah gave me... I thank my body again like a blessing."</i>

Table 3. Cont.

Name of Code	Definition	Category	Theme	Example
Taking an active role in health management				"...now I can do the VACs myself, I've learned how to do my dressings and everything, and I could help someone else."
Carrying perfume to prevent odor spread				"I solve it with Dalin (baby cologne); they say it doesn't smell, but when you feel that it smells, I spray it for my comfort."
Trying to regain independence				"...I drink tea, I make my own coffee, I can go and wash my own dishes... I've left behind my dependence now."
Family support				"...I pulled him (my brother) together, and now he's pulling me together. That's how we keep going, supporting each other."
Learning about ostomy				"There are those videos where people change their colostomy. Usually, they're accounts of people with colostomies. I had followed them on Instagram. It would also come up on TikTok."
Strengthening the adaptation of people with ostomies				"...After researching on the internet, I came across a pregnant woman who had an ileostomy... After that, I said I am not the only one who has experienced this."
Patients should be informed about ostomy	It is coded when the participant makes suggestions about what healthcare personnel can do to help facilitate the process for individuals with an ostomy.	Recommendations for health personnel	Recommendations to facilitate ostomy management.	"When it was first opened... if I had known there were people around me who were experienced, and that I wasn't the only one going through this, I wouldn't have had such a hard time."
Nurses should be informed about ostomy				"Nurses already provide support, but a ward nurse should definitely know about this too. The other staff also need to know. In an emergency situation, all of them need to know."
Helping patients make peace with their bodies				"...This is part of your body, and you must live with it. Sometimes you don't believe in destiny, but destiny makes you do everything."
Patients should have easy access to health personnel				"...Even at night, I used to write to her (my nurse). It's very important. Something can suddenly burst, something can suddenly happen."
People with ostomy should share their experiences with each other	It is coded when the participant makes suggestions aimed at facilitating the ostomy process for patients.	Recommendations for patients	Recommendations to facilitate ostomy management.	"...Only someone who's been through it can truly understand. I would have wanted someone like me to come, talk to me, and show me..."
Patients should accept the process				"...Yes, accept that it's that piece. People need to accept it. So everything actually starts with acceptance."
Patients should be advised to talk to their ostomies				"...Like I said, I talked to it (stoma); you can talk to it as a friend of yours. Because a part of you goes outside your body. Think of it as your friend..."

because I change my own stoma. I supported the new patient, and she adapted more easily than I did..."

"... I accepted everything, I accepted my foot, and I accepted my intestine... I wanted to do it myself. I used my own strength, and I gradually became stronger."

"...This is a part of me. It is a gift that Allah gave me... I thank my body for it, and I see it as a blessing."

Theme 4: Recommendations for Improving Ostomy Management

Category 4.1. Recommendations for Healthcare Professionals

Based on her experiences, the participant proposed four recommendations for healthcare professionals: [1] provide comprehensive education about ostomy care; [2] improve nurses' knowledge and competence regarding ostomy management; [3] support patients in accepting changes to their bodies; and [4] ensure timely access to healthcare professionals when concerns arise (Fig. 4). She explained:

"When my ostomy was first created, if I had known there were experienced people around me, or if I had known I wasn't the only one going through this, I don't think I would have struggled so much."

"...Even at night, I used to message my nurse. It was very important because the ostomy bag could suddenly leak or something unexpected could happen."

Category 4.2. Recommendations for Patients

The participant also offered recommendations for individuals living with an ostomy. These included: [1] sharing experiences with other people with ostomies; [2] accepting the adaptation process; and [3] talking to the stoma as a way of fostering emotional acceptance (Fig. 4). She stated:

"...Only someone who's been through it can truly understand. I really wished someone like me had come to talk to me, show me, and look at it together with me..."

"...Like I said, I talked to it (my stoma). You can talk to it like a friend because a part of you is now outside your body. Then you have a friend. Think of it as your friend—you can talk to it."

Discussion

Natural disasters such as earthquakes create complex challenges for individuals living with an ostomy by combining sudden physical changes with profound

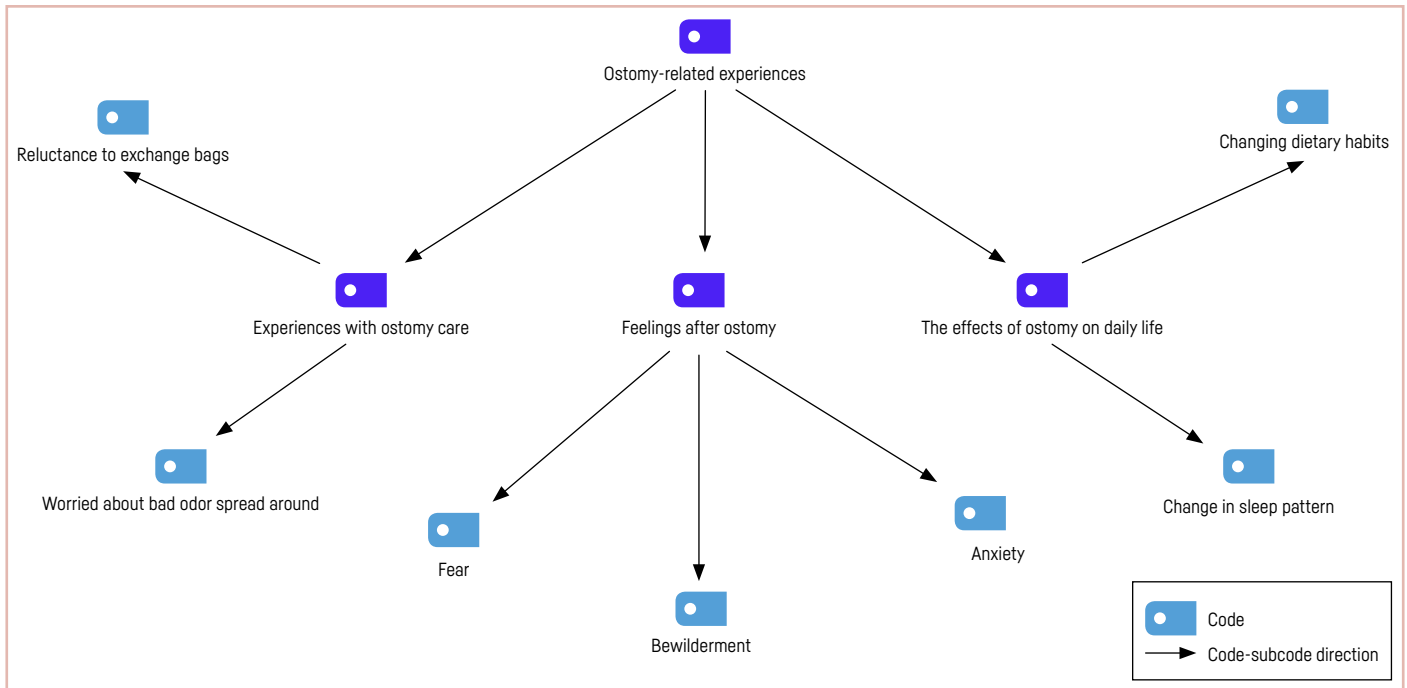


Figure 1. Ostomy-related experiences.

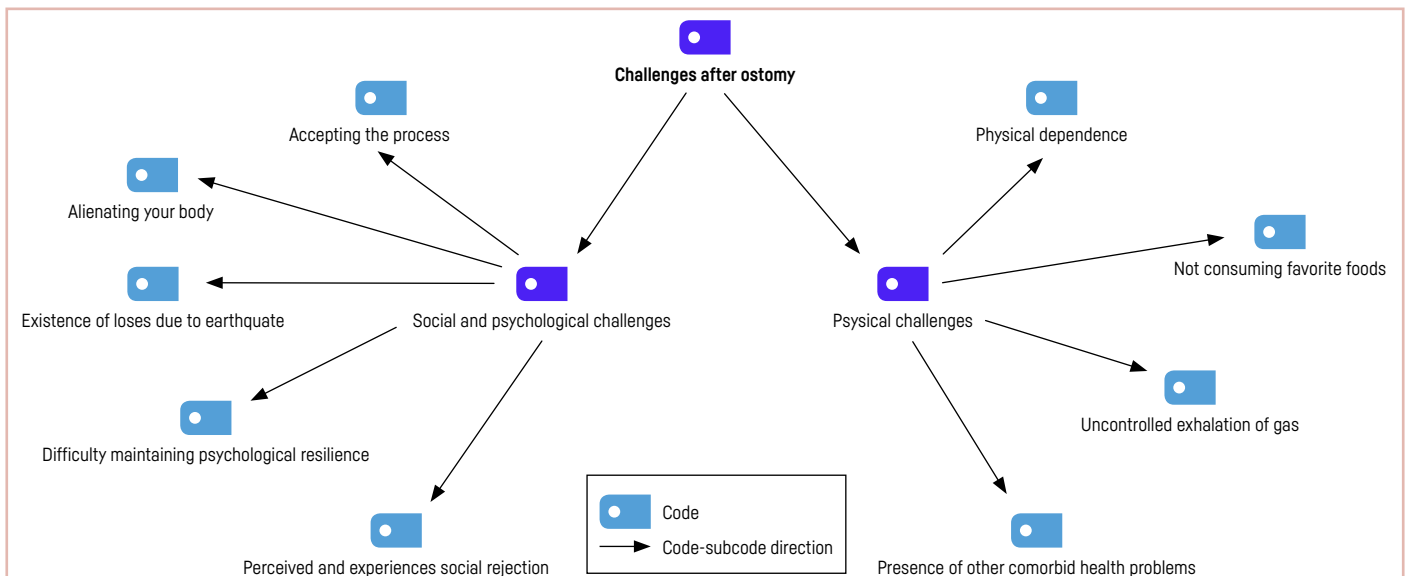


Figure 2. Challenges experienced following ostomy creation.

psychosocial demands. Alterations in body function, the need for specialized self-care, and disaster-related losses can disrupt quality of life and complicate recovery.^{3,26} Young adults may be particularly vulnerable to body image concerns, social stigma, and the loss of previous roles.^{8,11} Given the scarcity of studies involving individuals who undergo ostomy following disaster-related trauma, this discussion draws on evidence from research involving young adults with ostomies and survivors of natural disasters. The present case—a young national athlete who underwent bilateral lower-extremity amputation and emergency ostomy following the 2023 Kahramanmaraş earthquakes—offers a unique perspective on trauma recovery, adaptation to ostomy, and resilience.

Natural disasters challenge both physical functioning and psychosocial adaptation, often compromising quality of life.²⁶ In this study, the participant described fear, uncertainty, and anxiety immediately after ostomy surgery, largely due to limited knowledge about ostomy care and difficulty accepting the stoma. Similar emotional responses, including hopelessness, anxiety, and anger, have been reported among young adults following ostomy surgery.^{10–12} Adaptation may be especially difficult when an ostomy is created unexpectedly after traumatic injury. Recovery also appears to depend on access to rehabilitation services and peer support. Capilla-Díaz et al.²⁷ reported that participation in support groups facilitated adaptation and reduced perceived stigma. In contrast, the persistent difficulties experienced by the

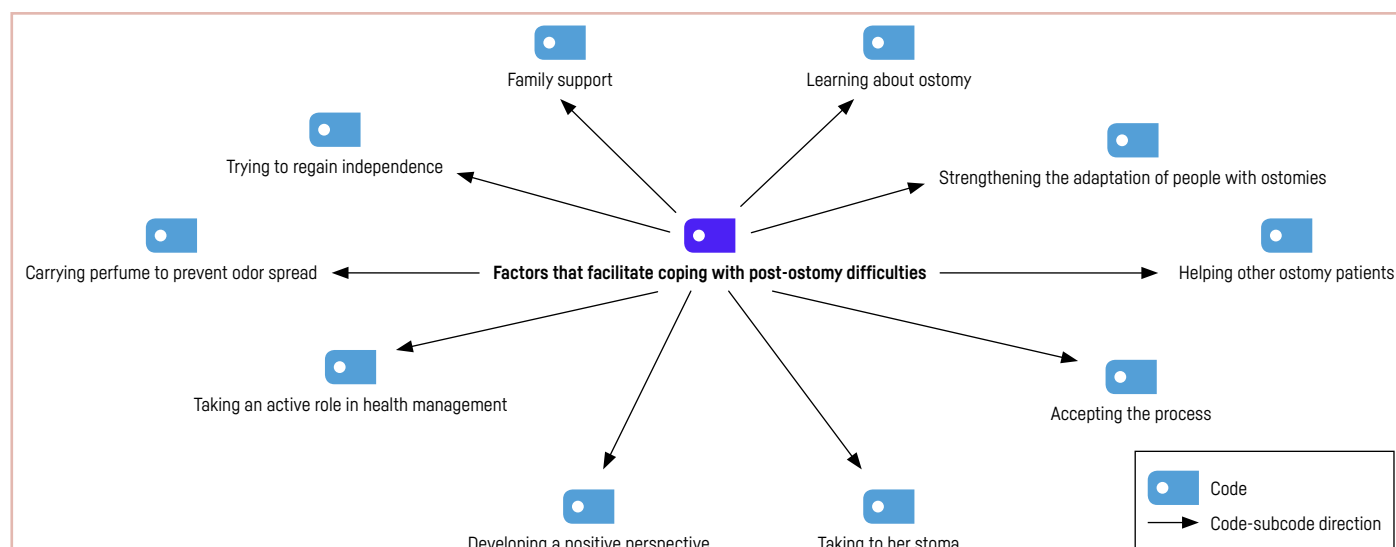


Figure 3. Factors that facilitated the participant's adaptation to and coping with post-ostomy challenges.

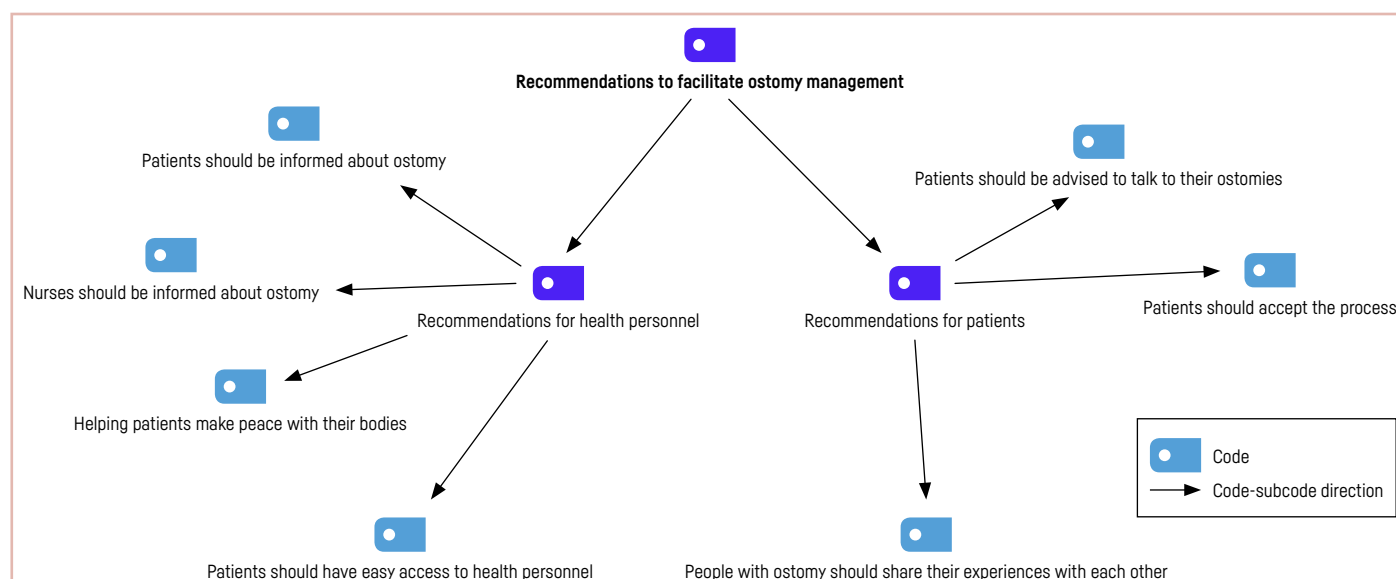


Figure 4. Recommendations for improving ostomy management from the participant's perspective.

participant, compounded by limited peer support following the earthquake, highlight the influence of social and contextual factors on the adaptation process. Findings from this case highlight the importance of integrating psychosocial support, family involvement, and follow-up care with technical ostomy education, particularly in disaster settings where sudden bodily changes may intensify emotional distress.

In this study, the participant described fear, discomfort, and disruptions to daily life associated with living with an ostomy, consistent with previous research. Previous studies have shown that patients with permanent colostomies often experience social isolation, disruptions to daily life, and negative perceptions of stoma care.¹⁰ Similarly, young women may perceive their condition as unusual and stigmatizing.¹¹ Dietary modifications to reduce odor and gas,^{28,29} together with leakage-related anxiety and sleep disruption, are also well documented.^{29,30} Although many individuals gradually adapt to these lifestyle changes over time,^{29,31} the participant in this study continued to express concerns about potential complications, which may have been influenced by her previous earthquake-related wounds and infections. This finding suggests that

a history of trauma may intensify ostomy-related anxieties in certain contexts, an aspect that has received limited attention in the literature. In this case, the findings suggest that ostomy care may benefit from integrating practical ostomy education with trauma-informed, individualized care that acknowledges patients' prior experiences and supports psychological resilience throughout the adaptation process.

In this case, earthquake-related material and emotional losses appeared to contribute primarily to psychosocial difficulties, whereas the physical challenges were largely associated with ostomy management. Similar psychosocial consequences, including sleep disturbances, disability, nutritional difficulties, grief, hopelessness, and psychological distress, have been reported among survivors of the Kermanshah earthquake.³² Sudden bodily changes may be particularly distressing for young adults, who often place considerable importance on body image, especially when combined with traumatic events such as earthquakes.⁸ Likewise, individuals who undergo emergency ostomy surgery frequently struggle with acceptance of altered body image.⁸ As one participant in a previous study expressed, "When I look at my-

self... I can't relate to a bag hanging there," suggesting that although stoma care can be learned, accepting bodily change remains challenging. In the present case, the findings indicate that ostomy care may need to extend beyond technical education to include trauma-informed counseling and body image-sensitive support, particularly for younger individuals adapting to sudden bodily changes.

In this study, the participant experienced several physical challenges related to ostomy management, including sleep disturbances and dietary restrictions aimed at controlling gas and odor, consistent with previous research.^{9,28} She also expressed concerns about complications associated with her earthquake-related wounds and her dependence on family members, particularly her siblings for ostomy care. Previous studies have similarly reported that young adults often perceive living with an ostomy as restrictive¹² and that family support plays a pivotal role in adaptation, particularly among earthquake survivors.^{10,27,31,32} Despite these challenges, the participant adopted several coping strategies, including talking to her stoma, supporting other individuals with ostomies, using perfume to alleviate concerns about odor, and maintaining a positive outlook. Although these strategies have been reported infrequently, they are consistent with evidence highlighting the importance of positive emotions and social support in facilitating adaptation.^{9,29} Ultimately, the participant emphasized that achieving independence and acceptance made living with an ostomy easier, stating, "...It was easier. You know, I think it was harder not to accept it." The participant's experiences can be understood through the four adaptive modes of the Roy Adaptation Model.^{16,17} The physiological mode is reflected in the physical challenges of ostomy management, including sleep disturbances and dietary modifications. The self-concept mode is evident in her experiences of body alienation, struggles with acceptance, and efforts to reconstruct a positive body image. The role function mode is illustrated by the disruption of her identity as a national athlete and the need to redefine her personal and social roles following the earthquake and bilateral lower extremity amputation. Finally, the interdependence mode is reflected in the importance of family support, relationships with healthcare professionals, and interactions with other individuals living with an ostomy. Viewed through the Roy Adaptation Model, this case illustrates how adaptation to an ostomy following disaster-related trauma occurs simultaneously across physiological, psychological, role-related, and interpersonal dimensions.

Nurses play a pivotal role in supporting patients throughout the ostomy care continuum, from preoperative preparation to postoperative adaptation and complication prevention.³³ Their responsibilities include providing patient education, assessing self-care abilities, promoting autonomy, involving family members, facilitating peer support, and delivering individualized care.^{33,34} In the present case, the participant did not receive consistent ostomy care because her treatment spanned multiple clinical settings. Nevertheless, two stomatherapy nurses maintained contact and continued to provide support by telephone. The participant's recommendations for healthcare professionals and other individuals living with an ostomy emphasized the importance of acceptance and sharing lived experiences, consistent with previous studies.^{9,33,34}

A distinctive finding of this study was the participant's use of coping strategies such as "talking to her stoma," supporting other individuals living with an ostomy, and using perfume to alleviate concerns about odor. These strategies can be interpreted through Lazarus and Folkman's Stress and Coping Theory, in which emotion-focused coping (e.g., positive reframing and personifying the stoma) and problem-focused coping (e.g., seeking peer support and managing odor) facilitate adaptation.³⁵ Although these strategies have been reported infrequently, previous studies similarly suggest that positive emotions and social support promote successful adaptation.⁹ Furthermore, "talking to the stoma" may reflect the process of body image reintegration described by Herlufsen and Brødsgaard.⁸

As this study was based on a single participant, the transferability of the findings is limited. However, narrative inquiry facilitates an in-depth exploration of individual experiences within their real-life context, providing a nuanced understanding of complex phenomena. Despite its single-case design, this study offers insights that may inform future research and clinical practice in similar post-disaster contexts.

Strengths and Limitations

To the best of our knowledge, this is the first study to explore the experiences of a young woman who underwent both intestinal ostomy and bilateral lower extremity amputation following an earthquake. The study provides valuable insights into the unique care needs of young adults with an ostomy following a disaster and may inform the delivery of individualized, holistic nursing care in similar settings.

Several limitations should be acknowledged. First, the findings are based on a single case, limiting their transferability to other populations. Second, the case represents a unique clinical situation involving a young adult who underwent both ostomy surgery and bilateral lower extremity amputation following the Kahramanmaraş earthquakes; therefore, the findings cannot be generalized to the broader population of individuals living with an ostomy. Third, the study was conducted at a single care center and reflects the experiences of one individual from an earthquake-affected region. Potential researcher bias was minimized through reflexive practices, field notes, and consensus among the research team during data analysis. These limitations should be taken into account when interpreting the findings.

Conclusion

This study provides insights into the complex challenges experienced by a young woman who underwent an ostomy following an earthquake. The findings highlight the emotional distress, disruptions to daily life, and challenges associated with ostomy management, as well as the effects of social rejection, body alienation, and disaster-related losses on the adaptation process. At the same time, coping strategies such as "talking to her stoma," supporting other individuals living with an ostomy, family support, and maintaining a positive outlook facilitated adaptation.

Young adults may experience heightened challenges when adapting to sudden bodily changes in the context of traumatic events. These findings highlight the value of age-sensitive nursing interventions that integrate technical ostomy education with psychosocial support to promote resilience and facilitate adaptation in post-disaster settings.

By centering the experiences of a young adult, this study contributes to the limited literature on disaster-related ostomies and underscores the importance of patient-centered, trauma-informed nursing care in post-disaster settings.

Ethics Committee Approval: The study was approved by the Başkent University Non-interventional Clinical Research Ethics Committee [Approval Number: 23/127, Date: 02.08.2023].

Informed Consent: Written informed consent was obtained from the participant prior to participation in the study.

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Assessment of Post-Earthquake Trauma and Coping Strategies for Earthquake-Related Stress Among Midwifery Students

Beril Nisa Yaşar, Sibel İçke

Department of Midwifery, Mardin Artuklu University
Faculty of Health Sciences, Mardin, Türkiye

Abstract

Background: Earthquakes are major sources of psychological stress that can adversely affect university students' personal and professional lives.

Aim: This study aimed to assess post-earthquake trauma levels and coping strategies among midwifery students.

Methods: This cross-sectional study included 251 midwifery students enrolled at a state university (participation rate: 71.71%). Data were collected online using the Introductory Information Form, the Scale that Determines the Level of Trauma After the Earthquake, and the Earthquake Stress Coping Strategies Scale. Data were analyzed using the Kolmogorov-Smirnov test, independent-samples t test, one-way analysis of variance (ANOVA), and Bonferroni test in SPSS version 25.

Results: The mean trauma score was 53.53 ± 14.78 , and the mean coping strategies score was 46.46 ± 7.76 . Students who reported fear during the earthquake, loss of family members, relatives, or close friends, or financial losses had significantly higher trauma scores than their counterparts. Significant differences were also found in the religious coping and seeking social support subscales according to earthquake experience, and in the seeking social support subscale according to housing damage ($p < 0.05$).

Conclusion: Midwifery students experienced considerable post-earthquake trauma. Developing effective psychosocial interventions and strengthening adaptive coping strategies may help reduce the long-term psychological effects of earthquake-related stress. Universities and healthcare professionals should implement targeted psychosocial support programs to strengthen students' resilience and enhance their coping abilities following natural disasters.

Keywords: Earthquake, midwifery, stress, students, trauma

Introduction

On February 6, 2023, two devastating earthquakes struck southeastern Türkiye. The first earthquake, with a magnitude of 7.7, was centered in the Pazarlık district of Kahramanmaraş Province, followed by a second earthquake measuring 7.6 in magnitude centered in Elbistan. On February 20, 2023, a magnitude 6.4 earthquake struck Büyükşehir in the Samandağ district of Hatay Province. Collectively, these earthquakes resulted in more than 50,000 deaths and over 100,000 injuries. Experts have described this disaster as one of the earthquakes with the widest area of impact ever recorded on land.¹

Earthquake survivors frequently experience cognitive, emotional, and behavioral problems, as well as sleep disturbances, because disasters threaten fundamental human needs such as safety and shelter. Consequently, their ability to cope with stress may be substantially impaired.² The psychological effects of earthquakes may persist long after the disaster. Moreover, psychological distress may also occur among individuals who do not experience direct loss of life or property but are indirectly exposed to the disaster or aware of its consequences.³⁻⁶

University students are in a critical developmental stage as they transition into adulthood. During this period, they must cope with numerous challenges, including setting life goals, meeting academic expectations, building social relationships, managing financial difficulties, and planning their future careers. Exposure to traumatic experiences, such as the loss of loved ones, displacement, and separation from family members, may further increase young adults' vulnerability to the psychological effects of disasters such as earthquakes.⁷

Although the psychological impact of earthquakes on university students has been widely investigated, most previous studies have focused on general student populations or mixed samples from various health-related disciplines rather than discipline-specific groups.^{7,8} Likewise, studies conducted in Türkiye after major earthquakes have consistently reported high levels of post-traumatic stress, anxiety, and emotional distress among university students; however, these studies have primarily emphasized the prevalence of psychological symptoms, with comparatively less attention given to coping strategies.^{4,6}

Evidence focusing specifically on midwifery students remains limited. As future healthcare professionals, midwives play essential roles in maternal, neonatal, and community health during disaster preparedness, emer-

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Corresponding author: Beril Nisa Yaşar
E-mail: yasarberil@gmail.com

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gency response, and post-disaster recovery.⁹ Disaster-related trauma may therefore influence not only their personal well-being but also their preparedness to fulfill future professional responsibilities.

Although trauma-related outcomes following earthquakes have been extensively documented, relatively few studies have examined coping strategies and their relationship with trauma severity.¹⁰ Furthermore, little is known about how trauma symptoms and coping strategies coexist among midwifery students or which coping approaches are associated with greater or lower levels of trauma in this population. Understanding how midwifery students cope with earthquake-related stress is essential for developing targeted psychosocial interventions and educational programs aimed at strengthening resilience among future healthcare professionals. Therefore, this study aimed to assess post-earthquake trauma levels and coping strategies among midwifery students at a state university and to examine the associations between trauma levels and selected demographic and earthquake-related characteristics.

Research Questions

The study addressed the following research questions:

1. What are the post-earthquake trauma levels of midwifery students?
2. What coping strategies do midwifery students use to manage earthquake-related stress?
3. Are post-earthquake trauma levels associated with selected demographic and earthquake-related characteristics?
4. Is there an association between post-earthquake trauma levels and coping strategies among midwifery students?

Materials and Methods

Study Design

The study employed a descriptive cross-sectional design.

Population and Sample

The study population consisted of all students actively enrolled in the Department of Midwifery, Faculty of Health Sciences, Mardin Artuklu University, Mardin, southeastern Türkiye, during the 2022–2023 academic year ($n=350$). Because the researchers aimed to include the entire population, no sampling method was applied.

A total of 251 students participated in the study, corresponding to a participation rate of 71.71%. Although a small proportion of participants ($n=16$) reported residing in cities where the earthquakes were not directly felt, they were retained in the study because large-scale disasters may have psychological effects through both direct and indirect exposure, including media coverage, concern for affected relatives or friends, disruption of daily life, and awareness of the widespread societal impact of the event. Accordingly, both directly and indirectly exposed students were considered relevant to the study objectives. The primary reasons for non-participation included absence during the data collection period, voluntary refusal to participate, and incomplete questionnaire responses. Owing to the anonymous nature of the survey and ethical considerations, no identifying information was collected from non-participants; therefore, comparisons between participants and non-participants could not be performed. This limitation was acknowledged as a potential source of non-response bias. The inclusion criteria were active enrollment in the midwifery program and voluntary agreement to participate in the study.

A post hoc power analysis was performed using G*Power version 3.1.9.7 to evaluate sample adequacy. Assuming a medium effect size (Cohen's $d=0.50$), a two-tailed test, and a significance level of $\alpha=0.05$, the achieved sample size of 251 participants yielded a statistical power of 0.99, indicating that the study was adequately powered to detect statistically meaningful differences.

Data Collection Instruments

Data were collected using the Introductory Information Form, the Scale that Determines the Level of Trauma After the Earthquake (SDLTAE), and the Earthquake Stress Coping Strategies Scale (ESCSS).

Introductory Information Form: The Introductory Information Form consisted of 26 questions designed to collect demographic information (e.g., age, marital

status, academic year, place of residence, and family type) and earthquake-related characteristics.

Scale that Determines the Level of Trauma After the Earthquake (SDLTAE):

The SDLTAE was developed by Tanhan and Kayri in 2013. It is a 20-item, five-point Likert-type scale comprising five subscales: behavioral problems [1, 2, 3, 4], emotional restriction [5, 6, 7, 8, 9], affective symptoms [10, 11, 12, 13], cognitive structuring [14, 15, 16, 17], and sleep problems [18, 19, 20].² Items 11 and 12 are reverse scored. Total scores range from 20 to 100, with higher scores indicating greater levels of earthquake-related trauma. The original study reported a Cronbach's alpha coefficient of 0.872. In the present study, the reliability of the SDLTAE was re-evaluated, yielding a Cronbach's alpha coefficient of 0.89, which indicates high internal consistency.

Earthquake Stress Coping Strategies Scale (ESCSS):

The ESCSS was developed by Yöndem and Eren.¹¹ It is a 16-item, four-point Likert-type scale consisting of three subscales: religious coping [2, 8, 9, 10, 11], positive reappraisal [5, 12, 13, 14, 15, 16], and seeking social support [1, 3, 4, 6, 7]. Items 3, 4, 7, and 12 are reverse scored.¹¹ Total scores range from 16 to 64, with higher subscale scores indicating greater use of the corresponding coping strategy. The original Cronbach's alpha coefficients ranged from 0.69 to 0.85.¹¹ In the present study, the overall Cronbach's alpha coefficient was 0.82.

