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AIM AND SCOPE

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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), EmCare (2025), Scopus (coverage from 2022; indexed in 2026) and the Web of Science Core Collection – Emerging Sources Citation Index (ESCI) (coverage from 2024; indexed in 2026).

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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INSTRUCTIONS TO AUTHORS

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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 health-care 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.

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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 Alassisted 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.

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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.

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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.

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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.

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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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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-recommen-dations.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.

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.

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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.

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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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JERN Journal of Education and Research in Nursing

EDITORIAL

Dear Readers,

We are pleased to share with you the 2026 Issue 4 (Volume 23, Issue 4, December 2026) of the Journal of Education and Research in Nursing.

As the Journal of Education and Research in Nursing (JERN), we are proud to have reached a significant milestone in our journey of scientific publishing. The inclusion of our journal in Scopus (coverage from 2022; indexed in 2026) and the Web of Science Core Collection – Emerging Sources Citation Index (ESCI) (coverage from 2024; indexed in 2026) represents a major achievement in strengthening our international visibility and the accessibility of our scientific publications. This accomplishment reflects not only our journal's continued progress toward international standards of scholarly publishing but also our commitment to making scientific knowledge generated in the field of nursing accessible to a broader international research community. We extend our sincere gratitude to our authors, reviewers, editorial board members, publisher, and all stakeholders whose valuable contributions have made this achievement possible.

The significance of this important milestone in strengthening our international scientific visibility is further reinforced by the diversity of research published in the current issue and its contributions to addressing contemporary challenges in nursing. The studies featured in our December 2026 issue focus on key priorities in the nursing profession, including innovative approaches to nursing education, cultural competence and global citizenship, patient safety, infection prevention, disaster preparedness, quality of clinical care, and the needs of family caregivers. In particular, research addressing virtual exchange programs, peer-supported education, earthquake preparedness, the safe intrahospital transport of critically ill patients, and the unmet supportive care needs of family caregivers of patients with cancer highlights the broad scope of nursing, extending from education to clinical practice and from individual care to social responsibility. We believe that these scientific contributions will provide a valuable foundation for advancing evidence-based nursing practice and shaping the future of nursing care.

I am pleased to announce that our journal is indexed in the databases of 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), EmCare (2025), SCOPUS (Coverage from 2022; indexed in 2026), and Web of Science - ESCI (coverage from 2024; indexed in 2026), and we are working to publish our journal within the framework of international academic publishing standards. The studies with a high level of evidence from you have been instrumental in achieving these goals, and we know how important the valuable contributions of our journal's stakeholders, our readers, editors, managing director, and advisory board members are.

In our December 2026 issue, we present 14 original articles. The titles of the contributions are as follows:

The original articles are titled "Knowledge, attitudes, and practices of nurses regarding the decontamination and sterilization of surgical instruments and devices across five provinces: a descriptive analysis", "Peer-supported education for pediatric medication administration: effects on nursing students' knowledge and self-efficacy", "Changes in nursing students' attitudes toward children with disabilities following clinical practice: a quasi-experimental study", "Parental readiness for discharge and home care of premature infants: a comparison of mothers and fathers", "A virtual exchange educational intervention to enhance cultural competence, leadership, and global citizenship in nursing education", "Validity and reliability of the Turkish version of the nurses' spiritual sensitivity scale: a methodological and descriptive study", "Infection Prevention Appraisal Scale (IPAS): cultural adaptation and psychometric properties of the Turkish version", "Nursing students' clinical placement experiences across healthcare settings: a ten-year repeated cross-sectional study", "Effectiveness of an educational program in enhancing preparedness for large-scale earthquakes among Japanese university students: a randomized controlled trial", "Evaluation of nursing students' knowledge of incident scene triage", "The hidden patients of oncology: unmet supportive care needs and caregiving burden among family caregivers of adults receiving chemotherapy", "Intrahospital Transport of critically ill patients: surgical nurses' perspectives on patient safety and associated risk factors", "Turkish adaptation of the cyber hygiene inventory for nursing students: a validity and reliability study", and "The relationship between coping with premenstrual syndrome and self-care agency among female university students".

I would like to express my endless thanks to our authors who have contributed to presenting the updated information obtained from the results of their studies to our readers in order to provide quality and safe nursing care services to society, to the members of the editorial board who have contributed to the publication of our journal, and to the members of the advisory board who have carefully evaluated each article.

"There are no boundaries or restrictions for science and knowledge."

Mustafa Kemal Atatürk

Kind regards,

Prof. Sevilay Şenol Çelik, PhD, RN

JERN Journal of Education and Research in Nursing

Original Article

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Knowledge, Attitudes, and Practices of Nurses Regarding the Decontamination and Sterilization of Surgical Instruments and Devices Across Five Provinces: A Descriptive Analysis

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Abstract

Background: Proper decontamination, disinfection, and sterilization of surgical instruments and medical devices are essential for preventing healthcare-associated infections.

Aim: This study aimed to assess nurses' knowledge, attitudes, and practices regarding decontamination, disinfection, and sterilization procedures and to examine the relationships among these domains.

Methods: This descriptive, cross-sectional study was conducted in 2025 and included 154 nurses working in hospitals across five provinces. Data were collected using a Sociodemographic Characteristics Form and a structured questionnaire comprising knowledge (25 items), attitude (10 items), and practice (10 items) subscales. Total scores ranged from 0 to 45. Data were analyzed using descriptive statistics, comparative analyses, reliability analysis, and correlation analysis. A p value <0.05 was considered statistically significant.

Results: The majority of participants were female and held a bachelor's degree. The questionnaire demonstrated excellent internal consistency (Cronbach's alpha=0.91). Statistically significant positive correlations were observed among nurses' knowledge, attitude, and practice scores (p<0.001). Higher educational attainment, employment in a sterilization unit, prior training on sterilization processes, and longer professional experience were associated with significantly higher scores (p<0.05). No significant differences were found according to gender, age, or work pattern.

Conclusion: Higher levels of knowledge were associated with more positive attitudes and higher practice scores related to sterilization processes. The findings may help identify priority areas for future educational and organizational initiatives aimed at improving sterilization practices.

Keywords: Attitude, decontamination, knowledge, nurse, practice, sterilization

Introduction

Surgical procedures are among the most frequently performed invasive interventions in modern healthcare. Surgical instruments and devices used during these procedures can serve as vehicles for the transmission of infectious agents to patients. Consequently, proper decontamination, disinfection, and sterilization of surgical instruments and devices are fundamental components of infection prevention and control.[1,2] Guidelines issued by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) emphasize that appropriate decontamination and sterilization before the reuse of medical devices are essential for ensuring patient safety.[3]

Surgical site infections (SSIs), one of the most common types of healthcare-associated infections (HAIs), pose a substantial threat to patient safety. A substantial proportion of HAIs have been attributed to surgical site infections.[1,4] These infections are associated with prolonged hospital stays, increased morbidity and mortality, and considerable economic burden on healthcare systems.[1,4] Preventing SSIs depends not only on the effective sterilization of medical devices but also on the knowledge, attitudes, and practices of healthcare professionals responsible for performing these procedures.[5]

Studies conducted in various countries have reported high rates of SSIs, with inadequate cleaning and sterilization of reusable medical devices identified as important contributing factors.[6-8] Likewise, studies conducted in primary and secondary public hospitals have reported high rates of steam sterilization failures and poor adherence to recommended protocols for medical device reprocessing and sterilization.[9,10] Effective sterilization requires healthcare professionals to possess adequate knowledge of each stage of the decontamination and sterilization process.

Nurses, particularly those working in operating rooms and Central Sterile Supply Departments (CSSDs), play a pivotal role in the decontamination and sterilization of surgical instruments and devices. Errors at any stage of the reprocessing cycle may compromise sterility and place patients at increased risk of infection. Therefore, nurses must maintain current knowledge of infection prevention principles, adhere to standardized sterilization protocols, and demonstrate positive attitudes toward these practices.[11] However, studies conducted in Türkiye have shown that nurses' knowledge regarding SSI prevention and sterilization practices remains below the desired level and that educational needs in this area are not adequately

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addressed.[12,13] Similarly, other studies have reported only moderate compliance with infection prevention practices, with insufficient knowledge and inadequate training identified as major barriers to optimal performance.[14]

As part of national initiatives to improve healthcare quality in Türkiye, infection prevention and the sterilization of medical devices are recognized as key quality indicators.[15,16] Guidelines issued by the Ministry of Health recommend that sterilization and decontamination processes be performed in accordance with established standards, by appropriately trained personnel, and under continuous quality monitoring.[17,18] Despite these recommendations, studies evaluating nurses' knowledge, attitudes, and practices related to decontamination and sterilization remain limited. International evidence likewise suggests that nurses may have gaps in their knowledge of medical device reprocessing and that adherence to recommended practices can be improved through structured education, ongoing supervision, and continuous professional development.[19,20] Taken together, these findings underscore the importance of evaluating nurses' knowledge, attitudes, and practices regarding decontamination and sterilization, given their critical role in infection prevention and control. Therefore, this study aimed to assess nurses' knowledge, attitudes, and practices regarding the decontamination and sterilization of surgical instruments and devices.

Study Questions

1. What are nurses' levels of knowledge, attitudes, and practices regarding the decontamination and sterilization of surgical instruments and devices?
2. Is there a relationship among nurses' knowledge, attitudes, and practices regarding the decontamination and sterilization of surgical instruments and devices?
3. Do nurses' knowledge, attitudes, and practices differ according to their sociodemographic and professional characteristics?
4. How do training and professional experience influence nurses' knowledge, attitudes, and practices regarding the decontamination and sterilization of surgical instruments and devices?

Materials and Methods

Study Design

This descriptive, correlational, cross-sectional study was conducted to evaluate nurses' knowledge, attitudes, and practices regarding the decontamination and sterilization of surgical instruments and devices.

Study Setting and Sample

The study was conducted between July and October 2025 among nurses working in operating rooms and sterilization units at one training and research hospital in Karabük, one training and research hospital in Ankara, one research and training hospital in Eskişehir, one training and research hospital in Kastamonu, and one private hospital in İzmir. These provinces were selected based on accessibility and feasibility, as the researchers had direct access to the participating healthcare institutions. The target population consisted of approximately 154 operating room and CSSD nurses employed at the participating hospitals during the study period.

The minimum required sample size was estimated based on the correlation analyses specified in the study objectives. Assuming a two-tailed test, a medium effect size (r=0.30), a significance level of α=0.05, and 80% statistical power, the minimum required sample size was calculated as 84 participants. The final sample of 154 nurses therefore exceeded the minimum sample size required for the planned analyses. All eligible nurses who voluntarily agreed to participate were invited to participate. Initially, 179 nurses completed the questionnaire. Data from 20 nurses who participated in the pilot study and five questionnaires with incomplete responses were excluded. Consequently, data from 154 nurses were included in the final analyses.

The inclusion criteria were employment as an operating room or CSSD nurse, at least six months of work experience in the relevant unit, voluntary participation, and completion of the questionnaire in its entirety. Nurses who were absent during the data collection period because of leave, illness, or other reasons were excluded.

Data Collection Instruments

Data were collected using a structured questionnaire developed by the researchers based on the relevant literature.[21-25] The questionnaire consisted of two sections. The first section collected participants' sociodemographic characteristics, whereas the second assessed their knowledge, attitudes, and practices regarding the decontamination and sterilization of surgical instruments and devices.

Sociodemographic Characteristics Form: This section consisted of 16 questions covering participants' demographic characteristics, including age, gender, educational level, years of professional experience, and work unit. One open-ended question asked, "What are the greatest challenges you encounter regarding sterilization?" Responses were categorized to identify the most frequently reported challenges experienced by nurses during the sterilization process (Table 1).

Knowledge, Attitude, and Practice Questionnaire: The questionnaire consisted of 45 items, including 25 knowledge items (Cronbach's alpha=0.887), 10 attitude items (Cronbach's alpha=0.772), and 10 practice items (Cronbach's alpha=0.846). The overall Cronbach's alpha coefficient for the questionnaire was 0.92. Items were rated using three response options: Yes, No, and Not sure. The Not sure response was treated as a neutral response and excluded from scoring. The knowledge section also included open-ended questions designed to assess participants' understanding of key sterilization parameters. Participants were asked to report the sterilization temperature used in their hospital's autoclaves, the recommended sterilization time for medical devices (micromotors) at that temperature, and the maximum storage duration for wrapped sterile medical devices under standard conditions. Responses were scored as 1 for correct answers and 0 for incorrect answers.

The knowledge section also included items assessing participants' ability to identify the appropriate reprocessing method for selected medical devices, including otoscope tips, scalpel handles, and thermometers. Participants selected the appropriate method (cleaning, disinfection, or sterilization) for each item. Correct responses were scored as 1 and incorrect responses as 0.

Each participant's total knowledge score was calculated by summing the number of correct responses, with higher scores indicating greater knowledge. Consistent with previous studies, responses of Yes were scored as 1, indicating correct or positive knowledge, attitudes, or practices, whereas No responses were scored as 0, indicating incorrect or negative knowledge, attitudes, or practices.[14,22-24]

Content validity was established before the pilot study using the Lawshe method based on evaluations from six academic experts in the field. Given the relatively small expert panel, content validity was interpreted according to expert consensus. Following expert review, the revised questionnaire was pilot-tested with 20 nurses who were not included in the main study. The reliability was subsequently evaluated using Cronbach's alpha coefficients calculated from the data collected in the main study.

Ethical Considerations

Ethical approval was obtained from Karabük University Non-interventional Clinical Research Ethics Committee (Approval Number: 2025/2326, Date: 23.05.2025), and institutional permission was obtained from the participating hospitals before data collection. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Collection

The questionnaire was converted into a Google Forms survey, and the survey link was distributed via WhatsApp. Participants were able to complete the online questionnaire only once. Paper-based questionnaires were also distributed by the researchers after explaining the purpose of the study, emphasizing that participation was voluntary, and informing participants of their right to withdraw at any time without consequence. Written informed consent was obtained from all participants before participation. Completion of the questionnaire required approximately 10–15 minutes, and participants were asked to answer all items.

Statistical Analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as means, standard deviations, minimum values, and maximum values, whereas categorical variables are presented as frequencies and percentages. Welch's t-test was used to compare two groups, and one-way analysis of variance (ANOVA) was used for comparisons among three or more groups. Bonferroni post hoc tests were performed to identify pairwise differences. Internal consistency was evaluated using Cronbach's alpha coefficients. Relationships among

Table 1. Participant characteristics (n=154)

Variable	Category	n (%)
Province	Karabük	35 (22.73)
	Eskişehir	35 (22.73)
	Ankara	33 (21.43)
	Kastamonu	26 (16.88)
	İzmir	25 (16.23)
Gender	Female	118 (76.6)
	Male	36 (23.4)
Age (years)	20–25	9 (5.84)
	26–30	21 (13.64)
	31–35	28 (18.18)
	36–40	14 (9.09)
	41–45	34 (22.08)
	46–50	12 (7.79)
	≥50	36 (23.38)
Educational level	High school	9 (5.87)
	Associate degree	20 (12.98)
	Bachelor's degree	113 (73.37)
	Master's degree	10 (6.49)
	Doctorate	2 (1.29)
Professional experience	1–3 years	23 (14.93)
	4–7 years	11 (7.15)
	8–11 years	85 (55.19)
	12–15 years	30 (19.48)
	16–19 years	5 (3.25)
Current work unit	Operating room	96 (62.34)
	CSSD	58 (37.66)
Experience in OR/CSSD	1–3 years	65 (42.21)
	4–7 years	42 (27.27)
	8–11 years	33 (21.43)
	12–15 years	11 (7.14)
	16–19 years	3 (1.95)
Work schedule	Rotating day/night shifts	79 (51.3)
	Day shifts only	75 (48.7)
Position	Staff nurse	144 (93.51)
	Charge nurse	10 (6.49)
Received sterilization training	Yes	113 (73.38)
	No	41 (26.62)
Source of sterilization training	In-service training	97 (62.34)
	Course	40 (25.97)
	Other	17 (11.69)
Received infection control training	Yes	109 (70.78)
	No	45 (29.22)
OR/CSSD certification	Yes	93 (60.39)
	No	61 (39.61)
Compliance with sterilization standards	Always	127 (82.47)
	Most of the time	27 (17.53)
Main challenge	None	7 (4.54)
	Poor material quality	3 (1.94)
	Heavy workload, high work intensity, and shortages of personnel or equipment	125 (81.17)
	Communication problems	10 (6.5)
	Occupational accidents	3 (1.95)
	Instrument tracking and delivery	4 (2.6)
	Insufficient education or training	2 (1.3)
Interested in additional training	Yes	100 (64.94)
	No	54 (35.06)

Table 2. Knowledge, attitude, and practice scores

Subscale	Items	Mean±SD	Min–max
Knowledge	25	18.67±5.45	0–25
Attitude	10	9.41±1.35	0–10
Practice	10	7.91±2.53	0–10
Total	45	35.99±8.16	0–45

Values are presented as mean±standard deviation (SD).

knowledge, attitude, and practice scores were examined using Pearson's correlation analysis. A p value <0.05 was considered statistically significant.

Results

Of the 154 nurses included in the study, 22.73% were employed in hospitals located in Karabük and Eskişehir, 21.43% in Ankara, 16.88% in Kastamonu, and 16.23% in İzmir. Most participants were female (76.6%) and held a bachelor's degree (73.37%). Regarding professional characteristics, 55.19% had 8–11 years of overall professional experience, 62.34% worked in operating rooms, and 42.21% had 1–3 years of experience in operating rooms or Central Sterile Supply Departments. More than half of the participants worked rotating day–night shifts (51.3%), and 6.49% held charge nurse positions.

Most nurses reported having received training in sterilization (73.38%), primarily through institutional in-service education programs (62.34%). In addition, 70.78% had received infection prevention and control training, and 60.39% held certification in operating room or sterilization nursing. The majority reported always complying with standards for the sterilization of surgical instruments (82.47%). The most frequently reported challenges were heavy physical workload, high work intensity, and shortages of personnel and equipment (81.17%). Furthermore, 64.94% expressed a desire to receive additional training on sterilization and decontamination processes (Table 1).

Nurses' knowledge, attitude, and practice scores regarding decontamination and sterilization are presented as mean ± standard deviation. The mean knowledge score was 18.67±5.45 (range: 0–25), the mean attitude score was 9.41±1.35 (range: 0–10), and the mean practice score was 7.91±2.53 (range: 0–10). The overall mean total score was 35.99±8.16 (range: 0–45) (Table 2).

Group comparisons demonstrated statistically significant differences in knowledge scores according to educational level (p=0.013), with nurses holding bachelor's degrees achieving higher scores than those with lower educational attainment. Nurses working in CSSDs also had significantly higher knowledge scores than those working in operating rooms (p=0.024). Likewise, nurses with at least five years of experience in operating rooms or CSSDs demonstrated significantly higher knowledge scores than those with less experience (p=0.041). Participants who had received sterilization training scored significantly higher than those who had not (p=0.001). No statistically significant differences were observed for the remaining variables; therefore, these findings are not presented in tabular form (Table 3).

Table 3. Factors associated with knowledge scores

Variable	Statistical test	p	Effect size
Educational level*	F≈4.28	0.013	η^2≈0.07
Current work unit*	F≈3.96	0.024	η^2≈0.06
Experience in OR/CSSD**	t≈2.05	0.041	d≈0.39
Sterilization training**	t≈3.46	0.001	d≈0.68

*: One-way analysis of variance (ANOVA) with Bonferroni post hoc test, **: Welch's t-test.
OR: Operating room, CSSD: Central Sterile Supply Department.

Pearson's correlation analysis demonstrated statistically significant positive correlations between knowledge and attitude scores (r=0.619, p<0.001), knowledge and practice scores (r=0.579, p<0.001), and attitude and practice scores (r=0.536, p<0.001). These findings indicate that higher knowledge scores were associated with more positive attitudes and higher practice scores (Table 4).

The findings of this study highlight several important patterns in nurses' knowledge, attitudes, and practices regarding decontamination and sterilization. These findings are discussed in the context of previous research to better understand their clinical and organizational implications.

Discussion

In this study, knowledge, attitude, and practice scores did not differ significantly according to demographic characteristics, including gender, age, and work schedule. Although most participants were female, the absence of gender-based differences suggests that knowledge and practices related to decontamination and sterilization are comparable across genders. This finding is consistent with a study conducted in Iraq, which reported no significant associations between nurses' knowledge of sterilization and the reuse of medical devices and either age or gender.[25] These findings suggest that nurses' knowledge, attitudes, and practices regarding decontamination and sterilization are influenced more by professional education, clinical setting, and work experience than by demographic characteristics.

In contrast, educational level, work setting, sterilization training, and years of experience in operating rooms or CSSDs were significantly associated with knowledge scores. Nurses holding bachelor's degrees, working in CSSDs, having received sterilization training, and possessing longer professional experience achieved higher knowledge scores. These findings underscore the importance of formal education, specialized training, and workplace experience in improving competence related to sterilization and infection prevention. Similar findings have been reported in Bangladesh, where educational level and training were positively associated with healthcare workers' knowledge, attitudes, and practices regarding sterilization and disinfection.[26] Nevertheless, because most participants in the present study held bachelor's degrees, the influence of educational level should be interpreted cautiously. Future studies including more balanced educational groups would help clarify this relationship.

Although participants demonstrated relatively high knowledge levels and highly positive attitudes, practice scores were comparatively lower. This finding supports previous reports describing a gap between healthcare professionals' knowledge and their actual clinical practice.[21] Similar studies have shown that adequate knowledge and favorable attitudes do not necessarily translate into consistent adherence to recommended sterilization practices.[8,27] Significant positive correlations were observed between knowledge and attitudes (r=0.619), knowledge and practices (r=0.579), and attitudes and practices (r=0.536). These findings indicate that higher knowledge scores were associated with more positive attitudes and higher practice scores.

However, the relatively weaker association between attitudes and practices indicates that practice is influenced by factors beyond individual beliefs and intentions. This interpretation is supported by participants' reports that heavy workload, staff shortages, and insufficient equipment were the most common barriers to effective sterilization. These findings emphasize the importance of organizational and systemic factors in determining adherence to recommended sterilization procedures.[27]

Table 4. Correlations among knowledge, attitude, and practice scores

Variable	Knowledge	Attitude	Practice
Knowledge	1	r=0.619 p=0.001	r=0.579 p=0.001
Attitude	r=0.619 p=0.001	1	r=0.536 p=0.001
Practice	r=0.579 p=0.001	r=0.536 p=0.001	1

Pearson's correlation coefficients (r) are presented. All correlations were statistically significant (p<0.01).

Consistent with previous research, inadequate staffing, excessive workload, insufficient supervision, and limited availability of equipment remain important barriers to optimal sterilization practices. These findings suggest that efforts to strengthen sterilization safety may need to consider not only theoretical knowledge but also organizational factors, including workload, staffing, equipment availability, training opportunities, and quality monitoring.

Limitations

This study has several limitations. First, its cross-sectional design precludes the establishment of causal relationships among knowledge, attitudes, and practices. Second, because the findings were based on self-reported data, responses may have been influenced by social desirability bias. These limitations should be considered when interpreting the results.

Conclusion

This study demonstrated that sterilization safety requires attention to nurses' knowledge, attitudes, and practices. Although nurses demonstrated generally adequate knowledge and positive attitudes, gaps were identified in the consistent application of recommended sterilization practices. Knowledge scores were associated with educational level, work setting, previous sterilization training, and professional experience, while practice scores varied according to work setting and sterilization training. The findings therefore highlight specific areas and groups that may warrant greater attention in efforts to improve sterilization practices.

These findings may help identify priorities for future educational and organizational initiatives, particularly for nurses without prior sterilization training and those working outside dedicated sterilization units. However, because of the descriptive and cross-sectional design of the study, the effectiveness of specific educational or organizational interventions cannot be inferred from the present findings. Future studies using multicenter, interventional, and longitudinal designs are needed to evaluate strategies for improving sterilization knowledge and practices and to further clarify the relationships among knowledge, attitudes, and practices.

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Peer-Supported Education for Pediatric Medication Administration: Effects on Nursing Students' Knowledge and Self-Efficacy

Abstract

Background: Limited opportunities for clinical practice leave nursing students feeling unprepared to administer pediatric medications safely. Peer education may enhance learning by promoting active participation and engagement.

Aim: This study aimed to examine the effects of a Peer Education Program on Pediatric Medication Administration on nursing students' knowledge and self-efficacy.

Methods: This randomized controlled trial included 62 third-year nursing students (experimental group=30; control group=32). The experimental group received peer education, whereas the control group received traditional classroom instruction. Data were collected using a Sociodemographic Information Form, the Medication Administration Self-Efficacy Scale in Children, and the Pediatric Medication Administration Knowledge Test. Pretest–posttest data were analyzed using independent- and dependent-samples t tests.

Results: Most participants had not previously received training in pediatric medication administration (93.5%), and the majority reported limited experience with pediatric medication administration (93.5%). The experimental group's mean posttest knowledge score (87.33±12.29) was significantly higher than that of the control group (68.75±19.30; p<0.001). The increase in knowledge from pretest to posttest was also greater in the experimental group. Similarly, posttest self-efficacy scores were higher in the experimental group (71.26±6.94) than in the control group (54.71±12.16; p<0.001).

Conclusion: Peer education effectively improves nursing students' knowledge of pediatric medication administration and their self-efficacy. Integrating peer education into nursing curricula may enhance clinical competence and contribute to safer medication administration practices.

Keywords: Medication administration, nursing students, pediatric nursing, peer education, self-efficacy

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Introduction

Medication errors are a major threat to patient safety and may result in serious morbidity and mortality, particularly among pediatric patients.[1] Children are more vulnerable to medication errors than adults because of differences in pharmacokinetic and pharmacodynamic characteristics, the complexity of weight-based dose calculations, and communication limitations.[2] According to a recent prospective observational study conducted among pediatric nurses, the most frequently observed medication administration errors included incorrect intravenous rate or duration (44.8%), incorrect solvent or diluent volume (35.5%), use of an incorrect solvent or diluent (16.2%), wrong-time administration (12.2%), wrong-dose administration (3.9%), and wrong-route administration (3.9%).[3] These errors can prolong treatment, increase healthcare costs, and negatively affect patient outcomes and satisfaction.[1-3]

Nurses play a central role in ensuring the accurate, safe, and timely administration of medications.[3] Therefore, it is essential that nursing students acquire adequate knowledge and skills in medication administration before graduation. Previous studies have reported high rates of medication errors among nurses, highlighting the need for educational programs on medication administration to be continuously developed and updated.[2-5] Furthermore, nursing students often report low self-efficacy in performing invasive procedures and considerable anxiety about making errors during clinical practice.[6] Structured and repetitive simulation-based training has been recommended to bridge the gap between theoretical knowledge and clinical practice, reduce students' anxiety, and improve medication administration skills. Nursing students who lack simulation-based learning opportunities frequently report feeling professionally unprepared and experience difficulty translating theoretical knowledge into clinical practice.[7] In a study conducted by Bowling[8] in 2015, simulation training was found to improve clinical skills; however, a substantial proportion of students still failed to verify patient identity or administer medications safely following the training. This finding highlights the need for repeated, practice-based educational strategies.

Peer education has emerged as an effective, evidence-based teaching approach in nursing education.[9] It is an educational process in which individuals of similar educational or professional levels exchange knowledge, skills, and experiences. Because peers do not occupy hierarchical roles and typically communicate using similar language and shared experiences, peer education fosters a collaborative learning environment.[10] Previous studies have demonstrated that peer education improves nursing students' clinical competence, communica-

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tion skills, self-efficacy, and professional confidence.[11] In pediatric clinical settings, peer mentoring has also been shown to facilitate students' adaptation to the clinical environment, reduce practice-related anxiety, and enhance competence in safe medication administration.

Although previous studies have examined the contribution of peer education to nursing education, randomized controlled trials evaluating its effects on both knowledge and self-efficacy related to pediatric medication administration remain limited.[10,11] Given the high risk of medication errors in pediatric care and the substantial anxiety experienced by nursing students during medication administration, further research is needed.[2,6] Therefore, this randomized controlled trial was conducted to examine the effects of a peer education program on pediatric medication administration on nursing students' knowledge and self-efficacy.

Research Hypotheses

H1: Nursing students who participate in the Peer Education Program on Pediatric Medication Administration will have significantly higher Medication Administration Self-Efficacy Scale in Children for Nursing Students scores after the intervention than before the intervention.

H2: Nursing students who participate in the Peer Education Program on Pediatric Medication Administration will have significantly higher Medication Administration Self-Efficacy Scale in Children for Nursing Students scores than those who receive traditional classroom instruction.

H3: Nursing students who participate in the Peer Education Program on Pediatric Medication Administration will demonstrate a significantly greater increase in Pediatric Medication Administration Knowledge Test scores from pretest to posttest than those who receive traditional classroom instruction.

Materials and Methods

Design

This randomized controlled trial was conducted between February and July 2024.

Sample

The study population comprised third-year nursing students enrolled in the pediatric nursing course at a university during the 2023–2024 academic year. The study sample consisted of students who met the inclusion criteria. Because the study included all eligible students enrolled in the course during the study period, an a priori sample size calculation was not performed. A total of 68 students were enrolled in the pediatric nursing course during the study period. After applying the inclusion and exclusion criteria, 64 eligible students were randomly assigned to the experimental or control group using stratified randomization. Following the withdrawal of two participants, the study was completed with 62 students. A post hoc power analysis was conducted based on the between-group difference in posttest knowledge scores. With 30 students in the experimental group and 32 in the control group, the study achieved a statistical power of 99.3% at a significance level of α=0.05.

The inclusion criteria were enrollment in the pediatric nursing course during the study period and willingness to participate. Students repeating the pediatric nursing course because of previous academic failure were excluded.