Data Collection

Data were collected between May 8 and June 11, 2023, using an online questionnaire developed with Google Forms. To minimize potential power imbalance associated with the student-instructor relationship, the survey link was distributed by student representatives through class communication groups rather than directly by the researchers.

Before completing the questionnaire, students received information regarding the purpose of the study and were informed that participation was voluntary. They were also assured that participation or non-participation would have no effect on their academic evaluation or course grades. Completion of the questionnaire required approximately 10–12 minutes.

Data Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated as percentages, means, standard deviations, and minimum and maximum values. The Kolmogorov-Smirnov test was used to assess the normality of continuous variables. Independent-samples t tests were used to compare the means of two independent groups, whereas one-way analysis of variance (ANOVA) was conducted to compare three or more groups. When ANOVA indicated statistically significant differences, Bonferroni post hoc tests were performed to identify the groups that differed significantly. Significant group comparisons are presented in the tables under the heading "Difference".

Correlation analysis was conducted to examine the relationships between post-earthquake trauma levels and coping strategies. To reduce the risk of Type I error associated with multiple comparisons, Bonferroni correction was applied to post hoc analyses. In addition to p values, effect sizes were calculated to assess the magnitude of observed differences. Cohen's d was reported for independent-samples t tests, whereas eta-squared (η^2) was calculated for ANOVA. Statistical significance was established at $p<0.05$.

Ethical Considerations

Ethical approval for the study was obtained from Mardin Artuklu University Non-interventional Clinical Research Ethics Committee [Approval Number: 2023/5-2, Date: 03.05.2023]. Informed consent was obtained electronically from the students for participation in the study. Participants were able to access the survey questions after agreeing to the voluntary consent form regarding the research. The study was conducted in accordance with the principles of the Declaration of Helsinki.

To minimize potential coercion arising from the student-instructor relationship, participation was entirely voluntary, and no incentives were offered. All data were collected anonymously, and no identifying information was obtained. The survey link

Table 1. Demographic characteristics and earthquake-related experiences of the participants

Variable		n	%
Age (years)	18–24	235	93.6
	25–29	13	5.2
	≥30	3	1.2
Marital status	Married	9	3.6
	Single	242	96.4
Number of children*	None	5	55.5
	One	4	44.5
Academic year	First	43	17.1
	Second	96	38.3
	Third	68	27.1
	Fourth	44	17.5
Current residence	Student dormitory	184	73.3
	Living with family	50	19.9
	Other (relatives' home, shared student housing)	17	6.8
Family structure	Nuclear	193	76.9
	Extended	53	21.1
	Separated	5	2.0
Have you experienced the earthquake?	Yes	191	76.1
	No	60	23.9
Did you have any physical health problems before the earthquake?	Yes	7	2.8
	No	244	97.2
Did you have any psychological problems before the earthquake?	Yes	11	4.4
	No	240	95.6
Were you alone during the earthquake?	Yes	12	4.8
	No	239	95.2
Were you asleep when the earthquake occurred?	Yes	209	83.3
	No	42	16.7
Did you feel afraid during the earthquake?	Yes	229	91.2
	No	22	8.8
Did the building where you lived collapse during the earthquake?	Yes	7	2.8
	No	244	97.2
Was the building where you lived damaged during the earthquake?	Yes	94	37.5
	No	157	62.5
Were you trapped under debris during the earthquake?	Yes	1	0.4
	No	250	99.6
Did you lose a family member, relative, or close friend because of the earthquake?	Yes	84	33.5
	No	167	66.5
Where were you during the earthquake?	I was in the earthquake-affected area.	105	41.8
	I was outside the affected area but felt the earthquake.	130	51.8
	I was in an area where the earthquake was not felt.	16	6.4
Where were you when the earthquake occurred?	At home	237	94.4
	In a dormitory	3	1.2
	At work	1	0.4
	At a relative's home	10	4.0
Did you experience financial loss because of the earthquake?	Yes	49	19.5
	No	202	80.5
Are you currently receiving psychological support?	Yes	2	0.8
	No	249	99.2
Are you currently taking psychiatric medication?	Yes	2	0.8
	No	249	99.2
Would you like to receive psychological support?	Yes	56	22.3
	No	195	77.7
Total		251	100

*: Percentages were calculated based on the number of respondents in the relevant subgroup.

was distributed by student representatives, and the researchers accessed the data only after the completion of the academic term.

Results

Participant Characteristics and Earthquake-Related Experiences

Most participants were between 18 and 24 years of age [93.6%]. Of the students, 38.3% were in their second year of study, 73.3% were living in student accommodation, and 76.9% reported living in a nuclear family. Nearly all participants were single [96.4%]; among the married students, 55.5% had no children.

Regarding earthquake exposure, 76.1% of the participants reported directly experiencing the earthquake, whereas 51.8% indicated that they felt the tremors despite being outside the affected region. Most students reported having no pre-existing physical illness [97.2%], were not alone during the earthquake [95.2%], and were at home when the earthquake occurred [94.4%]. The majority were asleep at the time of the earthquake [83.3%] and reported experiencing fear during the event [91.2%].

Regarding earthquake-related consequences, 97.2% reported that their building did not collapse, and 62.5% reported no structural damage to their residence. Nearly all participants were not trapped under debris [99.6%], 66.5% did not experience the loss of a family member, relative, or close friend, and 80.5% reported no material loss. Most students reported no diagnosed psychological disorder [95.6%] and were not receiving psychological treatment at the time of the study [99.2%]. Furthermore, 77.7% stated that they did not wish to receive psychological support [Table 1].

Scale Scores and Correlational Analysis

The mean total score on the SDLTAE was 53.5±14.8 [range: 20–86]. The mean total score on the ESCSS was 46.5±7.8 [range: 23–64] [Table 2].

Table 2. Mean scores of the Scale that Determines the Level of Trauma After the Earthquake and the Earthquake Stress Coping Strategies Scale and their subscales

Scale/subscale	n	Min	Max	Mean±SD
SDLTAE	251	20.0	86.0	53.5±14.8
Behavioral problems	251	4.0	20.0	9.6±3.9
Emotional restriction	251	5.0	25.0	13.5±5.2
Affective symptoms	251	4.0	15.0	9.1±2.4
Cognitive restructuring	251	4.0	20.0	13.7±4.3
Sleep problems	251	3.0	15.0	7.7±3.5
ESCSS	251	23.0	64.0	46.6±7.8
Religious coping	251	6.0	20.0	15.1±3.4
Positive reappraisal	251	8.0	24.0	17.6±3.7
Seeking social support	251	5.0	20.0	13.5±3.1

Min: Minimum, Max: Maximum, SD: Standard deviation, SDLTAE: Scale that Determines the Level of Trauma After the Earthquake, ESCSS: Earthquake Stress Coping Strategies Scale.

Correlation analysis revealed weak to moderate relationships between post-earthquake trauma symptoms and coping strategies. Religious coping was positively correlated with behavioral problems [$r=0.144$, $p=0.023$], cognitive restructuring [$r=0.213$, $p<0.001$], and sleep problems [$r=0.151$, $p=0.017$], but negatively correlated with affective symptoms [$r=-0.200$, $p=0.001$]. Positive reappraisal demonstrated weak negative correlations with emotional restriction [$r=-0.125$, $p=0.049$] and a moderate negative correlation with affective symptoms [$r=-0.361$, $p<0.001$]. Seeking social support was negatively correlated with behavioral problems [$r=-0.171$, $p=0.007$], emotional restriction [$r=-0.214$, $p<0.001$], affective symptoms [$r=-0.351$, $p<0.001$], and sleep problems [$r=-0.188$, $p=0.003$]. The strongest associations were observed between affective symptoms and positive reappraisal and between affective symptoms and seeking social support [Table 3].

Differences in Trauma Scores According to Participant Characteristics

Significant differences were observed in sleep problem scores across age groups, with students aged 25–29 years reporting higher scores than those in younger age groups. Single students demonstrated higher emotional restriction scores than married students. Significant differences were also found in total SDLTAE scores, behavioral problems, and emotional restriction between married students without children and those with one or more children.

Affective symptom scores differed significantly according to living arrangements. Students residing in student dormitories, living with their families, or living in other settings (e.g., relatives' homes or shared student housing) differed significantly, with the highest affective symptom scores observed among those in the "other" category. Significant differences in affective symptom scores were also observed between students from nuclear families and those from extended or separated family structures. Students who directly experienced the earthquake had higher scores on all SDLTAE subscales, except the affective symptoms subscale, as well as higher total trauma scores. Participants with pre-existing physical illnesses reported significantly higher behavioral problems and sleep problem scores. Students who were asleep when the earthquake occurred had higher scores on all trauma subscales except affective symptoms. Similarly, students who reported feeling fear during the earthquake had higher total trauma scores, behavioral problem scores, and cognitive restructuring scores.

Significant differences were observed between building collapse status and affective symptom scores, whereas housing damage was associated with all trauma subscales except affective symptoms. Students who experienced the loss of a family member, relative, or close friend, as well as those reporting material losses, had higher total trauma scores and higher behavioral problem, cognitive restructuring, and sleep problem scores. Participants who were in city centers during the earthquake also demonstrated higher trauma scores across all subscales except affective symptoms.

Students who reported receiving psychological support or using psychiatric medication had higher affective symptom scores. Additionally, students who expressed a desire to receive psychological support had higher scores on all SDLTAE subscales and the total trauma score, with the exception of the affective symptoms subscale [$p<0.05$] [Table 4].

Given the exploratory nature of the analyses and the large number of statistical comparisons performed, these findings should be interpreted cautiously. Effect size estimates are presented to facilitate interpretation of the practical significance of the observed differences.

Table 3. Correlations between the subscales of the Scale that Determines the Level of Trauma After the Earthquake and the Earthquake Stress Coping Strategies Scale

ESCSS subscale	SDLTAE_ Behavioral problems	SDLTAE_ Emotional restriction	SDLTAE_ Affective symptoms	SDLTAE_ Cognitive restructuring	SDLTAE_ Sleep problems
Religious coping	0.144 [$p=0.023$]	0.116 [$p=0.066$]	-0.200 [$p<0.001$]	0.213 [$p<0.001$]	0.151 [$p=0.017$]
Positive reappraisal	-0.055 [$p=0.389$]	-0.125 [$p=0.049$]	-0.361 [$p<0.001$]	0.048 [$p=0.446$]	0.010 [$p=0.880$]
Seeking social support	-0.171 [$p=0.007$]	-0.214 [$p<0.001$]	-0.351 [$p<0.001$]	-0.089 [$p=0.158$]	-0.188 [$p=0.003$]

SDLTAE: Scale that Determines the Level of Trauma After the Earthquake, ESCSS: Earthquake Stress Coping Strategies Scale.

Table 4. Comparison of total and subscale scores on the Scale that Determines the Level of Trauma After the Earthquake according to demographic and earthquake-related characteristics

Variable		Mean±SD*	Behavioral problems	Emotional restriction	Affective symptoms	Cognitive restructuring	Sleep problems
Age group	18–24 years ^a	53.2±14.7	9.5±3.8	13.4±5.2	9.0±2.4	13.6±4.1	7.5±3.5
	25–29 years ^b	59.5±14.4	10.4±4.0	14.6±5.2	10.3±1.8	14.0±5.5	10.0±3.3
	≥30 years ^c	54.0±14.1	10.3±4.9	12.3±4.5	7.3±1.1	14.6±5.5	9.3±3.2
	Statistical analysis	F=1.14 p=0.32	F=0.43 p=0.65	F=0.40 p=0.67	F=2.64 p=0.07	F=0.12 p=0.88	F=3.51 p=0.03
	Difference**						a-b
Marital status	Married	49.6±16.2	8.4±4.2	9.7±4.8	9.1±1.9	12.8±5.4	9.4±4.1
	Single	53.6±14.7	9.6±3.8	13.5±5.1	9.1±2.4	13.7±4.2	7.6±3.4
	Statistical analysis	t=-0.79 p=0.43	t=-0.88 p=0.37	t=-2.17 p=0.03	t=0.00 p=1.00	t=-0.57 p=0.57	t=1.50 p=0.13
Number of children*	None	54.4±15.1	9.9±3.8	13.6±5.2	9.3±2.4	13.4±4.3	8.0±3.6
	One	44.2±4.9	7.0±1.4	9.7±1.7	9.7±1.7	10.0±2.1	7.7±2.2
	Statistical analysis	t=3.68 p=0.02	t=3.84 p=0.02	t=4.10 p=0.01	t=-0.33 p=0.74	t=1.58 p=0.12	t=0.14 p=0.89
Current residence	Student dormitory ^a	52.9±14.4	9.3±3.8	13.3±5.1	9.0±2.4	13.6±4.1	7.5±3.4
	Living with family ^b	54.8±16.0	10.1±4.0	13.8±5.7	8.7±2.3	14.0±4.2	8.0±3.6
	Other (relatives' home, shared student housing) ^c	55.6±15.4	10.0±3.6	13.4±5.3	10.7±1.9	12.7±5.4	8.7±3.6
	Statistical analysis	F=0.48 p=0.62	F=0.82 p=0.44	F=0.16 p=0.85	F=4.29 p=0.01	F=0.64 p=0.53	F=1.16 p=0.32
	Difference				a-c, b-c		
Family structure	Nuclear ^a	53.2±14.7	9.5±3.8	13.4±5.3	8.8±2.3	13.8±4.2	7.6±3.5
	Extended ^b	53.3±14.7	9.5±3.7	13.2±4.9	9.7±2.5	13.1±4.3	7.6±3.5
	Separated ^c	65.4±15.8	12.0±6.8	17.4±3.9	11.6±1.6	14.8±5.2	9.6±3.5
	Statistical analysis	F=1.65 p=0.19	F=1.00 p=0.37	F=1.49 p=0.23	F=5.73 p=0.00	F=0.73 p=0.48	F=0.73 p=0.48
	Difference				a-b, a-c		
Have you experienced the earthquake?	Yes	55.8±14.5	9.9±3.9	14.2±5.1	9.1±2.3	14.3±3.9	8.1±3.5
	No	46.2±13.1	8.2±3.4	11.0±4.7	9.1±2.7	11.5±4.4	6.3±3.1
	Statistical analysis	t=4.53 p=0.00	t=3.07 p=0.00	t=4.29 p=0.00	t=0.04 p=0.97	t=4.55 p=0.00	t=3.61 p=0.00
Did you have any physical health problems before the earthquake?	Yes	62.2±10.9	12.8±2.7	15.1±5.5	9.2±2.7	14.5±3.2	10.4±2.5
	No	53.2±14.8	9.4±3.8	13.4±5.2	9.1±2.4	13.6±4.2	7.6±3.5
	Statistical analysis	t=1.59 p=0.11	t=2.29 p=0.02	t=0.87 p=0.39	t=0.19 p=0.85	t=0.56 p=0.58	t=2.08 p=0.04
Were you asleep when the earthquake occurred?	Yes	55.0±14.7	9.8±3.8	13.9±5.2	9.1±2.4	14.1±4.0	8.0±3.5
	No	46.1±12.8	8.2±3.7	11.2±4.2	9.1±2.6	11.5±4.5	5.9±3.1
	Statistical analysis	t=3.64 p=0.00	t=2.37 p=0.02	t=3.10 p=0.00	t=-0.02 p=0.98	t=3.65 p=0.00	t=3.59 p=0.00
Did you feel afraid during the earthquake?	Yes	54.2±14.9	9.7±3.9	13.6±5.2	9.1±2.4	13.8±4.1	7.8±3.5
	No	46.5±11.4	8.0±3.1	11.6±6.6	8.9±2.5	11.5±4.5	6.4±3.3
	Statistical analysis	t=2.34 p=0.02	t=1.99 p=0.04	t=1.71 p=0.09	t=0.41 p=0.69	t=2.44 p=0.02	t=1.83 p=0.07
Did the building where you lived collapse during the earthquake?	Yes	51.7±15.3	8.7±4.0	12.1±5.4	11.8±0.6	12.2±5.8	6.7±2.2
	No	53.5±14.7	9.5±3.8	13.4±5.2	9.0±2.4	13.7±4.2	7.7±3.5
	Statistical analysis	t=-0.33 p=0.74	t=-0.59 p=0.55	t=-0.67 p=0.50	t=9.30 p=0.00	t=-0.88 p=0.38	t=-0.76 p=0.45
Was the building where you lived damaged during the earthquake?	Yes	59.1±14.3	10.9±3.9	15.3±5.3	9.2±2.4	14.8±3.7	8.7±3.3
	No	50.1±14.0	8.7±3.6	12.3±4.8	9.0±2.4	12.9±4.4	7.0±3.5
	Statistical analysis	t=4.89 p=0.00	t=4.66 p=0.00	t=4.52 p=0.00	t=0.67 p=0.50	t=3.48 p=0.00	t=3.78 p=0.00

Table 4. Cont.

Variable		Mean±SD*	Behavioral problems	Emotional restriction	Affective symptoms	Cognitive restructuring	Sleep problems
Did you lose a family member, relative, or close friend because of the earthquake?	Yes	56.9±15.9	10.5±4.5	14.1±5.5	9.3±2.6	14.4±4.1	8.4±3.7
	No	51.8±13.8	9.0±3.4	13.0±5.0	9.0±2.3	13.2±4.2	7.3±3.3
	Statistical analysis	t=2.62 p=0.00	t=2.59 p=0.01	t=1.59 p=0.11	t=0.97 p=0.34	t=2.05 p=0.04	t=2.32 p=0.02
Where were you during the earthquake?	I was in the earthquake-affected area ^a	57.2±14.7	10.4±4.0	14.7±4.9	9.3±2.4	14.2±4.0	8.3±3.4
	I was outside the affected area but felt the earthquake ^b	51.8±14.4	9.1±3.6	12.7±5.2	9.0±2.3	13.5±4.3	7.3±3.5
	I was in an area where the earthquake was not felt ^c	42.8±9.5	6.8±2.7	10.6±4.6	8.5±2.8	10.7±3.7	6.1±3.6
	Statistical analysis	F=8.81 p=0.00	F=7.98 p=0.00	F=7.10 p=0.00	F=1.11 p=0.33	F=5.10 p=0.01	F=4.03 p=0.02
	Difference	a-b, a-c	a-b, a-c	a-b, a-c		a-c, b-c	a-c
Did you experience financial loss because of the earthquake?	Yes	61.7±13.7	11.2±3.8	16.0±4.9	10.0±2.0	15.0±3.9	9.3±3.5
	No	51.5±14.3	9.1±3.7	12.8±5.1	8.8±2.4	13.3±4.2	7.3±3.4
	Statistical analysis	t=4.48 p=0.00	t=3.53 p=0.00	t=3.91 p=0.00	t=3.15 p=0.00	t=2.44 p=0.02	t=3.70 p=0.00
Are you currently receiving psychological support?	Yes	69.5±9.1	13.0±2.8	20.0±4.2	12.5±2.1	15.5±4.9	8.5±0.7
	No	53.4±14.7	9.5±3.8	13.4±5.2	9.0±2.4	13.6±4.2	7.7±3.5
	Statistical analysis	t=1.54 p=0.12	t=1.26 p=0.21	t=1.79 p=0.07	t=1.99 p=0.05	t=0.61 p=0.55	t=0.31 p=0.75
Are you currently taking psychiatric medication?	Yes	66.5±4.9	12.0±1.4	17.5±0.7	13.5±0.7	13.0±1.4	10.5±2.1
	No	53.4±14.7	9.5±3.8	13.4±5.2	9.0±2.4	13.6±4.2	7.6±3.5
	Statistical analysis	t=1.25 p=0.21	t=0.88 p=0.38	t=1.10 p=0.27	t=2.58 p=0.01	t=-0.23 p=0.82	t=1.12 p=0.26
Would you like to receive psychological support?	Yes	63.2±13.5	12.0±3.7	16.5±4.7	9.6±2.2	14.9±3.9	10.0±3.0
	No	50.7±13.9	8.8±3.6	12.5±5.0	8.9±2.4	13.3±4.2	7.0±3.3
	Statistical analysis	t=5.93 p=0.00	t=5.63 p=0.00	t=5.31 p=0.00	t=1.92 p=0.06	t=2.55 p=0.01	t=6.01 p=0.00

*: Percentages were calculated based on the number of respondents in the relevant subgroup, **: Significant pairwise differences identified using the Bonferroni test are indicated. ^{a,b,c}: The letters were used in the post-hoc analysis to determine which groups differed from one another.

Table 5. Comparison of total and subscale scores on the Earthquake Stress Coping Strategies Scale according to earthquake-related characteristics

Variable		Mean±SD	Religious coping	Positive reappraisal	Seeking social support
Have you experienced the earthquake?	Yes	46.6±7.3	15.4±3.2	17.4±3.4	13.1±3.0
	No	46.3±9.0	13.9±3.5	18.0±4.2	14.3±3.2
	Statistical analysis	t=0.28 p=0.78	t=2.97 p=0.00	t=-0.95 p=0.35	t=-2.63 p=0.01
Was the building where you lived damaged during the earthquake?	Yes	45.9±7.6	15.3±3.9	17.3±3.4	12.7±3.5
	No	46.9±7.8	14.9±3.4	17.7±3.7	13.8±2.8
	Statistical analysis	t=-0.92 p=0.36	t=0.90 p=0.37	t=-0.79 p=0.43	t=-2.53 p=0.01

Coping Strategies According to Earthquake-Related Characteristics

Significant differences were identified in the religious coping and seeking social support subscales of the ESCSS according to direct earthquake exposure. In addition, seeking social support scores differed significantly according to the presence of housing or building damage. No statistically significant associations

were observed between the remaining participant characteristics and ESCSS scores ($p>0.05$) (Table 5).

Discussion

The findings of this study contribute to the existing literature by addressing an underexplored aspect of post-earthquake psychological responses among midwifery students. While previous studies have predominantly focused on general university

student populations, this study provides discipline-specific evidence on the relationship between trauma-related symptoms and coping strategies among midwifery students, whose future professional roles include maternal, neonatal, and community health during disaster preparedness, response, and recovery. This distinction is important because midwifery students may experience disaster-related stress not only as individuals but also in relation to their anticipated professional responsibilities and the development of their professional identity, similar to other healthcare students and professionals exposed to disasters.^{9,12}

Consistent with previous research, participants demonstrated relatively high levels of post-earthquake trauma. Similar findings have been reported among university students exposed to earthquakes and other large-scale disasters.^{13,14} The present findings indicate that trauma levels were associated with a range of demographic, earthquake-related, and contextual characteristics. Variables such as age, marital status, family structure, living arrangements, direct earthquake exposure, pre-existing physical illness, fear experienced during the earthquake, loss of relatives or close friends, and financial loss were significantly associated with trauma-related responses, consistent with previous studies.^{3,15–17}

An important contribution of this study is its examination of coping strategies alongside trauma levels. According to the model of stress and coping proposed by Lazarus and Folkman,¹⁸ coping comprises the cognitive and behavioral efforts individuals use to manage stressful situations. In the present study, trauma levels were weakly to moderately associated with coping strategies measured by the ESCSS. Specifically, students with higher trauma scores tended to report lower use of adaptive coping strategies, particularly positive reappraisal and seeking social support. However, given the modest magnitude of these associations, the findings should be interpreted with caution and considered exploratory. These findings are consistent with previous research showing that maladaptive or avoidance-oriented coping strategies are associated with greater psychological distress following traumatic events.^{8,10,19}

Among the trauma dimensions, cognitive restructuring demonstrated relatively high scores, suggesting that many students continued to cognitively process the earthquake experience through concerns about future disasters, personal safety, and the well-being of loved ones. Similar patterns of persistent cognitive and emotional processing have been reported following major disasters.^{13,14} Although cognitive processing may represent an adaptive attempt to understand traumatic experiences, prolonged rumination has also been associated with sustained psychological distress within stress and coping theory.¹⁸ In contrast, sleep problems were comparatively less pronounced. This finding may reflect early adaptation following the disaster; however, previous research suggests that sleep disturbances may emerge or persist over time, highlighting the importance of continued psychological follow-up.²⁰

Social and environmental circumstances were also associated with trauma severity. Students living away from their families, residing in damaged housing, or experiencing financial loss reported higher trauma scores. These findings are consistent with previous evidence indicating that housing stability and strong social support networks are associated with better psychological adjustment after disasters.^{16,17,20,21} However, given the cross-sectional design and the modest effect sizes observed, these findings should be interpreted as associations rather than evidence of causal or protective effects.

Students who reported receiving psychological support or using psychiatric medication also had higher trauma scores. This finding likely reflects greater symptom severity among these students rather than the effectiveness or ineffectiveness of support-seeking behavior. This interpretation is consistent with previous studies indicating that individuals experiencing more severe trauma symptoms are more likely to seek professional psychological support following disasters.^{13,17} Additionally, cultural attitudes toward mental health and competing priorities in the aftermath of disasters may influence both help-seeking behaviors and access to psychological support services.

Overall, the findings suggest a complex pattern of relationships between trauma, coping strategies, and contextual factors among midwifery students after the earthquakes. Although most of the observed associations were weak to moderate, they provide preliminary evidence regarding the psychological experiences of future midwives following large-scale disasters and may inform future research. Longitudinal studies incorporating multivariable analyses are needed to clarify the direction and strength of these associations and to better understand their implications for the development of trauma-informed educational and psychosocial interventions for

midwifery students in disaster-prone settings. Although this study focused on midwifery students from a single university, several of the identified stressors, including direct disaster exposure, housing damage, financial loss, and reduced social support, are not unique to this population. Similar challenges have been reported among students in other health science disciplines following disasters. However, midwifery students may experience these stressors differently because of the unique nature of their education and their anticipated professional responsibilities in maternal, neonatal, and community health. Therefore, caution is warranted when generalizing these findings beyond the present study population and setting. Future multicenter studies involving students from different health science disciplines and institutions are needed to evaluate the transferability and broader applicability of these findings.

Limitations

Several limitations should be considered when interpreting the findings. First, the cross-sectional design precludes causal inference; therefore, the observed relationships between trauma, coping strategies, and associated factors should be interpreted as correlational rather than causal. Longitudinal research is needed to clarify the temporal relationships among these variables.

Second, data were collected using self-administered online questionnaires, making the findings susceptible to recall and social desirability biases. Participants may have had difficulty accurately recalling their experiences during and after the earthquakes or may have provided socially desirable responses. Although anonymous participation and voluntary enrollment were intended to reduce these biases, they cannot be completely excluded.

Third, the large number of statistical comparisons increased the possibility of Type I error. Although Bonferroni correction and effect size estimates were used to reduce this risk, the findings should be interpreted with caution because of the exploratory nature of the analyses.

Fourth, trauma severity was assessed using continuous scores because the Scale for Determining the Level of Trauma After the Earthquake does not provide validated cut-off values for classifying trauma severity. Although this approach is consistent with the intended use of the instrument, it limits direct clinical interpretation of trauma severity.

Fifth, a small proportion of participants [6.4%] resided in areas where the earthquakes were not directly experienced. Although indirect exposure through media coverage, concern for relatives or friends, and awareness of the disaster may also contribute to psychological distress, their experiences may differ from those of directly exposed students. Therefore, the findings on trauma levels and coping strategies should be interpreted in the context of varying levels of disaster exposure.

Finally, because the study was conducted at a single state university, the generalizability of the findings to other institutions and student populations may be limited. Although many of the identified stressors are common among students in the health sciences, midwifery students may experience disaster-related stress differently because of the unique nature of their education and anticipated professional responsibilities. Future multicenter studies involving students from diverse health disciplines and geographical regions are needed to enhance the generalizability of the findings.

Conclusion

This study provides discipline-specific evidence regarding post-earthquake trauma and coping strategies among midwifery students. Midwifery students experienced considerable post-earthquake trauma, highlighting the need for targeted psychosocial support, particularly for those exposed to disaster-related risk factors. Higher trauma levels were accompanied by lower use of adaptive coping strategies, suggesting that interventions aimed at strengthening positive reappraisal and social support may help improve psychological adaptation following disasters. Although these findings should be interpreted cautiously because of the study's cross-sectional design, they highlight the importance of addressing coping processes alongside trauma symptoms.

Overall, the findings underscore the importance of implementing trauma-informed and context-sensitive support strategies within midwifery education. Future longitudinal and multicenter studies are needed to further clarify these relationships and inform the development of targeted interventions.

Ethics Committee Approval: The study was approved by the Mardin Artuklu University Non-interventional Clinical Research Ethics Committee [Approval Number: 2023/5-2, Date: 03.05.2023].

Informed Consent: Informed consent was obtained electronically from the students for participation in the study. Participants were able to access the survey questions after agreeing to the voluntary consent form regarding the research.

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Association Between Diabetes Risk and Attitudes Toward Healthy Eating Among Adults Visiting a Shopping Center in Istanbul

Zeynep Uyaniker,^{1,2} Tuğba Özdemir¹

Abstract

Background: Diabetes mellitus is a major global public health concern, and its prevalence continues to increase because of sedentary lifestyles and unhealthy dietary habits. Early identification of individuals at risk and the promotion of healthy eating behaviors are essential strategies for diabetes prevention.

Aim: This study aimed to assess diabetes risk and attitudes toward healthy eating among adults visiting a shopping center in Istanbul and to examine the relationship between these variables.

Methods: This descriptive study was conducted with 192 adults visiting a shopping center on the Anatolian side of Istanbul between October 14 and 15, 2024. Data were collected through face-to-face interviews using a sociodemographic questionnaire, the Finnish Type 2 Diabetes Risk Score (FINDRISC), and the Attitude Scale for Healthy Nutrition (ASHN). Descriptive statistics, the Kolmogorov-Smirnov test, and Spearman's correlation analysis were performed. Multiple linear regression analysis was used to examine the association between healthy eating attitudes and FINDRISC scores after adjusting for age and body mass index (BMI).

Results: Of the participants, 65.6% were female, and the mean age was 37.67±15.08 years. The mean FINDRISC score was 14.70±3.98, indicating a moderate risk of developing diabetes. The mean ASHN total score was 69.38±9.69, reflecting generally positive attitudes toward healthy eating. A weak but statistically significant negative correlation was observed between the FINDRISC score and the ASHN total score ($r=-0.152$, $p=0.035$), as well as between the FINDRISC score and the nutrition knowledge subscale ($r=-0.226$, $p=0.002$).

Conclusion: Adults with more positive attitudes toward healthy eating tended to have lower diabetes risk scores. Public health initiatives that promote healthy eating behaviors and improve nutrition-related knowledge may contribute to reducing diabetes risk and improving population health.