Randomization

Stratified randomization was performed using participants' baseline scores on the Medication Administration Self-Efficacy Scale in Children for Nursing Students and gender to ensure balanced group allocation. Participants were stratified according to self-efficacy scores (0–39 and 40–80) and gender. Within each stratum, participants were randomly assigned to the experimental or control group using a computer-generated random allocation sequence. The randomization process was conducted by an independent individual who was not involved in the study, and allocation was concealed from the researchers until group assignment had been completed.

Blinding of participants and researchers was not feasible because of the nature of the educational intervention. However, participants were not informed of their group assignment before the theoretical training and were unaware of whether they would subsequently participate in the skills training and simulation sessions.

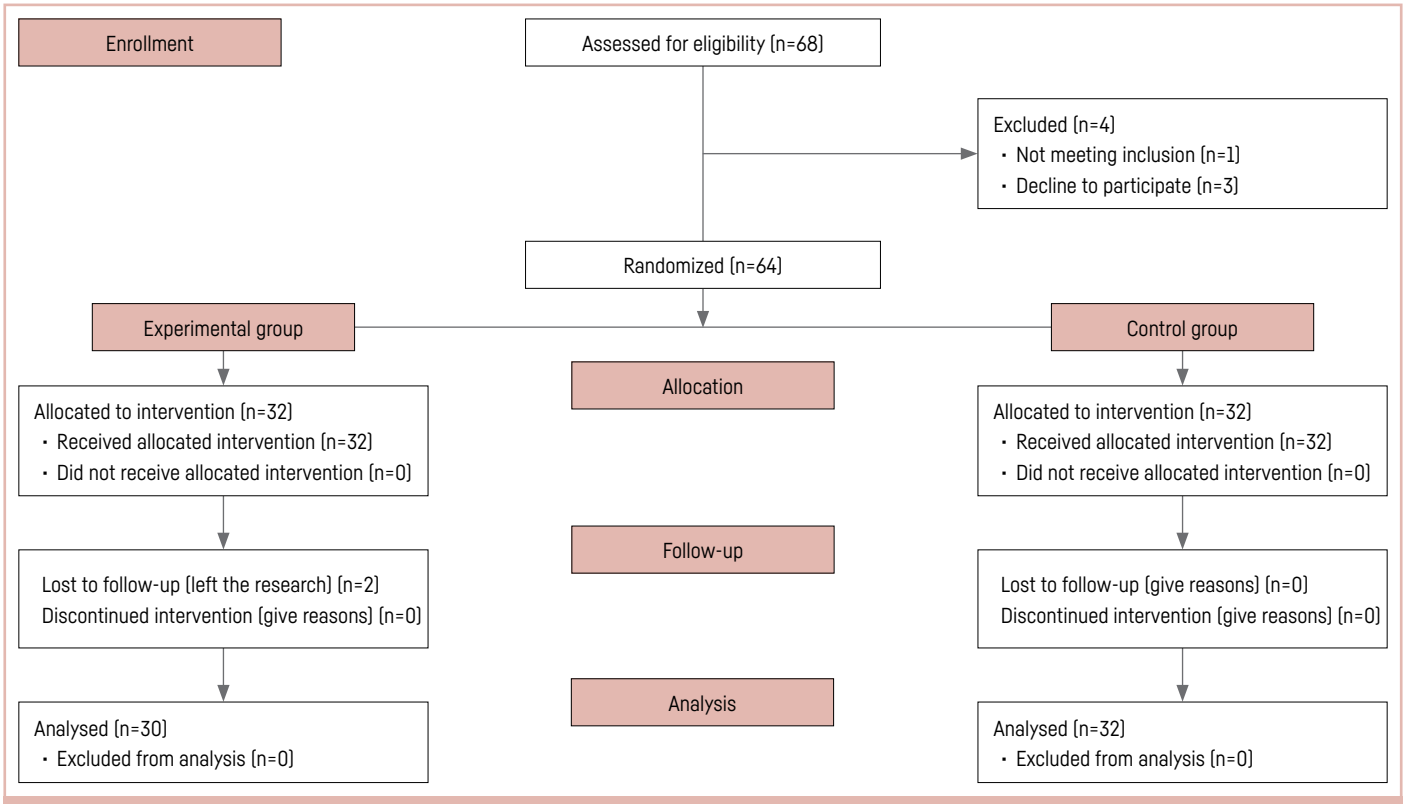


Figure 1. CONSORT 2010 flow diagram of the study.

Initially, 32 students were allocated to each group. Following the withdrawal of two participants from the experimental group, the final sample included 30 students in the experimental group and 32 students in the control group (Fig. 1).

Data Collection Instruments

Data were collected using the Sociodemographic Information Form, the Medication Administration Self-Efficacy Scale in Children for Nursing Students, the Pediatric Medication Administration Knowledge Test, the Peer Educator Training Presentation, the Pediatric Medication Administration Training Presentation, and the Pediatric Medication Administration Checklist.

Sociodemographic Information Form

The Sociodemographic Information Form was developed by the researchers based on the literature.[12,13] It consisted of 10 items assessing participants' demographic characteristics (e.g., age and gender), previous experience with peer education, and employment status in a healthcare setting.

Medication Administration Self-Efficacy Scale in Children for Nursing Students

The Medication Administration Self-Efficacy Scale in Children for Nursing Students, developed to assess nursing students' self-efficacy in pediatric medication administration, was used with written permission from its developers.[14] The scale consists of 16 items and two subscales and uses a five-point Likert scale with the following response options: 1=definitely not competent, 2=somewhat competent, 3=partially competent, 4=competent, and 5=definitely competent. Total scores range from 16 to 80, with higher scores indicating greater self-efficacy in pediatric medication administration. The scale assesses students' confidence in preparing medications for different pediatric age groups, calculating appropriate dosages, diluting medications correctly, measuring powdered medications accurately, administering medications safely, and preparing children and their families for medication administration. In the original study, Cronbach's alpha coefficients were 0.94 for the total scale, 0.91 for the medication preparation subscale, and 0.87 for the medication administration subscale. In the present study, Cronbach's alpha for the total scale was 0.944.

Pediatric Medication Administration Knowledge Test

The Pediatric Medication Administration Knowledge Test was developed by the researchers according to the literature and the learning objectives of the pediatric nursing course.[13,15,16] The test consists of 10 multiple-choice questions assessing knowledge of pediatric medication pharmacology, dosage calculations, and safe medication administration. Scores were converted to a 100-point scale, with higher scores indicating greater knowledge. Content validity was established through expert review by specialists in pediatric nursing and nursing education, and revisions were made based on their recommendations. The instrument was also pilot-tested to evaluate clarity and comprehensibility. Internal consistency was assessed using the Kuder–Richardson Formula 20 (KR-20), yielding a coefficient of 0.62, indicating moderate reliability.

Pediatric Medication Administration Checklist

A three-point Likert-type checklist was developed based on the literature and expert opinion to standardize practical training delivered by peer educators.[13] The checklist was used to guide skills training and structured debriefing but was not included in the outcome evaluation. Participants' performance was rated as inadequate (1) if the step was not performed, partially adequate (2) if the step was performed incompletely or with deficiencies, and adequate (3) if the step was performed correctly and completely. Debriefing sessions were conducted using the checklist as a structured feedback guide.

Educational Intervention

The educational intervention consisted of two components: peer educator training and pediatric medication administration training.

Peer Educator Training: The peer educator training program was developed by the principal investigator based on the literature. The training covered the principles and objectives of peer education, the roles and responsibilities of peer educators, educational materials and teaching strategies, essential competencies, approaches to managing potential challenges, and implementation of the training program.[7,9,10,11] Four fourth-year nursing students were selected and trained as peer educators by a faculty member certified in simulation-based nursing education. At the end of the training, peer educators completed a 10-item competency test. One student who scored below the predetermined competency threshold (70%) received additional training and was reassessed. All four peer educators ultimately achieved scores above 70% and participated in the intervention.

Pediatric Medication Administration Training: The pediatric medication administration training was developed by the researchers according to current literature. The 80-minute session included pediatric dosage calculations based on body weight, principles of safe medication administration, pediatric pharmacological characteristics, and medication administration routes.[16] The same peer educator delivered the standardized theoretical training to both the experimental and control groups.

Data Collection Procedure

Data collection was conducted in three phases. In the first phase, all participants completed the Sociodemographic Information Form, the Medication Administration Self-Efficacy Scale in Children for Nursing Students, and the Pediatric Medication Administration Knowledge Test as pretest measures. Subsequently, both groups received the same standardized theoretical training in pediatric medication administration. Following the pretest assessments, participants were randomly assigned to the experimental or control group before the theoretical training.

In the second phase, students in the experimental group participated in supervised skills practice led by trained peer educators. In the third phase, the experimental group completed simulation-based practice followed by a structured debriefing session. After completion of the intervention, all participants completed the knowledge test and self-efficacy scale as posttest measures. The study flow is presented in Table 1.

Bias Control

Several strategies were implemented to minimize bias. Selection bias was reduced through stratified randomization based on baseline self-efficacy scores and gender. The randomization sequence was generated by an independent individual who was not involved in the study, and allocation was concealed until all participants had been assigned to their respective groups. Performance bias was minimized by providing identical theoretical instruction to both groups using standardized educational materials delivered by the same peer educator. Measurement bias was minimized by using standardized data collection instruments and administering the same pretest and posttest assessments to both groups under identical conditions. Attrition bias was minimal because only two participants withdrew, and all remaining participants completed the intervention and outcome assessments.

Data Analysis

Data were analyzed using SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics are presented as frequencies, percentages, means, and standard deviations. Differences between categorical variables were analyzed using the chi-square test. Continuous variables were compared between groups using the independent-samples t test and within groups using the dependent-samples t test. Statistical significance was set at $p<0.05$. Exact p values are reported whenever possible, whereas values less than 0.001 are reported as $p<0.001$.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from Fenerbahçe University Non-interventional Clinical Research Ethics Committee (Approval Number: 25.2022fbu, Date: 14.09.2022). Institutional permission was obtained from the university where the study was conducted, and written informed consent was obtained from all participants before data collection. Permission to use the Medication Administration Self-Efficacy Scale in Children for Nursing Students was obtained from the scale developers. The study was conducted as an educational intervention involving nursing students in a university setting. As it did not involve clinical patients or therapeutic interventions, it was not registered in a clinical trial registry.

Table 1. Study flow

Four fourth-year nursing students completed a 4-hour Peer Educator Training Program delivered by a faculty member with expertise in pediatric nursing.
Peer educators scoring <70% on the competency test received additional training and were reassessed until competency was achieved.
Written informed consent was obtained from all participants.
The Sociodemographic Information Form was completed by all participants.
Participants completed the Medication Administration Self-Efficacy Scale in Children for Nursing Students at baseline (pretest).
Participants were assigned to the experimental or control group using stratified randomization based on baseline self-efficacy scores and gender. Participants were not informed of their group allocation before the theoretical training and were unaware of whether they would proceed to the skills and simulation sessions.

Experimental Group: Peer Education	**Control Group: Traditional Classroom Instruction**
STAGE I (Theoretical Training)	**STAGE I (Theoretical Training)**
The Pediatric Medication Administration Knowledge Test was administered as a pretest.	The Pediatric Medication Administration Knowledge Test was administered before the theoretical training (pretest).
Participants received an 80-minute standardized theoretical training session on pediatric medication administration.	Participants received an 80-minute standardized theoretical training session on pediatric medication administration.
Participants took a 15-minute break.	Following the training, the Pediatric Medication Administration Knowledge Test was administered (posttest).
Four trained peer educators were assigned to small groups of approximately eight students each.	Participants completed the Medication Administration Self-Efficacy Scale in Children for Nursing Students (posttest).
STAGE II (Skills Practice)	
Each peer educator supervised a one-hour skills practice session in pediatric medication administration using task trainer models and the Pediatric Medication Administration Checklist.	
Lunch break	
STAGE III (Simulation Practice)	
Each peer educator paired the students within their group and supervised a 15-minute simulation of pediatric medication administration using a structured scenario. The simulation session lasted approximately two hours. Orientation (15 minutes) Simulation practice (2 students, 15 minutes per pair; total for 8 students: 60 minutes) Debriefing (all 8 students together, 30 minutes)	
During the simulation practice, the Pediatric Medication Administration Checklist was completed by the peer educator, and the simulation performance was evaluated using this checklist during the debriefing session.	
After the debriefing session, the Pediatric Medication Administration Knowledge Test was administered as the posttest.	
After the debriefing session, participants completed the Medication Administration Self-Efficacy Scale in Children for Nursing Students (posttest).	
Students provided feedback on the peer education program.	

Results

Seventy percent of students in the experimental group and 65.6% of those in the control group were female. There were no significant differences between the groups in terms of age, gender, or high school graduation ($p>0.05$). In the experimental group, 56.7% of students had previously received training in general medication administration, compared with 71.9% in the control group. The majority of participants in both groups had not received training in pediatric medication administration (90% in the experimental group and 96.9% in the control group). Similarly, no statistically significant between-group differences were found regarding previous peer education, general medication administration training, or pediatric medication administration training ($p>0.05$). Only a small proportion of students in either group reported part-time employment in pediatric settings or previous experience with pediatric medication administration. Previous medication administration errors were reported by 3.3% of students in the experimental group and 3.1% of those in the control group. Overall, the two groups were comparable across all baseline characteristics (Table 2).

In the peer education group, among the 15 students who received simulation training, 11 failed to document the procedure, six failed to verify the patient, five administered medication to the wrong patient, five used medications with previously opened labels, three administered an incorrect drug dose, four administered the injection at the wrong site, four failed to manage waste appropriately, and three performed intramuscular injections without replacing the needle tip.

Students' knowledge of pediatric medication administration improved significantly following the intervention in both groups. In the experimental group, the mean knowledge score increased from 30.667 at pretest to 87.333 at posttest ($t=-13.527$, $p<0.001$, $d=2.470$, 95% confidence interval [CI]: -65.234 to -48.099). In the control group, the mean score increased from 35.625 to 68.750 ($t=-9.262$, $p<0.001$, $d=1.637$, 95% CI: -40.419 to -25.831). Additionally, posttest total scores differed significantly between the groups ($t(60)=4.487$, $p<0.001$), with the experimental group achieving higher mean scores ($\bar{x}=87.333$) than the control group ($\bar{x}=68.750$) (Table 3). An analysis of covariance (ANCOVA) was conducted to compare posttest knowledge scores between the groups while controlling for pretest scores. The results indicated a significant effect of the group on posttest knowledge scores ($F(1,59)=23.549$, $p<0.001$, $\eta^2=0.285$), with the experimental group demonstrating higher scores than the control group.

Self-efficacy regarding pediatric medication administration also improved significantly following the intervention ($t(60)=6.520$, $p<0.001$). The experimental group had higher posttest self-efficacy scores ($\bar{x}=71.267$) than the control group ($\bar{x}=54.719$).

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Table 2. Baseline characteristics of participants by study group

Characteristic	Experimental: Peer education		Control: Traditional instruction		Total		p
	n	%	n	%	n	%	
Age							
20–21	20	66.7	13	40.6	33	53.2	X^2=4.347 p=0.114
22–23	8	26.7	14	43.8	22	35.5	
24–26	2	6.7	5	15.6	7	11.3	
Gender							
Female	21	70.0	21	65.6	42	67.7	X^2=0.136 p=0.462
Male	9	30.0	11	34.4	20	32.3	
High school graduated							
Anatolian/science high school	20	66.7	25	78.1	45	72.6	X^2=1.311 p=0.519
Regular high school	3	10.0	3	9.4	6	9.7	
Health vocational high school	7	23.3	4	12.5	11	17.7	
Previous peer education							
Yes	0	0.0	2	6.2	2	3.2	X^2=1.938 p=0.262
No	30	100.0	30	93.8	60	96.8	
Previous training in general medication administration							
Yes	17	56.7	23	71.9	40	64.5	X^2=1.564 p=0.162
No	13	43.3	9	28.1	22	35.5	
Previous training in pediatric medication administration							
Yes	3	10.0	1	3.1	4	6.5	X^2=1.213 p=0.282
No	27	90.0	31	96.9	58	93.5	
Part-time work experience in pediatrics							
Yes	1	3.3	3	9.4	4	6.5	X^2=0.936 p=0.331
No	29	96.7	29	90.6	58	93.5	
Previous experience with pediatric medication administration							
Yes	1	3.3	3	9.4	4	6.5	X^2=0.936 p=0.331
No	29	96.7	29	90.6	58	93.5	
Previous medication administration error							
Yes	1	3.3	1	3.1	2	3.2	X^2=0.002 p=0.738
No	29	96.7	31	96.9	60	96.8	

Chi-square test.

Table 3. Comparison of Pediatric Medication Administration Knowledge Test scores between and within groups

Assessment	Experimental: Peer education (n=30)		Control: Traditional instruction (n=32)		t[a]	p
	Mean	SD	Mean	SD		
Pretest	30.667	20.500	35.625	17.769	-1.020	0.312
Posttest	87.333	12.299	68.750	19.302	4.487	**<0.001**
t[b]	-13.527		-9.262			
p	**<0.001**		**<0.001**			

[a]: Independent-samples t test, [b]: Dependent-samples t test. SD: Standard deviation.

Within the experimental group, Medication Administration Self-Efficacy Scale in Children for Nursing Students scores increased significantly from pretest ($\bar{x}$=36.333) to posttest ($\bar{x}$=71.267) (t=-19.349, p<0.001, d=3.533, 95% CI: -38.626 to -31.241). Similarly, the control group showed a significant increase from pretest ($\bar{x}$=34.469) to posttest ($\bar{x}$=54.719) (t=-13.691, p<0.001; d=2.420, 95% CI: -23.266 to -17.234) (Table 4). After controlling for pretest scores, ANCOVA revealed a significant effect of the group on posttest self-efficacy scores (F(1,59)=58.043, p<0.001, η^2=0.496), with the experimental group demonstrating higher self-efficacy than the control group.

Table 4. Comparison of Medication Administration Self-Efficacy Scores between and within groups

Assessment	Experimental: Peer Education (n=30)		Control: Traditional Instruction (n=32)		t[a]	p
	Mean	SD	Mean	SD		
Pretest	36.333	11.081	34.469	10.327	0.686	0.495
Posttest	71.267	6.943	54.719	12.163	6.520	**<0.001**
t[b]	-19.349		-13.691			
p	**<0.001**		**<0.001**			

Bold values indicate statistical significance (p<0.05). [a]: Independent-samples t test, [b]: Dependent-samples t test. SD: Standard deviation.

Discussion

Guidance and instruction from peers with similar experiences can help alleviate students' anxiety when learning new skills while providing a supportive learning environment.[11,17] Peer education may also foster a less stressful atmosphere in small-group settings and enhance the learning process.[11,17] Öztürk and Göçmen Baykara[11] reported that nursing students who learned complex skills through peer education greater skill improvement, better reinforcement of learning, and superior knowledge retention than those taught using conventional methods. Similarly, a systematic review examining the effects of peer education in pediatric nursing education found that peer education improved both cognitive knowledge level and communication skills.[17] More recently, Ramadan Ghareb et al.[18] reported that peer education combined with role-playing was more effective than traditional teaching methods in developing pediatric nursing students' competence in intramuscular injection and gavage feeding. They also found that students trained using these methods reported higher levels of self-confidence and satisfaction. Consistent with these findings, nursing students in the present study, who were trained in peer groups of eight, reported feeling more comfortable, enjoying the learning process more, communicating more easily, and feeling better understood and closer to their peers. They also described experiencing positive excitement, greater stress when the course instructor was present, less fear of making mistakes during skills practice, and a greater sense of interacting with friends rather than being formally evaluated.

In a 2020 study, Powell et al.[19] found that pharmacy students who provided peer education to nursing students significantly improved the nursing students' pharmacotherapy knowledge while enhancing their self-awareness and professional self-confidence. Likewise, another study reported that nursing student peer educators who provided stoma care training using a low-fidelity simulator increased learners' knowledge levels.[12] The findings of the present study are consistent with this evidence. Although both peer education and conventional instruction resulted in significant improvements in nursing students' knowledge of pediatric medication administration, the greater improvement observed in the peer education group suggests that the peer education program was more effective in facilitating learning.

The large effect size observed in the experimental group, according to Cohen's classification, indicates a substantial educational impact. This finding suggests that peer-supported simulation training produced not only statistically significant but also educationally meaningful improvements in pediatric medication administration knowledge. The magnitude of this effect may be attributed to the active participation, repeated practice opportunities, immediate feedback, and collaborative learning environment inherent in peer education and simulation-based training.

Previous studies have shown that nursing students' self-efficacy in pediatric medication administration influences their likelihood of committing medication errors.[20] In a 2023 study, Akça and Berşe[21] reported that students who did not experience anxiety during pediatric medication administration had significantly higher self-efficacy than those who reported feeling anxious. Consistent with these findings, the present study demonstrated a significant increase in students' self-efficacy for medication administration in children following the training program. The greater improvement observed in the peer education group suggests that this educational approach was particularly effective in enhancing students' confidence in administering medications safely. Furthermore, the significantly higher posttest knowledge and self-efficacy scores in the peer education group, compared with the conventional education group, underscore the value of structured and repetitive educational strategies in promoting safe pediatric medication administration.

Medication errors remain a major concern in pediatric nursing practice, where they occur at relatively high rates and can have serious consequences because of the vulnerability of pediatric patients. The persistence of these errors suggests that professional experience alone is insufficient to eliminate them.[3,4,15,22,23] In a phenomenological study exploring pediatric nurses' experiences with implementing the "ten rights" of medication administration, nurses generally reported adhering to these principles but identified particular challenges with ensuring the correct dose and correct time.[24] Similarly, a study conducted in a pediatric intensive care unit demonstrated that increasing staff awareness and implementing technology-based strategies significantly improved medication safety.[25] A study conducted in a simulated hospital setting to examine medication administration errors among nursing students found that such errors were common and that students frequently failed to account for the displacement volume of dry-powder medications during reconstitution.[13] These findings underscore the importance of providing effective, structured training in safe medication administration during undergraduate nursing education. Sears et al.[26] reported that although experienced nurses made more medication errors, the severity of these errors was lower, suggesting that experience and repeated practice may enhance awareness of medication safety. Based on the serious errors observed among students in the present study, it appears that this level of awareness has not yet fully developed.

The debriefing session conducted after the simulation training yielded valuable insights into students' experiences. Most students reported feeling anxious, fearful, and stressed during the simulation, particularly while administering medications, as the responsibility associated with the task intensified their anxiety. Similarly, Türkmen et al.[6] found that nursing students enrolled in pediatric nursing courses experienced mild state and trait anxiety, with anxiety levels increasing during invasive procedures. In the present study, however, students reported that they gradually learned to manage their stress as the training progressed and that the simulation experience enhanced their sense of professional competence. Several students commented that they "*felt like a real nurse*" during the simulation, indicating that the experience strengthened their self-confidence. Students also reported that the simulation increased their awareness of the importance of being adequately prepared for medication administration and enhanced the retention of the knowledge they had acquired. They perceived theoretical instruction alone as insufficient for long-term retention, whereas simulation reinforced their learning and provided valuable experience for future clinical practice. Some students suggested that the use of simulated patients, rather than manikins, could further enhance the realism of the learning experience and increase motivation. These perceptions are consistent with previous studies demonstrating that simulation enhances students' knowledge and clinical skills by increasing the realism and authenticity of the learning experience.[7,27,28]

Jarvill[29] reported in 2021 that nursing students were not adequately prepared for safe medication administration before graduation. Özgüven Öztornaci et al.[30] reported that the mean pediatric medication error rate among nursing students decreased from 55.37% before the intervention to 13.52% following simulation training supported by a web-based Double-Eye Control Program. Bowling[8] also highlighted the positive effects of simulation training on clinical skills but reported that more than half of the students failed to verify patient identity or administer medications safely. Consistent with these findings, more than half of the students in the experimental group in the present study omitted critical medication safety steps during the simulation despite having previously received instruction in general medication administration. Common errors included failing to verify patient identity, administering medication to the wrong patient, calculating an incorrect dose, and administering medication at the wrong

site. These findings suggest that theoretical instruction or a single skills practice session is insufficient to ensure safe medication administration and that students require repeated, structured opportunities to practice medication administration skills.

The findings of this study suggest that peer education is an effective educational strategy for improving nursing students' knowledge and self-efficacy related to pediatric medication administration. Learning in small peer groups within a supportive and less stressful environment appears to facilitate knowledge acquisition and skill development. Combining peer education with simulation-based learning may further promote the translation of theoretical knowledge into clinical practice, reduce students' anxiety about making errors, and strengthen safe medication administration practices. Incorporating peer education and simulation-based learning into nursing curricula may therefore improve educational outcomes while ultimately contributing to patient safety. Providing peer support during preparation for clinical practice may also strengthen students' self-efficacy, and repeated peer-assisted learning experiences may promote long-term knowledge retention. Moreover, the benefits of peer-supported simulation training may extend beyond undergraduate education. Enhancing pediatric medication administration knowledge and self-efficacy before graduation may contribute to safer medication practices, greater professional confidence, and improved patient safety during professional practice. Integrating peer education into nursing curricula may therefore help prepare competent and confident novice nurses for pediatric clinical settings.

Limitations

This study was conducted with a relatively small sample of third-year nursing students from a single university; therefore, the findings may not be generalizable to the broader population of nursing students. In addition, data were collected over a single academic term, precluding the evaluation of long-term knowledge and skill retention. Furthermore, the simulation and peer education activities were conducted in a laboratory setting, which may not fully reflect students' behavior and performance in actual clinical practice.

Because the assessments were based on self-report scales and a knowledge test, the findings may be subject to response bias. In addition, the knowledge test was developed by the researchers, and its properties were not formally evaluated through validity and reliability testing. Future studies with larger sample sizes, multicenter designs, and longer follow-up periods are needed.

Conclusion

The findings of this study demonstrate that a three-stage peer education program improved nursing students' knowledge and self-efficacy regarding pediatric medication administration. The improvements observed among students who participated in peer education were greater than those achieved through conventional theoretical instruction alone. In the short term, peer-supported simulation training enhanced students' knowledge, self-efficacy, and confidence in pediatric medication administration. In the long term, strengthening these competencies during undergraduate nursing education may promote safer medication administration practices and facilitate a smoother transition to clinical practice after graduation. These findings suggest that peer education may be an effective educational strategy in pediatric nursing education. Therefore, incorporating structured peer education and simulation-based learning into nursing curricula may contribute to the development of competent, confident, and practice-ready nurses.

Ethics Committee Approval: The study was approved by the Fenerbahçe University Non-interventional Clinical Research Ethics Committee (Approval Number: 25.2022fbu, Date: 14.09.2022).

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

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

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Changes in Nursing Students' Attitudes Toward Children with Disabilities Following Clinical Practice: A Quasi-Experimental Study

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Abstract

Background: It is essential for nursing students to develop awareness of children with disabilities and their families to ensure appropriate professional attitudes and practices throughout their careers.

Aim: This study aimed to investigate changes in nursing students' attitudes toward children with disabilities following practice in a special education setting.

Methods: This quasi-experimental study employed a pre-test–post-test design. The study was conducted between May 27 and June 11, 2024, among nursing students (N=98) who completed clinical practice at a Special Education Vocational School. The study used a complete enumeration (total population) sampling approach and included students (n=85) who were undertaking clinical practice at the school, volunteered to participate, and met the inclusion criteria. Data were collected using a questionnaire form and the Attitudes Toward Persons with Disabilities Inventory. Independent samples t test, one-way analysis of variance (ANOVA), and paired-samples t test were used for data analysis.

Results: The students' mean total attitude score increased from 168.11±16.04 before the practice to 173.38±16.88 after the practice. Post-practice attitude scores were significantly higher among female students and among students who had not previously taken courses related to disability or individuals with disabilities.

Conclusion: The findings suggest that experiential learning in special education settings may play a significant role in fostering more positive attitudes among nursing students toward children with disabilities. Integrating disability-focused experiential learning into nursing curricula may help cultivate compassionate professionals who are better prepared to advocate for the rights and well-being of individuals with disabilities.

Keywords: Attitude, children with disabilities, nursing, practice, student

Introduction

Disability is defined as a limitation in an individual's physical and/or psychological functioning resulting from congenital or acquired conditions.[1] According to the National Disability Data System, 381,129 children aged 0–19 years are registered as living with a disability.[2] Disability is a condition that requires support not only for affected children but also for their families because of ongoing care needs.[3] Negative societal attitudes and behaviors toward children with disabilities and their families further complicate their daily lives.[3-7] Studies have shown that children with disabilities and their families who experience negative attitudes and discrimination face numerous psychosocial challenges,[6,8-10] including anxiety, depression, and loneliness.[6,9] Health professionals play a crucial role in promoting the acceptance and inclusion of children with disabilities and their families within society.[11]

Nurses provide care across diverse settings, including schools, hospitals, and workplaces. Consequently, they play a key role in supporting the social inclusion of children with disabilities.[12,13] Previous studies have shown that nurses encounter various challenges when communicating with and caring for children with disabilities and their families.[14-18] These challenges may hinder the adaptation of children and their families to the care process and limit the provision of effective nursing care.[16,18] To fulfill their professional responsibilities, nursing students should acquire adequate knowledge and competencies during their education while also developing essential skills such as empathy and effective communication.[10,19]

Nurses' responsibilities in caring for children with disabilities include developing individualized care plans, regularly monitoring and evaluating health status, communicating effectively with families, providing educational support, demonstrating empathy and sensitivity, using effective communication skills, advocating for children and their families in legal and ethical matters, and keeping current with developments in disability care.[11] However, relatively few experimental studies have examined changes in nursing students' attitudes toward individuals with disabilities.[19,20] Further research is needed to strengthen the evidence in this area. Therefore, this study was conducted to examine changes in nursing students' attitudes toward children with disabilities following clinical practice in a special education institution as part of the Pediatric Health and Diseases Nursing course.