Keywords: Adults, attitude, diabetes risk, healthy eating, public health

¹Department of Nursing, İstanbul Gedik University
Faculty of Health Sciences, İstanbul, Türkiye

²Department of Surgical Nursing, İstanbul
University-Cerrahpaşa, Institute of Graduate Studies,
İstanbul, Türkiye

Introduction

According to the latest reports from the Noncommunicable Diseases Risk Factors Collaboration (NCD-RisC) and the International Diabetes Federation (IDF), diabetes mellitus remains one of the most prevalent non-communicable diseases worldwide, with its burden continuing to increase. The 11th edition of the *IDF Diabetes Atlas* [2025] estimates that approximately 589 million adults aged 20–79 years were living with diabetes in 2024, corresponding to a global prevalence of 11.1%.¹ This represents a substantial increase from the estimated 537 million adults reported in 2021. If current trends continue, the number of adults living with diabetes is projected to reach 853 million by 2050.¹ Similarly, the World Health Organization (WHO) reports that the global number of adults aged 18 years and older living with diabetes increased from approximately 108 million in 1980 to 422 million in 2014 and nearly 830 million in 2022. This increase reflects not only rising disease prevalence but also population growth and aging.² Because of its increasing prevalence and associated complications, diabetes is recognized as a major global public health challenge. Effective management and prevention require individuals to actively engage in lifelong self-management, including regular medical follow-up and adherence to recommended lifestyle modifications. Healthy eating, regular physical activity, and effective stress management are fundamental components of diabetes prevention and control.³ Healthy eating represents a fundamental component of these lifestyle modifications. A balanced diet that provides appropriate amounts of carbohydrates, proteins, and healthy fats supports blood glucose regulation and helps maintain a healthy body weight. Therefore, adopting healthy dietary habits is a key strategy for reducing the risk of diabetes and preventing diabetes-related complications.⁴ Successful participation in diabetes prevention and management requires support from family members, healthcare professionals, and the broader social environment. In this context, the impact of diabetes extends beyond the individual to affect families, communities, and society as a whole. The increasing prevalence of diabetes places a substantial burden not only on individual and population health but also on healthcare systems and national economies. As healthcare professionals who maintain close contact with the community, nurses play a pivotal role in identifying individuals at risk, promoting healthy lifestyle behaviors, and providing preventive care using both individual- and family-centered approaches.⁵ Nursing education and practice are essential for reducing the burden of diabetes, promoting early detection and intervention, and improving individuals' quality of life.

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Corresponding author: Zeynep Uyaniker
E-mail: uyanikerzeynep@gmail.com

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Previous studies investigating diabetes risk have primarily focused on dietary quality, sustainable dietary behaviors, food literacy, and healthy lifestyle practices. Although these factors are important determinants of metabolic health, relatively few studies have specifically examined the relationship between diabetes risk and attitudes toward healthy eating in community-based populations.⁶⁻⁸ Moreover, existing studies have largely been conducted among university students or academic staff rather than the general adult population.^{9,10}

Shopping centers provide accessible community settings that attract individuals from diverse sociodemographic backgrounds, making them appropriate locations for community-based health screening and health promotion activities. Assessing diabetes risk and attitudes toward healthy eating in such settings may facilitate the early identification of individuals at increased risk and provide evidence to inform community-level diabetes prevention strategies.

Accordingly, this study aimed to determine the diabetes risk levels and attitudes toward healthy eating among adults visiting a shopping center in Istanbul and to examine the relationship between these variables.

Study Questions

1. What are the diabetes risk levels of adults visiting a shopping center?
2. What are their attitudes toward healthy eating?
3. Is there a relationship between diabetes risk and attitudes toward healthy eating?

Materials and Methods

Study Design

This descriptive study was conducted among adults visiting a shopping center in Istanbul.

Study Sample

The study population comprised adults who visited a shopping center on the Anatolian side of Istanbul between October 14 and 15, 2024. The required sample size was calculated using G*Power version 3.1.9.4. Based on a medium effect size ($r=0.30$), $\alpha=0.05$, and a statistical power of 95% ($1-\beta=0.95$), the minimum required sample size was 111 participants.¹¹ The inclusion criteria were: (1) age ≥ 18 years, (2) no previous diagnosis of diabetes, (3) ability to communicate in Turkish, and (4) provision of written informed consent.

Data Collection Instruments

Data were collected using a Sociodemographic Information Form, the Finnish Type 2 Diabetes Risk Score (FINDRISC), and the Attitude Scale for Healthy Nutrition (ASHN).

Sociodemographic Information Form: The researcher-developed sociodemographic information form was prepared based on the relevant literature.⁴ It included questions on participants' age, sex, height, and weight. The form included three open-ended questions [age, height, and weight] and one multiple-choice question on sex.

Finnish Type 2 Diabetes Risk Score (FINDRISC): The FINDRISC was developed in Finland in 2003 based on a community-based cohort study.⁶ The Turkish version was adapted by the Turkish Society of Endocrinology and Metabolism and is currently recommended for diabetes screening in Türkiye. The FINDRISC consists of eight items assessing age, body mass index (BMI), waist circumference, physical activity, fruit and vegetable consumption, history of hypertension, history of elevated blood glucose, and family history of diabetes. The items are scored as follows: age (≥ 65 years=4 points); BMI (<25 kg/m²=0 points, 25–30 kg/m²=1 point, >30 kg/m²=3 points); waist circumference (men: >102 cm=4 points; women: >88 cm=4 points); engaging in at least 30 minutes of physical activity on most days (yes=0 points, no=2 points); daily consumption of fruits and vegetables (every day=0 points, not every day=1 point); history of antihypertensive medication use or diagnosis of hypertension (no=0 points, yes=2 points); history of elevated or borderline blood glucose during a routine examination, illness, or pregnancy (no=0 points, yes=5 points); and family history of diabetes (no=0 points, yes in second-degree relatives=3 points, yes in first-degree relatives=5 points). According to the scoring system, the total FINDRISC score ranges from 0 to 26 points. Based on the classification proposed by Lindström, which established the validity and reliability of the questionnaire, the es-

timated 10-year risk of developing type 2 diabetes is categorized as follows: low (<7 points), slightly elevated (7–11 points), moderate (12–14 points), high (15–20 points), and very high (>20 points).¹²

Attitude Scale for Healthy Nutrition (ASHN): The Attitude Scale for Healthy Nutrition scale was developed by Tekkurşun Demir and Cicioğlu,¹³ who also established its validity and reliability. The scale consists of 21 items grouped into four subscales: Nutrition Knowledge, Positive Nutrition, Poor Nutrition, Emotions related to Nutrition. The total ASHN score ranges from 21 to 105. Total scores are interpreted as follows: 21, very low; 23–42, low; 43–63, moderate; 64–84, high; and 85–105, ideal healthy eating attitude. Positive items are rated on a five-point scale: Strongly Disagree, Disagree, Undecided, Agree, and Strongly Agree.¹³ In the present study, the overall Cronbach's alpha coefficient for the ASHN was 0.77. Cronbach's alpha coefficients for the subscales were 0.82 for Nutrition Knowledge, 0.67 for Emotions Related to Nutrition, 0.55 for Positive Nutrition, and 0.62 for Poor Nutrition.

Data Collection

Data were collected through face-to-face interviews conducted at a shopping center on the Anatolian side of Istanbul between October 14 and 15, 2024. All study variables were measured at a single time point. Participation was voluntary, and written informed consent was obtained from all participants before data collection. Data were collected directly by the researchers. During data collection, body weight was measured using a Sinbo digital glass scale with a maximum capacity of 180 kg and an accuracy of 100 g. The scale's measurement consistency was verified by repeated measurements performed by the researcher. Height was measured using a Mesilife wall-mounted meter with a measurement range of 0–200 cm and 1-mm increments. Waist circumference was measured using a Hoehchstmass measuring tape with a range of 0–150 cm and 1-mm increments. Waist circumference measurements were classified according to the categories specified in the FINDRISC instrument. Participants' BMI was calculated by the researchers using the Centers for Disease Control and Prevention (CDC) formula. BMI was calculated as body weight in kilograms divided by the square of height in meters (kg/m²): BMI = weight (kg) / height (m)².¹⁴

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Science (SPSS) version 24.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participant characteristics. The Kolmogorov-Smirnov test was used to assess the normality of the data distribution, and Spearman's rank correlation coefficient was used to examine the relationship between variables. Multiple linear regression analysis was performed to evaluate the association between healthy eating attitudes and FINDRISC scores after adjusting for age and BMI. Statistical significance was set at 0.05.

Ethical Considerations

Written informed consent was obtained from all participants before enrollment in the study. Permission to use the measurement instruments was obtained from their respective developers via email. Ethical approval was obtained from İstanbul Gedik University Ethics Committee [Approval Number: 2024/11, Date: 29.11.2024]. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Of the participants, 65.6% were female, and the mean age was 37.67 ± 15.08 years. The mean body weight was 72.31 ± 14.63 kg, and the mean height was 168.23 ± 8.41 cm. Based on BMI, 45.8% of participants were classified as having normal weight, 37.5% as overweight, 15.1% as obese, and 1.6% as underweight. Overall, the majority of participants had a BMI within or above the normal range [Table 1].

The mean FINDRISC score was 14.70 ± 3.98 . The mean total score on the ASHN was 69.38 ± 9.69 , reflecting a high level of healthy eating attitudes. The mean scores for the ASHN subscales were 22.16 ± 2.82 for Nutrition Knowledge, 16.91 ± 3.30 for Positive Nutrition, 15.39 ± 3.85 for Poor Nutrition, and 14.90 ± 4.33 for Emotions Related to Nutrition [Table 2].

A weak but statistically significant negative correlation was found between the FINDRISC score and the total ASHN score ($p < 0.05$). A weak negative correlation was also observed between the Nutrition Knowledge subscale score and the

Table 1. Characteristics of the participants (n=192)

	n	%
Sex		
Female	126	65.6
Male	66	34.4
Waist circumference category		
Women <80/Men <94	33	17.3
Women 80–88/Men 94–102	118	61.8
Women >88/Men >102	40	20.9
	Mean±SD	Min–Max
Age [years]	37.67±15.08	19–74
Weight [kg]	72.31±14.63	47–135
Height [cm]	168.23±8.41	144–191
BMI		
Underweight (<18.5 kg/m ²)	3	1.6
Normal weight (18.5–24.9 kg/m ²)	88	45.8
Overweight (25–29.9 kg/m ²)	72	37.5
Obese (≥30 kg/m ²)	29	15.1

kg: Kilograms, cm: Centimeters, SD: Standard deviation, BMI: Body mass index.

FINDRISC score. No significant correlations were found between the FINDRISC score and the Positive Nutrition, Poor Nutrition, or Emotions Related to Nutrition subscale scores ($p>0.05$) [Table 3].

Multiple linear regression analysis was performed to examine the independent associations of healthy eating attitudes, age, and BMI with FINDRISC scores. The overall model was statistically significant ($F(3,187)=29.33$, $p<0.05$) and explained 31% of the variance in FINDRISC scores (adjusted $R^2=0.309$). After adjustment for age and BMI, healthy eating attitude remained a significant negative predictor of FINDRISC score ($\beta=-0.210$, $p<0.05$), indicating that more positive attitudes toward healthy eating were independently associated with lower diabetes risk. Age was the strongest predictor of FINDRISC score ($\beta=0.399$, $p<0.05$), followed by BMI ($\beta=0.228$, $p<0.05$) [Table 4].

Discussion

The present study found that participants had a mean FINDRISC score corresponding to a moderate risk of developing diabetes. Although the sample consisted predominantly of young-to-middle-aged adults, the findings suggest that diabetes risk is not confined to older populations. While increasing age is a well-established risk factor for type 2 diabetes, the prevalence of diabetes among younger adults has also risen because of unhealthy lifestyle behaviors.^{15,16}

Participants demonstrated generally positive attitudes toward healthy eating, suggesting that they had a favorable awareness of healthy nutrition. However, the coexistence of a moderate diabetes risk indicates that positive attitudes and nutrition knowledge alone may not be sufficient to reduce diabetes risk. In particular, the high score for the Nutrition Knowledge subscale indicates that partic-

Table 2. FINDRISC and ASHN scores

	Mean±SD	Min–Max
FINDRISC score	14.70±3.98	5–25
Low risk (<7)	6.62±0.74	5–7
Slightly elevated risk (7–11)	9.74±1.21	8–11
Moderate risk (12–14)	13.05±0.74	12–14
High risk (15–20)	17.33±1.57	15–20
Very high risk (>20)	22.36±1.20	21–25
ASHN total score	69.38±9.69	50–95
Nutrition knowledge	22.16±2.82	11–25
Emotions related to nutrition	14.90±4.33	6–24
Positive nutrition	16.91±3.30	9–24
Poor nutrition	15.39±3.85	5–25

ASHN: Attitude Scale for Healthy Nutrition, SD: Standard deviation.

Table 3. Correlations between FINDRISC and ASHN scores

	FINDRISC
ASHN	$r=-0.152$ $p=0.035^*$
Nutrition knowledge	$r=-0.226$ $p=0.002^*$
Emotions related to nutrition	$r=-0.504$ $p=0.455$
Positive nutrition	$r=-0.70$ $p=0.338$
Poor nutrition	$r=-0.102$ $p=0.160$

*: $p<0.05$. FINDRISC: Finnish Type 2 Diabetes Risk Score, ASHN: Attitude Scale for Healthy Nutrition, r: Spearman's coefficient.

ipants possessed a good level of nutrition-related knowledge. However, previous research has shown that nutrition knowledge alone is insufficient to produce sustained behavioral change.¹⁷ Although greater nutrition knowledge and positive attitudes toward healthy eating are associated with better diet quality, these improvements do not necessarily translate into healthier dietary behaviors.^{17,18} This may explain why, despite the high level of nutrition knowledge observed in the present study, the behavioral subscales of the ASHN were not significantly associated with diabetes risk.

The observed association suggests that individuals with more positive attitudes toward healthy eating may have a lower diabetes risk. However, the weak strength of this relationship indicates that diabetes risk is influenced by multiple biological and behavioral factors rather than healthy eating attitudes alone. This finding suggests that individuals with more positive attitudes toward healthy

Table 4. Multiple linear regression analysis examining factors associated with FINDRISC scores

Variable	B	SE	β	t	p	95% CI for B	VIF
Constant	11.234	2.339	–	4.803	<0.001	6.620–15.849	–
Healthy eating attitude	-0.084	0.025	-0.210	-3.397	0.001	-0.134–-0.035	1.054
BMI	0.212	0.064	0.228	3.280	0.001	0.084–0.339	1.326
Age	0.105	0.018	0.399	5.682	<0.001	0.069–0.141	1.359
Constant	11.234	2.339	–	4.803	<0.001	6.620–15.849	–

$R=0.566$, $R^2=0.320$, Adjusted $R^2=0.309$, $F(3,187)=29.33$, $p<0.05$. SE: Standard error, CI: Confidence interval, VIF: Variance inflation factor, BMI: Body mass index.

eating tend to have lower diabetes risk. Previous studies have similarly reported that healthier dietary patterns and greater adherence to healthy eating recommendations are associated with improved glycemic control and a lower risk of diabetes.^{19,20} However, diabetes risk is multifactorial and is influenced by numerous factors, including genetic predisposition, physical activity, and body composition.²¹ Accordingly, the weak correlation observed in the present study suggests that attitudes toward healthy eating alone explain only a small proportion of the variation in diabetes risk.

Among the ASHN subscales, a weak but statistically significant negative correlation was observed only between the Nutrition Knowledge subscale and the FINDRISC score. This finding suggests that greater nutrition knowledge may contribute to a lower risk of diabetes. Consistent with this result, large cohort studies have demonstrated that adherence to healthy dietary patterns is associated with a reduced incidence of diabetes.^{22,23}

However, no significant associations were observed between diabetes risk and the Emotions Related to Nutrition, Positive Nutrition, or Poor Nutrition subscales. This finding suggests that although individuals may possess adequate nutrition-related knowledge, this knowledge does not necessarily lead to healthier eating behaviors. This finding is consistent with the concept of the *knowledge-behavior gap* in health psychology.²⁴

Taken together, these findings indicate that educational interventions focusing solely on increasing nutrition knowledge may be insufficient for community-based diabetes prevention. Instead, diabetes prevention programs should incorporate comprehensive behavior change strategies, including motivational support and environmental modifications that facilitate healthier lifestyle choices.^{25,26} Consistent with this recommendation, randomized controlled trials have demonstrated that multicomponent lifestyle interventions combining dietary modification, physical activity, and behavioral support significantly reduce the incidence of type 2 diabetes.^{27,28}

Limitations

This study has several limitations. First, the data were based on participants' self-reports. Second, internal consistency was not assessed for the FINDRISC because it is a formative instrument. This reflects the measurement characteristics of the instrument rather than a methodological limitation of the study. Furthermore, the absence of biochemical confirmation precluded the evaluation of diagnostic accuracy. In addition, although waist circumference was assessed, the exact measurements in centimeters were not recorded; instead, participants were classified directly according to the waist circumference categories used in the FINDRISC instrument. This approach may have reduced the precision of anthropometric assessment and, consequently, the accuracy of waist circumference-based risk estimation.

Conclusion

This study suggests that having adequate nutrition knowledge alone may not be sufficient to promote healthier eating behaviors or reduce diabetes risk. Therefore, community-based diabetes prevention programs should not focus solely on improving nutrition knowledge but should also incorporate behavioral strategies that facilitate long-term lifestyle changes. Fostering positive attitudes toward healthy eating, encouraging regular physical activity, and promoting individual responsibility for health may further contribute to reducing diabetes risk. Overall, comprehensive, multidimensional interventions that combine nutrition knowledge with behavior change strategies are likely to be more effective in promoting sustainable healthy lifestyle behaviors and supporting diabetes prevention.

Ethics Committee Approval: The study was approved by the İstanbul Gedik University Ethics Committee [Approval Number: 2024/11, Date: 29.11.2024].

Informed Consent: Written informed consent was obtained from all participants.

Conflict of Interest: The authors have no conflicts of interest to declare.

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Association Between Basic Psychological Needs and University Adjustment Among First-Year University Students

Abstract

Background: Adjustment to university life plays a crucial role in students' academic, social, and emotional development. The fulfillment of basic psychological needs such as autonomy, competence, and relatedness, is a key factor influencing this adjustment process.

Aim: This study aimed to examine the relationship between first-year university students' basic psychological needs and their level of adjustment to university life. The findings are expected to contribute to the development of support systems that facilitate students' adaptation to the university environment.

Methods: This cross-sectional, descriptive-correlational study was conducted during the 2023–2024 academic year with 345 associate degree students. Data were collected using the Personal Information Form, the Basic Psychological Needs Scale, and the University Adaptation Scale. Data were analyzed using the chi-square test, independent-samples t test, one-way analysis of variance (ANOVA), and multiple linear regression analysis.

Results: Overall, students reported high levels of satisfaction of their psychological needs for autonomy, competence, and relatedness and demonstrated high levels of university adjustment. However, differences in academic, social, and institutional adjustment were observed across academic programs. Regression analysis revealed that autonomy, competence, and relatedness significantly predicted the subdimensions of university adjustment, explaining 9–15% of the variance.

Conclusion: The findings highlight the importance of creating supportive educational environments that foster autonomy, strengthen students' sense of competence, and enhance interpersonal connectedness. Universities should implement student-centered policies and psychosocial support services that promote the satisfaction of basic psychological needs to facilitate a smoother and more sustainable adjustment to university life.

Keywords: *Psychological needs, university adjustment, university life*

✉ Mihriban Tuncer,¹ ✉ Dilek Gümüş,¹
✉ Pelin Senemoğlu,¹ ✉ Zeynep Yılmaz,¹
✉ Hatice Ecem Gezer,¹ ✉ Gülgün Durat²

¹Department of Medical Services and Techniques,
Bilecik Şeyh Edebali University, Bilecik, Türkiye

²Department of Nursing, Sakarya University Faculty of
Health Sciences, Sakarya, Türkiye

Introduction

Adolescence and young adulthood represent developmental periods characterized by increasing autonomy and the gradual assumption of social roles and responsibilities. From a sociological perspective, this stage marks the transition from childhood dependence to adulthood, during which individuals develop a stable and coherent sense of identity. As young people move toward independence, they may experience emotional fluctuations, internal conflicts, or feelings of liberation.¹ University education generally coincides with this developmental period. During these years, students shape their future aspirations, clarify their academic and professional goals, and consolidate their identities.²

In evolutionary theory, adaptation represents a core concept involving the selective retention of fitness-enhancing variants. In developmental psychology, adaptation can be understood as a dynamic regulatory process through which individuals adjust their goals and evaluations in response to obstacles, losses, threats, and developmental challenges.³

The transition to university introduces students to a new academic and sociocultural environment that requires substantial adjustment, particularly during the first year. Students must cope with increased academic demands, independent living, and the development of new social relationships. Although adaptive skills may facilitate coping with these challenges, factors such as shyness, loneliness, fear of failure, and sensitivity to criticism may hinder the adjustment process. Previous studies have reported that male students tend to demonstrate higher levels of university adjustment and that participation in sociocultural activities supports academic adjustment.⁴ First-year students may also experience considerable difficulties related to independent learning, living away from their families, loneliness, accommodation, financial pressures, and the formation of new friendships.⁵ The adjustment process may therefore be influenced by contextual factors, including institutional support services, accommodation conditions, characteristics of the university environment, and students' financial circumstances. During this period, students adapt to a new environment, establish social networks, and consider their future careers. Although the transition may be experienced as exciting and liberating, it may also generate considerable stress.⁵ University life thus presents both opportunities and challenges. First-year students commonly experience separation from their families and difficulties forming new

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Corresponding author: Mihriban Tuncer
E-mail: mihriban.tuncer@bilecik.edu.tr

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friendships, whereas final-year students may experience stress related to academic workload, fear of failure, and uncertainty about their future careers.^{5,6}

Overall, adjustment to university life requires balancing academic demands, social relationships, personal responsibilities, and future aspirations. This multifaceted process presents both developmental opportunities and potential risks. Successful adjustment is a key determinant of students' academic achievement, educational experiences, and psychological well-being.^{1,2} Conversely, adjustment difficulties and insufficient social or institutional support during this transitional period are associated with academic underperformance, social isolation, psychological distress, and an increased risk of university dropout.⁷

The transition to university is a multidimensional process that affects students' academic, social, and emotional well-being. Baker and Siryk conceptualized university adjustment as comprising four dimensions: academic adjustment, social adjustment, personal-emotional adjustment, and institutional attachment. Academic adjustment refers to successfully managing academic demands; social adjustment involves developing satisfying interpersonal relationships; personal-emotional adjustment reflects psychological well-being and effective stress management; and institutional attachment refers to students' sense of belonging to their university.⁸

Within this framework, Self-Determination Theory, developed by Deci and Ryan,⁹ proposes that optimal functioning and well-being depend on the satisfaction of three basic psychological needs: autonomy, competence, and relatedness. Autonomy refers to experiencing a sense of choice, competence involves feeling effective, and relatedness reflects the development of meaningful interpersonal relationships. Satisfaction of these needs promotes intrinsic motivation, engagement, resilience, and psychological well-being, whereas frustration of these needs may contribute to adjustment difficulties. Consequently, the extent to which first-year students' basic psychological needs are satisfied may play a critical role in their adjustment to university life.⁹

This study examines the extent to which basic psychological needs influence the dimensions of university adjustment, conceptualizing adjustment as a developmental process shaped by underlying psychological mechanisms rather than merely as an outcome. It addresses a gap in the literature by clarifying the motivational foundations of university adjustment and empirically examining the contribution of basic psychological needs to its multidimensional structure. A better understanding of these relationships may provide an evidence-based framework for designing targeted interventions. For example, promoting autonomy may enhance academic adjustment, strengthening relatedness may facilitate social adjustment, and fostering competence may support personal-emotional adjustment. Thus, this study contributes both to the theoretical understanding of university adjustment and to the development of institutional practices that promote student success and well-being in higher education.

Research Questions

1. Do the levels of basic psychological need satisfaction (autonomy, competence, and relatedness) among first-year university students significantly predict the dimensions of university adjustment (academic, social, personal-emotional, and institutional adjustment)?
2. Do levels of basic psychological need satisfaction and university adjustment among first-year university students differ significantly according to sociodemographic characteristics?

Materials and Methods

Study Design

This study employed a cross-sectional, descriptive-correlational design.

Sample and Setting

The required sample size was determined using the Raosoft® online sample size calculator, and the statistical power of the study was subsequently evaluated. This tool provides an efficient method for estimating the required sample size for finite populations. The study population consisted of 745 first-year students enrolled in the Vocational School of Health Services during the 2023–2024 academic year

($n=745$). The following parameters were used in the sample size calculation: population size (n): 745, margin of error (e): 5%, confidence level: 95%, and response distribution (p): 50% (maximum variability assumption).

Based on these parameters, the minimum required sample size was calculated as 254 participants. To increase the precision of the findings and the reliability of the statistical analyses, a larger sample was recruited. Data from 345 students who voluntarily agreed to participate and completed all study instruments were included in the analyses. This sample exceeded the minimum required sample size, thereby enhancing the representativeness of the study population. A post hoc power analysis was also conducted to evaluate the adequacy of the sample size. Assuming a medium effect size ($r=0.30$) for the planned correlation and regression analyses, a significance level of $\alpha=0.05$, the analysis indicated that a minimum of 85 participants would be sufficient to achieve adequate statistical power. Therefore, the final sample of 345 participants provided adequate statistical power and precision for both descriptive and inferential analyses. The inclusion criteria were being a first-year university student enrolled during the 2023–2024 academic year and providing voluntary informed consent to participate. The exclusion criteria included insufficient Turkish language proficiency to complete the study instruments and a self-reported history of a psychiatric diagnosis.

Data Collection Instruments

Data were collected using a Personal Information Form, the Basic Psychological Needs Scale–General Form (BPNS-G), and the University Adaptation Scale (UAS).

Personal Information Form

The Personal Information Form was developed by the researchers to collect participants' sociodemographic characteristics and information regarding their university life (Table 1).

Basic Psychological Needs Scale–General Form (BPNS-G)

The Basic Psychological Needs Scale–General Form (BPNS-G), developed by La Guardia¹⁰ and adapted into Turkish by Cihangir-Çankaya,¹¹ is a 21-item instrument designed to assess the extent to which individuals' basic psychological needs are satisfied. The scale comprises three subscales: autonomy (7 items), competence (6 items), and relatedness (8 items). Items are rated on a 7-point Likert scale ranging from 1 (Not at all true) to 7 (Very true), with higher scores indicating greater satisfaction of basic psychological needs. The reported Cronbach's alpha coefficient for the Turkish version of the total scale is 0.83, with coefficients of 0.82 for autonomy, 0.82 for competence, and 0.81 for relatedness. In the present study, Cronbach's alpha coefficients were 0.84 for the total scale, 0.74 for autonomy, 0.53 for competence, and 0.69 for relatedness. The scale contains reverse-scored items in each subscale. Possible score ranges are 7–49 for autonomy, 6–42 for competence, and 8–56 for relatedness.

University Adaptation Scale (UAS)

The University Adaptation Scale (UAS), developed by Sevinç Tuhanoğlu and Gizir,¹² was used to assess students' adjustment to university life across four subdimensions: academic adjustment (12 items), social adjustment (13 items), personal-emotional adjustment (10 items), and institutional adjustment (10 items). Items are rated on a 7-point Likert scale ranging from 1 (Not at all suitable) to 7 (Completely suitable), with higher scores indicating better university adjustment. The original study reported a Cronbach's alpha coefficient of 0.93 for the total scale and coefficients of 0.86, 0.80, 0.76, and 0.88 for the academic, social, personal-emotional, and institutional adjustment subscales, respectively. In the present study, the corresponding Cronbach's alpha coefficients were 0.92, 0.93, 0.90, 0.77, and 0.92, respectively. Reverse-scored items are included in all subscales. Possible score ranges are 12–84 for academic adjustment, 13–91 for social adjustment, 10–70 for personal-emotional adjustment, and 10–70 for institutional adjustment.

Data Collection

Data were collected between February and April during the spring semester of the 2023–2024 academic year using a structured online questionnaire created by the researchers and administered through Google Forms. Data collection was conducted in classrooms and the school library. Eligible students were informed about the purpose and procedures of the study before participation. Participation

Table 1. Sociodemographic characteristics of the students

Variable	n (%)	Variable	n (%)
Gender		Age group [years]	
Female	285 [82.6]	18–24	324 [93.9]
Male	60 [17.4]	25–32	12 [3.5]
Academic program		≥33	9 [2.6]
Operating Room Services	34 [9.9]	Voluntarily chose academic program	
Child Development	86 [24.9]	No	28 [8.1]
Pharmacy Services	26 [7.5]	Yes	317 [91.9]
Medical Documentation and Secretarial	36 [10.4]	Satisfied with academic program	
Opticianry	25 [7.2]	No	11 [3.2]
First and Emergency Aid	45 [13]	Yes	253 [73.3]
Medical Laboratory Techniques	93 [27]	Undecided	81 [23.5]
Difficulty adjusting to university life		Enjoy university life	
No	288 [83.5]	No	136 [39.4]
Yes	57 [16.5]	Yes	209 [60.6]
Feel lonely at university		University contributed to my cultural development	
No	287 [83.2]	No	269 [78]
Yes	58 [16.8]	Yes	76 [22]
Classroom physical conditions are adequate		Course and examination schedules are adequate	
No	190 [55.1]	No	180 [52.2]
Yes	155 [44.9]	Yes	165 [47.8]
Classroom equipment is adequate		Communication between instructors and students is adequate	
No	236 [68.4]	No	131 [38]
Yes	109 [31.6]	Yes	214 [62]
Instructors possess sufficient professional knowledge		Library services are adequate	
No	167 [48.4]	No	140 [40.6]
Yes	178 [51.6]	Yes	205 [59.4]
Other campus facilities are adequate		Internet services are adequate	
No	318 [92.2]	No	172 [49.9]
Yes	27 [7.8]	Yes	173 [50.1]
Canteen and cafeteria services are adequate		Social and cultural activities (e.g., scientific societies, cultural events etc.) are adequate	
No	140 [40.6]	No	286 [82.9]
Yes	205 [59.4]	Yes	59 [17.1]
Social activity areas are adequate			
No	281 [81.4]		
Yes	64 [18.6]		

was voluntary, and informed consent was obtained electronically before participants accessed the questionnaire. Completion of the survey required approximately 10–15 minutes. All data were collected in accordance with ethical principles, and participant confidentiality was maintained throughout the study.

Statistical Analysis

Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) for macOS, version 29.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized using the mean, standard deviation, median, minimum, and maximum values, whereas categorical variables were summarized using frequencies and percentages. The chi-square test or Fisher's exact test was used to compare categorical variables, the independent-samples t-test was used to compare two groups, and one-way analysis of variance (ANOVA) was used to compare three or more groups. Bonferroni post hoc tests were used to identify significant pairwise

differences between groups. Multiple linear regression analysis was performed to examine the effects of basic psychological needs on university adjustment. Statistical significance was set at $p < 0.05$. Before the regression analysis was performed, multicollinearity and the independence of residuals were assessed. Variance inflation factor (VIF) values below 10, tolerance values above 0.10, and Durbin-Watson statistics between 1 and 3 were considered acceptable.¹³ In the present study, the Durbin-Watson statistic was 1.98 and the VIF values were 1.00, indicating that the assumptions for regression analysis were satisfied.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from Sakarya University Ethics Committee (Approval Number: 66/27, Date: 21.02.2024). Written informed consent was obtained electronically from all participants before data collection commenced.