Hypothesis

H1: Clinical practice in a special education institution improves nursing students' scores on the Attitudes Toward Persons with Disabilities Inventory.

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Materials and Methods

Study Design

This quasi-experimental study employed a pre-test–post-test design. This study is reported in accordance with the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) guidelines.

Study Population and Sample

This study was conducted to determine the effect of clinical practice in a special education institution, undertaken as part of the Pediatric Health and Diseases Nursing course, on third-year nursing students' attitudes toward individuals with disabilities. The institution was selected because it serves students with a range of disabilities, including mild intellectual disability, autism spectrum disorder, and combined intellectual and physical disabilities.

A complete enumeration (total population) sampling approach was used. Of the 98 third-year nursing students who completed clinical practice at the special education institution, 85 met the inclusion criteria and agreed to participate. Thirteen students were excluded because they did not meet the requirement of attending clinical practice for at least two full days (Fig. 1). The study was conducted between May 27 and June 11, 2024.

Inclusion Criteria

- Voluntary participation in the study,
- Attendance at clinical practice for at least two full days.

Exclusion Criteria

- Failure to complete the data collection forms,
- Attendance only during the third week of clinical practice without participating in the first two weeks,
- Repeating the Pediatric Health and Diseases Nursing course.

Intervention

The special education school where the clinical practice was conducted served children aged 15–18 years with mild intellectual disabilities, autism spectrum disorder, and combined intellectual and physical disabilities. Nursing students completed clinical practice over a three-week period, attending the institution on Mondays and Tuesdays each week for a total of six practice days. The intervention was implemented as part of a structured clinical placement in the special education setting. On the first day, two to three nursing students were assigned to each classroom. Throughout the placement, each nursing student was responsible for one student receiving special education during the entire practice day.

During the first two weeks (Days 1–4), the nursing students observed and interacted with the students to identify their health educational needs. Based on these observations, they developed individualized educational materials. During the final week (Days 5 and 6), the nursing students delivered the planned educational sessions under the supervision of the responsible faculty member (Fig. 2).

Data Collection Instruments

Data were collected using a researcher-developed Questionnaire Form for Nursing Students and the Attitudes Toward Persons with Disabilities Inventory.

Questionnaire Form for Nursing Students: The questionnaire collected information on participants' age, sex, economic status, the presence of individuals with disabilities among family members or close acquaintances (e.g., friends), previous education related to disability, and perceived difficulty communicating with individuals with disabilities.

Attitudes Toward Persons with Disabilities Inventory: The Attitudes Toward Persons with Disabilities Inventory was developed by Kaner et al.[21] as part of the How Society Understands Disability project conducted by the Prime Ministry Administration for Disabled People in 2008. The instrument consists of 43 items organized into six subscales and uses a five-point Likert scale. Participants indicate their level of agreement with each statement by selecting one of five response options: strongly agree (5), agree (4), undecided (3), disagree (2), or strongly disagree (1). The six subscales are Educational Environment (EE), Interpersonal Relationships (IR), Working Life (WL), Family Life (FL), Personal Characteristics (PC), and Competence–Independent Living (CIL). In the original study, the overall Cronbach's alpha coefficient was 0.88. The Cronbach's alpha coefficients for the subscales were 0.56 (EE), 0.80 (IR), 0.74 (WL), 0.67 (FL), 0.74 (PC),

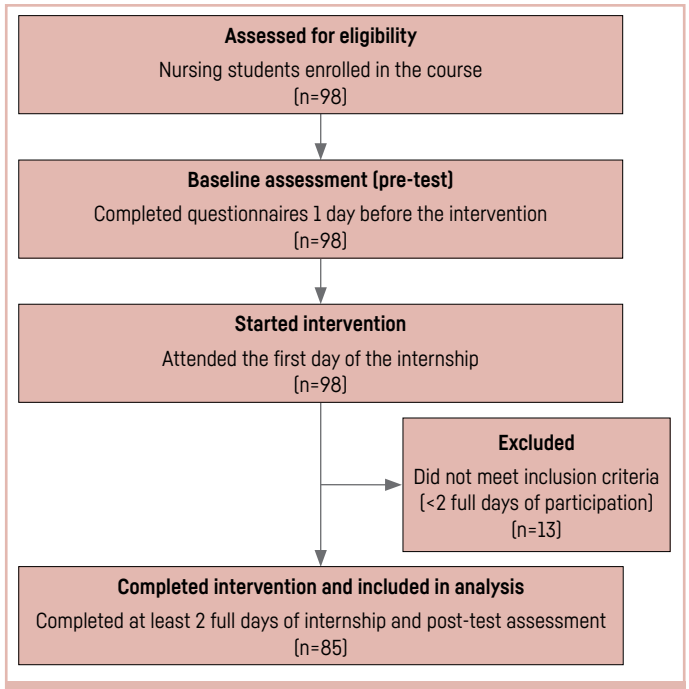


Figure 1. Flow diagram of participant recruitment, eligibility assessment, exclusions, and inclusion in the final analysis.

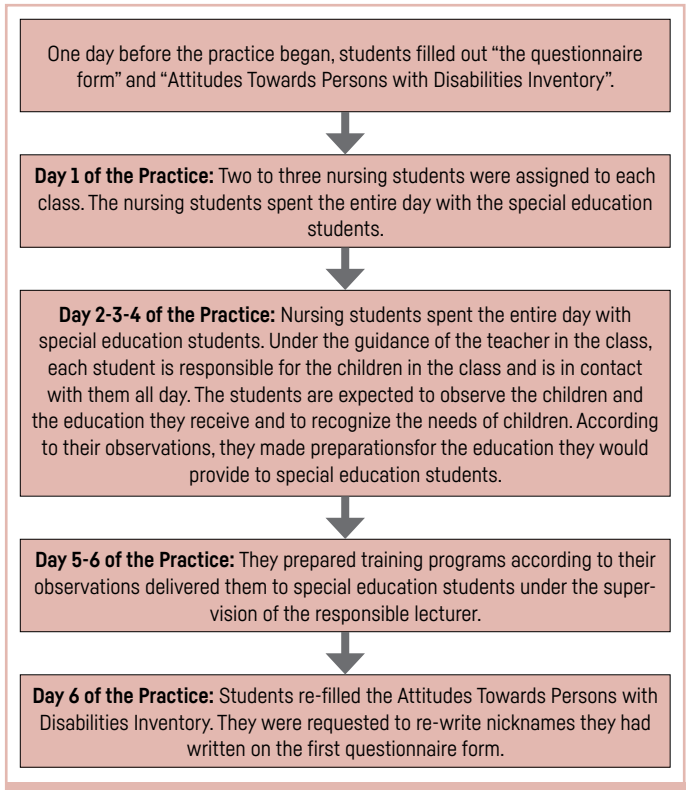


Figure 2. Flow diagram of the study procedure.

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Table 1. Participant characteristics

Descriptive characteristics	n	%
Sex		
Female	62	72.9
Male	23	27.1
Economic status		
Income less than expenses	6	7.0
Income equal to expenses	65	76.5
Income greater than expenses	14	16.5
Family member with a disability		
Yes	5	5.9
No	80	94.1
Individual with a disability in the immediate social environment		
Yes	30	35.3
No	55	64.7
Previous disability-related education		
Yes	9	10.6
No	76	89.4
Difficulty communicating with individuals with disabilities		
Yes	6	7.0
Partially	70	82.4
No	9	10.6
Total	85	100.0

and 0.83 (CIL). Negatively worded items (Items 1, 5, 7, 8, 9, 11, 16, 17, 18, 20, 22, 23, 28, 33, 37, 39, 40, 42, and 43) were reverse-scored. Subscale scores may be interpreted individually or combined to produce a total score. Total scores on the scale range from 43 to 215. The score ranges for the subscales are 3–15 for Educational Environment and Family Life, 9–45 for Interpersonal Relationships and Working Life, 7–35 for Personal Characteristics, and 12–60 for Competence–Independent Living. Higher total and subscale scores indicate more positive attitudes toward individuals with disabilities. In the present study, the overall Cronbach's alpha coefficient was 0.92 for the pre-test and 0.93 for the post-test. The Cronbach's alpha coefficients for the subscales were 0.55 (EE), 0.77 (IR), 0.80 (WL), 0.69 (FL), 0.77 (PC), and 0.76 (CIL) in the pre-test, and 0.51 (EE), 0.80 (IR), 0.80 (WL), 0.71 (FL), 0.80 (PC), and 0.84 (CIL) in the post-test.

Data Collection Procedure

Participants completed the questionnaire form and the Attitudes Toward Persons with Disabilities Inventory one day before beginning clinical practice. To match pre-test and post-test responses while maintaining anonymity, students were asked to create and use a unique identifier code. Following completion of the three-week clinical placement, participants completed the inventory again on the final day of practice using the same pseudonym (Fig. 2).

Data Analysis

Statistical analyses were performed using IBM SPSS Statistics, version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were used to summarize the data. Because the data were normally distributed, parametric statistical tests were used. Independent-samples t test was used to compare two independent groups, one-way analysis of variance (ANOVA) test was used to compare three or more independent groups, and paired-samples t test was used to compare pre-test and post-test scale scores.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from KTO-Karatay University Non-Drug and Medical Device Research Ethics Committee (Approval Number: 2024/019, Date: 09.05.2024), and institutional permission was granted (Permission No. 240179073). Before data collection, participants received written information describing the study's purpose and procedures. Written informed consent was obtained from all participants before enrollment, and only students who voluntarily agreed to participate were included in the study. Permission to use the Attitudes Toward Persons with Disabilities Inventory was obtained from the relevant copyright holders.

Table 2. Comparison of students' scores on the Attitudes Toward Persons with Disabilities Inventory before and after clinical practice

Scale/subscale	Pre-test Mean±SD	Post-test Mean±SD	Test
Total score	168.11±16.04	173.38±16.88	t=-3.401 **p=0.001**
Educational environment	13.62±1.35	13.94±1.13	t=-2.332 **p=0.022**
Interpersonal relationships	36.50±4.33	37.96±4.32	t=-3.179 **p=0.002**
Working life	35.90±4.16	36.44±4.41	t=-1.286 p=0.202
Family life	9.40±2.02	9.58±2.25	t=-0.952 p=0.344
Personal characteristics	27.82±3.28	28.74±3.52	t=-2.801 **p=0.006**
Competence–independent living	44.85±4.83	46.70±5.65	t=-3.077 **p=0.003**

Results

Thirteen students were excluded from the study because they did not meet the inclusion criterion of attending clinical practice for at least two full days. Consequently, the final sample consisted of 85 students (Fig. 1). The participants had a mean age of 21.75±1.20 years. Their demographic and descriptive characteristics are presented in Table 1.

The students' mean total score on the Attitudes Toward Persons with Disabilities Inventory increased from 168.11±16.04 at baseline (pre-test) to 173.38±16.88 after completion of the clinical practice (post-test). This increase was statistically significant. Significant improvements were also observed in the Educational Environment, Interpersonal Relationships, Personal Characteristics, and Competence–Independent Living subscale scores following the clinical practice (Table 2).

Comparison of the pre-test scores according to participants' characteristics showed a difference only with respect to perceived difficulty in communicating with individuals with disabilities (p=0.005). Post hoc analyses indicated that this difference was observed between students who reported having difficulty communicating and those who reported no difficulty (p=0.004), as well as between students who reported partial difficulty and those who reported no difficulty (p=0.042). This difference was no longer evident in the post-test assessment (Table 3).

Comparison of the post-test scores according to participants' characteristics revealed significant differences by sex (p=0.039) and previous education related to individuals with disabilities (p=0.028) (Table 3).

Discussion

The findings of this study indicate that nursing students had above-average attitudes toward individuals with disabilities before the clinical practice. Previous studies conducted among students in Faculties of Health Sciences have reported mean attitude scores ranging from 157 to 172.[22,23] Consistent with these findings, our results suggest that nursing students generally hold positive attitudes toward individuals with disabilities. In contrast, a descriptive cross-sectional study conducted among nursing students in selected private colleges in Birgunj found that more than half of the participants (61.1%) had negative attitudes toward individuals with disabilities.[24] Positive attitudes toward individuals with disabilities are essential for promoting their well-being and supporting their families and caregivers. Nurses who demonstrate positive attitudes are more likely to establish effective therapeutic relationships, encourage individuals with disabilities to express their needs and

Table 3. Comparison of pre-test and post-test total attitude scores according to participants' characteristics

Characteristic	Pre-test		Post-test	
	Mean±SD	Test*	Mean±SD	Test*
Sex				
Female	168.98±14.94	t=0.815 p=0.47	175.67±15.63	t=2.093 **p=0.039**
Male	165.78±18.86		167.21±18.85	
Economic status				
Income less than expenses	155.16±13.70	F=2.162 p=0.122	174.83±13.37	F=1.151 p=0.321
Income equal to expenses	169.15±15.67		174.60±16.77	
Income greater than expenses	168.85±17.27		167.14±18.36	
Family member with a disability				
Yes	170.80±22.03	t=0.383 p=0.702	175.60±7.70	t=0.300 p=0.765
No	167.95±15.77		173.25±17.31	
Individual with a disability in the immediate social environment				
Yes	169.40±18.25	t=0.542 p=0.589	175.86±16.94	t=1.000 p=0.320
No	167.41±14.84		172.3±16.84	
Previous disability-related education				
Yes	166.44±17.61	t=-0.329 p=0.743	161.77±12.82	t=-2.233 **p=0.028**
No	168.31±15.96		174.76±16.84	
Difficulty communicating with individuals with disabilities				
Yes(1)	154.50±26.49	F=5.591 **p=0.005** **1<3** **2<3**	159.83±20.97	F=2.721 p=0.072
Some difficulty(2)	167.64±14.44		173.71±16.35	
No(3)	180.88±11.93		179.88±15.02	

*t=independent-samples t test; F=one-way analysis of variance (ANOVA).

preferences, and facilitate access to healthcare services. Furthermore, as respected members of society, nurses' attitudes may influence public perceptions and contribute to greater social acceptance and inclusion of individuals with disabilities.

The present study demonstrated that nursing students' attitudes toward individuals with disabilities improved following clinical practice in a special education setting. Improvements were particularly evident in the domains of Educational Environment, Interpersonal Relationships, Personal Characteristics, and Competence–Independent Living. Similar findings have been reported by Özkan et al.[19] In their study, third-year nursing students completed an educational program that included films depicting individuals with intellectual disabilities and autism spectrum disorder, as well as case-based discussions addressing the challenges faced by individuals with disabilities and their families. Following completion of the educational modules, the students participated in clinical practice for 2.5 days per week over a three-week period. The intervention resulted in an improvement in nursing students' attitudes toward individuals with disabilities, as reflected by higher overall attitude scores after the program. Likewise, another study[20] found that participation in experiential learning activities related to the care of individuals with disabilities significantly improved nursing students' attitudes. A systematic review[25] also concluded that disability-focused educational programs positively influenced the attitudes of nursing and medical students toward disability. However, a pilot study by Edwards et al.[26] reported that a curriculum intervention involving interaction with individuals with disabilities did not produce significant changes in nursing students' attitudes. Differences among studies may reflect variations in curriculum content. Nevertheless, the findings of the present study support the value of providing nursing students with structured opportunities to interact directly with individuals with disabilities during their clinical education.

Before the clinical practice, students who reported no difficulty communicating with individuals with disabilities demonstrated significantly more positive attitudes than those who reported partial or complete difficulty. No significant associations were found between attitude scores and the other descriptive characteristics examined. Previous studies[27-30] have similarly reported that factors such as economic status, having a family member with a disability, or knowing someone with a disability are not significantly associated with attitudes toward individuals with disabilities. Our findings are consistent with this body of evidence.

Following the clinical practice, female students demonstrated more positive attitudes toward individuals with disabilities than male students. Similar findings have been reported in several previous studies.[29,31] In contrast, Rakap et al.[3] found a significant gender difference favoring male students. Taken together, these findings suggest that sex may be associated with attitudes toward individuals with disabilities. However, the direction of this association remains inconclusive. Further studies are needed to better understand the role of sex in shaping these attitudes.

Another notable finding was that students who had not previously received disability-related education demonstrated significantly more positive attitudes after the clinical practice than those who had received such education. This finding differs from several studies reporting more positive attitudes among students who had received disability-related education.[32,33] Conversely, Kaldık (2022) has found no association between disability-related education and attitudes.[34] These inconsistent findings may be explained by differences in educational content, teaching strategies, and instructional approaches.

Limitations

The study sample consisted of nursing students from a single institution who voluntarily participated in a clinical placement in a special education setting, which may limit the generalizability of the findings. The short duration of the intervention (six clinical practice days) is another limitation, as it may not have been sufficient to capture sustained changes in attitudes. Additionally, participants were not selected using a random sampling method. Another limitation of this study is that, although the overall Cronbach's alpha coefficient for the scale indicated acceptable internal consistency, the Educational Environment subscale demonstrated relatively low internal consistency (α=0.55). Therefore, findings related to this subscale should be interpreted with caution. Finally, because students receiving special education were transported between home and school, nursing students had limited opportunities to interact with their parents or caregivers.

Conclusion

The study found that nursing students demonstrated above-average attitudes toward individuals with disabilities before the clinical practice and that these attitudes improved significantly following the intervention. The greatest improvements were observed in the domains of Educational Environment, Interpersonal Relationships, Personal Characteristics, and Competence–Independent Living.

Based on these findings, integrating structured, disability-focused experiential learning opportunities into undergraduate nursing curricula is recommended to enhance students' empathy and communication skills when caring for individuals with disabilities. Such experiences have the potential not only to strengthen these competencies but also to prepare future nurses to advocate for the rights, autonomy, and inclusion of individuals with disabilities. In the present study, the intervention period was necessarily brief because students rotated through multiple clinical placements as part of the course. Future studies should evaluate the effects of longer-term clinical practice on nursing students' attitudes toward individuals with disabilities.

Ethics Committee Approval: The study was approved by the KTO-Karatay University Non-Drug and Medical Device Research Ethics Committee (Approval Number: 2024/019, Date: 09.05.2024).

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

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

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Parental Readiness for Discharge and Home Care of Premature Infants: A Comparison of Mothers and Fathers

Abstract

Background: Premature infants require specialized care following discharge from the Neonatal Intensive Care Unit (NICU), making adequate parental preparation essential for ensuring safe and effective home care.

Aim: This study aimed to assess and compare the readiness of mothers and fathers of premature infants for discharge and home care and to identify factors associated with parental readiness.

Methods: This cross-sectional study included 39 mothers and 39 fathers of premature infants admitted to the Neonatal Intensive Care Unit of a tertiary maternity and children's training and research hospital (blinded for peer review). Sociodemographic characteristics and readiness for discharge and home care were assessed using validated instruments. Data were analyzed using the chi-square test and the Mann–Whitney U test.

Results: Mothers and fathers demonstrated similarly high levels of readiness for discharge and home care. After adjustment for differences in the maximum possible scores of the assessment scales, no statistically significant difference was observed in overall readiness scores between mothers and fathers. Previous neonatal intensive care experience was reported more frequently by mothers (25.6%) than fathers (7.7%). Fathers who perceived the care of premature infants as similar to that of term infants had significantly higher scores in the nutritional support subdomain.

Conclusion: Both mothers and fathers demonstrated high levels of readiness for discharge and home care. Fathers' perceptions of premature infant care were significantly associated with their readiness, particularly in the domain of nutritional support. These findings highlight the importance of family-centered discharge education and targeted interventions to strengthen fathers' caregiving competencies.

Keywords: Home nursing, infant, intensive care units, neonatal, parents, patient discharge, premature

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Introduction

Premature birth is a leading cause of neonatal morbidity and mortality worldwide, including in Türkiye. According to the Turkish Statistical Institute, approximately 150,000 infants are born prematurely in Türkiye each year, many of whom require intensive medical and psychosocial care during the neonatal period.[1] Parents of premature infants often experience considerable stress, anxiety, and uncertainty throughout their infant's hospitalization in the Neonatal Intensive Care Unit (NICU), with these challenges frequently intensifying during the transition from hospital to home.[2,3]

Discharge from the NICU is a major milestone for families, bringing hope and relief while also introducing new caregiving responsibilities and concerns. Caring for a premature infant at home requires knowledge and skills in multiple areas, including feeding, medication administration, respiratory care, and infection prevention.[4] Therefore, ensuring that parents are adequately prepared with the necessary knowledge, practical skills, and psychosocial support before discharge is essential for promoting infant health and family well-being.[4,5]

Although family-centered care has become increasingly integrated into neonatal services in Türkiye, parents' active involvement in NICU care and preparation for discharge remain suboptimal. Mothers traditionally assume primary caregiving responsibilities, whereas fathers often have fewer opportunities to participate in infant care.[3,6] However, growing evidence indicates that fathers' active involvement in the care of premature infants promotes infant neurodevelopment and psychosocial well-being, strengthens parent–infant attachment, and enhances family functioning.[3,4,7] Moreover, involving fathers in caregiving has been associated with reduced maternal stress and anxiety, increased parental self-efficacy, and improved family cohesion.[7–9]

Most studies examining parental readiness for NICU discharge and home care have focused primarily on mothers, with relatively little attention given to fathers' experiences and educational needs.[10] Comparative evidence regarding mothers' and fathers' readiness for discharge, as well as the sociodemographic and clinical factors associated with readiness, remains limited. Similarly, studies conducted in Türkiye have largely described the challenges experienced by parents of premature infants rather than quantitatively evaluating and comparing discharge readiness between mothers and fathers.[2,3] This study addresses this gap by comparing the discharge and home care readiness of mothers and fathers of premature infants and examining the sociodemographic and clinical factors associated with parental readiness. This study aims to contribute

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to the advancement of family-centered care by highlighting fathers' roles and support needs during the discharge and home care process. The findings may help inform the development of pre-discharge parental education and tailored support programs that address the specific needs of both mothers and fathers.

Study Questions

1. What are the discharge and home care readiness levels of mothers and fathers of premature infants?
2. Is there a significant difference in discharge and home care readiness between mothers and fathers of premature infants?

Materials and Methods

Study Design

This descriptive, comparative study was conducted to assess the discharge and home care readiness of mothers and fathers of premature infants and to determine whether there was a statistically significant difference between the two groups.

Participants

The study included mothers and fathers of premature infants who had been hospitalized for at least 24 hours in the NICU of Giresun University Women and Children's Training and Research Hospital between April and July 2025 and whose infants were within 24 hours of discharge.

The required sample size was determined using G*Power version 3.1 based on Cohen's (1988) effect size recommendations, assuming a significance level of α=0.05 (95% confidence level) and a statistical power of 80% (1-β=0.80.[11] The power analysis assumed a large effect size (Cohen's d=0.80), and a minimum sample size of 39 participants per group was targeted. The power analysis indicated that a minimum of 34 participants was required in each group (mothers and fathers) to achieve adequate statistical power. To account for potential data loss, 39 mothers and 39 fathers were recruited. Mothers and fathers were analyzed as separate groups.

Eligible participants were required to be able to speak and understand Turkish, communicate verbally, have no diagnosed psychiatric disorder, and provide written informed consent. Parents who did not meet these criteria or whose infants had major congenital anomalies were excluded.

Data Collection Instruments

Parent–Infant Descriptive Information Form: This researcher-developed questionnaire consisted of 22 items assessing parents' sociodemographic characteristics, pregnancy and birth history, previous NICU experience, and infant health characteristics.

Readiness for Discharge and Home Care Scale for Mothers of Premature Infants in the NICU: This scale, developed by Tiryaki,[12] consists of 22 positively worded items grouped into four subscales: Nutrition, General Condition Assessment, Hygienic Care, and Care Practices. Items are rated on a 7-point Likert scale ranging from 1 (Not ready at all) to 7 (Completely ready). Total scores range from 22 to 154, with higher scores indicating greater readiness for discharge and home care. In the present study, the scale demonstrated excellent internal consistency (Cronbach's α=0.935).

Readiness for Discharge and Home Care Scale for Fathers of Premature Infants in the NICU: This scale, also developed by Tiryaki,[12] comprises 20 positively worded items organized into three subscales: Nutritional Support, Hygienic Care, and Care Practices. Items are rated on a 7-point Likert scale ranging from 1 (Not ready at all) to 7 (Completely ready). Total scores range from 20 to 140, with higher scores indicating greater readiness for discharge and home care. In the present study, the scale demonstrated high internal consistency (Cronbach's α=0.872).

Data Collection

Data were collected through face-to-face interviews conducted by a trained researcher (in Giresun Women and Child Education and Research Hospital Neonatal Intensive Care Unit between April and July 2025). Parents of premature infants who had been hospitalized in the NICU for at least 24 hours and were within 24 hours of discharge were interviewed using standardized data collection procedures. Clear inclusion and exclusion criteria were applied to minimize selection bias. Mothers and fathers were analyzed as separate groups to allow independent evaluation of maternal and paternal readiness. Owing to the nature of the study, blinding of participants and the researcher was not feasible.

Statistical Analysis

Because the maternal and paternal readiness scales differed in the number of items and maximum possible scores, normalized readiness scores were calculated using the following formula:

Normalized score (%) = (Observed score / Maximum possible score) × 100

Comparisons between mothers and fathers were based on normalized scores rather than raw total scores. Data were analyzed using Number Cruncher Statistical System (NCSS) software (NCSS LLC, Kaysville, UT, USA). Normality was assessed using skewness and kurtosis values. According to Tabachnick and Fidell,[13] skewness and kurtosis values between −1.5 and +1.5 indicate an approximately normal distribution. For variables that met the assumption of normality, data are presented as mean ± standard deviation, and between-group comparisons were performed using the independent-samples t test. Variables that were not normally distributed are presented as median (minimum–maximum) and were compared using the Mann–Whitney U test. Categorical variables were compared using the chi-square test. Internal consistency of the scales and their subscales was evaluated using Cronbach's alpha (α) coefficient. Cronbach's alpha values of <0.40 indicate poor reliability, 0.40–0.60 low reliability, 0.60–0.80 acceptable reliability, and ≥0.80 high reliability.[14] Continuous variables are presented as mean±standard deviation or median (minimum–maximum), as appropriate, whereas categorical variables are presented as frequencies and percentages. A p value <0.05 was considered statistically significant, and 95% confidence intervals were reported.

Ethical Considerations

Ethical approval was obtained from Giresun Training and Research Hospital Scientific Research Ethics Committee (Approval Number: 16.04.2025/06, Date: 16.04.2025). Permission to use the study instruments was obtained from the scale developer. Before data collection, all participants received information about the study and provided written informed consent. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Table 1 summarizes the sociodemographic characteristics and health-related variables of the participating mothers and fathers. No statistically significant difference was found in the educational level between mothers and fathers (p=0.906). High school graduates constituted the largest educational group among mothers (33.3%) and fathers (38.5%). No statistically significant differences were observed between mothers and fathers in employment status (p=0.774), spouse's educational level (p=0.657), spouse's employment status (p=0.170), or socioeconomic status (p=0.989). A statistically significant difference was found in preferred infant gender (p<0.001), with mothers more frequently preferring a female infant and fathers more frequently preferring a male infant. Additionally, mothers were significantly more likely than fathers to report having previously had an infant admitted to a neonatal intensive care unit (25.6% vs. 7.7%, p=0.033). No significant difference was observed in the history of previous preterm birth (p=0.498) (Table 1).

Tables 2 and 3 present the descriptive statistics for the maternal and paternal readiness for discharge and home care scales. Mothers had a mean total readiness score of 138.79±18.02 (range: 95–154), whereas fathers had a mean score of 127.41±12.80 (range: 89–140). Because the maternal and paternal scales differ in the number of items (22 vs. 20), raw total scores were not directly compared. After normalization to the maximum possible score of each scale, the mean total readiness score was 90.1±11.7 for mothers and 91.0±9.1 for fathers. No statistically significant difference was observed in overall discharge and home care readiness between mothers and fathers (U=845.000, p=0.400) (Table 4). Both scales demonstrated high reliability (α=0.935 for the maternal scale and α=0.872 for the paternal scale) (Tables 2, 3).

Tables 5 and 6 compare discharge and home care readiness scores according to parents' expectations of experiencing difficulties in caring for or feeding their

Table 1. Comparison of sociodemographic and clinical characteristics of mothers and fathers

	Group				χ^2	p
	Mothers		Fathers			
	n	%	n	%		
Educational level					0.559	0.906
Primary school	6	15.4	5	12.8		
Middle school	8	20.5	6	15.4		
High school/university	13	33.3	15	38.5		
Bachelor's degree or higher	12	30.8	13	33.3		
Employment status					0.083	0.774
Employed	8	20.5	7	17.9		
Unemployed	31	79.5	32	82.1		
Spouse's educational level						0.657
Primary school	9	23.1	12	30.8	2.433	
Middle school	12	30.8	11	28.2		
High school	10	25.6	6	15.4		
University	4	10.3	7	17.9		
Graduate degree	4	10.3	3	7.7		
Spouse's employment status					1.880	0.170
Employed	33	84.6	28	71.8		
Unemployed	6	15.4	11	28.2		
Socioeconomic status					0.021	0.989
Income less than expenses	14	36.8	15	38.5		
Income equal to expenses	20	52.6	20	51.3		
Income greater than expenses	4	10.5	4	10.3		
Planned pregnancy					0.743	0.389
Yes	30	76.9	33	84.6		
No	9	23.1	6	15.4		
Previous pregnancy					0.052	0.820
Yes	22	56.4	21	53.8		
No	17	43.6	18	46.2		
Mode of delivery					0.126	0.723
Vaginal delivery	5	12.8	4	10.3		
Cesarean section	34	87.2	35	89.7		
Infant sex					78.000	**<0.001**
Female	39	100.0	0	0.0		
Male	0	0.0	39	100.0		
Previous preterm birth					0.459	0.498
Yes	6	15.4	4	10.3		
No	33	84.6	35	89.7		
Previous infant admitted to the NICU					4.523	**0.033**
Yes	10	25.6	3	7.7		
No	29	74.4	36	92.3		

premature infant after discharge. No statistically significant associations were found between anticipated caregiving difficulties and readiness scores in either mothers or fathers (p>0.05). Among mothers, the mean total readiness score was 130.20±24.24 for those who expected difficulties and 140.06±17.03 for those who did not (U=0.827, p=0.409). Among fathers, the corresponding scores were 123.17±12.38 and 128.18±12.90, respectively (U=0.997, p=0.319) (Tables 5, 6).