Table 2. Descriptive statistics for the Basic Psychological Needs Scale and University Adaptation Scale scores

Basic psychological needs scale	Score
Autonomy	
Mean±SD	23.7±5.3
Median [Min–Max]	24 [7–39]
Competence	
Mean±SD	20.1±4.8
Median [Min–Max]	20 [6–32]
Relatedness	
Mean±SD	28.7±5.9
Median [Min–Max]	29 [8–48]
Total	
Mean±SD	72.6±14.1
Median [Min–Max]	73 [21–113]
University adaptation scale	Score
Academic Adjustment	
Mean±SD	57.8±18.5
Median [Min–Max]	60 [12–84]
Social adjustment	
Mean±SD	51.6±14
Median [Min–Max]	53 [15–91]
Personal-emotional adjustment	
Mean±SD	36.8±17.6
Median [Min–Max]	34 [10–70]
Institutional adjustment	
Mean±SD	36.2±10.8
Median [Min–Max]	35 [10–70]
Total	
Mean±SD	182.4±43.5
Median [Min–Max]	183 [49–315]

SD: Standard deviation.

Results

Of the participants, 17.4% were men and 82.6% were women. Participants ranged in age from 17 to 52 years, with a mean age of 20±4 years. Most participants were unmarried (69%), lived in dormitories (73.9%), had health insurance (69.6%), did not consume alcohol (89.3%), and did not smoke (71.3%). Additionally, 91.9% reported that they had voluntarily chosen their academic program, and 46.1% reported that their family income exceeded the minimum wage.

The total scores on the Basic Psychological Needs Scale ranged from 21 to 113 (median: 73). Median scores for the subscales were 24 [range: 7–39] for autonomy, 20 [range: 6–32] for competence, and 29 [range: 8–48] for relatedness. For the University Adaptation Scale, median scores were 60 [range: 12–84] for academic adjustment, 53 [range: 15–91] for social adjustment, 34 [range: 10–70] for personal-emotional adjustment, and 35 [range: 10–70] for institutional adjustment (Table 2).

The results of the analyses examining differences in Basic Psychological Needs Scale and University Adaptation Scale scores according to gender and academic program are presented in Table 3. No statistically significant differences were found between men and women in the total basic psychological needs score or in the autonomy, competence, and relatedness subscales ($p>0.05$). Likewise, gender was not significantly associated with the total university adjustment score or with the academic, social, personal-emotional, or institutional adjustment subscales

($p>0.05$). One-way ANOVA showed no significant differences among academic programs in autonomy, competence, relatedness, or total basic psychological needs scores ($p>0.05$). In contrast, significant differences among academic programs were observed for academic adjustment ($F=3.723$; $p<0.05$), social adjustment ($F=3.037$; $p<0.05$), institutional adjustment ($F=3.093$; $p<0.05$), and total university adjustment ($F=3.147$; $p<0.05$). Post hoc analyses indicated that students enrolled in the Child Development ($\bar{x}=60.2$) and Medical Laboratory Techniques ($\bar{x}=60.9$) programs had higher academic adjustment scores than students enrolled in the Medical Documentation and Secretarial program ($\bar{x}=47.9$). For social adjustment, students in the Medical Laboratory Techniques program ($\bar{x}=54.3$) scored higher than those in the Medical Documentation and Secretarial program ($\bar{x}=45.4$). Regarding institutional adjustment, students in the First and Emergency Aid program ($\bar{x}=39.8$) had higher scores than students in the Medical Documentation and Secretarial program ($\bar{x}=31.3$). Furthermore, students in the Child Development ($\bar{x}=184.8$), Opticianry ($\bar{x}=194$), and Medical Laboratory Techniques ($\bar{x}=188.8$) programs demonstrated higher total university adjustment scores than students in the Medical Documentation and Secretarial program (Table 3).

To examine the predictive effects of basic psychological needs (autonomy, competence, and relatedness) on university adjustment, four separate multiple linear regression models were constructed. In each model, autonomy, competence, and relatedness were entered as independent variables, whereas one of the four adjustment dimensions served as the dependent variable. In the first model, academic adjustment was the dependent variable. The overall regression model was statistically significant ($R=0.30$, $R^2=0.09$, $F=33.929$, $p<0.001$). Autonomy ($\beta=0.24$, $p<0.001$), competence ($\beta=0.24$, $p<0.001$), and relatedness ($\beta=0.29$, $p<0.001$) were all significant positive predictors of academic adjustment, collectively explaining 9% of the variance. In the second model, social adjustment was the dependent variable. The model was statistically significant ($R=0.33$, $R^2=0.10$, $F=41.892$, $p<0.001$). Autonomy ($\beta=0.29$, $p<0.001$), competence ($\beta=0.32$, $p<0.001$), and relatedness ($\beta=0.26$, $p<0.001$) each significantly and positively predicted social adjustment, accounting for 10% of the variance.

In the third model, personal-emotional adjustment was the dependent variable. The regression model was statistically significant ($R=0.37$, $R^2=0.13$, $F=52.613$, $p<0.001$). Autonomy ($\beta=0.34$, $p<0.001$), competence ($\beta=0.41$, $p<0.001$), and relatedness ($\beta=0.22$, $p<0.001$) were significant positive predictors of personal-emotional adjustment. Together, these variables explained 13% of the variance. In the fourth model, institutional adjustment was the dependent variable. The regression model was also statistically significant ($R=0.39$, $R^2=0.15$, $F=60.778$, $p<0.001$). Autonomy ($\beta=0.35$, $p<0.001$), competence ($\beta=0.40$, $p<0.001$), and relatedness ($\beta=0.28$, $p<0.001$) each made significant positive contributions, explaining 15% of the variance in institutional adjustment.

Overall, the findings demonstrate that satisfaction of the basic psychological needs for autonomy, competence, and relatedness significantly and positively predicts all dimensions of university adjustment. Among these predictors, competence exhibited the strongest associations with personal-emotional and institutional adjustment (Table 4).

Discussion

This study found that first-year university students generally reported high levels of university adjustment and adequate satisfaction of their basic psychological needs for autonomy, competence, and relatedness. No significant gender differences were observed in psychological need satisfaction or university adjustment, whereas adjustment differed across academic programs. Furthermore, autonomy, competence, and relatedness significantly and positively predicted academic, social, personal-emotional, and institutional adjustment. These findings suggest that the satisfaction of basic psychological needs constitutes an important psychological resource that supports students' adjustment to university life.

Although most participants were female, no significant gender differences were found in the satisfaction of basic psychological needs or in university adjustment. These findings suggest that, within this sample, gender was not a significant factor influencing psychological need satisfaction or adjustment to university life. Consistent with previous research, the findings suggest that university adjustment is influenced more by psychological and contextual factors, particularly the satisfaction of the basic psychological needs for autonomy, competence, and relatedness, than by gender alone.¹⁴

Table 3. Independent-samples t test and one-way ANOVA results for Basic Psychological Needs and University Adjustment Scores by gender and academic program

Variable	Gender	N	$\bar{X}$	SD	t	p
Autonomy	Female	285	23.7	5.2	-0.620	0.53
	Male	60	24.1	5.9		
Competence	Female	285	20.1	4.6	-0.075	0.94
	Male	60	20.2	5.6		
Relatedness	Female	285	28.7	5.7	0.210	0.83
	Male	60	28.6	6.8		
Basic Psychological Needs	Female	285	72.5	13.4	-0.170	0.88
	Male	60	72.9	17.2		
Academic Adjustment	Female	285	58	18.4	0.454	0.65
	Male	60	56.8	19		
Social Adjustment	Female	285	51.1	13	-1.464	0.23
	Male	60	54	18		
Personal-Emotional Adjustment	Female	285	37.4	17.9	1.286	0.17
	Male	60	34.2	16.3		
Institutional Adjustment	Female	285	35.7	10.1	-1.931	0.11
	Male	60	38.6	13.7		
University Adjustment	Female	285	182.2	40.5	-0.237	0.84
	Male	60	183.6	56.1		
	Academic program	N	$\bar{X}$	SD	F	p
Autonomy	Operating Room Services	34	24.3	3.7	1.403	0.21
	Child Development	86	22.9	5.1		
	Pharmacy Services	26	24.8	6		
	Medical Documentation and Secretarial	36	22.3	5.7		
	Opticianry	25	24.4	4.8		
	First and Emergency Aid	45	23.9	6.4		
	Medical Laboratory Techniques	93	24.6	5.1		
Competence	Operating Room Services	34	20.4	3.7	0.907	0.49
	Child Development	86	20	5.2		
	Pharmacy Services	26	21	5		
	Medical Documentation and Secretarial	36	18.7	4.2		
	Opticianry	25	21	4.5		
	First and Emergency Aid	45	19.8	5.7		
	Medical Laboratory Techniques	93	20.4	4.3		
Relatedness	Operating room services	34	29.9	4.6	1.698	0.12
	Operating Room Services	86	27.6	6.1		
	Child Development	26	28.9	5.6		
	Pharmacy Services	36	27	6		
	Medical Documentation and Secretarial	25	29.4	4.8		
	Opticianry	45	29	7.4		
	First and Emergency Aid	93	29.7	5.6		
Basic Psychological Needs	Operating Room Services	34	74.2	10	1.522	0.17
	Child Development	86	70.5	14.7		
	Pharmacy Services	26	74.7	13.3		
	Medical Documentation and Secretarial	36	68	14		
	Opticianry	25	74.4	12.5		
	First and Emergency Aid	45	72.7	18.5		
	Medical Laboratory Techniques	93	74.6	12.7		
Academic Adjustment	Operating Room Services	34	60.7	15.2	3.723	0.00*
	Child Development	86	60.2	19.8		
	Pharmacy Services	26	55.3	16.6		
	Medical Documentation and Secretarial	36	47.9	18.2		
	Opticianry	25	61.6	16.5		
	First and Emergency Aid	45	51.9	18.1		
	Medical Laboratory Techniques	93	60.9	18		

Table 3. Cont.

	Academic program	N	$\bar{X}$	SD	F	p
Social Adjustment	Operating Room Services	34	49.9	11.8	3.037	0.00*
	Child Development	86	53.3	15.4		
	Pharmacy Services	26	46.6	13.3		
	Medical Documentation and Secretarial	36	45.4	13.1		
	Opticianry	25	55	11.6		
	First and Emergency Aid	45	50	14.4		
	Medical Laboratory Techniques	93	54.3	13.5		
Personal-Emotional Adjustment	Operating Room Services	34	37.9	16.7	0.954	0.45
	Child Development	86	36.8	18.1		
	Pharmacy Services	26	41	18.3		
	Medical Documentation and Secretarial	36	31	15.6		
	Opticianry	25	38.4	20.4		
	First and Emergency Aid	45	36.6	15.8		
	Medical Laboratory Techniques	93	37.3	18.1		
Institutional Adjustment	Operating Room Services	34	36.1	9.6	3.093	0.00*
	Child Development	86	34.6	10.8		
	Pharmacy Services	26	39	10.7		
	Medical Documentation and Secretarial	36	31.3	8.3		
	Opticianry	25	39	10.2		
	First and Emergency Aid	45	39.8	10.8		
	Medical Laboratory Techniques	93	36.4	11.6		
University Adjustment	Operating Room Services	34	184.6	35.4	3.147	0.00*
	Child Development	86	184.8	48.2		
	Pharmacy Services	26	181.8	31.5		
	Medical Documentation and Secretarial	36	155.6	41.1		
	Opticianry	25	194	35.3		
	First and Emergency Aid	45	178.3	46.9		
	Medical Laboratory Techniques	93	188.8	42.7		

*: $p < 0.05$. $\bar{X}$: Mean, SD: Standard deviation.

Table 4. Multiple linear regression analysis

Variable	B	β	t	p	p	R	R ²	F
Model 1: Academic adjustment								
Autonomy	0.07	0.24	4.66	0.00*	0.00*	0.300	0.09	33.929
Competence	0.06	0.24	4.75	0.00*				
Relatedness	0.09	0.29	5.73	0.00*				
Model 2: Social adjustment								
Autonomy	0.11	0.29	5.65	0.00*	0.00*	0.330	0.10	41.892
Competence	0.10	0.32	6.29	0.00*				
Relatedness	0.11	0.26	5.10	0.00*				
Model 3: Personal-emotional adjustment								
Autonomy	0.10	0.34	6.85	0.00*	0.00*	0.365	0.13	52.613
Competence	0.11	0.41	8.35	0.00*				
Relatedness	0.07	0.22	4.32	0.00*				
Model 4: Institutional Adjustment								
Autonomy	0.17	0.35	6.97	0.00*	0.00*	0.388	0.15	60.778
Competence	0.17	0.40	8.15	0.00*				
Relatedness	0.15	0.28	5.50	0.00*				

*: $p < 0.05$. $R = 0.594$, $R^2 = 0.353$, $F = 187.008$, VIF: 1.00, Watson: 1.98.

No statistically significant differences were observed between male and female students in the satisfaction of the basic psychological needs for autonomy, competence, and relatedness. Similarly, gender was not significantly associated with ac-

ademic, social, personal-emotional, or institutional adjustment. Although male students had slightly higher mean scores for social and institutional adjustment, these differences were not statistically significant. These findings suggest that gender

was not a significant factor influencing university adjustment in this sample. Overall, the findings suggest that male and female students experienced comparable levels of psychological need satisfaction and university adjustment. These results are consistent with previous studies reporting no significant gender differences in students' adjustment to university life.¹⁵⁻¹⁷ However, some studies have reported gender differences in specific dimensions of university adjustment. For example, female students have been found to report higher levels of academic and social adjustment.¹⁸ The literature also suggests gender differences in psychological characteristics and coping strategies. Male students have been reported to exhibit higher levels of self-esteem, emotional stability, and achievement motivation, as well as advantages in certain aspects of cognitive performance.¹⁹ In contrast, female students tend to report higher levels of anxiety and stress, which may adversely affect their psychological well-being and adjustment to university life.^{20,21} Previous research has also shown gender differences in coping strategies, with men tending to adopt problem-focused coping, whereas women are more likely to use emotion-focused strategies, such as seeking emotional support.^{20,22} Despite these differences, studies have generally found no significant gender differences in the satisfaction of the basic psychological needs for autonomy and competence, although men have occasionally reported higher levels of relatedness satisfaction.²³ In light of these findings, the absence of significant gender differences in the present study suggests that university adjustment is more strongly associated with the satisfaction of basic psychological needs than with gender. Consistent with Self-Determination Theory, the satisfaction of the needs for autonomy, competence, and relatedness constitutes an important psychological resource that facilitates successful adjustment to university life. Therefore, rather than emphasizing gender-based differences, interventions designed to promote university adjustment should focus on enhancing the satisfaction of students' basic psychological needs and strengthening supportive educational environments. The findings also showed that university adjustment and the satisfaction of basic psychological needs were examined according to students' academic program. Specifically, the ANOVA results revealed no significant differences among academic programs in autonomy, competence, relatedness, or total basic psychological need satisfaction, suggesting that these needs were satisfied at similar levels across fields of study. In contrast, significant differences were observed in academic, social, institutional, and overall university adjustment. Students enrolled in the Medical Documentation and Secretarial program reported lower levels of academic and social adjustment than students in several other programs, whereas students in the Child Development, Opticianry, and Medical Laboratory Techniques programs demonstrated higher levels of adjustment in specific domains. These findings suggest that although satisfaction of the basic psychological needs for autonomy, competence, and relatedness is relatively consistent across academic programs, students' adjustment may be influenced by program-specific academic and contextual characteristics.²⁴ Differences in curriculum structure, academic workload, learning environments, and the quality of student-faculty interactions may contribute to variations in university adjustment. Accordingly, students enrolled in programs associated with lower levels of adjustment may benefit from targeted academic and psychosocial support to facilitate their transition to university life. Consistent with previous research indicating that academic contexts influence the satisfaction and expression of basic psychological needs,²⁵ the present findings underscore the importance of considering structural and contextual factors when evaluating students' adjustment processes.

These findings suggest that differences in curriculum structure, academic workload, and learning environments across academic programs may influence students' adjustment to university life. In addition to program-related characteristics, previous research suggests that students' adjustment generally improves as they progress through university, particularly during the second and third years of study.²⁶ This developmental pattern may reflect increasing familiarity with academic expectations and the development of more effective coping strategies. Moreover, resilience has been associated with emotional stability, psychological flexibility, self-acceptance, and academic motivation, all of which contribute to successful adjustment and positive educational experiences.²⁷ The quality of teacher-student interactions may also influence the relationship between basic psychological need satisfaction and university adjustment. Students who engage in more flexible and constructive communication report lower levels of psychological need frustration and greater satisfaction of their needs for autonomy, competence, and relatedness.²⁸ According to Self-Determination Theory, satisfaction of the basic psychological needs for autonomy, competence, and relatedness is a key psychological resource that facilitates

successful adjustment to university life. The transition to university is widely recognized as a stressful period that may adversely affect students' mental health, academic performance, and overall well-being.^{29,30} Students who perceive themselves as competent, autonomous, and socially connected are better equipped to regulate their emotions, cope with academic stress, and engage more effectively in their studies.^{31,32} Thus, satisfaction of basic psychological needs appears to serve as an important protective factor that facilitates successful adjustment to university life.

Multiple linear regression analyses were conducted to determine whether the dimensions of the basic psychological needs (autonomy, competence, and relatedness) predicted students' adjustment to university life. In each model, one dimension of university adjustment (academic, social, personal-emotional, or institutional adjustment) was specified as the dependent variable. Autonomy, competence, and relatedness were entered as the independent predictors. The findings demonstrated that all three dimensions of basic psychological needs significantly and positively predicted each dimension of university adjustment. The models explained between 9% and 15% of the variance, indicating that satisfaction of basic psychological needs is an important, although modest, contributor to students' adjustment to university life. These findings are consistent with Self-Determination Theory,⁹ which proposes that satisfaction of the basic psychological needs for autonomy, competence, and relatedness promotes intrinsic motivation, psychological well-being, and adaptive functioning. Similarly, previous research has demonstrated that satisfaction of these needs is associated with greater academic engagement and more successful adjustment to university life.^{31,32} Although the effect sizes were modest, the consistent predictive pattern across all four dimensions of university adjustment supports the proposition that satisfaction of basic psychological needs represents an important psychological resource for successful adjustment to university life.

Overall, the findings indicate that satisfaction of the basic psychological needs for autonomy, competence, and relatedness provides an important psychological foundation for successful university adjustment across academic, social, personal-emotional, and institutional domains. Students who perceive themselves as competent, autonomous, and socially connected appear better equipped to cope with the demands of university life. Although the regression models explained a modest proportion of the variance, the consistent predictive pattern across all dimensions of university adjustment suggests that satisfaction of basic psychological needs is an important contributor to successful adjustment. Consistent with Self-Determination Theory, fostering autonomy, competence, and relatedness may enhance students' intrinsic motivation, emotional regulation, and adaptive functioning. Therefore, educational environments that promote autonomy-supportive practices, provide competence-enhancing feedback, and foster meaningful interpersonal relationships may facilitate students' adjustment and psychological well-being during the transition to higher education.

Study Limitations

This study has several limitations. The sample was drawn from selected academic programs at a single university, which may limit the generalizability of the findings. The use of self-report measures and the cross-sectional study design precludes causal inferences. Future research should include larger samples from multiple universities and academic disciplines and employ longitudinal or experimental designs to evaluate interventions aimed at enhancing students' basic psychological need satisfaction.

Conclusion

The results of this study suggest that supporting students' basic psychological needs is essential for promoting successful adjustment to university life. Additionally, incorporating these psychological needs into the development of interventions may facilitate students' adaptation to the university environment. Significant differences in university adjustment were also observed across academic programs. Overall, these findings underscore the multidimensional nature of university adjustment, suggesting that it is shaped by both individual psychological resources and the broader academic context.

Based on these findings, interventions that support the satisfaction of first-year students' basic psychological needs are recommended. Strengthening orientation programs, expanding peer mentoring initiatives, improving access to counseling services, and providing structured academic feedback that enhances students'

sense of competence may facilitate successful adjustment to university life. In addition, program-specific academic support and learning environments that foster autonomy, competence, and relatedness may further promote students' adjustment.

In conclusion, the findings highlight the important role of satisfaction of the basic psychological needs in university adjustment and underscore the multidimensional nature of the adjustment process, which is associated with both individual psychological factors and academic program characteristics.

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Emerging Competency Expectations in Operating Room Nursing: A Qualitative Study of Surgeons' and Nurses' Perspectives

Ayşe Uçak,¹ Fatma Cebeci²

Abstract

Background: The operating room is a high-risk clinical environment in which, beyond technical skills, non-technical competencies, such as communication and collaboration, situational awareness, initiative and advocacy, accountability, cognitive agility, professional autonomy and identity, and emotional resilience, are increasingly critical for ensuring patient safety and maintaining workflow continuity.

Aim: This study aimed to identify emerging competency expectations for operating room nursing (ORN) from the perspectives of surgeons and operating room nurses.

Methods: This qualitative descriptive study was conducted in Türkiye between December 1, 2024 and May 31, 2025. A total of 27 surgeons and 30 operating room nurses from six hospitals in the city centers of two provinces participated in the study. Data were collected through semi-structured, in-depth interviews and analyzed using content analysis.

Results: Five themes emerged: operational flow and efficiency; professional development and standards; professional autonomy and identity; cognitive and mental skills; and emotional and motivational characteristics. Participants emphasized that non-technical competencies, including communication and collaboration, situational awareness, initiative and advocacy, accountability, and the ability to minimize errors under stress, are increasingly essential for ensuring patient safety and maintaining workflow continuity.

Conclusion: Compared with existing operating room (OR) nursing competency frameworks, the findings highlight cross-cutting competencies, including autonomy, professional identity, cognitive flexibility, and emotional resilience, that support technical performance, effective teamwork, and patient safety. Although the findings are not broadly generalizable, they have important implications for competency-based education, competency assessment, mentoring, and initiatives to strengthen patient safety culture.

Keywords: Competence, non-technical skills, operating room nursing, qualitative research, technical skills

¹Department of Nursing, Burdur Mehmet Akif Ersoy University Faculty of Health Sciences, Burdur, Türkiye

²Department of Surgical Nursing, Akdeniz University Faculty of Nursing, Antalya, Türkiye

Introduction

Professional competence refers to an individual's overall capacity to effectively apply knowledge, skills, and personal, social, and methodological abilities in practice. The European Qualifications Framework (EQF) defines competence as the proven ability to use knowledge, skills, and personal, social and/or methodological abilities in work or study settings and in professional and personal development.¹ The Organisation for Economic Co-operation and Development (OECD) classifies competence into cognitive-metacognitive, social-emotional, and practical/physical dimensions.² In healthcare, these frameworks emphasize the integrated application and assessment of knowledge, technical skills, values, and attitudes. Technological, organizational, and ethical changes in surgical care have further increased the importance of competence in operating room (OR) nursing.³ Competence is widely recognized as a multidimensional construct encompassing knowledge, skills, values, attitudes, and clinical reasoning that enables safe, effective, and ethical practice.⁴⁻⁶ In Benner's model, the competent stage represents a developmental level characterized by a more holistic understanding of clinical situations and increasingly effective and safe practice.^{7,8}

Operating room nursing competence is a key determinant of the care safety and quality of perioperative care. The European Operating Room Nurses Association (EORNA) defines perioperative nursing competence across the domains of professional, ethical, and legal practice; nursing care and surgical practice; communication; organizational, managerial, and leadership skills; and education, professional development, and research. However, OR competence extends beyond psychomotor, technical, and specialty-specific skills⁹ to include non-technical competencies such as situational awareness, decision-making, teamwork, communication, and stress management.^{10,11} These cognitive, affective, social, and contextual dimensions interact to shape professional practice, while personal attributes contribute to the development and sustainability of competence.^{4,11,12}

The OR is a complex, dynamic clinical environment in which multiple professional groups work in close collaboration. Consequently, role clarity, interprofessional collaboration, and adequate competence are essential for ensuring safe surgical care.¹³ However, role definitions and professional expectations vary across countries, healthcare institutions, and professional cultures, potentially leading to role ambiguity, role conflict, and differing

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Corresponding author: Ayşe Uçak
E-mail: ayseucak32@gmail.com

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perceptions of operating room nursing competence.¹⁴ Therefore, assessment of operating room nursing competence should extend beyond nurses' self-evaluation to include the perspectives of other members of the surgical team, particularly surgeons. A multisource approach can provide a more comprehensive and practice-based understanding of how competence is demonstrated in everyday clinical practice.¹⁵ Accordingly, this study explored how operating room nursing competence is conceptualized, maintained, and shaped by evolving clinical expectations from the perspectives of operating room nurses and surgeons. By integrating these perspectives, the study seeks to identify competency dimensions that are embedded within existing frameworks but may remain implicit in routine clinical practice. The findings may contribute to a more contextualized understanding of perioperative nursing competence, clarify learning outcomes in perioperative nursing education, inform competency assessment through approaches such as team-based learning and multisource feedback, and strengthen competency-based practices that promote patient safety.

Research Questions

1. How do operating room nurses and surgeons define the core characteristics of a competent operating room nurse in contemporary surgical practice?
2. How do operating room nurses and surgeons describe the essential factors for maintaining competence in operating room nursing?
3. How do operating room nurses and surgeons describe evolving expectations regarding operating room nursing competence, and which competency dimensions do they perceive as reflected in clinical practice?

Materials and Methods

Research Design

This study employed a qualitative descriptive design. Qualitative descriptive research provides a rich description of experiences and perceptions related to a specific phenomenon by using participants' accounts and organizing the data into categories and themes.¹⁶ The study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.

Study Setting and Participants

This qualitative descriptive study was conducted in the operating rooms of six hospitals in Türkiye, including three public hospitals, two private hospitals, and one university hospital. To enhance the representativeness of the findings across the Mediterranean region, institutional permission was obtained from public, private, and university hospitals located in the city centers of different provinces. The study included surgeons and operating room nurses who were actively working in the operating rooms of the participating hospitals. A total of 57 participants were recruited, comprising 27 surgeons and 30 operating room nurses (Table 1). Purposive sampling was used, specifically criterion sampling and maximum variation sampling. Data collection continued until data saturation was achieved.^{16,17} Data collection and preliminary analysis were conducted concurrently. After each interview, the researchers reviewed the transcript and emerging codes. Data saturation was considered to have been reached when subsequent interviews yielded no new codes, categories, or themes and when the existing themes were sufficiently supported by data from both operating room nurses and surgeons.

Eligible participants were those who volunteered to participate and had at least one year of operating room experience. Participants were free to withdraw from the study at any stage without consequence.

Data Collection Instruments

Data were collected using a Demographic Characteristics Form (DCF) and a Semi-Structured Interview Form (SSIF), both developed by the researchers based on the literature. The DCF included six questions addressing age, sex, educational level, profession, institution, and years of operating room experience. The SSIF included the following open-ended questions:

"How would you describe a competent operating room nurse?"

"In your opinion, what are the fundamental requirements for maintaining competence in operating room nursing?"

"Do you think there are emerging or increasing expectations regarding competence in operating room nursing? If so, what are they?"

"In your opinion, what characteristics distinguish a competent operating room nurse?"

"Is there anything else you would like to add?"

To evaluate the clarity and comprehensibility of the interview guide, pilot interviews were conducted with one OR nurse and one surgeon. Minor revisions were made to improve the wording of several questions without altering their meaning or scope. Because no substantial modifications were required, the pilot interviews were included in the final analysis.

Data Collection

Participants were informed about the study's purpose, data collection procedures, and confidentiality measures. Written informed consent was obtained before participation. Data were collected between December 1, 2024 and May 31, 2025. Individual face-to-face interviews were conducted by A.U. in a comfortable and private setting. Each interview lasted approximately 40 minutes. With participants' written consent, all interviews were audio-recorded and transcribed verbatim for analysis.

Data Analysis

Participants' demographic characteristics were summarized using frequencies, percentages, and means. Statistical analyses were performed using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA).

Data were analyzed using inductive content analysis, following the approach described by Graneheim and Lundman.¹⁶ Interview transcripts were read repeatedly to achieve familiarity with the data. Meaning units were then identified, condensed, and coded, and similar codes were grouped into subcategories and categories, from which overarching themes were developed.¹⁶ Researchers experienced in qualitative research performed the manual coding and theme development. The researchers compared their coding, discussed discrepancies, and reached consensus on the final coding framework and thematic structure. The findings are illustrated with representative quotations. To protect participants' anonymity, surgeons are identified as "S" and operating room nurses as "ORN," followed by sequential participant numbers. Data collection and analysis were concluded once data saturation had been achieved.

Rigour and Trustworthiness

The trustworthiness of the study was evaluated according to the four criteria of credibility, transferability, dependability, and confirmability, and specific strategies were implemented to address each criterion.^{16,17}

To enhance credibility, prolonged engagement with participants was achieved, and all interviews were conducted by the same researcher to ensure consistency in data collection. Two researchers analyzed and interpreted the data, and the analytic process was based on established qualitative methodology and described in detail.

To support transferability, purposive sampling, including criterion sampling and maximum variation sampling, was employed. The inclusion criteria, study context, and participant characteristics are described in detail. The findings are supported by representative quotations illustrating each category and theme. Interviews were conducted in Turkish, and the quotations presented in this article were translated into English by a bilingual translator. The accuracy of the translations was subsequently verified. The data collection and analysis procedures are described in detail to demonstrate methodological consistency.

To ensure verifiability, the data collection instruments, raw data, coding records, and researchers' field notes were systematically documented and independently reviewed to establish an audit trail.

To ensure confirmability, the findings were grounded in participants' accounts and supported by representative quotations. Two researchers independently analyzed the interview transcripts and reached consensus on the final codes and categories.

Ethical Consideration

Ethical approval was obtained from Burdur Mehmet Akif Ersoy University Ethics Committee (Approval Number: GO 2024/119, Date: 06.03.2024). Written institutional permission was obtained from all participating hospitals. Before participation, all participants were informed about the study's purpose, the voluntary nature of participation, confidentiality procedures, and their right to withdraw at any time without

Table 1. Characteristics of the study participants (n=57)

Participant ID	Operating room nurses					Surgeons				
	Hospital	Age	Sex	Education	Years of OR experience	Hospital	Age	Sex	Surgical specialty	Years of OR experience
ORN1/S1	Public	31	Female	License	1	Private	45	Male	General Surgery	20
ORN2/S2	Private	29	Female	License	8	Public	49	Male	Neurosurgery	25
ORN3/S3	University	35	Male	License	6	University	50	Male	Otorhinolaryngology (ENT)	25
ORN4/S4	University	59	Female	License	39	University	65	Male	Pediatric Surgery	38
ORN5/S5	University	41	Female	License	13	Private	40	Male	Neurosurgery	15
ORN6/S6	University	42	Female	License	20	Private	50	Male	Obstetrics and Gynecology	22
ORN7/S7	University	42	Female	License	22	University	42	Female	Otorhinolaryngology (ENT)	25
ORN8/S8	University	49	Female	License	33	Public	44	Male	General Surgery	18
ORN9/S9	University	45	Female	License	35	Private	51	Male	Urology	23
ORN10/S10	Public	50	Female	License	22	Public	42	Male	Urology	15
ORN11/S11	Private	25	Female	Associate degree	8	University	50	Male	Obstetrics and Gynecology	23
ORN12/S12	Public	44	Female	Associate degree	19	Private	39	Male	Pediatric Surgery	14
ORN13/S13	Public	41	Male	License	22	Private	38	Male	Obstetrics and Gynecology	13
ORN14/S14	Public	41	Female	License	16	Public	51	Male	General Surgery	26
ORN15/S15	Public	24	Male	License	3	Public	45	Male	Plastic Surgery	20
ORN16/S16	Public	27	Female	License	10	University	40	Male	Pediatric Surgery	14
ORN17/S17	Private	23	Female	Associate degree	2	University	30	Male	Neurosurgery	4
ORN18/S18	Public	41	Female	License	22	University	28	Male	Orthopedics and Traumatology	2
ORN19/S19	Public	24	Female	License	4	University	29	Male	Orthopedics and Traumatology	2
ORN20/S20	University	41	Female	License	8	University	30	Female	Plastic Surgery	4
ORN21/S21	Public	43	Male	License	10	Private	52	Male	Neurosurgery	25
ORN22/S22	Public	35	Male	License	14	Public	42	Male	Urology	18
ORN23/S23	Private	25	Female	License	2	Public	48	Male	General Surgery	22
ORN24/S24	University	37	Male	License	12	Private	37	Male	Cardiovascular Surgery	12
ORN25/S25	Public	59	Female	License	15	Private	45	Male	Neurosurgery	19
ORN26/S26	University	44	Female	License	8	Public	36	Male	Otorhinolaryngology (ENT)	10
ORN27/S27	University	39	Female	License	9	University	50	Male	General Surgery	20
ORN28	Public	37	Female	License	10					
ORN29	Public	44	Female	License	20					
ORN30	Private	29	Male	Associate degree	3					

ORN: Operating room nurse, S: Surgeon, ENT: Ear, nose, and throat.

penalty. Written informed consent was obtained from all participants. The study was conducted in accordance with the principles of the Declaration of Helsinki. All data were stored securely, used solely for scientific purposes, and handled in a manner that protected participants' confidentiality. The research data will be retained securely for five years after completion of the study.

Results

The study included 30 operating room nurses and 27 surgeons. Most participants were male [58%], aged 40–49 years (42.1%), had 1–20 years of professional experience [70%], worked in public or university hospitals [74%], and held a bachelor's or postgraduate degree [93%] (Table 2). Content analysis identified five overarching themes and 18 sub-themes related to operating room nursing competence (Table 3).

Theme 1. Operational Flow and Efficiency

This theme describes the competencies required to manage the surgical process safely, efficiently, and without interruption. It comprises five sub-themes: effective communication and collaboration; responsibility and accountability; resource management;

situational awareness and feedback; and stress management, calmness, and error reduction. Participants emphasized that effective communication and teamwork are fundamental to maintaining operational flow in the OR (S=27, ORN=30).

Nurses defined communication as being “*clear, straightforward... clear, concise, short sentences...*” (ORN2) and “*...giving the right message to the right person at the right time*” (ORN23), while surgeons stated that it facilitated the process, expressing that “*...sometimes a look, a gesture says it all*” (S13).

Within the sub-theme of responsibility and accountability, surgeons highlighted the nurse's “*mastery of the steps of the surgery...*” (S4) and proactive preparation for subsequent stages of surgery as key indicators of competence (S=20; ORN=28). The resource management sub-theme emphasized the importance of effectively managing surgical instruments, equipment, and materials. As one surgeon explained, “*...when a material is missing, or when there is a problem with the equipment being used, you may not be able to perform surgeries for months...*” (S12), illustrating how equipment-related problems can disrupt surgical services. Although this competency was mentioned less frequently, participants regarded it as essential (S=15; ORN=17).

Table 2. Sociodemographic characteristics of the study participants

Characteristic	Category	Operating room nurses (n)	Surgeons (n)	%
Sex	Female	23	2	42
	Male	7	25	58
Age (years)	≤29	6	2	17.5
	30–39	6	5	19.3
	40–49	13	11	42.1
	≥50	5	9	21.1
Years of OR experience	1–10	13	5	35
	11–20	7	12	35
	21–30	4	9	23
	≥31	6	1	7
Hospital type	Public	12	8	37
	University	11	10	37
	Private	7	9	26
Educational level	Associate degree	4	0	7
	Bachelor's degree	26	4	51
	Postgraduate degree	0	23	42
	Total	30	27	100.0

%. Percentage.

Participants also emphasized situational awareness and timely feedback as indispensable competencies in the dynamic operating room environment [S=27, ORN=30]. Surgeons valued nurses who anticipated problems during surgery, stating that they should “*identify problems on the screen during the procedure and have the necessary materials ready accordingly. If you wait until after a problem arises, some things can be significantly delayed*” [S15] highlighting how anticipation can reduce delays. Similarly, nurses emphasized anticipating complications and actively participating

in patient care: “*They anticipate potential complications in advance... and actively participate in the process.*” [ORN26]. The final sub-theme, stress management and calmness, highlighted the importance of maintaining composure during emergencies. Participants emphasized that nurses should “*...help calm the atmosphere during moments of panic*” and that “*managing a crisis calmly is very important*” [ORN13]. This competency was consistently emphasized by both groups [S=26, ORN=30].

Theme 2. Professional Development and Standards

This theme includes four sub-themes: reliable professional partnership; professional leadership, mentoring, and guidance; ethical responsibility; and patient-centeredness and advocacy. Participants viewed the operating room nurse as more than a technical practitioner, describing the role as one that fosters trust, facilitates team learning, and upholds professional standards. Within the reliable professional partnership sub-theme, participants emphasized trust-based collaboration [S=24, ORN=27]. Surgeons described competent nurses as professionals who “*...manage the process and provide support throughout the procedure*” [S21], whereas nurses emphasized teamwork: “*The OR is like a chain... it is important for team members to complement each other's work whenever necessary*” [ORN14]. One surgeon summarized the benefits of effective collaboration: “*When there is good coordination, operating time is shortened, and the risk of error decreases*” [S1].

The guiding role of experienced nurses within the clinical flow was emphasized in the professional leadership/mentoring/guidance sub-theme [S=23, ORN=28]. Surgeons stated that nurses are effective in team learning, saying, “*They can guide the assistants... they learn many things from the nurses.*” [S14]. Nurses expressed their responsibility for “*training and guiding the newcomers*” [ORN9] and indicated “*stepping outside their area and making decisions*” when necessary. [ORN24].

Within the ethical responsibility sub-theme, participants emphasized professional discipline, ethical sensitivity, and accountability [S=19, ORN=24]. Surgeons highlighted the importance of “*work ethic and work discipline*” [S22], whereas nurses emphasized being “*ethical, respectful, and accountable*” [ORN29]. Instrument and surgical count procedures were described as leaving “*no room for distraction*” [ORN18], reflecting adherence to professional standards. The patient-centeredness and advocacy sub-theme demonstrated nurses' commitment to “*representing*” patients' interests in the operating room and continuously safeguarding patient safety. As one nurse explained, “*We stay with patients from the moment they enter the operating room until they leave*” [ORN5], while another stated, “*We protect their rights*”

Table 3. Competency domains identified in operating room nursing

Theme	Sub-theme	Surgeons (n=27)	Operating room nurses (n=30)
Operational flow and efficiency	Effective communication and collaboration	27	30
	Responsibility and accountability	20	28
	Resource management	15	17
	Situational awareness and feedback	27	30
	Stress management, calmness, and error reduction	26	30
Professional development and standards	Reliable professional partnership	24	27
	Professional leadership, mentoring, and guidance	23	28
	Ethical responsibility	19	22
	Patient-centeredness and advocacy	18	24
Professional autonomy and professional identity	Authority and self-confidence	17	22
	Respect and equal membership	21	25
	Reduced fear of making mistakes and confidence in completing tasks	22	29
Cognitive and mental characteristics	Attention to detail and meticulousness	23	28
	Problem-solving ability	25	24
	Rapid learning and adaptation	22	23
Emotional and personal motivational characteristics	Resilience and perseverance	27	30
	Self-motivation and curiosity	18	19
	Conscientiousness and integrity	13	20

(ORN23). Surgeons emphasized the importance of “*compassion and empathy*” in patient care, with one commenting, “*We should make patients feel a mother's warmth.*” (S9) This sub-theme was emphasized by both groups (S=18, ORN=24).

Theme 3. Professional Autonomy and Professional Identity

This theme comprises three sub-themes: authority and trust (S=17, ORN=22); respect and equal membership (S=21, ORN=25); and reduced fear of making mistakes and confidence in completing tasks (S=22, ORN=29).

Within the authority and trust sub-theme, surgeons associated competence with commitment and a willingness to assume responsibility, describing competent nurses as individuals who “*are fully committed to their work... and willingly take on responsibility*” (S11). Nurses emphasized both physical and psychological preparedness, noting the need to “*adapt one's life to the demands of the operating room... and be mentally prepared*” (ORN 17).

Within the respect and equal membership sub-theme, nurses emphasized that professional respect is earned through knowledge and competence, stating, “*When I know what I'm doing... they respect me more*” (ORN 22). Surgeons valued nurses who actively contributed their observations and suggestions during surgery, describing them as “*showing me another way... or offering suggestions when I encounter a problem*” (S10).

Within the final sub-theme, reduced fear of making mistakes and confidence in completing tasks, participants explained that increasing experience enhanced self-confidence and strengthened their ability to manage the surgical process. Nurses emphasized anticipating subsequent stages of surgery, stating, “*You must always be ready for the next step... you have to lead the team*” (ORN 28). Surgeons similarly valued nurses who inspired confidence during critical situations, noting that “*It is reassuring when the nurse manages the situation... by making quick decisions*” (S10).

Theme 4. Cognitive and Mental Characteristics

This theme encompasses competencies related to sustained attention, rapid decision-making, problem-solving, and adaptation in high-risk clinical environments. Three sub-themes emerged: attention to detail and meticulousness; problem-solving ability; and rapid learning and adaptation. Within the attention to detail and meticulousness sub-theme, surgeons identified meticulousness as an essential professional characteristic, emphasizing that competent nurses should be “*extremely meticulous and attentive*” (S24) (S=23, ORN=28). Within the problem-solving ability sub-theme, surgeons emphasized the importance of nurses' ability to anticipate needs, generate alternative solutions, make rapid decisions, and adapt their actions to the clinical situation. As one surgeon explained, “*They should be able to anticipate what you will need without being asked and develop alternative solutions*” (S2). Another added, “*They should be able to make quick decisions... and adapt the process to the situation*” (S26). Nurses focused primarily on problem-solving during emergencies, emphasizing that “*...when an emergency arises, they should be able to manage the situation immediately*” and that they should “*...help calm the atmosphere and ensure effective coordination*” (ORN 17) (S=25, ORN=24).

Within the rapid learning and adaptation sub-theme, surgeons emphasized that nurses “*must keep up with advances in technology and current practice*” (S6). Similarly, nurses highlighted the need for continuous learning in response to the evolving operating room environment, stating, “*You have to keep up with technology*” (ORN7) (S=22, ORN=23). Overall, both groups emphasized meticulousness, problem-solving, and adaptability. However, surgeons tended to associate problem-solving with anticipation and generating alternatives, whereas nurses focused more on coordination and managing the clinical environment.

Theme 5. Emotional and Personal Motivational Characteristics

This theme encompasses the personal qualities that support competent practice, including resilience and patience; self-motivation and curiosity; and conscientiousness and honesty. The resilience and patience sub-theme was strongly emphasized by both groups (S=27, ORN=30). Drawing attention to the physical and psychological demands of lengthy surgical procedures, surgeons stated that nurses “*must be resilient and able to cope with that level of stress*” (S8). Similarly, nurses emphasized that working in the operating room requires “*... physical strength, mental resilience, and patience*” (ORN15). Within the self-motivation and curiosity sub-theme, nurses emphasized the importance of continuous learning and professional growth, stating that nurses “*must be open to learning... and enjoy their work; that is the source of*

motivation” (ORN25). Within the conscientiousness and honesty sub-theme, surgeons emphasized personal integrity, describing competent nurses as “*well-intentioned... good people*” (S2). Nurses, in contrast, associated this competency with “*trustworthiness*” and “*confidentiality*,” stating that “*what is discussed should stay in the operating room... trustworthiness is essential*” (ORN21). This sub-theme was mentioned more frequently by nurses (ORN=20) than by surgeons (S=13).

Discussion

This study examined OR nursing competence from the perspectives of both operating room nurses and surgeons, resulting in a practice-oriented, multi-stakeholder framework that reflects the collaborative nature of perioperative care. Consistent with previous research, OR nursing competence emerged as a contextual and multidimensional construct that integrates technical, cognitive, social, emotional, and ethical components.^{4,6,9,11,18,19} Unlike the EORNA competency framework, which organizes perioperative nursing competence into five core domains (professional, ethical, and legal practice; nursing care and perioperative practice; communication; organizational, managerial, and leadership competencies; and education, research, and professional development), the themes identified in this study emphasize the enabling, cross-cutting capacities that support competent performance in clinical practice.³ Although competencies related to operational flow and efficiency are reflected in EORNA's communication and leadership domains,³ experiential dimensions such as professional autonomy, professional identity, team membership, trust, and confidence in managing errors remain less explicitly articulated. Therefore, rather than contradicting the competency domains defined by EORNA, our findings extend the framework by highlighting the importance of cognitive resources (e.g., problem-solving, rapid learning and adaptability, and meticulousness) and emotional and motivational resources (e.g., resilience, curiosity, conscientiousness, and honesty), and professional autonomy and identity as essential enablers of competent practice. EORNA's inclusion of “personal, social, and methodological skills” within its definition of competence enables a discussion of these transversal themes in a manner consistent with the underlying theory. Furthermore, because transversal competencies are often not explicitly defined as distinct categories within the standards, our aim of “exploring new expectations” is well justified.

The findings demonstrate that ORNs play a pivotal role in maintaining operational flow, facilitating interprofessional communication and collaboration, coordinating resources, and promoting patient safety in high-risk clinical environments. These findings are consistent with evidence showing that patient safety and process efficiency in perioperative care depend not only on technical expertise but also on non-technical skills such as communication, teamwork, situational awareness, feedback, and stress management.^{5,20,21} Surgeons and nurses similarly emphasized communication and situational awareness/feedback, reinforcing the team-based nature of perioperative safety.^{4,19} In contrast, the less frequent mention of resource management suggests that this domain of competence often remains invisible, although disruptions in resource management can directly compromise perioperative workflow.^{11,22} Effective stress management and emotional composure likewise emerged as protective mechanisms that support sound decision-making and error prevention.^{10,23}

The theme of Professional Development and Standards demonstrated that the ORN role extends beyond technical practice to encompass trust-based professional partnerships, mentoring and leadership, ethical responsibility, and patient-centered advocacy. The findings suggest that ORNs can assume a coordinating role within the perioperative team. Experienced nurses also strengthen the learning culture by mentoring novice nurses and resident physicians, consistent with the literature highlighting the importance of mentoring and structured professional development for maintaining quality of care.^{11,13,18,24} Furthermore, nurses placed greater emphasis on patient-centeredness and advocacy, reflecting their role in representing and safeguarding the patient's interests throughout the perioperative process.^{20,25} The close association between ethical responsibility and patient safety practices, such as surgical counts and follow-up accountability, suggests that ethical awareness is an integral component of perioperative safety culture.^{26,27} The theme of Professional Autonomy and Professional Identity highlighted that ORNs are not only technical practitioners but also proactive professionals who initiate action, coordinate care processes, and assume responsibility when required. Participants associated professional respect and recognition as “equal members” of the surgical team with demonstrated competence, reliability, discipline, and effective communication rather than professional status alone, consistent with previous research showing that respect is earned through

performance and collaborative relationships.³² The reduced fear of making mistakes and the increasing confidence reported with experience further suggest that clinical competence evolves through the integration of knowledge, intuition, experience, and self-confidence.²⁸ Supporting professional autonomy may therefore enhance individual development, team cohesion, and ultimately patient safety.²⁹

The theme of Cognitive and Mental Characteristics identified meticulous attention to detail, effective problem-solving in unexpected situations, and adaptability to rapidly evolving technologies as central components of ORN competence. Surgeons emphasized anticipation and contingency planning, whereas nurses highlighted coordination and environmental management, reflecting complementary perspectives on collaborative problem-solving. These findings align with evidence that the operating room demands high cognitive workload and rapid decision-making.^{4,5,19} The comparable emphasis placed by both professional groups on adaptability and lifelong learning further suggests that competence is closely linked to maintaining "current knowledge" and technological proficiency.³¹ The theme of Emotional and Personal Motivation Characteristics demonstrated that resilience, intrinsic motivation, and ethical integrity are essential for sustaining performance during prolonged procedures and in high-stress environments. The strong emphasis placed by both surgeons and nurses on resilience and patience suggests that psychological endurance is an inherent requirement of perioperative nursing practice.^{19,23} Participants also associated curiosity and self-motivation with continuous professional development, highlighting the importance of lifelong learning in sustaining competence.³⁰ Nurses, in particular, emphasized conscientiousness, honesty, trustworthiness, and respect for patient privacy, indicating that professional identity is grounded in a strong ethical framework.^{13,31} These findings further support previous evidence linking emotional well-being with effective teamwork and improved patient safety.³²

Limitations

A major strength of this study is its inclusion of both surgeon and nurse perspectives, providing a comprehensive understanding of OR nursing competence as a relational and context-dependent phenomenon that emerges through interprofessional collaboration. Data were collected from 57 participants across six hospitals in two cities, representing diverse professional roles and levels of experience. The inclusion of representative quotations enhanced the transparency and credibility of the findings, while independent coding by two researchers followed by consensus-based theme development strengthened methodological rigor. One limitation of this study is that participants were unable to verify the interview transcripts because of their heavy clinical workload, which may have affected credibility. However, this limitation was partially mitigated through independent coding, the inclusion of representative quotations, and systematic documentation of the analytic process. Additionally, because the sample was limited to hospitals located in two city centers, the transferability of the findings to other healthcare settings may be limited.

Conclusion

Competence in operating room (OR) nursing extends beyond technical proficiency to encompass process management, adherence to professional standards, professional autonomy and identity, cognitive agility, emotional resilience, ethical responsibility, and patient advocacy. By jointly considering the perspectives of nurses and surgeons, this study demonstrates that competence is a multidimensional, team-based construct that contributes to patient safety and continuity of perioperative care. In particular, nurses' greater emphasis on patient advocacy and ethical responsibility indicates that perceptions of competence may vary according to professional roles and responsibilities.

The findings highlight the need to clearly define OR nurses' roles, responsibilities, autonomy, and accountability; support structured orientation and mentorship processes for novice nurses; and strengthen communication, teamwork, situational awareness, resource management, and psychologically safe feedback environments. These findings may contribute to the development of competency frameworks, orientation programs, institutional policies, and assessment approaches specific to OR nursing.

Future research should focus on developing valid and reliable competency assessment tools specific to OR nursing and conducting multicenter studies across diverse healthcare institutions and surgical specialties. In addition, intervention studies should examine the effects of educational approaches, mentorship programs, organizational support practices, and initiatives aimed at strengthening the safety culture on professional competence, teamwork, patient safety, and clinical outcomes.

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"I Wish Waste Bins Would Sound an Alarm": A Qualitative Study of Head Nurses' Experiences and Perspectives on Sustainability in Healthcare

Abstract

Background: Healthcare professionals, including nurses and head nurses, play a key role in integrating sustainable practices into healthcare delivery. Despite their central role in shaping the clinical work environment, head nurses' experiences and perspectives on sustainability have received limited attention.

Aim: This study explored head nurses' experiences and perspectives on integrating sustainability into nursing practice, with a focus on successes, facilitators, barriers, and recommendations for improvement.

Methods: A descriptive qualitative design was employed in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines. Between September and October 2025, semi-structured, in-depth interviews were conducted with 14 head nurses working in medical-surgical, intensive care, emergency, perioperative, and pediatric units. Data were analyzed using content analysis guided by the ecological-economic-sociocultural dimensions framework.

Results: Three main categories emerged: *ecological issues*, *economic aspects*, and *sociocultural interactions*. The ecological category encompassed waste management and energy and water conservation. The economic category focused on resource management and budgetary considerations. The sociocultural category highlighted team dynamics during orientation and socialization, as well as strategies for promoting equity and equality in care. Reported successes included effective waste segregation, efficient resource utilization, conservation of energy and water, equitable care, and supportive orientation practices. Reported challenges included competing priorities, inconsistent policies, limited staff engagement, and organizational barriers. Key facilitators included leadership support, interdepartmental collaboration, technology, and education.

Conclusion: The findings highlight the pivotal role of head nurses in advancing sustainability through resource stewardship, equitable care, and staff engagement. Sustainable nursing practices may be strengthened by recognizing successful initiatives, addressing barriers through targeted education and standardized protocols, and establishing effective mechanisms for responding to staff feedback.

Keywords: Ecological, economic, head nurse, healthcare, social, sustainable development

Hasan Fehmi Dirik,¹ Nuray Yalçın,²
Arzu Akbaba,³ Menevşe Yıldırım⁴

¹Department of Nursing Management, Dokuz Eylül University Faculty of Nursing, İzmir, Türkiye

²Department of Public Health Nursing, Dokuz Eylül University Faculty of Nursing, İzmir, Türkiye

³Department of Internal Medicine Nursing, Dokuz Eylül University Faculty of Nursing, İzmir, Türkiye

⁴Department of Nursing Management, Sıtkı Koçman University, Fethiye Faculty of Health Sciences, Muğla, Türkiye

Introduction

The United Nations (UN) defines sustainable development as meeting present needs without compromising the ability of future generations to meet their own.¹ Sustainable development comprises three interconnected dimensions: environmental protection, economic growth, and sociocultural values, that collectively support human health and well-being.^{1,2} The ecological dimension focuses on protecting natural resources and biodiversity, the economic dimension on maintaining high-quality healthcare within finite financial resources, and the sociocultural dimension on promoting teamwork, equity, justice, and patient safety.^{2,3}

The Sustainable Development Goals (SDGs) provide a global framework for promoting health and well-being, quality education, equality, access to clean water and affordable energy, decent work and innovation, responsible consumption, climate action, and peace, justice, and strong partnerships, with the overarching aim of empowering societies and fostering cooperation.¹ Achieving the SDGs requires coordinated action from all stakeholders, including healthcare systems and healthcare professionals.^{1,4,5}

Healthcare systems consume substantial resources to deliver care, including energy, water, materials, and waste management services, and account for approximately 4.4% of global net greenhouse gas emissions, a substantial proportion of which is directly attributable to healthcare delivery.⁶ Sustainable practices can improve the quality of care while reducing waste and greenhouse gas emissions,⁷ highlighting the urgent need for healthcare systems to develop strategies that address the environmental and economic impacts of energy consumption, waste generation, and resource utilization.⁸ The World Health Organization (WHO) advocates for sustainable health systems that adhere to the principle of *avoiding harm* by redesigning healthcare services to minimize environmental impacts while ensuring cost-effectiveness, affordability, and efficient resource use.^{4,5}

The sociocultural dimension of sustainability encompasses patient safety and healthy work environments.^{4,5} Nurses make a critical contribution to sustainable healthcare through health promotion, disease prevention, treatment, rehabilitation, and person-centered care. In addition, nursing contributes to broader SDGs, including Quality Edu-

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Corresponding author: Hasan Fehmi Dirik
E-mail: fehmidirik@gmail.com

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cation [Goal 4], Gender Equality [Goal 5], and Decent Work [Goal 8].⁹ As members of the global socio-environmental system, nurses are expected to promote sustainable development by engaging healthcare teams in the design, implementation, and evaluation of sustainable interventions.¹⁰ However, evidence suggests that nursing engagement with the SDGs remains largely confined to Goal 3 (Good Health and Well-Being), resulting in inconsistent integration of ecological, economic, and sociocultural sustainability into routine practice. Limited engagement has been attributed to inadequate awareness of the SDGs, perceptions of limited influence over sustainability challenges, and uncertainty regarding the relevance of the SDGs to nursing practice.^{11,12}

Despite increasing attention to sustainability in healthcare, healthcare professionals, including nurses and head nurses, report greater familiarity with the ecological dimension of sustainability¹³⁻¹⁷ than with its economic and sociocultural dimensions.³ This imbalance likely reflects the predominance of previous research examining environmental sustainability, particularly among staff nurses. Although these studies have provided valuable insights, they have largely overlooked head nurses, despite their pivotal role in shaping organizational priorities and implementing sustainable practices. Given the central role of leadership in healthcare organizations, a better understanding of head nurses' experiences and perspectives is essential for advancing sustainability in nursing practice.

Accordingly, the present study focuses on head nurses as leaders responsible for integrating sustainability into everyday nursing practice. Guided by the ecological-economic-sociocultural framework,^{2,3} which encompasses all dimensions of sustainable development, this study addresses an important gap in the literature by providing a comprehensive exploration of sustainability from the perspective of nurse leaders. By interviewing head nurses from a diverse range of hospital units, the study examines how sustainable development is integrated into nursing practice, identifies perceived facilitators and barriers to implementation, and explores successful practices and opportunities for further improvement.

Research Questions

1. How are sustainable development practices integrated into and experienced in everyday nursing practice?
2. What barriers and facilitators influence the integration of sustainable development practices?
3. What successful sustainability practices have been implemented, and which areas require further development?

Materials and Methods

Design

A qualitative descriptive design was employed to enable an in-depth exploration of head nurses' experiences and to develop a comprehensive understanding of their perspectives.^{18,19} The study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ).

Setting and Participants

The study was conducted at a university hospital in western Türkiye that provides tertiary healthcare services to the regional population. Purposive sampling was used to recruit 14 head nurses from a range of clinical units, including internal medicine, surgery, emergency, and intensive care. This sampling strategy ensured variation in roles and experiences relevant to the integration of sustainable practices in clinical settings.

Data Collection Instrument

A semi-structured interview guide was developed following a review of the literature, United Nations reports, and the relevant theoretical framework. The guide comprised four broad questions with follow-up probes addressing the ecological, economic, and sociocultural dimensions of sustainability:

- i) How are sustainable development practices integrated into and experienced in your daily work?
- ii) What challenges are encountered when implementing sustainable practices?
- iii) What resources or opportunities support the integration of sustainable practices, and what additional resources would facilitate this process?

- iv) How could the integration of sustainable development practices be improved, and what actions or recommendations would facilitate this?

Participants were also asked to provide demographic and professional information, including age, gender, educational level, years of professional experience, and current clinical unit.

Data Collection

Semi-structured interviews were conducted between September and October 2025 in private rooms within the hospital or nursing faculty. Before each interview, participants received information about the study purpose, voluntary participation, confidentiality, and the intended use of the data. All interviews were conducted in Turkish by the first author, audio-recorded with participants' permission, and transcribed verbatim. The transcripts were subsequently translated into English while preserving their original meaning. Following analysis of the first 12 interviews, no new categories or concepts emerged, indicating that data saturation had been achieved.¹⁹ Two additional interviews were conducted to confirm saturation, resulting in a final sample of 14 participants. Interviews lasted between 30 and 82 minutes (mean=45 minutes). All transcripts were anonymized before analysis.

Data Analysis

Data were analyzed using a combination of deductive and inductive content analysis.²⁰ The ecological-economic-sociocultural framework informed the analysis of sustainable practices and guided the initial categorization of the data. A deductive approach ensured that the analysis was grounded in established theoretical perspectives, while an inductive approach allowed new subcategories to emerge from the data. Inductive analysis was considered appropriate given the limited research on the economic and sociocultural dimensions of sustainable development in healthcare. The transcripts were read repeatedly to identify codes, subcategories, and representative participant quotations that illustrated each subcategory. During the collaborative analysis, each member of the research team independently reviewed the transcripts before meeting to compare interpretations, discuss discrepancies, and reach consensus on the final categories, thereby enhancing analytical rigor. To preserve participants' original meaning and context, the translated transcripts were returned to participants for review, allowing them to identify inaccuracies, clarify interpretations, and provide additional information where appropriate.

Ethical Considerations

Ethical approval was obtained from Dokuz Eylül University Non-interventional Research Ethics Committee (Approval Number: 2025/31-15, Date: 17.09.2025). Institutional approval was also obtained from the participating hospital. All participants provided written and verbal informed consent before participation. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Rigor (Trustworthiness)

The research team followed established guidelines for conducting qualitative research.^{18,19} The methods and findings were described in sufficient detail to ensure transparency. The interview guide was developed through a systematic review of the relevant literature.^{2,3,16} Two pilot interviews with head nurses were conducted to evaluate the interview guide. No revisions were required, and the pilot interviews were excluded from the final analysis. To enhance credibility, participants reviewed and validated the interview transcripts. The research team collaboratively analyzed the data, reflected on the emerging categories, resolved discrepancies through discussion, and reached consensus on the final structure. To minimize potential bias, participants were recruited using procedures that ensured the interviewer had no supervisory or managerial relationship with them. This approach reduced potential power imbalances during data collection and facilitated open and equitable interactions.^{21,22}

Results

The study included 14 head nurses from medical-surgical, intensive care, and emergency units (Table 1). The analysis identified three main categories: "ecological issues", "economic aspects", and "sociocultural interactions". Across these categories and their subcategories, participants described successes, challenges, and recommendations for strengthening sustainable practices (Table 2).

Table 1. Characteristics of the participants

Participant	Age	Professional experience (years)	Gender	Clinical unit	Highest education	Interview duration (minutes)
Participant 1	46	23	Female	Intensive Care Unit	BSN	33
Participant 2	38	12	Female	Emergency Department	BSN	33
Participant 3	47	25	Female	Obstetrics and Gynecology	BSN	35
Participant 4	40	17	Female	Surgical Unit	PhD	58
Participant 5	47	27	Female	Critical Care Unit	BSN	33
Participant 6	47	27	Female	Surgical Unit	MS	82
Participant 7	42	19	Female	Surgical Unit	MS	38
Participant 8	44	22	Female	Surgical Unit	BSN	65
Participant 9	40	17	Female	Operating Room	MS	41
Participant 10	56	35	Female	Psychiatry	BSN	39
Participant 11	45	6	Female	Pediatrics	MS	64
Participant 12	44	5	Female	Intensive Care Unit	BSN	30
Participant 13	44	6	Female	Oncology	MS	30
Participant 14	50	5	Female	Medical- Surgical Unit	BSN	48

BSN: Bachelor of Science in Nursing, MS: Master of Science, PhD: Doctor of Philosophy.

Table 2. Categories, subcategories, and analytical descriptions derived from the content analysis

Category	Subcategory	Representative codes	Analytical description
Ecological issues	Waste management	Training and audits; waste segregation; inconsistent protocol adherence; workload; staff awareness	Waste management was supported through routine training and audits. However, inconsistent adherence to segregation protocols, heavy workloads, and limited awareness hindered effective implementation.
	Water and energy use	Environmental awareness; limited conservation practices; infrastructure limitations; delayed maintenance	Awareness of energy and water conservation was evident; however, implementation was constrained by outdated infrastructure, the lack of sensor-operated systems, and delayed maintenance.
Economic aspects	Resource use	Efficient resource management; supply overuse; staffing shortages	Resource management emphasized the efficient use of supplies and medications; however, material overuse and staffing shortages hindered sustainable practice..
	Budgeting	Financial constraints; procurement; cost-quality balance; staff feedback	Budgeting was influenced by financial constraints, requiring procurement decisions to balance cost-effectiveness with the quality and suitability of clinical supplies.
Sociocultural interactions	Team dynamics during orientation and socialization	Supportive orientation practices; role expectations; workplace tensions	Orientation and socialization were generally characterized by supportive relationships; however, differences in role expectations occasionally created tensions within the team.
	Collective approaches to ethical and equitable care	Shared responsibility; effective communication; patient-centered decision-making	Ethical and equitable care was promoted through shared responsibility, effective communication, and patient-centered decision-making.