Table 2. Readiness for discharge and home care scale for mothers of premature infants in the neonatal intensive care unit

	Mean±SD	Range	CA (α)	Skewness	Kurtosis
Nutritional support	18.08±3.77	8–21	0.694	-1.306	0.680
General condition assessment	24.56±4.44	10–28	0.893	-1.515	2.076
Hygienic care	42.15±8.51	17–49	0.895	-1.308	1.148
Care practices	54.00±4.70	37–56	0.944	-2.526	5.653
Total score	138.79±18.02	95–154	0.935	-1.206	0.421

SD: Standard deviation, CA (α): Cronbach's alpha.

Table 3. Descriptive statistics and reliability of the paternal readiness or discharge and home care scale

	Mean±SD	Range	CA (α)	Skewness	Kurtosis
Nutritional support	49.62±6.64	32–56	0.784	-1.107	0.512
Hygienic care	43.21±6.89	21–49	0.832	-1.730	2.997
Care practices	34.59±0.79	32–35	0.660	-1.859	2.578
Total score	127.41±12.80	89–140	0.872	-1.316	1.378

SD: Standard deviation, CA (α): Cronbach's alpha.

In both groups, parents who did not expect to experience difficulties after discharge had higher readiness scores than those who did. No significant differences were observed in the subscale scores for Nutritional Support, Hygienic Care, or Care Practices in either mothers or fathers. Among mothers, scores for the General Condition Assessment subscale also did not differ according to anticipated caregiving difficulties. These findings suggest that the relationship between parents' perceived readiness for discharge and their expectations of future caregiving difficulties is complex. Similar patterns observed among mothers and fathers indicate that parental readiness may not differ substantially by parent gender in this context.

Table 4 presents the comparison of normalized readiness scores between mothers and fathers. Normalized scores were calculated as (observed score / maximum possible score) × 100 to account for differences in the number of scale items and maximum possible scores (maternal scale: 22 items, maximum score=154; paternal scale: 20 items, maximum score=140). After normalization, no statistically significant difference was observed in overall readiness scores between mothers and fathers (p>0.05). The General Condition Assessment subscale was not compared because the paternal scale does not include an equivalent subscale (Table 4).

Discussion

This study compared the discharge and home care readiness of mothers and fathers of premature infants and examined factors associated with parental readiness. When interpreted in the context of the current literature, these findings provide important insights into the gender dynamics of parenting roles, the distribution of caregiving responsibilities, and the implementation of family-centered care.

In this study, the sociodemographic characteristics of mothers and fathers were largely comparable. This finding is consistent with the study conducted in Australia by Aydon et al.[10] which reported relatively similar educational and occupational characteristics among parents of premature infants. However, the marked difference in infant gender preference between mothers and fathers is noteworthy. This finding is consistent with the observations of Ireland et al.[8] regarding fathers' experiences in neonatal care units and suggests that gender roles may shape parental expectations.

Previous studies have also highlighted the impact of the coronavirus disease 2019 (COVID-19) pandemic on parental involvement in neonatal care. Parental perceptions indicate that neonatal unit visitation restrictions implemented during the

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Table 4. Maternal readiness for discharge and home care according to expected difficulty in infant care after discharge

	Do you expect to have difficulties caring for and feeding your baby at home after discharge?							
	n	Mean	SD	Median	Minimum	Maximum	U	p
Nutritional support							1.135	0.256
Yes	5	16.60	3.65	15.00	13.00	21.00		
No	34	18.29	3.79	20.00	8.00	21.00		
General condition assessment								
Yes	5	23.80	4.27	24.00	19.00	28.00	0.502	0.616
No	34	24.68	4.51	26.00	10.00	28.00		
Hygienic care								
Yes	5	36.20	13.39	33.00	17.00	49.00	1.045	0.296
No	34	43.03	7.46	46.00	23.00	49.00		
Care practices								
Yes	5	53.60	4.83	56.00	45.00	56.00	0.657	0.511
No	34	54.06	4.75	56.00	37.00	56.00		
Total score								
Yes	5	130.20	24.24	127.00	96.00	154.00	0.827	0.409
No	34	140.06	17.03	147.00	95.00	154.00		

Mann–Whitney U test; p<0.05. SD: Standard deviation.

Table 5. Comparison of normalized readiness scores between mothers and fathers

Subscale	Mothers Mean±SD (%)	Fathers Mean±SD (%)	U	p	r	Significance
Nutritional support	86.1±18.0	88.6±11.9	705.0	0.564	0.065	p>0.05
Hygienic care	86.0±17.4	88.2±14.1	763.0	0.984	0.002	p>0.05
Care practices	96.4±8.4	98.8±2.3	–	–	–	–
Total score	90.1±11.7	91.0±9.1	845.0	0.400	0.095	p>0.05

Comparisons were performed using the Mann–Whitney U test on normalized percentage scores (n=39 per group). SD: Standard deviation.

Table 6. Paternal readiness for discharge and home care according to expected difficulty in infant care after discharge

	Do you expect to have difficulties caring for and feeding your baby at home after discharge?							
	n	Mean	SD	Median	Minimum	Maximum	U	p
Nutritional support								
Yes	6	46.50	7.56	46.50	38.00	56.00	1.259	0.208
No	33	50.18	6.42	51.00	32.00	56.00		
Hygienic care								
Yes	6	41.67	6.86	42.00	33.00	49.00	0.730	0.465
No	33	43.48	6.96	45.00	21.00	49.00		
Care practices								
Yes	6	35.00	0.00	35.00	35.00	35.00	1.525	0.127
No	33	34.52	0.83	35.00	32.00	35.00		
Total score								
Yes	6	123.17	12.38	122.50	107.00	140.00	0.997	0.319
No	33	128.18	12.90	133.00	89.00	140.00		

Mann–Whitney U test; p<0.05. SD: Standard deviation.

COVID-19 pandemic negatively affected parental involvement and discharge preparation.[15] These findings suggest that pandemic-related restrictions may have influenced parental readiness and engagement during the discharge process.

Difference was observed in overall readiness scores between mothers and fathers. This finding suggests that the apparent difference in raw total scores was primarily attributable to differences in the structure of the maternal and paternal

scales rather than to a true difference in readiness. Previous research has emphasized the importance of involving both mothers and fathers in discharge preparation and promoting fathers' active participation in neonatal care. Evidence further suggests that technology-supported and digitally delivered educational interventions can enhance fathers' engagement and preparedness for infant care.[9] These findings suggest that technology-supported educational programs may represent a promising strategy for enhancing parental preparedness during discharge.[9] In our study, fathers who perceived the care of premature infants as similar to that of term infants had significantly higher scores on the Nutritional Support subscale. This finding is consistent with previous research on fathers' roles in premature infant care and suggests that fathers' knowledge and confidence regarding infant nutrition may contribute to their overall readiness for caregiving.[3] Recent research has further emphasized the importance of fathers' involvement in neonatal care and discharge preparation. Evidence from the COVID-19 pandemic indicates that neonatal unit visitation restrictions reduced opportunities for parental participation in infant care and negatively affected discharge preparation.[15] These findings support the association between fathers' involvement in nutritional care and parental readiness observed in our study and underscore the potential value of targeted educational interventions.[16] Furthermore, the absence of a significant association between parents' expectations of experiencing difficulties after discharge and their readiness levels is consistent with Pohlman's[6] qualitative study of parenting experiences in the NICU. Together, these findings suggest that parents' perceived readiness for discharge may not necessarily.

Emerging evidence also indicates that parents' perceived readiness before discharge does not always correspond to their actual experiences after returning home. Studies have shown that parents often report higher levels of preparedness than are reflected in the challenges they encounter after discharge, particularly in emergency management, the use of medical technologies, and access to social support services.[5] These findings suggest that pre-discharge assessments should be comprehensive and should evaluate both parents' perceived readiness and their anticipated support needs.

Compared with the findings of Bora Güneş and Çavuşoğlu[2] on the post-discharge experiences of mothers of premature infants in Türkiye, our results suggest that although mothers report high levels of discharge readiness, they may still encounter challenges in providing care after discharge. This discrepancy between perceived readiness and actual caregiving experiences underscores the importance of ongoing post-discharge support and follow-up services.

Recent studies conducted in Türkiye also support these findings. A multicenter study reported that parents of preterm infants experienced considerable difficulties during the transition from hospital to home, along with increased anxiety related to infant care and post-discharge stress.[17] These findings highlight the need for Türkiye-specific discharge preparation programs that address cultural and psychosocial factors.

The findings of this study have important implications for family-centered neonatal care. The association between fathers' readiness and nutritional support highlights the need to actively involve fathers in discharge education and infant feeding programs. Additionally, although mothers demonstrated high readiness levels, the similar expectations of post-discharge caregiving difficulties reported by both parents suggest that discharge education should address not only technical caregiving skills but also psychosocial support and problem-solving strategies. Recent evidence supports the effectiveness of innovative approaches in family-centered care. Systematic reviews have shown that technology-enhanced educational interventions, including virtual reality–based applications, improve parental engagement and learning outcomes compared with traditional educational methods. In addition, peer support–based interventions have been shown to enhance perceived social support and reduce parental stress during the transition from hospital to home. These findings suggest that future discharge support programs should integrate technology-enhanced educational strategies with structured social support components.[18]

Study Limitations

This study has several limitations that should be acknowledged. First, it was conducted at a single center with a relatively small sample of 39 mothers and 39 fathers, which may limit the generalizability of the findings to other settings and populations. Second, the cross-sectional design precludes causal inferences and does not allow changes in parental readiness or post-discharge outcomes to be evaluated over time. Third, the marked difference in preferred infant sex between mothers and fathers may reflect sampling characteristics or response bias and warrants further investigation. Fourth, the study relied on self-reported measures, which may have been influenced by social desirability bias. Fifth, cultural and socioeconomic factors specific to the study setting may limit the generalizability of the findings to other populations. Finally, the study did not include post-discharge follow-up to evaluate actual home care experiences and outcomes, limiting the ability to examine the relationship between perceived readiness before discharge and caregiving experiences after discharge.

Conclusion

This study highlights the importance of involving both mothers and fathers in discharge preparation and home care education for premature infants. Discharge education should adopt a family-centered approach that recognizes the caregiving roles and support needs of both parents, with particular attention to fathers' involvement in infant feeding and care. Tailored educational and supportive interventions may help strengthen parents' confidence and preparedness during the transition from hospital[ÖE1] to home. Future multicenter and longitudinal studies with larger and more diverse samples are needed to further explore parental readiness and evaluate the effectiveness of family-centered discharge education and support interventions. [ÖE1] The Conclusion has been rewritten to emphasize the main implications of the study findings and practical recommendations without repeating the statistical results.

Ethics Committee Approval: The study was approved by the Giresun Training and Research Hospital Scientific Research Ethics Committee (Approval Number: 16.04.2025/06, Date: 16.04.2025).

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A Virtual Exchange Educational Intervention to Enhance Cultural Competence, Leadership, and Global Citizenship in Nursing Education

Abstract

Background: Effective healthcare delivery relies on nurses' ability to communicate effectively with patients, families, and colleagues from diverse cultural and social backgrounds. Virtual exchange can overcome geographic barriers and create opportunities for collaborative learning. Graduate nursing students from Japan, South Africa, Spain, Sweden, the United Kingdom, and the United States participated in an innovative virtual exchange educational intervention focused on cultural competence, leadership, and global citizenship.

Aim: This pilot study aimed to evaluate the effects of a virtual exchange educational intervention on transcultural self-efficacy and perceptions of cultural competence while enhancing opportunities for global citizenship.

Methods: A pretest-posttest design was used to recruit 23 graduate nursing students from six universities worldwide. Two structured questionnaires, including measures of Transcultural Self-Efficacy and Cultural Competence, were administered. Qualitative data were collected through participants' written reflections. Both quantitative and qualitative data were collected using secure Qualtrics surveys.

Results: Among the 14 participants who completed both the pretest and posttest Transcultural Self-Efficacy survey, perceived transcultural self-efficacy increased significantly following the workshop ($t(13)=-3.02$, $p=0.010$). Similarly, among the 16 participants who completed both the pretest and posttest Cultural Competence survey, perceived cultural competence increased significantly ($t(15)=-2.31$, $p=0.035$). Thematic analysis identified three key themes: cultivating leadership skills, increasing awareness of cultural competence, and fostering global citizenship in nursing.

Conclusion: Virtual exchange expands opportunities for nurses to enhance transcultural self-efficacy and cultural competence while developing leadership skills for global citizenship. This educational intervention, which focused on cultural competence, leadership, global citizenship, and transcultural self-efficacy, proved effective.

Keywords: Cultural competence, educational intervention, global citizenship, graduate nursing education, virtual exchange

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Introduction

The increasing global mobility of nurses underscores the need to prepare practitioners who can collaborate effectively across national and cultural boundaries. Developing nurses who are capable of leading in culturally diverse settings is therefore imperative.[1] Many nurses enter practice with limited awareness of social injustice, cultural differences, and educational inequalities,[2,3] highlighting the need for curricula and educational interventions that promote cultural awareness, global citizenship, and patient safety.[4] Educational strategies that include multicultural experiences, such as study abroad programs, broaden students' perspectives beyond their own communities and increase appreciation of other cultures.[5] However, social and economic factors often limit students' ability to participate in international mobility programs.[6] Furthermore, international travel has been constrained in recent years because of the coronavirus disease 2019 (COVID-19) pandemic and growing concerns regarding the environmental sustainability of higher education.[5,6] Therefore, virtual exchange among students and educators offers an excellent opportunity to promote global citizenship.

Global citizenship encompasses the social, political, environmental, and economic responsibilities of globally minded individuals and communities.[7] It promotes respect for diverse identities based on humanitarian principles[8] that transcend national and cultural boundaries. Developing global citizenship requires an understanding of multicultural dynamics and encourages healthcare professionals to promote cultural competence and diversity.[9] Nursing leaders with diverse cultural experiences are better equipped to lead within healthcare organizations and exemplify the principles of global citizenship.[10] Cultural competence has been defined as "a multidimensional learning process that integrates transcultural skills in all three dimensions (cognitive, practical, and affective), involves transcultural self-efficacy as a major influencing factor, and aims to achieve culturally congruent care."[11] Education for global citizenship supports the development of the knowledge, skills, and values necessary to promote a sustainable future.[12] It also fosters an understanding of the importance of leadership skills for working in diverse healthcare environments and addressing healthcare inequalities and emerging global health challenges.[13-15] Effective cross-cultural communication and collaboration further contribute to improved patient health literacy and health outcomes.[16] Consequently, educational interventions designed to strengthen global citizenship and cultural competence should be grounded in a clear conceptual framework.