Category 1: Ecological Issues

The ecological issues category comprised two subcategories: "waste management" and "water and energy use."

Subcategory 1: Waste Management

Head nurses described regular waste management training and routine audits as important components of sustainable practice. Although most nurses were reported to adhere to waste segregation protocols, participants observed that some non-nursing members of the healthcare team did not consistently follow these protocols and frequently missed training sessions, which undermined nurses' efforts to maintain effective waste management practices to some extent.

"...Resident physicians don't pay attention to whether an item is medical waste or household waste. They simply throw it into whichever bin they come across..." [P4]

"...Although we separate everything during the day, the night-shift staff come and put everything into the same bag..." [P4]

Participants further reported that waste management equipment was generally adequate; however, they perceived that many waste segregation problems stemmed from limited individual awareness. They also identified time constraints, heavy workloads, stress, and the chaotic nature of the clinical environment as additional barriers to effective waste management.

"...There are separate and sufficient waste bins in every area. The bins are clearly distinguishable; their colors and shapes differ, and they are labeled. I think the problems with waste segregation are related to people's level of attention..." [P2]

"...Time constraints and the high number of patients affect waste management..." [P8]

"...The clinic is chaotic and crowded, so in that chaos, we sometimes forget..." [P2]

Participants recommended motivational initiatives and continuous, inclusive educational programs to strengthen staff engagement in waste management.

"...A team member who is very good at this could be selected as Employee of the Month..." [P9]

"...Training sessions could be repeated more frequently as reminders..." [P2]

Participants also proposed technological innovations to reinforce correct waste segregation and encourage sustainable behaviors.

"...We're in a technological era; I wish waste bins would sound an alarm..." [P3]

Subcategory 2: Water and Energy Use

Head nurses emphasized that awareness of energy and water conservation is fundamental to environmental sustainability.

"...We don't leave air conditioners on unnecessarily. We turn off lights that aren't needed. We also pay attention to water use. Some devices shouldn't remain plugged in after their batteries are charged. Leaving them plugged in unnecessarily also damages the device..." [P5]

However, participants reported limited awareness of energy and water conservation among both healthcare team members and patients.

"...Water often keeps running while people wash their hands, and even reminders don't seem to change this habit. Devices can stay plugged in for hours..." [P4]

"...Patients use devices such as kettles. Despite our warnings, we can't prevent it..." [P8]

Participants also identified infrastructural and technological barriers to efficient energy and water use, including the absence of sensor-operated taps and lighting systems, outdated infrastructure, delayed maintenance, and inadequate organizational policies.

"...Faucets should be sensor-operated; this would really save a lot of water..." [P4]

"...Many malfunction reports were submitted about dripping taps, but the repair process took too long..." [P6]

"...Because the building is old, the cooling system is insufficient. We had to use many electric fans because of the heating and cooling problems..." [P13]

Participants viewed leadership and role modeling as essential for fostering individual awareness and encouraging sustainable behaviors among both staff and patients.

"...When new colleagues start, I tell them not to use water and electricity unnecessarily. I remind them to be careful, even when washing their hands... Patients and the team observe what I do. If I turn off a light, I see that they follow my example and turn it off too. Leadership and role modeling are very important here, in my opinion..." [P13]

Participants further recommended technological and educational strategies to improve energy and water conservation, including installing sensor-operated taps and lighting systems, providing staff with feedback on energy consumption, and displaying educational notices to increase patient awareness.

"...If there were sensor-operated lights, we wouldn't need to turn on the lights even during the day..." [P8]

"...There could be warning notices. For example, information such as 'Our water consumption this month is...' could be displayed..." [P9]

"...Electricity and water use vary greatly among patients. They think these resources merely belong to the hospital, but we need to instill the idea that they are national resources..." [P13]

Category 2: Economic Aspects

The economic aspects category comprised two subcategories: "resource use" and "budgeting."

Subcategory 1: Resource Use

Head nurses described several practices that promoted the efficient use of supplies, equipment, and medications, thereby supporting both clinical effectiveness and economic sustainability.

"...I check them monthly to prevent the tubes from expiring. I ensure that they are transferred from the storage area to the treatment carts because we use the items on the carts first..." [P3]

"...I initiated a process to convert expense forms into digital documents. As a result, our paper use decreased. This reduced costs and eliminated unnecessary barcode printing..." [P6]

"...We aligned medication administration times with physician rounds. This allowed us to take action if a medication or infusion was interrupted during the round. It has many benefits—saving labor, time, and resources..." [P6]

However, participants noted that economic sustainability could be undermined by overestimating supply requirements and by the inappropriate or inefficient use of materials. Staff shortages were also perceived to hinder the effective management of supplies and equipment.

"...Because of the shortage of nurses, extra supplies are opened just to be on the safe side. Sometimes, two of each item are opened. For example, in surgery, materials are prepared for every possible scenario—what if there is bleeding or sutures are needed..." [P9]

Participants recommended system-level improvements and greater individual accountability, emphasizing the need for comprehensive training for resident physicians and adequate staffing.

"...Sometimes, when our colleagues enter unnecessary consumables or medications into the system, the system should alert them and reject the request..." [P1]

"...It would be better if resident physicians came to the operating room only after receiving sufficient training... and if there were also a circulating nurse..." [P9]

Subcategory 2: Budgeting

Participants indicated that economic conditions and financial constraints complicated procurement and budgeting processes. They preferred cost-effective, high-quality materials that would support patient safety.

"...We want to use high-quality materials for our patients. Because of low-quality materials, we sometimes have to use three dressings instead of one..." [P4]

"...Instead of buying a cheaper device that repeatedly causes problems, it would be better to purchase a more durable, high-quality device for long-term use. Otherwise, parts break frequently, resulting in additional costs..." [P2]

Head nurses reported that material quotas complicated care management, increased staff anxiety, and encouraged stockpiling.

"...Restrictions on materials and the need to manage the clinic according to certain quotas inevitably wear us out. Over the years, hospital spending on budgets and allocations has been reduced..." [P8]

"...If a material is unavailable for a while, a stockpiling culture develops because people are afraid they won't be able to access it again..." [P6]

Participants explained that clinical staff were involved in evaluating medical products before bulk procurement decisions were made by testing products and providing feedback on their quality and suitability.

"...For example, if a syringe plunger is broken or an infusion set is defective, I write a report and send it to the Nursing Services Directorate. We use these feedback reports to ensure that defective syringes, infusion sets, or three-way stopcocks are replaced..." (P14)

Participants further suggested that procurement processes could be strengthened if senior management assumed greater responsibility for purchasing decisions and gave greater consideration to staff feedback.

"...Our feedback needs to be valued because I am the person responsible for everything here. I know this unit—its problems, its needs, and its excesses..." (P4)

"...Each unit should be provided with the quota it requires. Senior management should establish effective collaboration with both the units and the suppliers..." (P6)

Category 3: Sociocultural Interactions

The sociocultural interactions category comprised two subcategories: "team dynamics during orientation and socialization" and "collective approaches to ethical and equitable care."

Subcategory 1: Team Dynamics During Orientation and Socialization

Most participants described supportive approaches to newly appointed staff, particularly during orientation and workplace socialization. These interactions were perceived as reciprocal rather than one-sided and were considered beneficial for staff engagement and work performance.

"...My team shares its knowledge and experience during the orientation process and supports newcomers in developing their skills. The younger generation is also very good with technology and supports us in that respect. These are positive interactions..." (P4)

"...We never withdraw our support from newly appointed nurses; we never leave them alone. In this way, we gain a committed nurse and ensure that the work runs smoothly..." (P6)

In contrast, some participants described tensions between novice and experienced nurses arising from differences in expectations and attitudes, particularly regarding work schedules and leave arrangements.

"...Some senior nurses immediately put the newcomers in their place. They can be very aggressive..." (P1)

"...The new generation tends to act more freely... They start with ten shifts and immediately want to reduce them to eight. When it comes to annual leave, they aim for the most desirable months without waiting for the senior nurses to schedule theirs..." (P3)

Subcategory 2: Collective Approaches to Ethical and Equitable Care

Almost all head nurses reported that care was delivered without favoritism. They emphasized that clinical need and patient acuity were the primary determinants of care and prioritization.

"...We treat every patient with the same respect, dignity, and compassion, prioritizing only medical necessity and clinical acuity..." (P7)

Participants acknowledged that conflicts occasionally arose when patients or their relatives expected preferential treatment.

"...Conflicts can sometimes occur during triage. My team explains to patients and their relatives why priority cannot be given and that no special privileges can be granted..." (P2)

Participants further emphasized that patient well-being remained the central focus of all professional interactions. They highlighted the importance of effective communication, shared understanding, and collaborative decision-making in resolving conflicts and maintaining patient-centered care.

"...I believe that good communication and constructive relationships can resolve all problems. We work as a team, and everyone shares their ideas. We discuss patient care together and make decisions collectively. We all speak the same language because we share the same goal: improving the patient's health..." (P10)

Discussion

The findings provide insight into the ecological, economic, and sociocultural dimensions of sustainability in healthcare. Several of the identified subcategories are consistent with those reported in previous studies; however, the present study extends existing knowledge by offering new perspectives, particularly on the relatively understudied economic and sociocultural dimensions. This section discusses the relationships among these dimensions and considers the achievements, challenges, and recommendations identified by participants.

Ecological Issues

Participants generally reported adherence to appropriate waste segregation practices and described regular training sessions and audits, consistent with the findings of Baykara Mat and Mutlu¹⁶ and Cruz et al.¹⁵ Despite these positive practices, a significant challenge remained: *"not all team members follow the rules carefully, and some frequently skip training sessions, and this situation leads to incorrect waste segregation practices."* Most participants attributed this problem to insufficient staff awareness rather than deficiencies in the availability of waste segregation equipment. Cruz et al.¹⁵ identified a comparable challenge under the subcategory "lack of understanding/belief," highlighting the need for a comprehensive understanding of the ecological consequences of healthcare activities. Such understanding is essential to address widespread misinformation, knowledge gaps, and entrenched conventional practices that hinder sustainable behaviors.¹⁵

Participants also identified time pressure, heavy workloads, stress, and the chaotic nature of clinical settings as barriers to sustainable waste management. Similarly, Zoromba and El-Gazar¹⁷ reported competing priorities and limited motivation as key obstacles, while Cruz et al.¹⁵ identified busy schedules and excessive workloads. Leppänen et al.³ further found that complex care processes hindered the integration of sustainable practices. Nurses' understanding and implementation of ecological sustainability principles are challenged by the demands of daily clinical practice, particularly by recycling processes in busy and often chaotic operating rooms.³ Participants therefore recommended reducing workloads, introducing motivational initiatives, and adopting technological solutions to support sustainable waste management. Compared with previous studies, however, they placed less emphasis on redesigning clinical spaces to address these barriers, improve preparedness for future care environments,¹⁶ and integrate ecological values into routine practice.³

The findings also showed that head nurses used specific strategies to reduce water and energy consumption. Bartoli et al.¹⁴ linked sustainability in intensive care settings to three individual-level factors: energy use, resource conservation, and waste management. Similarly, Badawy et al.¹³ described "energy conservation efforts," while Baykara Mat and Mutlu¹⁶ reported practices such as installing sensor-operated faucets, controlling air-conditioning use, using energy-efficient lighting, and promoting the mindful use of electronic devices. These findings demonstrate nurses' active contribution to water and energy conservation.¹³ Participants also emphasized the need to raise patients' awareness that energy and water resources are finite, noting that such awareness was often limited. This finding is consistent with the "educational and advocacy roles in promoting eco-consciousness" identified by Badawy et al.,¹³ which included nurses' efforts to educate patients about sustainable behaviors and model environmentally responsible practices.

Participants identified role modeling as a critical factor in individual awareness and promoting sustainable team behaviors. Similarly, Zoromba and El-Gazar¹⁷ reported comparable findings, which are consistent with those of Baykara Mat and Mutlu,¹⁶ who identified the absence of institutional strategic plans and dedicated sustainability teams as barriers to implementing sustainable practices. Two additional studies reported similar findings. Bartoli et al.¹⁴ advocated for greater involvement of hospital management in sustainability initiatives and the standardization of protocols, while Cruz et al.¹⁵ emphasized the pivotal role of leadership in advancing environmental sustainability through the implementation of comprehensive strategies and policies.¹⁵ Collectively, these studies indicate that effective leadership is a fundamental driver of the successful implementation of sustainable practices.

Economic Aspects

This study found that head nurses were more familiar with budgeting and the economic dimension of sustainability than has been reported previously, perhaps reflecting greater engagement with these issues. In contrast, Leppänen et al.³ found that nurses and nurse managers had limited familiarity with the economic dimension of sustainability and often perceived economic considerations as financial matters beyond their professional responsibility, rather than as issues directly related to patient care.³

Participants promoted economic sustainability through the efficient management of clinical equipment and medications. Similarly, Cruz et al.¹⁵ identified the use of environmentally sustainable materials and efficient resource management as key strategies for reducing both ecological and economic impacts while promoting sustainable healthcare practices.¹⁵ These findings are reflected in participants' emphasis on material quotas, efficient resource utilization, and the evaluation of medical products before procurement. Participants stressed that although upper management requested staff feedback on these issues, there was room for greater integration of this feedback into decision-making processes. Participants also described financial constraints and procurement challenges that limited access to high-quality, safe, and cost-effective materials. Similarly, Cruz et al.¹⁵ reported that financial constraints, particularly in the public sector, may hinder investment in environmentally sustainable technologies, practices, and infrastructure. They also identified the limited availability of environmentally sustainable products as a significant barrier to implementing green practices, as such equipment and supplies are often more expensive and less accessible than conventional alternatives. Taken together, these findings suggest that healthcare organizations should balance economic efficiency with the procurement of high-quality materials that support safe and equitable, patient care.

Sociocultural Interactions

This study is among the first to prioritize the sociocultural dimension of sustainability, particularly the challenge of managing intergenerational team dynamics. Leppänen et al.³ identified several sociocultural barriers that may hinder social sustainability, including entrenched workplace hierarchies and differences in experience and tenure in the operating room. Less experienced nurses often felt compelled to show excessive and unreciprocated respect toward senior colleagues, while nurse managers observed that some senior nurses were reluctant to support the professional development of junior staff.³ These findings underscore the need for managers at all levels to bridge differences among team members and foster mutual understanding, with particular emphasis on the role of head nurses as key facilitators of supportive work environments. Such efforts are essential for strengthening the social sustainability of the nursing workforce and may also contribute to effective leadership and greater job satisfaction.²³

Fairness and equity in care are fundamental to effective team dynamics. Participants were generally positive in this regard, stating that patients received equitable care regardless of their cultural or socioeconomic background, with clinical needs consistently prioritized. Patients' requests for preferential treatment were addressed professionally and with a commitment to equitable care, enabling conflicts to be resolved promptly. Similar equality-promoting practices were reported by Leppänen et al.,³ including safeguarding patient privacy, demonstrating respect and friendliness, and addressing the needs of all patients. Nurse managers in that Finnish study regarded equitable treatment as self-evident and suggested that it may have been facilitated by the relative homogeneity of the local population, with limited interaction with people from different cultural backgrounds as colleagues or patients.³

Participants further emphasized that the patient should remain the central focus of all professional relationships and that conflicts could be resolved through respectful communication, mutual understanding, and collaborative decision-making. Consistent with these findings, Leppänen et al.³ recommended fostering collaboration, strengthening professionalism, and developing social and cultural competencies to enhance the sociocultural dimension of sustainability.

Limitations

Like all research approaches, qualitative research has inherent limitations, particularly with respect to trustworthiness.¹⁹ As this study was conducted at a single center, the findings should be interpreted with caution when considering their

transferability to other healthcare settings. In addition, organizational dynamics may have influenced participants' responses. The translation process may also have introduced minor variations in meaning, despite rigorous efforts to preserve the participants' original intent. Nevertheless, the credibility of the findings was strengthened by the inclusion of head nurses from diverse clinical units and by the study design, which provided a comprehensive and nuanced understanding of the phenomenon under investigation.

Conclusion

Head nurses perceived healthcare sustainability as comprising three interconnected dimensions—ecological, economic, and sociocultural—each shaped by structural conditions, team dynamics, and individual behaviors. Ecological sustainability was associated with effective waste management, resource conservation, and environmental awareness, whereas economic sustainability centered on the efficient management of resources and medications, timely procurement, and the adoption of structural and technological solutions despite workload and infrastructural constraints. Social sustainability was characterized by ethical and equitable care, effective staff orientation, supportive intergenerational collaboration, and a sustained commitment to patient-centered care.

These findings demonstrate that embedding sustainability into routine clinical practice requires coordinated leadership, active staff engagement, and organizational support. The implementation of sustainable practices should be reinforced through continuous education, structured quality improvement initiatives, lean management approaches, technological innovations²⁴ that optimize resource utilization, and systematic feedback to inform procurement decisions. Furthermore, fostering environmentally responsible behaviors among patients and strengthening collaboration across generations of healthcare professionals may enhance both social sustainability and the delivery of equitable care. Integrating ecological, economic, and sociocultural sustainability into everyday clinical decision-making is essential for developing resilient, efficient, and sustainable healthcare systems.

Ethics Committee Approval: The study was approved by the Dokuz Eylül University Non-interventional Research Ethics Committee (Approval Number: 2025/31-15, Date: 17.09.2025).

Informed Consent: Written and verbal informed consent was obtained from the participants.

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The Relationship Between Artificial Intelligence Literacy and Attitudes Toward Artificial Intelligence Among Nursing Students

Merve Çil,¹ Berna Eren Fidancı,² Dilek Yıldız²

Abstract

Background: As artificial intelligence (AI) continues to advance, nursing education programs should ensure that student nurses acquire knowledge and skills necessary to effectively use AI technologies.

Aim: This study aimed to examine the relationship between nursing students' AI literacy and their attitudes toward AI.

Methods: This descriptive, cross-sectional study included 478 nursing students who met the inclusion criteria and agreed to participate. Data were collected using an Information Form, the AI Literacy Scale, and the AI Attitude Scale. Data were analyzed using descriptive statistics, the Student's t-test, the Kruskal-Wallis test, Pearson correlation analysis, and linear regression analysis. A p value <0.05 was considered statistically significant.

Results: The mean AI Literacy Scale score was 60.55±10.98 (range: 12–84), and the mean AI Attitude Scale score was 45.75±6.76 (range: 13–65). A statistically significant, moderate positive correlation was found between students' AI literacy and AI attitude scores ($r=0.502$, $p<0.05$). Additionally, AI literacy and attitude scores differed significantly according to students' academic year, interest in AI, knowledge of AI, and knowledge of AI applications in health sciences and nursing.

Conclusion: The findings indicate that nursing students had generally positive levels of AI literacy and attitudes toward AI. Higher AI literacy was associated with more positive attitudes toward AI. Accordingly, considering AI literacy and related competencies in nursing education may be beneficial in preparing students to engage with AI technologies in their future professional practice.

Keywords: Artificial intelligence, attitude, literacy, nursing students

¹Department of Pediatric Nursing, Lokman Hekim University, Ankara, Türkiye

²Department of Pediatric Nursing, University of Health Sciences, Ankara, Türkiye

Introduction

Artificial intelligence (AI) refers to systems, programs, and machines capable of following defined rules, learning from experience, making decisions, and performing tasks that typically require human intelligence, thereby simulating intelligent behavior with minimal human intervention.¹ AI is an innovative technology that is increasingly being adopted across various sectors and is playing an expanding role in nursing practice.^{1,2}

AI has the potential to improve patient outcomes and enhance the quality and efficiency of nursing care.^{3,4} It supports clinical decision-making by enabling nurses to develop more efficient and personalized care plans, assists with routine nursing activities such as monitoring vital signs, and reduces the time required for documentation while improving its accuracy and completeness.^{5,6}

As AI technology continues to evolve, nursing education programs should ensure that student nurses acquire the knowledge and skills required to use AI effectively. These competencies are collectively referred to as AI literacy, which encompasses the ability to critically evaluate AI technologies, communicate and collaborate effectively with AI systems, and use AI as a tool.⁷⁻⁹ Elcicek et al.⁹ reported that high school, associate degree, and undergraduate students had low levels of AI literacy, whereas El Sayed et al.¹⁰ found that nursing students demonstrated moderate levels of AI literacy.

Attitudes toward AI play an important role in the acceptance and use of AI-based technologies in health-care. Student nurses' attitudes toward AI are influenced by several factors, including perceived ease of use, perceived usefulness, and confidence in their ability to use AI technologies.¹¹ Furthermore, positive attitudes toward AI increase nursing students' readiness to adopt and integrate AI into nursing practice.^{12,13}

Both national and international studies have examined nursing students' views, perceptions, attitudes, anxiety, knowledge, readiness to adopt AI, perceived barriers to AI use, and AI literacy.^{4,9,13-15} However, to our knowledge, no previous study has investigated the relationship between nursing students' AI literacy and their attitudes toward AI. Therefore, this study aimed to examine the relationship between nursing students' AI literacy and their attitudes toward AI.

Research Questions

- How do nursing students' sociodemographic characteristics influence their AI literacy and attitudes toward AI?
- Is there a significant relationship between nursing students' AI literacy and their attitudes toward AI and its subdimensions?

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Corresponding author: Merve Çil
E-mail: merve.cil@lokmanhekim.edu.tr

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Materials and Methods

Research Design

This study employed a descriptive, cross-sectional design. The study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines developed by the EQUATOR Network.

Participants and Sample

The study population consisted of undergraduate nursing students enrolled in the Gülhane Faculty of Nursing at Health Sciences University during the 2024–2025 academic year. Participants were recruited using a convenience sampling method. An invitation to participate was announced to all eligible students during a class session held before the final examination period. Data collection forms were distributed immediately after the examination and completed by students who met the eligibility criteria and agreed to participate. Data collection dates were scheduled according to the examination timetable to maximize participation from students across all academic years. A total of 478 nursing students participated in the study. A post hoc power analysis was conducted based on the observed correlation coefficient ($r=0.502$). With a sample size of 478 and a significance level of $\alpha=0.05$, the statistical power of the study exceeded 0.99. Students enrolled in the Gülhane Faculty of Nursing at University of Health Sciences whose native language was Turkish and who voluntarily agreed to participate were eligible for inclusion.

Data Collection Instruments

The study variables included students' attitudes toward AI, measured using the AI Attitude Scale, and AI literacy, measured using the AI Literacy Scale. Sociodemographic characteristics collected using the Information Form were included as independent variables.

Information Form: Developed by the researchers based on the literature, the Information Form consisted of seven questions assessing participants' age, sex, academic year, knowledge of AI, interest in AI, knowledge of AI applications in nursing and health sciences, and previous AI-related training.^{7,16,17}

AI Literacy Scale: The AI Literacy Scale was developed by Wang et al. in 2022 and adapted into Turkish by Celebi et al.¹⁸ in 2023. The scale consists of 12 items across four subscales: Awareness, Usage, Evaluation, and Ethics. It is rated on a seven-point Likert scale, with total scores ranging from 12 to 84; higher scores indicate greater AI literacy.¹⁸ The original study reported a Cronbach's alpha coefficient of 0.85, and the Cronbach's alpha coefficient in the present study was 0.768.

AI Attitude Scale: The AI Attitude Scale was developed by Aktay et al.¹⁹ in 2024. It consists of 13 items grouped into three subscales: Benefits of AI, Risks of AI, and Use of AI. The scale is rated on a five-point Likert scale, with total scores ranging from 13 to 65. Higher scores indicate more positive attitudes toward AI.¹⁹ The original study reported a Cronbach's alpha coefficient of 0.80, whereas the coefficient in the present study was 0.834.

Data Collection

Data were collected in June 2025. Following ethics committee approval from University of Health Sciences Gülhane Scientific Research Ethics Committee (Approval Number: 2025-201, Date: 08.04.2025), and institutional permission, students who met the inclusion criteria were invited to participate. Data collection was conducted face-to-face during the final examination period. Before each examination, the researchers informed students about the study and distributed informed consent forms. Immediately after the examinations, students who agreed to participate completed the questionnaires in approximately 10 minutes and returned them to the researchers. Data collection sessions were scheduled according to the examination timetable to ensure representation from all academic years.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 29.0. The dependent variables were the total and subscale scores of the AI Literacy Scale and the AI Attitude Scale. The independent variables were participants' sociodemographic characteristics. Descriptive statistics were presented as frequencies, percentages, means, standard deviations, and medians. Differences in AI Literacy Scale and AI Attitude Scale total and subscale scores according to

participants' sociodemographic characteristics were examined using the *t* test, one-way analysis of variance (ANOVA), and appropriate post hoc tests. For variables that did not meet the assumption of normality, the Mann-Whitney *U* test and the Kruskal-Wallis test, followed by appropriate post hoc tests, were used. Spearman's correlation analysis was used to examine the relationships between the total and subscale scores of the AI Literacy Scale and the AI Attitude Scale.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the University of Health Sciences Scientific Research Ethics Committee (Decision No. 2025/201; Date: April 8, 2025; Meeting No. 2025/04). Permission to use the measurement instruments was obtained from the authors who conducted their validity and reliability studies. Before data collection, participants were informed about the purpose and procedures of the study, and the confidentiality of their responses. Written informed consent was obtained from all participants.

Results

Table 1 summarizes the sociodemographic characteristics of the nursing students who participated in the study. The mean age of the participants was 21.25 ± 2.66 years. Most participants were female (85.6%), and 27% were fourth-year students. Regarding AI, 46.4% reported having some interest in AI, 56.9% reported having some knowledge of AI, and 56.3% reported having some knowledge of AI applications in health sciences and nursing. Additionally, 91.6% of the students reported that they had not received any formal training related to AI.

Table 1. Sociodemographic and descriptive characteristics of the nursing students (n=478)

	n	%
Sex		
Female	409	85.6
Male	69	14.4
Academic year		
First year	123	25.7
Second year	118	24.7
Third year	108	22.6
Fourth year	129	27.0
Interest in AI		
Yes	215	45.0
Partially	222	46.4
No	41	8.6
Knowledge of AI		
Yes	141	29.5
Partially	272	56.9
No	65	13.6
Knowledge of AI applications in health sciences and nursing		
Yes	79	16.5
Partially	269	56.3
No	130	27.2
Previous AI training		
Yes	45	9.4
No	433	90.6
	Mean±SD	Min-max
Age	21.25±2.66	18–46

SD: Standard deviation, Min: Minimum, Max: Maximum.

Table 2. Descriptive statistics and Cronbach's alpha coefficients for the AI literacy scale and AI attitude scale [n=478]

	Mean±SD	Median (min-max)	Cronbach's alpha coefficient
AI literacy scale	60.55±10.98	12-84	0.768
Awareness	15.16±2.99	3-21	
Usage	14.89±3.32	3-21	
Evaluation	15.54±3.80	3-21	
Ethics	14.96±3.27	3-21	
AI attitude scale	45.75±6.76	13-65	0.834
Benefits of AI	12.55±2.52	3-15	
Risks of AI	10.86±3.52	4-20	
Use of AI	22.34±4.72	6-30	

SD: Standard deviation, Min: Minimum, Max: Maximum.

Table 2 presents the descriptive statistics for the AI Literacy Scale and the AI Attitude Scale. The mean total AI Literacy Scale score was 60.55±10.98, whereas the mean total AI Attitude Scale score was 45.75±6.76.

Table 3 presents the correlations between the AI Literacy Scale and the AI Attitude Scale and their respective subscales.

Statistically significant positive correlations were found between all AI Literacy Scale subscales (Awareness, Usage, Evaluation, and Ethics), as well as the total AI literacy score, and the Benefits of AI, Use of AI, and total AI Attitude Scale scores. The strength of these correlations ranged from weak to moderate. Specifically, the Awareness subscale demonstrated weak positive correlations with the Benefits of AI, Use of AI, and total AI Attitude Scale scores. The Usage and Evaluation subscales showed moderate positive correlations with these variables. In contrast, the Evaluation subscale demonstrated a weak negative correlation with the Risks of AI subscale. The Ethics subscale was weakly but positively correlated with the Benefits of AI, Use of AI, and total AI Attitude Scale scores. Likewise, the total AI Literacy Scale score was moderately and positively correlated with the Benefits of AI, Use of AI, and total AI Attitude Scale scores. All reported correlations were statistically significant ($p < 0.05$).

Table 4 compares AI literacy and AI attitude scores according to participants' sociodemographic and descriptive characteristics. The total AI Literacy Scale score differed significantly according to interest in AI ($F=12.556$, $p=0.000$), with students reporting high or moderate interest in AI demonstrating higher AI literacy. AI literacy scores also differed significantly according to self-reported knowledge of AI ($F=22.548$, $p=0.000$), with students reporting extensive or moderate knowledge of AI achieving higher AI literacy scores. Likewise, significant differences were observed according to knowledge of AI applications in health sciences and nursing ($F=11.141$, $p=0.000$), with students reporting extensive or moderate knowledge demonstrating higher AI literacy.

AI Attitude Scale scores differed significantly according to academic year ($H=8.584$; $p=0.035$), with second-year nursing students reporting the most positive attitudes toward AI. AI attitude scores also differed significantly according to interest in AI ($H=55.080$; $p=0.000$), with students reporting high or moderate interest in AI demonstrating more positive attitudes. Finally, AI attitude scores differed significantly according to knowledge of AI applications in health sciences and nursing ($H=18.455$; $p=0.000$), with students reporting extensive or moderate knowledge exhibiting more positive attitudes toward AI.

Discussion

The findings of this study indicate that nursing students demonstrated relatively high levels of AI literacy and generally positive attitudes toward AI. Moreover, higher AI literacy was associated with more positive attitudes toward AI. Previous studies have consistently reported that participants are predominantly female, primarily fourth-year students, and aged 20 years or older.²⁰⁻²² The present study also found that attitudes toward AI varied by academic year, with second-year students demon-

Table 3. Correlations between AI literacy scale and AI attitude scale scores among nursing students [n=478]

	Benefits of AI	Risks of AI	Use of AI	AI attitude scale total score
Awareness				
r	0.365**	0.028	0.287**	0.365**
p	0.000	0.537	0.000	0.000
Usage				
r	0.483**	0.070	0.419**	0.514**
p	0.000	0.126	0.000	0.000
Evaluation				
r	0.490**	-0.108*	0.487**	0.462**
p	0.000	0.019	0.000	0.000
Ethics				
r	0.340**	0.022	0.237**	0.316**
p	0.000	0.627	0.000	0.000
AI literacy scale total score				
r	0.508**	0.006	0.431**	0.502**
p	0.000	0.891	0.000	0.000

** $p < 0.05$. Spearman's correlation analysis.

strating particularly positive attitudes. Similarly, Salem et al.²¹ reported that second-year nursing students exhibited more positive attitudes toward AI. One possible explanation is that students in the early stages of their education may be more open to adopting emerging technologies and innovative learning approaches. In contrast, Akca Sumengen et al.²³ found that third-year nursing students exhibited more positive attitudes toward AI than first-year students, while El Arab et al.²⁴ reported that academic seniority was associated with more positive attitudes, with fourth-year nursing students demonstrating more favorable attitudes toward AI than students in earlier years. These inconsistencies may be explained by differences in AI exposure across educational institutions, curriculum content, technological resources, and students' previous experience with AI technologies.

This study found that students with higher or moderate levels of AI knowledge demonstrated greater AI literacy. Furthermore, students who reported high or moderate interest in AI and those with higher or moderate knowledge of AI applications in health sciences and nursing exhibited both higher AI literacy and more positive attitudes toward AI. These findings are consistent with previous studies. Al Omari et al.²⁵ reported that nursing students who were knowledgeable about AI applications had more positive attitudes toward AI, while Tuncer et al.¹⁶ found that nurses who were knowledgeable about and used AI applications also demonstrated more positive attitudes toward AI.

The moderate positive correlation was found between students' AI literacy and their attitudes toward AI. Previous studies involving health education students and nurses have similarly demonstrated that greater AI-related knowledge and literacy are associated with more positive attitudes toward AI.^{16,26} However, evidence that students in health-related disciplines may hold positive attitudes toward AI despite having limited knowledge suggests that favorable attitudes are not always accompanied by adequate AI knowledge.²⁷ Higher AI literacy may enable individuals to better understand the capabilities, limitations, and potential applications of AI, thereby reducing uncertainty and promoting more realistic perceptions of the technology. Therefore, enhancing AI literacy in nursing education may not only strengthen students' AI-related knowledge but also contribute to the development of informed and positive attitudes toward AI.

The moderate positive correlations were found between nursing students' AI use and their perceptions of the benefits of AI, attitudes toward AI use, and overall attitudes toward AI. Exposure to AI technologies and gaining experience with these technologies during learning activities designed to enhance nursing students'

Table 4. Comparison of AI literacy scale and AI attitude scale scores according to participants' sociodemographic and descriptive characteristics (n=478)

	n	AI literacy scale total score		AI attitude scale total score	
		Mean±SD	Median (min-max)	Mean±SD	Median (min-max)
Age					
≤20 years	185	59.87±11.19			46 [19-65]
≥21 years	293	60.97±10.84			46 [13-65]
		t=-1.056; p=0.292		Z=-0.286; p=0.775	
Sex					
Female	409	60.77±10.75			46 [13-65]
Male	69	59.20±12.23			48 [29-65]
		t=1.100; p=0.272		Z=-1.258; p=0.209	
Academic year*					
First year	123	59.10±11.28			45 [13-58]
Second year	118	61.34±12.61			48 [23-65]
Third year	108	60.78±10.75			46 [28-65]
Fourth year	129	60.99±9.12			46 [23-58]
		F=0.942; p=0.421		H=8.584; p=0.035	
Interest in AI**§					
Yes	215	62.26±11.62			48 [13-65]
Partially	222	60.24±9.54			45 [24-63]
No	41	53.17±11.79			40 [20-50]
		F=-12.556; p=0.000		H=55.080; p=0.000	
Knowledge of AI***§§					
Yes	141	64.18±10.87			49 [13-65]
Partially	272	60.31±10.46			45.5 [19-65]
No	65	53.63±9.93			44 [24-56]
		F=22.548; p=0.000		H=40.507; p=0.000	
Knowledge of AI applications in health sciences and nursing****§§§					
Yes					
Partially	79	63.31±12.21			48 [13-65]
No	269	61.49±10.57			46 [23-65]
	130	56.90±10.16			44 [19-58]
		F=11.141; p=0.000		H=18.455; p=0.000	
Previous AI training					
Yes	45	59.35±12.97			46 [29-65]
No	433	60.67±10.76			46 [13-65]
		t=-0.658; p=0.514		Z=-0.753; p=0.452	

*: A significant difference was observed between first- and second-year students (p<0.05; post hoc test), **: Significant differences were observed among all groups (p<0.05; post hoc test), ***: Significant differences were observed among all groups (p<0.05; post hoc test), ****: Significant differences were observed between the Yes and No groups and between the No and Partially groups (p<0.05; post hoc test), §: Partially>No; Yes>No (p<0.05; post hoc test), §§: Yes>Partially>No (p<0.05; post hoc test), §§§: Yes>No, Partially>No (p<0.05; post hoc test). The H statistic represents the Kruskal-Wallis test, whereas the Z statistic represents the Mann-Whitney U test. The t statistic represents the independent-samples t test, whereas the F statistic represents the one-way analysis of variance. SD: Standard deviation, Min: Minimum, Max: Maximum.

theoretical knowledge and clinical skills may positively influence their perceptions of the benefits of AI; in turn, greater perceived benefits may be associated with more positive attitudes toward AI and a greater willingness to adopt these technologies.²⁸⁻³⁰ This relationship may be explained by increased interaction with AI enhancing students' perceptions of its usefulness, ease of use, and reliability, thereby contributing to more positive overall attitudes.^{14,31} In this context, practical experience gained through AI-based learning activities, clinical simulations, and digital tools may enable students to better understand the potential contributions of AI to professional nursing practice, thereby facilitating technology adoption and fostering more positive attitudes toward AI.^{22,32}

The moderate positive relationship was found between nursing students' ability to evaluate AI applications and their attitudes toward the benefits and use of AI,

as well as their overall attitudes toward AI. The ability to critically evaluate AI applications may enable students to better understand both the potential benefits and limitations of these technologies, thereby contributing to the development of more informed and balanced attitudes toward AI.²⁶ This is particularly important because, although experiencing the effectiveness of AI applications may promote more positive perceptions, using these technologies without critical evaluation or with excessive confidence may increase the risk of bias and errors.^{11,25} Therefore, students who are better able to evaluate the capabilities, limitations, and appropriate applications of AI may be more likely to recognize its potential value in healthcare while also being more aware of its risks and limitations. In this context, integrating learning activities that emphasize the critical evaluation of AI applications into nursing education may help students develop the competencies

required to use AI appropriately and responsibly and contribute to the informed adoption of these technologies in their future nursing practice.²⁵

The moderate positive correlation was found between nursing students' AI literacy and their attitudes toward the benefits and use of AI. This relationship may be explained by the possibility that students with higher AI literacy are better able to evaluate the potential benefits of AI technologies and develop more favorable attitudes toward their use through greater AI-related knowledge, awareness, ethical understanding, and practical skills. The associations of AI literacy with the intention to use AI and of greater AI knowledge with more frequent use of generative AI tools further support this explanation.^{26,33} In this context, enhancing AI literacy may help students not only recognize the potential benefits of AI technologies but also critically and consciously evaluate these technologies and better understand their value in professional practice.

Limitations

Certain limitations should be considered when interpreting the findings of this study. First, the study was conducted at the Faculty of Nursing of a single university in Türkiye, which may limit the generalizability of the findings to nursing students in other educational settings or countries with different curricula and teaching approaches. Furthermore, the study sample may not be representative of the broader nursing student population, which limits the generalizability of the findings. Future studies should include larger and more diverse samples through multicenter research designs. Second, the data were collected exclusively through self-report questionnaires, which may be subject to reporting bias, including social desirability bias. Participants may have been inclined to provide socially desirable responses, which may not have fully reflected their actual perceptions or experiences. In addition, reliance on self-reported data may have affected the accuracy of the findings. Future studies should consider incorporating alternative data collection methods, such as interviews or observations, to reduce these potential biases. Furthermore, the absence of predefined cutoff scores for the scales used in this study limits the interpretation of AI literacy and attitudes toward AI. The absence of predefined cutoff scores may result in subjective interpretation of the findings and limit comparisons across studies. Finally, the descriptive, cross-sectional design allowed the examination of associations between variables but did not permit causal inferences. Therefore, although the findings provide insight into potential relationships, no causal conclusions can be drawn. Given these limitations, future studies should employ more diverse and comprehensive research designs to generate more robust and generalizable findings.

Conclusion

This study demonstrated that higher AI literacy among nursing students was associated with more positive attitudes toward AI. This relationship suggests that AI literacy may be important not only in terms of students' knowledge of AI but also in shaping their attitudes toward this technology. In addition, higher levels of AI use and stronger AI evaluation skills were positively associated with attitudes toward the benefits and use of AI, as well as with overall attitudes toward AI. Similarly, higher AI literacy was associated with more favorable attitudes toward the benefits and use of AI. Taken together, these findings indicate that AI literacy, AI use, and AI evaluation skills are important dimensions to consider in relation to nursing students' attitudes toward AI. Accordingly, considering these dimensions in nursing education may be beneficial in preparing students to engage with AI technologies in their future professional practice.

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Informed Consent: Written informed consent was obtained from all participants.

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Nursing Management of Anti-GD2 Dinutuximab-Related Adverse Effects in Children with Neuroblastoma: A Scoping Review

Abstract

Background: Anti-disialoganglioside GD2 (anti-GD2) immunotherapy, particularly dinutuximab, has significantly improved survival outcomes in children with high-risk neuroblastoma. However, treatment is frequently associated with severe adverse effects, including neuropathic pain, hypersensitivity reactions, and capillary leak syndrome, which present major challenges to patient comfort and treatment adherence.

Aim: This scoping review aimed to map the existing literature on dinutuximab-related adverse effects and the strategies used to manage them.

Methods: A comprehensive search was conducted across multiple databases for studies published between 2010 and 2024. Clinical trials, cohort studies, case series, and expert recommendations involving pediatric patients receiving dinutuximab were included. A narrative synthesis was used to integrate and interpret the findings.

Results: The initial database search identified 962 studies, of which 29 met the inclusion criteria. Pain, hypersensitivity reactions, and infusion-related complications were the most frequently reported adverse events. Current evidence supports multimodal analgesia, standardized premedication protocols, and nursing-led supportive care to mitigate these toxicities. To our knowledge, this is the first scoping review to synthesize both pharmacological and nursing-led supportive care strategies for managing dinutuximab-related toxicities in children with high-risk neuroblastoma.

Conclusion: This review highlights the importance of multidisciplinary management and standardized, nursing-inclusive care pathways to improve treatment tolerability and optimize outcomes in children receiving anti-GD2 therapy.

Keywords: Anti-GD2, children, dinutuximab, neuroblastoma, nursing, side effects

● Münevver Erkul,¹ ● İlçim Ercan Koyuncu,²
● Aylin Akça Sumengen,³ ● Ayşe Ay,²
● Eysan Hanzade Savaş,⁴ ● Remziye Semerci Şahin⁴

¹Department of Nursing, Antalya Bilim University Faculty of Health Sciences, Antalya, Türkiye

²Department of Pediatric Nursing, Başkent University Faculty of Health Sciences, Ankara, Türkiye

³The University of Alabama, Capstone College of Nursing, Alabama, USA

⁴Department of Pediatric Nursing, Koç University School of Nursing, İstanbul, Türkiye

Introduction

Neuroblastoma is the most common extracranial tumor of the peripheral sympathetic nervous system in childhood.^{1,2} Originating from neural crest progenitor cells, it is classified as an embryonal neuroendocrine tumor.³ Neuroblastoma accounts for 15% of childhood cancer-related deaths.² The median age at diagnosis is 17 months, with fewer than 5% of cases diagnosed after 10 years of age.⁴ It is rarely detected by prenatal ultrasonography, and 90% of cases are diagnosed before the age of 5 years.⁵ The prevalence of neuroblastoma among children younger than 15 years is approximately 1 in 7,000 live births, with an incidence of 8.3 cases per million.⁶ Approximately 700–800 new cases are diagnosed annually in the United States.⁵ One international study reported the highest incidence rates in high-income countries, including Italy (18.9 per million), Hungary (17.0 per million), and Japan (15.7 per million).⁷ In contrast, the lowest incidence rates were reported in Guinea (0), Niger (0.3 per million), and The Gambia (0.4 per million). The incidence was 12.4 per million in the United States and 10.6 per million in Türkiye.⁷ These findings suggest that the lower reported incidence in low-income countries may reflect underreporting or children dying before receiving a diagnosis.⁷

Neuroblastoma exhibits marked clinical heterogeneity. Some tumors undergo spontaneous regression without treatment, progress rapidly despite intensive therapy.⁴ Patients are classified into low-, intermediate-, and high-risk groups, with 50–60% of high-risk patients being either older than 12 years or younger than 18 months.^{8,9} Prognosis is strongly influenced by amplification of the N-Myc genetic marker, and treatment should be tailored accordingly.^{10,11} The presence of the N-Myc marker necessitates a multimodal treatment approach that includes conventional chemotherapy, surgery, hematopoietic cell transplantation, immunotherapy, and retinoid therapy.^{8,12} Historically, despite aggressive treatment, the five-year survival rate for high-risk neuroblastoma was approximately 30%.¹³ The introduction of dinutuximab, a monoclonal antibody targeting the GD2 glycolipid, has substantially improved outcomes, increasing five-year survival to as high as 66%.¹⁴ This improvement underscores the importance of effectively managing dinutuximab related toxicities to enable children to complete therapy while maintaining comfort and adherence.^{13,14} Dinutuximab was developed in the United States through a series of phase I, II, and III clinical trials conducted by the Children's Oncology Group¹⁵ and was approved by the U.S. Food and Drug Administration (FDA) in 2015.^{16,17}

Dinutuximab has demonstrated substantial clinical benefit and has become the standard of care for children with high-risk neuroblastoma; however, its use is associated with a broad range of adverse effects.¹⁸ Because dinutuximab targets the GD2 protein found in peripheral nerve fibers, pain is one of the most common adverse ef-

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Corresponding author: Münevver Erkul
E-mail: munevver.erkul@antalya.edu.tr

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fects. This pain typically begins shortly after treatment initiation and subsides following completion of the infusion. Although it most commonly occurs in the abdomen, it may affect any part of the body.¹⁵ Fever, reported in 39% of patients, is primarily associated with interleukin-2-induced (IL-2-induced) pyrogen release.^{15,19} Other serious side effects resulting from immune activation and cytokine release include hypotension and hypersensitivity reactions.²⁰ Furthermore, dinutuximab can cause capillary leak syndrome as a result of cytokine release, potentially leading to shock and multiorgan failure.¹⁴ This process causes vasodilatation and increased permeability secondary to drug-induced endothelial cell injury, resulting in vascular leakage into the interstitial spaces and tissues, which may become life-threatening.^{14,15} Patients may also experience less common adverse effects during treatment, including liver dysfunction, electrolyte imbalances (particularly hypokalemia), nausea, vomiting, diarrhea, and visual disturbances.^{14,16–21}

Considering its substantial survival benefit despite the associated toxicities, dinutuximab has become a standard component of treatment for children with high-risk neuroblastoma and requires a multidisciplinary approach to care.⁶ The treatment course typically extends over six months and involves repeated 10–20-hour infusions and frequent hospital or outpatient visits.²² Pediatric oncology nurses play a central role throughout this process.¹⁸ Managing the diverse adverse effects associated with dinutuximab requires individualized care, expert clinical assessment, and timely intervention.²³ Effective coordination among patients, families, and the multidisciplinary healthcare team is essential to ensure completion of the treatment regimen and optimize long-term outcomes.²² Management of individual adverse effects typically involves a combination of pharmacological and non-pharmacological strategies tailored to the patient's clinical presentation. Although existing protocols and expert recommendations primarily focus on pharmacological management, nursing-led interventions, including symptom assessment, continuous monitoring, and patient and family education, are often only briefly described and have not been comprehensively synthesized across the literature.^{21,22} Furthermore, standardized evidence-based guidelines for the management of dinutuximab-related adverse effects in children with high-risk neuroblastoma remain lacking.²⁴ Pediatric oncology nurses play a pivotal role in the early recognition, monitoring, and management of treatment-related toxicities because they provide continuous bedside care and coordinate multidisciplinary supportive interventions.

Despite the central role of nursing, standardized nursing protocols and clearly defined supportive care pathways for children receiving dinutuximab remain limited in the literature.

Therefore, this scoping review aims to map not only the pharmacological strategies but also the nursing-led supportive care practices and multidisciplinary management approaches used to address dinutuximab-associated adverse effects in pediatric patients.

Research Questions

This scoping review was guided by the following research questions:

1. What adverse effects are associated with anti-disialoganglioside GD2 (anti-GD2) dinutuximab therapy in pediatric patients with neuroblastoma?
2. What pharmacological and nursing-led supportive care strategies are used in clinical practice to manage these adverse effects?

Materials and Methods

To conduct this scoping review, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed.²⁵

Search Strategy

A comprehensive search was conducted by a librarian across the PubMed, Web of Science, Cochrane Library, MEDLINE, CINAHL, Scopus, and Google Scholar databases, covering literature from each database's inception through May 2024. The search strategy included the following terms: "Pediatrics"[MeSH] OR "pediatric" OR "pediatr*" OR "child" OR children OR "pediatrics" OR "Child"[MeSH] AND "Neoplasms"[MeSH] OR "cancer" OR "neoplasm" OR "Oncology Service, Hospital"[MeSH] OR "oncology service" OR oncology AND "Neuroblastoma"[MeSH] OR neuroblastoma AND "Anti-GD2 Dinutuximab" OR "Anti-GD2" OR "Dinutuximab". Duplicate records were removed, and a consolidated reference library was created using Covidence systematic review software. Covidence was subsequently used for title, abstract, and full-text screening.

Eligibility Criteria

The inclusion and exclusion criteria were developed using the Patient/Population, Intervention, Context, and Outcomes (PICOS) framework.²⁶ Although the Population, Concept, and Context (PCC) framework is commonly recommended for scoping reviews, we considered PICOS to be appropriate because our research question focused on a specific intervention (anti GD2 dinutuximab) and its adverse effects and management strategies in a clearly defined pediatric population. The PICOS framework allowed us to specify the intervention and outcome parameters more precisely while maintaining the broad, exploratory nature of a scoping review. Studies were included if they met the following criteria:

Population: Pediatric patients aged 18 years or younger diagnosed with neuroblastoma.

Intervention: Studies focusing on adverse effects, nursing care, and management related to anti-GD2 immunotherapy.

Context: Articles published through May 2024. Given the exploratory scope of this scoping review, a broad range of study designs was eligible, including reviews, meta-analyses, randomized controlled trials (RCTs), prospective and retrospective cohort studies, and clinical guidelines.

Outcomes: The primary outcomes included adverse effects associated with anti-GD2 dinutuximab treatment in pediatric patients with neuroblastoma and strategies for managing those adverse effects.

Studies were excluded if they did not report adverse effects associated with anti-GD2 dinutuximab or their management in pediatric patients with neuroblastoma, focused solely on vomiting as an isolated symptom, or were published in a language other than English.

Selection of Studies

All citations retrieved from the seven databases were imported into EndNote version 20.1, a reference management program, which was also used to remove duplicate records. Study selection and data extraction were performed independently by four reviewers using Covidence, with reviewers blinded to one another's decisions but not to journal titles, authors, or institutional affiliations. Articles were screened according to the predefined inclusion and exclusion criteria to determine their eligibility. Any disagreements were resolved through consensus discussions. The screening process and study selection are illustrated in the PRISMA flow diagram (Fig. 1).²⁵

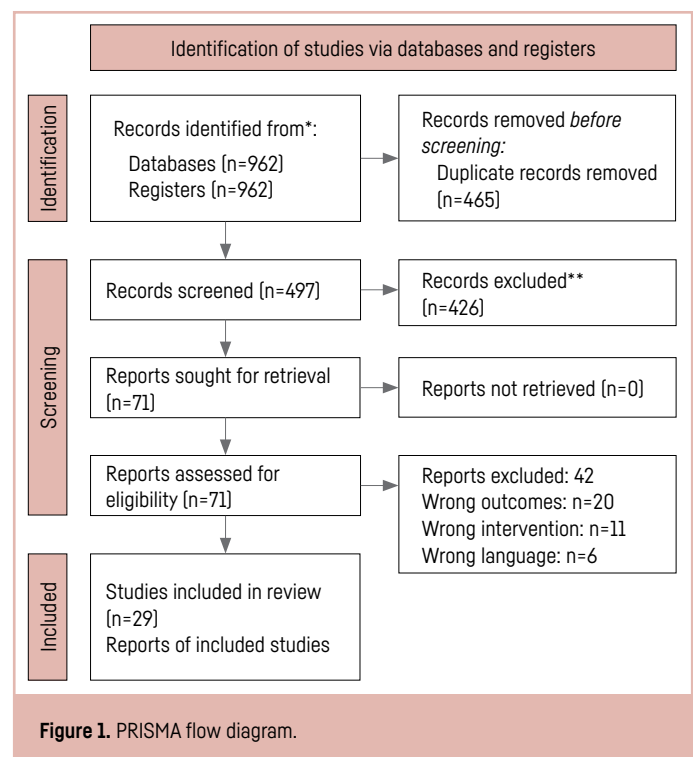


Table 1. Characteristics of included studies

Author, year, country	Age of participants	Study design	Neuroblastoma subtype
Secola et al., 2017, ²² USA	Not reported	Review	High-risk
Cabral et al., 2022, ²³ Canada	Not reported	Review	High-risk
Barone et al., 2021, ²⁴ United Kingdom	Not reported	Review	High-risk
Edwards et al., 2024, ²⁷ USA	12 years	Case report	High-risk
Balaguer et al., 2023, ²⁸ Spain	12–18 months	Review	High-risk
Nysom et al., 2023, ²⁹ Denmark	Not reported	Special report	High-risk
Aurensanz-Clemente et al., 2023, ³⁰ Spain	15–18 years	Case report	High-risk
Lode et al., 2023, ³¹ Germany	1–21 years	Prospective, open-label, single-arm, multicenter phase II study	Relapsed or refractory
Cupit-Link et al., ³² 2023, USA	<19 years	Review	High-risk
Görgeş et al., ³³ 2015, Canada	2–12 years	Case report	High-risk
Launspach et al., ³⁴ 2021, German	3 years	Case Presentation	High-risk
Spencer et al., ³⁵ 2020, USA	3 years	Case report	High-risk
Wallace et al., ³⁶ 1997, USA	4–7 years	Case report	High-risk
Anghelescu et al., ³⁷ 2015, USA	1–15 years	Review	High-risk
Bertolizio et al., ³⁸ 2021, Canada	3–8 years	Review	Neuroblastoma
Castel et al., ³⁹ 2010, Spain	Not reported	Review	Refractory or recurrent
Killinger et al., ⁴⁰ 2017, USA	1–18 years	Review	High-risk
Parsons et al., ⁴¹ 2013, USA	Not reported	Review	High-risk
Mastrangelo et al., ⁴² 2021, USA	>1 year	Review	Neuroblastoma
McGinty et al., ⁴³ 2012, Italy	Not reported	Review	High-risk
Kushner et al., ⁴⁴ 2022, USA	<19 months	Prospective clinical trial	High-risk
Mueller et al., ⁴⁵ 2018, Germany	0–26 years	Prospective clinical trial	High-risk
Navid et al., ⁴⁶ 2014, USA	2–16 years	Prospective clinical trial	Refractory or recurrent
Ari et al., ⁴⁷ 2018, USA	0–10 years	Retrospective study	High-risk
Olgun et al., ⁴⁸ 2022, Türkiye	>12 months	Single-center experience	High-risk
Achbergerová et al., ⁴⁹ 2022, Slovakia	<6 years	Observational case series follow-up	Neuroblastoma
Ding et al., ⁵⁰ 2017, USA	2–12 years	Case series	High-risk
Featherly et al., ⁵¹ 2022, USA	0–18 years	Retrospective observational cohort study	High-risk
Tse et al., ⁵² 2015, USA	2–16 years	Retrospective observational cohort study	Refractory or recurrent

Data Extraction

Data extraction included key study characteristics, including authors, publication year, country, patient age, study design, and neuroblastoma subtype, as presented in Table 1. Outcomes related to adverse effects associated with anti-GD2 dinutuximab treatment and their management strategies were summarized in Table 2 and Appendix 1. In addition, we specifically extracted nursing-related information, including monitoring and assessment practices, non-pharmacological interventions, and patient and family education strategies, to characterize nursing-led supportive care across the included studies. A customized data extraction form was developed and implemented within the Covidence platform. Data were extracted independently and in duplicate by reviewer pairs. The four reviewers conducted the extraction collaboratively through Zoom meetings. Any discrepancies were resolved through consensus following re-examination of the full-text articles. When necessary, study authors were contacted to obtain additional or missing information.

Data Synthesis

The findings were synthesized using descriptive and quantitative summaries of the included studies' characteristics, including authorship, publication year, country, patient age, study design, and neuroblastoma subtype. Throughout the synthesis process, findings were discussed among the authors to ensure the accuracy, validity, and reliability of the results. A narrative synthesis was used to integrate and interpret the findings. For clarity and ease of interpretation, the results are organized into thematic domains, including adverse effects associated

with anti-GD2 dinutuximab treatment in pediatric patients with neuroblastoma and strategies used to manage these adverse effects. Consistent with the exploratory aim of a scoping review, we did not conduct a formal methodological quality assessment or risk-of-bias appraisal of the included studies because our primary objective was to map the breadth and nature of the available evidence rather than estimate intervention effects.

Results

Study Identification and Selection

The initial database search identified 962 records. After duplicate removal using EndNote 20, 497 unique studies remained. Title and abstract screening resulted in 71 articles being selected for full-text review. Following full-text assessment, 42 studies were excluded because they did not address the review questions or failed to meet the eligibility criteria. Ultimately, 29 studies met the inclusion criteria and were included in the review [Fig. 1].²⁵

Characteristics of the Included Studies

Country Distribution

The included studies were conducted across several countries, reflecting a global effort to improve the understanding and treatment of neuroblastoma. Sixteen studies originated from the United States, three each from Germany, Canada, and Spain, and one each from the United Kingdom, Denmark, Türkiye, and Italy [Table 1].

Table 2. Side effects associated with Anti-GD2 Dinutuximab treatment in pediatric patients with neuroblastoma

Study / Studies number	Respiratory distress n=3	Pain n=18	Neuropathic pain n=7	Extravasation n=2	Fever n=7	Neurological toxicity n=2	Ocular toxicity n=4	Hematological toxicity n=7	Hepatotoxicity n=6	Nephrotoxicity n=2	Cardiac toxicity n=8	Anaphylactic reactions n=9	Hyponatremia n=6	Gastrointestinal system n=10	Skin problem n=11	Vascular disorders n=8	Musculoskeletal system n=2	Neutropenia n=3	Others n=4
Secola et al., 2017 ²¹		✓	✓									✓			✓	✓			✓
Cabral et al, 2022 ²²		✓									✓				✓				
Barone et al., 2021 ²³		✓			✓	✓		✓	✓			✓		✓		✓			
Edwards et al., 2024 ²⁶							✓												
Balaguer et al., 2023 ²⁷			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
Nysom et al., 2023 ²⁸		✓																	
Aurensanz-Clemente et al., 2023 ²⁹											✓								
Lode et al., 2023 ³⁰			✓					✓			✓		✓	✓	✓				
Cupit-Link et al., 2023 ³¹								✓	✓	✓								✓	✓
Görges et al., 2015 ³²		✓																	
Launspach et al., 2021 ³³				✓															
Spencer et al., 2020 ³⁴														✓		✓			
Wallace et al., A., 1997 ³⁵		✓																	
Anghelescu et al., 2015 ³⁶			✓																
Bertolizio et al., 2021 ³⁷	✓	✓																	
Castel et al., 2010 ³⁸		✓			✓						✓				✓				
Killinger et al., 2017 ³⁹		✓									✓				✓	✓			
Parsons et al., 2013 ⁴⁰	✓	✓			✓			✓	✓		✓	✓	✓	✓	✓	✓		✓	
Mastrangelo et al., 2021 ⁴¹		✓	✓																
McGinty et al., 2012 ⁴²		✓	✓					✓			✓	✓				✓			✓
Kushner et al., 2022 ⁴³	✓	✓													✓				
Mueller et al., 2018 ⁴⁴		✓												✓	✓	✓	✓		
Navid et al., 2014 ⁴⁵		✓			✓		✓		✓		✓		✓	✓	✓			✓	✓
Ari et al., 2018 ⁴⁶			✓		✓						✓			✓					
Olgun et al., 2022 ⁴⁷		✓			✓						✓	✓		✓	✓				
Achbergerová et al., 2022 ⁴⁸		✓						✓	✓		✓	✓	✓	✓	✓	✓			
Ding et al., 2017 ⁴⁹																			
Featherly et al., 2022 ⁵⁰		✓																	
Tse et al., 2015 ⁵¹							✓												

The most recent study was published in 2024 by Edwards et al.²⁷ Most studies addressing the management of adverse effects associated with anti-GD2 dinutuximab therapy were published in recent years, with the largest number appearing in 2023. Five studies were published in 2022, four in 2021, one in 2020, two in 2018, five in 2017, five in 2015, one in 2014, one in 2013, one in 2010, and one in 1997.^{28–32} The age of study participants ranged from infancy through adolescence and young adulthood (0–16 years), reflecting the broad age distribution of patients affected by neuroblastoma [Table 1].

The included studies comprised case reports,^{27,30,33–36} review articles,^{22–24,28,32,37–43} prospective clinical trials,^{31,44–46} retrospective studies,^{47–49} special reports,²⁹ case series,^{49,50} and retrospective observational cohort studies.^{51,52} Together, these study designs contributed complementary evidence regarding treatment efficacy, adverse effects, and management strategies [Table 1].

Among the 29 included studies, 22 focused on patients with high-risk neuroblastoma, four on refractory or recurrent disease, and three included mixed neuroblastoma populations [Table 1].

Adverse Effects Associated with Anti-GD2 Dinutuximab Treatment

Table 2 summarizes the adverse effects associated with anti-GD2 dinutuximab treatment in pediatric patients with neuroblastoma. Pain was the most frequently reported adverse event, appearing in 18 studies.^{15,21–23,27,32,35–40,44,45,47,48,50–52} Skin toxicities were reported in 11 studies,^{21,22,30,38–40,43–45,47,48} while gastrointestinal adverse effects were documented in 10 studies.^{23,27,30,34,40,42,44,48} Anaphylactic reactions were reported in nine studies,^{21,23,27,38,39,40,42,47,48} followed by cardiac toxicity^{22,27,29,30,40,45,46,47} and vascular disorders [eight studies each].^{21,23,34,39,40,42,44,48} Hematologic toxicity^{23,27,30,31,40,42,48} and fever^{23,27,38,40,45–47} were each identified in seven studies. Neuropathic pain was reported in seven studies,^{15,21,24,27,41,46,50} hepatotoxicity in six stud-

ies,^{23,27,31,40,45,48} and hyponatremia^{27,30,40,42,45,48} in six studies. Less frequently reported adverse events included ocular toxicity,^{26,27,45,51} neutropenia,^{31,40,45} respiratory distress,^{37,40,43} musculoskeletal^{144,49} complications, extravasation,^{27,33} neurologic toxicity,^{23,27} and other miscellaneous adverse events.^{21,31,42,45}

Management Strategies

Management strategies varied considerably across the included studies [Appendix 1]. Pain control most commonly involved multimodal analgesia using opioids (morphine, fentanyl, and hydromorphone), adjuvant agents such as gabapentin, and ketamine administered as boluses or infusions.^{21,22,37,41,45,50} Preventive analgesic regimens were routinely initiated before infusions.^{23,27,31} Neuropathic pain management included prophylactic gabapentin and opioid-based premedication.^{24,28,41} Hypersensitivity reactions and anaphylaxis were managed with antihistamines and corticosteroids, whereas capillary leak syndrome was managed using fluid balance protocols.^{23,39,40} Fever was treated with antipyretics such as paracetamol, metamizole, or ibuprofen.^{27,45,47} Diarrhea was managed with supportive hydration or loperamide, whereas vomiting was prevented with prophylactic serotonin 5-HT₃ antagonists.^{24,28,46,47} Cardiac toxicity required close cardiac monitoring, whereas hepatotoxicity and nephrotoxicity were managed through dose modifications and laboratory surveillance.^{24,27,30,48,51} Skin toxicity was managed with topical therapies, while musculoskeletal and neurologic toxicities were treated with corticosteroids, intravenous immunoglobulin (IVIG), and plasmapheresis when clinically indicated.^{36,41,49} These findings underscore the need for individualized, multidisciplinary care throughout dinutuximab therapy. Across the included studies, nursing led monitoring and supportive care were consistently identified as integral components of dinutuximab management.^{21,23} Protocols described regular assessment of neurologic status, serial complete blood counts, liver and renal function tests, and close cardiac monitoring during and after infusions, along with frequent monitoring of vital signs, fluid balance, and serum electrolyte levels.^{24,27,30,36,39-41,48,51} Supportive measures, including blood product transfusions, ophthalmologic assessment, prophylactic antiemetic therapy, intravenous hydration to prevent hypotension, and careful titration or interruption of infusions in response to treatment-related toxicity were also commonly described.^{23,24,28,30,31,39,40,47,48} In addition, nurses frequently used age appropriate pain assessment tools, including the FLACC (Face, Legs, Activity, Cry, Consolability) scale, the Faces Pain Scale-Revised, and the Numeric Rating Scale, to guide analgesic titration.³³

Non-pharmacological interventions, including distraction techniques, positioning for comfort, and ongoing education and reassurance for children and their families, were reported as important adjuncts to pharmacological management. In several reports, nurses were also responsible for recognizing the early signs of hypersensitivity reactions and coordinating timely multidisciplinary interventions.^{21,23}

Discussion

This scoping review mapped the toxicities associated with anti-GD2 monoclonal antibody therapy with dinutuximab in children with high-risk neuroblastoma, together with the strategies used to manage them, with particular attention to the contribution of nursing care. Twenty-nine studies met the inclusion criteria, most of which concerned high-risk disease and were conducted in high-income countries following regulatory approval of the agent in 2015. These studies portray a therapy whose adverse effects are well delineated, yet whose clinical management remains only partially systematized. The toxicity profile of dinutuximab was consistent and clearly characterized across independent data sources, suggesting a mature and reproducible evidence base in this respect. By contrast, its management relied on a recurring but seldom standardized set of pharmacological and supportive interventions, indicating persistent variability in practice. Most striking was the disparity between the clinical centrality of nursing care and its limited visibility in the literature: the activities through which nurses ensure the safe administration of this therapy, although indispensable at the bedside, were documented only fragmentarily.

The predominance of high-risk disease among the included studies is consistent with the current role of anti-GD2 immunotherapy. High-risk neuroblastoma accounts for approximately half of all cases and has historically carried a poor prognosis despite intensive multimodal treatment.^{2,63} The pivotal Children's Oncology Group trial demonstrated that anti-GD2 antibody therapy combined with granulocyte-macrophage colony-stimulating factor (GM-CSF) and interleukin-2 improved outcomes, leading to its approval as a frontline treatment and substantially improving long-term survival in this population.^{14,15,17} Five-year survival, historically limited to approximately one-third of

patients with high-risk disease, has increased substantially following the incorporation of anti-GD2 antibodies into frontline treatment.^{13,14} The concordance between the present findings and the broader literature reinforces the status of dinutuximab as a standard component of contemporary neuroblastoma treatment.^{28,43,44} Because the agent confers a clinically meaningful survival advantage, effective management of its toxicities and preservation of treatment adherence are correspondingly important.

The adverse events identified in this review (principally pain and neuropathic pain, hypersensitivity and anaphylactic reactions, gastrointestinal disturbances, capillary leak syndrome, and fever, together with a range of less frequent organ-specific toxicities) correspond closely to the profiles reported in pivotal trials, regulatory documentation, and previous reviews.^{17,54-58} This agreement across data sources supports the external validity of the synthesis and indicates that the characteristic toxicity profile of anti-GD2 therapy is now well established. The predominance of pain is attributable to the mechanism of action of dinutuximab, which binds to the GD2 antigen expressed on peripheral nerve fibers as well as on tumor cells. The resulting neuropathic pain is frequently severe and may be refractory to conventional analgesia. Capillary leak syndrome, although less common, is clinically important because cytokine-mediated endothelial injury and increased vascular permeability can precipitate hemodynamic instability and organ dysfunction. Hypersensitivity reactions vary in severity, ranging from isolated cutaneous manifestations to hypotension and, in rare cases, bronchospasm, angioedema, or anaphylaxis. This gradation is clinically relevant because it determines the required intensity of monitoring and the immediacy with which rescue interventions must be available.

The heterogeneity of toxicities reported across studies warrants specific consideration. This variability is more plausibly attributable to differences in treatment regimens than to inconsistent ascertainment. Co-administration of dinutuximab with cytokines such as GM-CSF and interleukin-2 increases the inflammatory and infusion-related burden and is associated with flu-like symptoms, capillary leak, and infusion-related pain, whereas the inclusion of isotretinoin is associated predominantly with dermatologic effects and transient hypertriglyceridemia.^{14,59} Anticipatory assessment and prophylaxis should therefore be aligned with the specific treatment regimen rather than applied uniformly,²⁸ enabling the clinical team to focus surveillance on the adverse events most likely to occur.

The management approaches documented across the included studies converged on multimodal analgesia, structured premedication, and systematic physiological monitoring. For pain, the literature consistently supports continuous opioid therapy, most frequently morphine, initiated before and maintained throughout the infusion, with prophylactic gabapentin for the neuropathic component and agents such as ketamine or lidocaine reserved for refractory cases.^{14,24,41,51} Prophylaxis for nausea, vomiting, and diarrhea with serotonin receptor antagonists, supportive hydration, and premedication with an antipyretic and an antihistamine to reduce hypersensitivity were similarly consistent. Combined with prolonged infusion schedules, these measures appear to have limited most hypersensitivity reactions to mild, predominantly cutaneous manifestations.^{28,58,59} Beyond symptom-directed treatment, the reviewed studies described systematic surveillance of cardiac, hepatic, and renal function, with laboratory monitoring and dose modification used to detect and mitigate organ-specific toxicity. A notable feature of the evidence, however, is that this apparent uniformity of practice is derived largely from expert recommendations and single-center experience rather than comparative trials. Current recommendations should therefore be regarded as a pragmatic, consensus-based standard rather than one established through high-level evidence. The corresponding absence of standardized, graded protocols means that the consistency of symptom control is likely to vary according to local expertise, with potential consequences for patient comfort and safety.²⁴

Strengths and Limitations

The strengths of this scoping review include the breadth of the available data and the comprehensive overview of the topic. However, the included studies varied in methodology, participant age, and treatment protocols, which may have introduced heterogeneity and limited the generalizability of the findings. Additionally, the lack of access to individual patient data prevented detailed analysis of variation in treatment responses and adverse effects across patient subgroups. A formal methodological quality or risk of bias assessment of the included studies was not conducted. Although this approach is consistent with the primary aim of a scoping review (to map the extent and nature of available evidence), it limits our ability to comment on the overall certainty and comparative strength of the findings and should be considered when interpreting the results.

Furthermore, the eligibility criteria were structured using the PICOS framework rather than the PCC mnemonic more commonly applied in scoping reviews, which may have constrained the extent to which contextual factors were captured.

Conclusion

This scoping review highlights the clinical importance of dinutuximab-based immunotherapy in children with high-risk neuroblastoma. Despite its therapeutic benefits, treatment is associated with clinically significant adverse effects, including severe pain, hypersensitivity reactions, dermatologic toxicities, and gastrointestinal symptoms, which require systematic assessment and timely management. Pediatric oncology nurses play a central role in infusion administration, toxicity monitoring, symptom management, and caregiver education. Supportive care should combine pharmacological and non-pharmacological interventions tailored to symptom severity, patient age, comorbidities, and previous treatment responses. Standardized protocols, clear management algorithms, and multidisciplinary collaboration are therefore essential to ensure safe and individualized care. Further research is needed to identify the most effective strategies for managing dinutuximab-related toxicities and to evaluate long-term patient outcomes. Strengthening nursing competence and integrating evidence-based supportive care into clinical pathways may improve treatment tolerability, adherence, and continuity while helping to preserve the survival benefits of dinutuximab therapy.

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Appendix 1. Management of adverse effects associated with anti-GD2 dinutuximab therapy in pediatric patients with neuroblastoma

Study	Management strategies
Secola et al., ²² 2017	Pain Management: • Administer all required premedications before each dinutuximab infusion. • Initiate the analgesic protocol with an intravenous (IV) loading dose of morphine, hydromorphone, or fentanyl, followed by a continuous patient-controlled analgesia (PCA) infusion beginning 30 minutes before dinutuximab administration. • Titrate analgesic infusion rates according to the patient's clinical response. Peripheral Neuropathy: • Permanently discontinue dinutuximab in patients with severe, treatment-refractory peripheral neuropathy. Hypersensitivity and Dermatologic Reactions: • Management may include reducing the infusion rate, increasing antihistamine dosing, and administering appropriate respiratory therapies. • Delay treatment in patients with active viral infections. • Topical agents, such as pramoxine hydrochloride lotion or colloidal oatmeal preparations, may be used to relieve pruritus. • Closely monitor patients for dermatologic manifestations during the infusion. • Mild reactions responsive to hydroxyzine may be managed with alternating doses of hydroxyzine and diphenhydramine every 6 hours. • For grade 3 or 4 hypersensitivity reactions (e.g., angioedema or persistent cough), immediately discontinue dinutuximab and cytokine therapy. Supportive management includes diphenhydramine and corticosteroids. Capillary Leak Syndrome and Fluid Imbalance: • Weigh patients twice daily and closely monitor fluid intake and output. • Monitor albumin levels; if the concentration is ≤ 3.0 g/dL, administer albumin followed by furosemide as indicated. • Establish an individualized preinfusion management plan based on the patient's clinical history. Hypotension: • In patients with symptomatic hypotension (defined as systolic blood pressure [SBP] below age-specific norms or a $>15\%$ decrease from baseline), temporarily interrupt dinutuximab and cytokine therapy. • Once hypotension has resolved, resume dinutuximab at 50% of the original infusion rate. • Persistent or recurrent hypotension may require additional normal saline boluses, 25% albumin, or packed red blood cell transfusion. Febrile Episodes and Infection Risk: • For temperatures $>38.5^{\circ}\text{C}$ (101°F), obtain blood cultures and initiate empiric broad-spectrum antibiotic therapy. • Discontinue antibiotics only after the patient has remained afebrile for more than 24 hours and blood cultures have remained negative for 48 hours. • In patients with confirmed infection, suspend dinutuximab therapy until the infection has completely resolved. Pain Management: Pain associated with anti-GD2 monoclonal antibody therapy requires a multimodal approach. General recommendations include: • Premedication: Administer premedication before the infusion to prevent pain onset. • Breakthrough Pain Medication: Ensure that rapid-acting opioids are readily available during the infusion. • Postinfusion Medication: Continue analgesic therapy for 24–48 hours after the infusion as clinically indicated. • Nonpharmacologic Strategies: Use interventions such as distraction, massage, and guided imagery to complement pharmacologic pain management, particularly in younger children. Hypotension: • Prevention: Administer prophylactic intravenous normal saline (10 mL/kg) 1 hour before dinutuximab (or naxitamab) infusion to reduce the risk of hypotension. • Mild Hypotension: Manage by repositioning the patient and providing additional hydration. • Moderate to Severe Hypotension: Temporarily interrupt the infusion. Vasopressors (e.g., intravenous or intramuscular epinephrine) may be required for hypotension refractory to fluid therapy. Hypersensitivity and Allergic Reactions: • Closely monitor patients for infusion-related reactions, including cough, bronchospasm, hypoxia, angioedema, anaphylaxis, pruritus, and urticaria. • Premedication: Institutional protocols may include diphenhydramine, hydroxyzine, or age-appropriate cetirizine, together with an H2-receptor antagonist such as famotidine. • Administration: Administer antihistamines over 10–15 minutes beginning 30 minutes before dinutuximab infusion and repeat every 6 hours during the infusion as needed to maintain prophylactic coverage. Hypertension: • Patients with poorly controlled hypertension should receive appropriate antihypertensive therapy before initiating dinutuximab. • Persistent hypertension that is unresponsive to medical management may require temporary or permanent discontinuation of anti-GD2 therapy to ensure patient safety.
Cabral et al., ²³ 2022	

Appendix 1. Cont.	
Study	Management strategies
Barone et al., ²⁴ 2021	Pain: • Triple Therapy: Use a combination of a nonopioid analgesic, gabapentin, and morphine for aggressive pain management. Fever: • Prophylactic Antipyretics: Administer paracetamol during immunotherapy, particularly in patients with a history of fever during previous treatment cycles. • Metamizole: Administer intermittently or continuously, where approved, for fever prevention. Hypersensitivity Reactions: • Antihistamines: Administer intravenous diphenhydramine or chlorphenamine 20 minutes before each dinutuximab beta infusion, with repeat doses every 4–6 hours as needed. Alternatively, oral antihistamines may be started the day before the infusion and continued throughout treatment. Capillary Leak Syndrome: • Monitoring: Closely monitor blood pressure and body weight. • Fluid Management: Adjust fluid administration or restriction according to the patient's clinical status and institutional protocols. • Diuretics: Use cautiously because of the risk of hypotension. Visual Disturbances: • Corrective Lenses: Temporary corrective glasses may be required for patients with pupillary palsy. • Sunglasses: Recommend sunglasses for patients whose symptoms worsen with sunlight exposure. • 1% Pilocarpine: 1% pilocarpine may help alleviate symptoms. Diarrhea: • Mild Diarrhea: Manage with supportive fluid replacement. • Severe Diarrhea: Treat with loperamide or racecadotril. Neurotoxicity: • Transverse Myelitis: Immediately discontinue the infusion and permanently stop dinutuximab beta therapy. Administer intravenous immunoglobulin and high-dose steroids. Not reported.
Edwards et al., ²⁷ 2024	Neuropathic Pain: • Gabapentin Prophylaxis: Initiate gabapentin three days before each dinutuximab beta cycle (day -3: 10 mg/kg once daily; day -2: 20 mg/kg/day in two divided doses; day -1: 30 mg/kg/day in three divided doses; maximum dose, 300 mg/dose) and continue until completion of the infusion. • Morphine Premedication: Administer morphine before the first and subsequent treatment cycles, particularly during the early phases of therapy, to reduce neuropathic pain.
Balaguer et al., ²⁸ 2023	Anaphylactic Reactions: • Intravenous Antihistamines: Administer antihistamines 20 minutes before the infusion and repeat every 4–6 hours as clinically indicated. Fever: • Antipyretics: Administer metamizole, paracetamol, or ibuprofen (only when platelet counts are within the normal range) to manage fever and other systemic symptoms. Neurologic Toxicity: • Severe Neurotoxicity: Treat with corticosteroids, intravenous immunoglobulin (IVIg), and plasmapheresis when clinically indicated. Ocular Toxicity: • Ophthalmologic Evaluation: Perform a comprehensive ophthalmologic examination before the first treatment cycle and continue monitoring throughout therapy. Hematologic Toxicity: • Monitoring and Supportive Care: Perform regular complete blood count (CBC) monitoring and provide supportive care (e.g., transfusions), as clinically indicated. Hepatotoxicity: • Liver Function Monitoring: Monitor liver function tests regularly and manage abnormalities according to their severity and the patient's clinical status. Nephrotoxicity: • Avoidance of Nephrotoxic Agents: Avoid nephrotoxic medications in patients with renal impairment below grade 3 toxicity. • Continuous Infusion: Consider continuous dinutuximab beta infusion to reduce renal toxicity and minimize pain. Cardiac Toxicity: • Cardiac Monitoring: Assess cardiac function regularly using electrocardiography and manage cardiac abnormalities as clinically indicated. Hyponatremia: • Serum Sodium Monitoring: Monitor sodium concentrations regularly and promptly correct electrolyte abnormalities. Vomiting and Diarrhea: • Antiemetic Prophylaxis: Administer serotonin (5-HT₃) receptor antagonists to prevent chemotherapy-induced nausea and vomiting. • Diarrhea Management: Manage mild diarrhea with oral hydration and supportive care, escalating treatment according to symptom severity.

Appendix 1. Cont.

Study	Management strategies
Nysom et al., ²⁹ 2023	Pain: * Used a multimodal approach incorporating opioid analgesics, ketamine, gabapentin, and other adjuvant agents together with nonpharmacologic interventions.
Aurensanz-Clemente et al., ³⁰ 2023	Myocarditis: * Corticosteroids constitute the first-line therapy for the management of most immune checkpoint inhibitor (ICI)-related toxicities.
Lode et al., ³¹ 2023	Supportive therapy protocols were implemented in accordance with established international and institutional standards. Pain was managed with oral gabapentin and intravenous morphine according to the World Health Organization (WHO) analgesic ladder, providing adequate control of neuropathic and acute infusion-related pain. To prevent fever and manage infusion-related constitutional symptoms, prophylactic antipyretics, including metamizole, acetaminophen, or ibuprofen (when platelet counts were within the normal range), were administered in accordance with institutional protocols. Additionally, intravenous hydration was administered concurrently with dinutuximab beta infusions to reduce the risk of infusion-related hypotension, a commonly reported adverse event associated with anti-GD2 immunotherapy.
Cupit-Link et al., ³² 2023	Not reported.
Görgeş et al., ³³ 2015	Hydromorphone Infusion: • Initiate hydromorphone infusion 1 hour before the ch14,18 infusion. • On day 1 of each treatment cycle, begin at 2 mcg/kg/h and titrate to a maximum of 8 mcg/kg/h. • Adjust the infusion every 30 minutes according to the patient's clinical response. • Taper hydromorphone after the infusion as tolerated and discontinue when the patient reports adequate pain relief. Dexmedetomidine Infusion: • Initiate dexmedetomidine infusion 1 hour before the ch14,18 infusion. • Begin at 0.1 mcg/kg/h and titrate to a maximum of 0.6 mcg/kg/h. • Alternate dose adjustments with hydromorphone titration at 30-minute intervals as clinically indicated. • Discontinue dexmedetomidine 1 hour after completion of the ch14,18 therapy. Gabapentin: • Administer gabapentin as an adjuvant analgesic when additional pain control is required. Pain Assessment: • Assess pain using age-appropriate validated instruments, including: • FLACC (Face, Legs, Activity, Cry, Consolability) scale • Faces Pain Scale-Revised (FPS-R) • Numeric Rating Scale (NRS) • Nurses should document the location, characteristics, and intensity of pain together with relevant clinical observations. Acute Pain Service (APS): • Oversee the administration and adjustment of hydromorphone and dexmedetomidine infusions. • Perform twice-daily patient assessments. • Nursing staff should promptly report physiologic changes to the APS team for timely intervention.
Launspach et al., ³⁴ 2021	Extravasation: * Intravenous Fluid Therapy: Administered to maintain hydration and fluid balance. * Dimethyl Sulfoxide (DMSO): Applied topically to the affected area to minimize tissue injury. * Analgesia with Dipyrone: Administered dipyrone for pain control. * Intravenous Antibiotics: Administered intravenous antibiotics to prevent bacterial superinfection, particularly in severely immunocompromised patients.
Spencer et al., ³⁵ 2020	Not reported.
Wallace et al., ³⁶ 1997	Pain: • Lidocaine: Administered a loading dose of 2 mg/kg over 30 minutes, followed by a continuous infusion at 1 mg/kg/h. • Morphine: Administered a loading dose of 0.1 mg/kg over 30 minutes, followed by a continuous infusion at 0.05–0.1 mg/kg/h.
Anghelescu et al., ³⁷ 2015	Neuropathic Pain: * Opioid Premedication: Used opioids such as morphine, fentanyl, or hydromorphone as premedication to reduce infusion-related pain. • Morphine Loading Dose: Administered a loading dose of 50 mcg/kg immediately before initiation of the ch14,18 infusion. • Continuous Infusion: A continuous morphine infusion at 20–50 µg/kg/h was administered during treatment and maintained for 2 hours after completion of the infusion. • Additional Doses: Additional bolus doses and escalation of the infusion rate were administered as needed based on the patient's clinical response and clinical judgment.

Appendix 1. Cont.	
Study	Management strategies
Bertolizio et al., ³⁸ 2021	Pain: * Morphine or Ketamine Boluses: All pain episodes were effectively managed within 20 minutes with morphine or ketamine boluses. Desaturation (Sato₂ <90%): * Appropriate interventions were implemented to restore and maintain oxygen saturation above 90%. Not reported.
Castel et al., ³⁹ 2010	Pain: Not reported.
Killinger et al., ⁴⁰ 2017	Pain: * Premedication: Use acetaminophen and opioid analgesics such as morphine or hydromorphone. * Systemic Analgesia: Administer systemic analgesia throughout treatment. Capillary Leak Syndrome: * Fluid Management: Carefully monitor and manage fluid balance. * Vasopressors: Administer as needed to maintain blood pressure. Hypersensitivity: * Premedication: Use diphenhydramine and acetaminophen to prevent hypersensitivity reactions. * Rescue Treatment: Ensure the immediate availability of subcutaneous epinephrine and inhaled bronchodilators for severe hypersensitivity or anaphylactoid reactions. Not reported.
Parsons et al., ⁴¹ 2013	Neuropathic Pain: * Pain management should include triple therapy combining gabapentin, nonopioid analgesics, and opioids.
Mastrangelo et al., ⁴² 2021	* Initiate prophylactic oral gabapentin three days before infusion at 10 mg/kg/day, increase to 10 mg/kg twice daily on day 2, and to 10 mg/kg 3 times daily on day 3 (maximum single dose, 300 mg). * Administer an intravenous morphine bolus [0.02–0.05 mg/kg] 2 hours before dinutuximab beta infusion, followed by a continuous infusion at 0.03 mg/kg/h throughout treatment. * Adjust the infusion rate according to the patient's pain response. * If morphine is administered for more than 5 days, taper the dose by approximately 20% per day after completion of therapy. * If neuropathic pain persists after discontinuation of IV morphine, administer oral morphine sulfate [0.2–0.4 mg/kg every 4–6 hours] or tramadol as needed.
	Peripheral Neuropathy: * Temporarily discontinue dinutuximab beta in patients with grade 2 peripheral neuropathy and resume treatment only after neurologic symptoms have resolved. * Permanently discontinue treatment in patients with objective, persistent muscle weakness. * Consider systemic corticosteroid therapy if neurologic symptoms persist for several days.
McGinty et al., ⁴³ 2012	Infusion Reactions: * Before initiating dinutuximab, administer intravenous 0.9% sodium chloride [10 mL/kg] over 1 hour. Twenty minutes before the infusion, administer acetaminophen and an antihistamine such as diphenhydramine. Repeat acetaminophen every 4–6 hours for fever or pain, and repeat antihistamines every 4–6 hours during the infusion as tolerated. Monitor patients for infusion-related reactions throughout treatment and for at least 4 hours after completion of the infusion.
	Pain: * To prevent infusion-related pain, administer intravenous morphine sulfate at 50 µg/kg before dinutuximab. Continue morphine infusion at 20–50 mg/kg/h during the dinutuximab infusion and for 2 hours after its completion. If pain persists, administer morphine boluses or consider adjunctive gabapentin or lidocaine.
Kushner et al., ⁴⁴ 2022	Pain, Urticaria, and Cough: * Full doses were administered during the second and third infusions in each treatment cycle, with the infusion duration extended to 4 hours.
Mueller et al., ⁴⁵ 2018	Pain: Intravenous Morphine: * Cycle 1: Continuous intravenous morphine was administered at 30 µg/kg/h beginning on day 8 and continued as clinically indicated. * Cycle ≥2: Morphine was administered as needed according to the patient's clinical response. Oral Gabapentin: * Administered according to the following schedule: • Day 5: 10 mg/kg/day (single dose) • Day 6: 10 mg/kg twice daily • Days 8–15 (or longer if clinically indicated): 10 mg/kg three times daily Metamizole: * Administered continuously at 80 mg/kg/day from days 8–15 or longer, according to clinical need. Adverse effects were largely confined to the 4-day infusion period and were managed with standard premedication and analgesic protocols.
Navid et al., ⁴⁶ 2014	

Appendix 1. Cont.

Study	Management strategies
Ari et al., ⁴⁷ 2018	Neuropathic Pain: * Premedication: Patients received opioid premedication with morphine, fentanyl, or hydromorphone according to institutional protocols. * Oral Gabapentin: Oral gabapentin was administered according to a predefined dosing schedule to manage neuropathic pain. Nausea and Vomiting: * Ondansetron: Administered on a scheduled basis to prevent nausea and vomiting. * Lorazepam: Administered as needed for breakthrough nausea. Pruritus: * Naloxone Infusion: Naloxone infusion was administered as needed in conjunction with nurse-controlled or patient-controlled opioid analgesia (NCA/PCA) to counteract pruritus. * Topical Treatments: Moisturizers and anti-itch creams were applied as needed. Fever: * Acetaminophen: Acetaminophen was administered for the prevention and management of fever. * Antipyretics: Additional antipyretics, including metamizole or ibuprofen, were administered when required and when platelet counts were within the normal range. Hypotension: * IV Fluid Boluses: Intravenous fluid boluses were administered to prevent and manage hypotension during ch14.18 infusion. Anaphylaxis Prevention: * Diphenhydramine and Acetaminophen: Diphenhydramine and acetaminophen were administered to reduce the risk of anaphylactic reactions. Fever: * Broad-Spectrum Antibiotics: Administered after blood culture collection to treat potential underlying infections contributing to febrile episodes. Diarrhea: * Prophylactic Cefixime: Used to prevent irinotecan-induced diarrhea. * Loperamide: Administered to patients with diarrhea to reduce its frequency and severity. Tachycardia: * Propranolol: Initiated based on cardiac assessment findings to manage elevated heart rate. Pain Management: * Gabapentin: Oral gabapentin was administered at 15 mg/kg/day in 3 divided doses beginning 3 days before dinutuximab beta (DB) infusion. * Acetaminophen (Paracetamol): Oral acetaminophen (paracetamol) was administered at 60 mg/kg/day in 4 divided doses (maximum, 4 g/day). * Morphine: Administered intravenously at 10 mg/kg/hour, beginning 1–2 hours before the start of the DB infusion. Nausea and Vomiting: * Ondansetron and Lorazepam: Prescribed as scheduled and as-needed medications to prevent and control chemotherapy-induced nausea and vomiting. Adverse events, including capillary leak syndrome, mild-to-moderate pain, and allergic reactions, were largely manageable with supportive care. Close patient monitoring and supportive interventions, including optimization of hydration, pain management, supplemental oxygen, and antiallergic therapy, helped mitigate dinutuximab beta-associated adverse events. Transverse Myelitis: Case 1: • Initial Therapy: Intravenous dexamethasone pulse (10 mg) was administered initially, followed by 4 mg every 6 hours for 48 hours. • High-Dose Steroids: Methylprednisolone (20 mg/kg/day) was administered for 5 consecutive days. • Oral Corticosteroids: Oral prednisone was gradually tapered over 3 weeks. • Plasmapheresis: Five sessions of single-volume exchange plasmapheresis were performed. Case 2: • Initial Therapy: High-dose intravenous methylprednisolone (30 mg/kg/day) was administered for 5 days. • Subsequent Treatment: Methylprednisolone was then continued at 2 mg/kg/day with gradual weekly tapering. Case 3: • Initial Therapy: Methylprednisolone (30 mg/kg) was administered within 6 hours of symptom onset. • Subsequent Treatment: Treatment was continued with methylprednisolone at 2 mg/kg/day followed by gradual weekly tapering. • Adjunctive Therapy: Intravenous immunoglobulin was administered at a dose of 2 g/kg over five days. Pain: * Dinutuximab-associated neuropathic pain was managed with a combination of intravenous lidocaine infusion and morphine. Mydriasis and Impaired Accommodation: * Hu14.18K322A was administered intravenously over 4 hours daily for 4 consecutive days every 28 days.
Olgun et al., ⁴⁸ 2022	
Achbergerová et al., ⁴⁹ 2022	
Ding et al., ⁵⁰ 2017	
Featherly et al., ⁵¹ 2022	
Tse et al., ⁵² 2015	

Commentary on “Determining the Relationship Between Compassion Fatigue and Emotion Regulation Skills in Nurses”

Dear Editor,

I read with great interest the recent article by Dinç and Onan,¹ “*Determining the Relationship Between Compassion Fatigue and Emotion Regulation Skills in Nurses*,” published in the *Journal of Education and Research in Nursing*.¹ This study provides valuable insights into the relationship between emotion regulation skills and compassion fatigue, with important implications for nurses’ well-being and the quality of patient care.

The authors reported a strong negative correlation between emotion regulation skills and compassion fatigue, indicating that nurses with better emotion regulation skills experienced lower levels of compassion fatigue. These findings are consistent with previous research identifying ineffective emotional coping as a key contributor to burnout and psychological distress among healthcare professionals.² The study is particularly relevant in the post-pandemic context, in which many nurses continue to experience heavy workloads, moral distress, and repeated exposure to traumatic events, all of which increase their vulnerability to compassion fatigue.

The existing literature indicates that compassion fatigue is a global concern, with systematic reviews reporting moderate levels of compassion fatigue among nurses across a variety of healthcare settings.³ These findings underscore the need for continued efforts to prevent and manage compassion fatigue through evidence-based interventions. Although the study by Dinç and Onan¹ makes an important contribution to the literature, several limitations warrant consideration. First, the cross-sectional design precludes causal inference. It remains unclear whether poor emotion regulation contributes to compassion fatigue, whether prolonged compassion fatigue impairs emotion regulation, or whether the relationship is bidirectional. Longitudinal and intervention studies are needed to clarify these relationships. Second, the reduced participation rate resulting from pandemic-related restrictions may limit the generalizability of the findings, particularly in post-pandemic healthcare settings. Third, the study did not account for organizational factors, such as workload management, institutional support, or employee wellness programs, all of which have been shown to mitigate compassion fatigue among healthcare professionals.⁴

The authors also reported higher levels of compassion fatigue among divorced nurses, suggesting that limited social support may contribute to greater emotional exhaustion. This finding deserves further investigation, particularly because resilience and social support have been shown to protect healthcare professionals from emotional strain.⁴

Finally, I support the authors’ recommendation for targeted educational interventions. Mindfulness-based and emotion regulation interventions have been shown to improve coping abilities and reduce emotional distress. Incorporating these approaches into routine in-service education may strengthen nurses’ resilience and help sustain compassionate care.⁵

Future research should also prioritize longitudinal and intervention studies examining emotion regulation, resilience, and social support, as these factors have been associated with reduced compassion fatigue among nurses.²

In conclusion, the study by Dinç and Onan¹ advances our understanding of the relationship between emotion regulation and compassion fatigue among nurses. Future research incorporating longitudinal designs and organizational-level interventions is needed to inform the development of comprehensive occupational health strategies that promote nurses’ well-being.

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 Anchal Thakur,¹  Kamna Naryal²

¹Department of Physiotherapy, GNA University,
Phagwara-Hoshiarpur Road, Punjab, India

²Adarsh College of Nursing, Punjab, India

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Corresponding author: Anchal Thakur

E-mail: anchalthakur78760@gmail.com

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