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The literature identifies a need for innovative teaching and learning strategies that are developed within a robust conceptual framework to improve the cultural competence of diverse student groups preparing to care for patients from varied cultural backgrounds.[2,11] Jeffreys's Cultural Competence and Confidence (CCC) Model provides a comprehensive framework grounded in Bloom's taxonomy of learning,[17] psychological theory,[18] and transcultural nursing.[11] The CCC Model integrates the cognitive, practical, and affective domains of learning, with Transcultural Self-Efficacy (TSE) serving as a central determinant of culturally competent care. According to the model, TSE is influenced by development of transcultural skills across these three learning domains, as well as by formal cultural competence education and other relevant learning experiences.[11] The model is based on the premise that increased TSE promotes the development of cultural competence and ultimately leads to culturally congruent patient care. Guided by the CCC model and supporting literature,[11,19,20] a virtual exchange educational intervention was developed to cultivate cultural competence and leadership for global citizenship in nursing.

Based on this framework and the recognized need for nursing programs to foster global citizenship among students, a team of seven nursing educators representing six universities in Japan, Spain, South Africa, Sweden, the United Kingdom, and the United States of America developed a four-week virtual exchange educational intervention. All educators were members of the International Network of Universities (INU) Nursing Collaborative. The intervention aimed to (a) evaluate the effects of the synchronous virtual exchange on graduate nursing students' transcultural self-efficacy and perceptions of cultural competence and (b) expand opportunities for global citizenship.

Research Questions

1. How does participation in a virtual exchange educational intervention affect graduate nursing students' perceptions of transcultural self-efficacy and cultural competence?
2. What are students' perceptions of global citizenship in relation to their current and future nursing practice?
3. How do students perceive their experience within the virtual learning environment?

Materials and Methods

Study Design

The pilot study employed a pretest-posttest design. Quantitative data on cultural competence (CC) and transcultural self-efficacy were collected using two structured questionnaires, while qualitative data were collected through open-ended reflection questions. Both quantitative and qualitative data were collected before and after the virtual exchange educational intervention using a pretest–posttest design.

The educational intervention was developed using the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation).[21] The intervention focused on leadership, cultural competence, transcultural self-efficacy, and global citizenship in nursing.

Study Sample

Purposive sampling was used to recruit graduate nursing students from six participating universities. Eligible participants were nurses enrolled in a master's or doctoral nursing program at one of the participating institutions, able to read and speak English, and who had completed at least 50% of their current program. Individuals who were not registered nurses or were not enrolled in a graduate nursing program at one of the participating universities were excluded. Participants were recruited with assistance from graduate program directors or coordinators at each institution.

Invitations were distributed to all eligible graduate nursing students across the six universities, and 23 students voluntarily consented to participate. The educational intervention was developed by a team of seven nurse educators representing the six participating nursing schools. The educators voluntarily designed and facilitated the four-week virtual exchange.

Data Collection

Quantitative data were collected using Marianne R. Jeffreys' licensed Cultural Competence Assessment instruments, which included the Demographic Data Sheet–Nurses (DDS–N), the Transcultural Self-Efficacy Tool (TSET), and the Cultural Competence Clinical Evaluation Tool–Student Version (CCCET–SV).[19] Permission to use these instruments was obtained before study implementation. The CCC Model and TSET have demonstrated excellent reliability and validity across multiple studies, with Cronbach's alpha coefficients ranging from 0.92 to 0.97 in studies conducted in the United States and internationally, including China, Greece, Türkiye, Australia, Canada, Norway, and the Philippines.[11] The principal investigator (PI) distributed Qualtrics survey links through the Microsoft Teams™ channel one week before the virtual exchange and again one week following completion of the intervention. Participants created personalized usernames to enable anonymous matching of pretest and posttest responses.

Qualitative data were collected through Qualtrics using open-ended reflection questions posted in the Microsoft Teams™ channel. Data collection was conducted from October to November 2022. Quantitative data were collected during the week before and immediately after the educational intervention, whereas qualitative data were collected after each of the four virtual exchange sessions. Following each virtual exchange session, participants were asked to spend approximately 20 minutes reflecting on their experiences by responding to the following questions:

1. Reflect on your virtual exchange experience and how it contributed to the development of your leadership skills.
2. Reflect on your virtual exchange experience and how it contributed to the development of your cultural competence.
3. Why is learning about global citizenship important for nurses, and how does it apply to your current and future nursing practice?

Participants also responded to two Padlet™ questions during the virtual exchange. These responses were included in the data analysis:

1. What were the key messages you learned from this session?
2. How will increased self-awareness influence your nursing practice?

Educational Intervention

The educational intervention was designed to enhance participants' cultural competence, transcultural self-efficacy, leadership skills, and understanding of global citizenship through a synchronous virtual exchange that connected participants in real time. The intervention was conducted synchronously via the Microsoft Teams™ platform. Four virtual exchange sessions were held over a four-week period, with educators and students meeting for two hours each week.

The intervention was developed using the ADDIE instructional design model.[21] During the analysis phase (phase one), the nurse educators identified the knowledge, skills, and attitudes necessary to achieve the desired learning outcomes. A literature review was conducted, and the educators met online every three weeks over a five-month period to identify students' learning needs. Curriculum content, teaching experiences, and professional observations were shared to inform the educational design.

During the design phase (phase two), the educators developed an instructional blueprint that outlined how the intervention would be delivered. This phase included selecting instructional methods and developing learning objectives to guide the educational intervention. PowerPoint presentations were created for each session, incorporating breakout rooms, Padlet™, Mentimeter™, and videos. Group discussions conducted in Microsoft Teams™ breakout rooms promoted active participation and collaboration among participants. The team agreed that all sessions would be conducted synchronously in English using Microsoft Teams™, which served as the central platform for content sharing, communication, and virtual meetings.

Four learning objectives guided the intervention:

1. Discuss and apply leadership concepts and leadership styles to promote global citizenship.
2. Identify and promote cultural diversity among nurses from different higher education institutions.
3. Demonstrate cultural competence in professional nursing practice.
4. Reflect on leadership and global citizenship within contemporary nursing.

Learning objectives were developed using Bloom's taxonomy.[17]

To support participant learning, a virtual course guide was created containing faculty biographies, course objectives, preparatory and supplementary readings, instruc-

Table 1. Learning outcomes, session content, and teaching and learning methods used in the virtual exchange educational intervention

Learning outcome	Session and content	Teaching and learning methods
Apply leadership concepts and leadership styles to promote global citizenship in nursing.	Session 1: Introduction to leadership and the DiSC® assessment	Power Point presentation and introductory video on DiSC® leadership Breakout room discussions: Participants were grouped by their identified leadership style to discuss the characteristics, strengths, and challenges of each style. Group discussion: Each group shared and described its assigned leadership style with the larger group. Reflective notes
Develop cultural competence, cultural awareness, and transcultural self-efficacy in global nursing practice.	Session 2: Introduction to cultural competence and transcultural self-efficacy	PowerPoint presentation on cultural competence, cultural diversity, and transcultural self-efficacy Breakout rooms discussions: Participants worked in small groups using guided questions to explore the characteristics and competencies of a culturally competent nurse. Group discussion: One representative from each group presented the group's key discussion points to the larger group. Reflective notes
Examine the role of virtual exchange in fostering leadership and global citizenship among nurse leaders.	Session 3: Leadership in the context for global citizenship	PowerPoint presentation on the influence of culture on leadership and global citizenship in nursing. Breakout rooms discussions exploring leadership, culture, and global citizenship in nursing. Padlet™ activity: Each group posted a summary of the key concepts discussed during the breakout session. Reflective notes
Examine the influence of culture on professional nursing values, workplace practice, and leadership.	Session 4: Closing session – integration and summary of previous topics	Guest lecture: Culturally Competent Engagement: A Mindful Approach.[23]. Breakout room discussions on key learning outcomes and the application of cultural competence and self-awareness in nursing practice. Word cloud: Participants described their learning journey using three words. Reflective notes

tions for accessing the virtual learning environment, informed consent documentation, and links to study questionnaires.

Following the design phase, the development phase (phase three) focused on creating and organizing the educational materials used during the virtual exchange. The intervention consisted of four two-hour sessions. The instructional content and teaching strategies for each session are summarized in Table 1. Before the first session, participants completed the Everything DiSC®[22] assessment to identify their individual leadership style. The results were discussed during the first session to increase participants' understanding of leadership styles and the importance of promoting personal and collective well-being, shared values, and effective teamwork.[23]

Following the analysis, design, and development phases, the intervention was implemented (Phase Four). Prior to implementation, the nurse educators pilot-tested the platform, communication channels, hyperlinks, and learning resources. Participants received access to all course materials before the first session and joined each session through Microsoft Teams™. Given the short duration of the virtual exchange and the small team of nurse educators, the intervention was implemented in its entirety without modification.

During the evaluation phase (phase five), participants provided feedback through an open-ended question evaluating their experiences with the virtual exchange and offering suggestions for improving the course content and structure. Participant learning was assessed using Mentimeter™ activities, Padlet™ discussions, quizzes, short-answer questions, and reflective questions based on the learning materials and supporting literature.

Data Analysis

Quantitative data were analyzed using Intellectus 360.[24,25] Descriptive statistics, including frequencies and percentages, were calculated for all study variables. Statistical significance was established at 0.05 (two-tailed). The lower and upper limits for Cronbach's alpha were calculated using a 95% confidence interval. The TSET and CCET-SV each contain 83 Likert-scale items. The CCET-SV is adapted from the TSET and includes three subscales (cognitive, practical, and affective) that measure distinct dimensions of cultural competence. Only participants who completed both the pretest and posttest questionnaires were included in the quantitative analyses. One questionnaire item with missing data was excluded from the analysis, and outliers were removed as appropriate. Participants' reflections and responses to the open-ended questions were analyzed using a six-step thematic analysis approach.[26] Each researcher independently analyzed the data before meeting to discuss the emerging themes and reach consensus on the final thematic interpretation. This collaborative process enhanced the trustworthiness of the study findings.[27]

Ethical Considerations

The study was approved by Ethics Committee of James Madison University (Approval Number: 22-3468, Date: 29.08.2022). The participating universities recognized the primary university as the IRB of record for the study. Informed electronic consent was obtained from all participants through a Qualtrics survey link distributed via the Microsoft Teams™ platform by the principal investigator. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Results

Participant Characteristics

Fourteen participants completed both the pretest and posttest TSET, and 16 participants completed the CCET-SV questionnaire. Most participants were female (85%), with males comprising 15% of the sample. Participants were predominantly 25–34 years of age (49%), followed by 35–44 years (30%), 45–54 years (19%), and 55–64 years (2%). Participants identified as White (35%), Asian (32%), Black (18%), or another ethnicity (15%). Most participants were employed full-time (68%), had completed a master's degree (67%), and had not previously completed a course in transcultural nursing or cultural competence (81%).

Quantitative Results

Reliability of the TSET and the CCCET-SV was high for both the pretest and posttest administrations, as indicated by Cronbach's alpha coefficients. A two-tailed paired-samples t test was conducted to compare pretest and posttest transcultural self-efficacy scores. The analysis demonstrated a statistically significant increase in

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Table 2. Reliability of the self-efficacy and cultural competence measures

Measure	Items (n)	α	Lower limit	Upper limit
Self-efficacy				
Pretest	58	0.98	0.97	0.99
Posttest	58	0.98	0.96	0.99
Cultural competence				
Pretest	30	0.96	0.94	0.98
Posttest	30	0.97	0.95	0.99

The lower and upper limits for Cronbach's alpha were calculated using a 95% confidence interval.

Table 3. Changes in self-efficacy and cultural competence following the educational intervention

Measure	n	Mean	SD	t	p
Self-efficacy				-3.02	0.010
Pretest	14	8.02	1.34		
Posttest	14	8.94	0.71		
Cultural competence				-2.31	0.035
Pretest	16	8.65	1.1		
Posttest	16	9.15	0.71		

Paired-samples t tests (two-tailed) were used. SD: Standard deviation.

Table 4. Themes and subthemes identified from participants' reflections on the virtual exchange educational intervention

Main Theme	Subthemes
Cultivating Leadership Skills	Fostering Connections For Professional Growth Developing Leadership Skills Increasing Self-Awareness and Understanding of Leadership Styles
Increasing Awareness of Cultural Competence	Understanding Cultural Competence and Cultural Diversity Gaining New Cultural Perspectives
Global Citizenship in Nursing	Understanding Global Citizenship Importance of Global Citizenship in Healthcare for Patient Safety and Quality of Care Global Citizenship and Cultural Diversity

transcultural self-efficacy following the educational intervention. Mean self-efficacy scores increased significantly from 8.02 before the intervention to 8.94 after the intervention, representing a large effect (t(13)=-3.02, p=0.010). Owing to the small sample size, analyses of the TSET subscales were not conducted (Table 2).

Similarly, mean cultural competence scores increased significantly following the intervention, rising from 8.65 to 9.15. Although statistically significant, the magnitude of the effect was moderate (t(15)=-2.31, p=0.035). Overall, the quantitative findings demonstrated improvements in both transcultural self-efficacy and cultural competence following participation in the virtual exchange educational intervention (Table 3).

Qualitative Results

Thematic analysis of participants' reflections from the four virtual exchange sessions identified three overarching themes and eight subthemes (Table 4). Participants submitted a total of 86 anonymous reflections, which contained no identifying information.

Theme 1: Cultivating Leadership Skills

Participants reported that the virtual exchange enhanced their leadership skills. Three subthemes emerged: (1) fostering connections for professional growth, (2) developing leadership skills, and (3) increasing self-awareness and understanding of leadership styles.

Subtheme 1.1: Fostering Connections for Professional Growth

Participants reported that the virtual exchange enabled them to connect with nurses from different countries, fostering opportunities for shared learning and professional growth. They described the virtual exchange as a safe and supportive environment in which to share experiences and learn about different leadership styles.

> "*Interaction with international colleagues was beneficial… and the leadership session was a great experience that allowed us to share our thoughts*."

Subtheme 1.2: Developing Leadership Skills

According to the participants, virtual exchanges provided opportunities to develop essential leadership skills. They highlighted enhanced communication skills, intercultural competence, and digital literacy as important outcomes of the virtual exchange.

> "*Virtual learning helps cultivate leadership by enabling leaders to become more knowledgeable and proficient in using digital platforms that support meaningful and interactive learning*."

> "*Technology-enabled interaction, supported by educators, helps students develop digital literacy, effective communication skills, intercultural competence, and global awareness, preparing them for future leadership roles*."

Subtheme 1.3: Increasing Self-Awareness and Understanding of Leadership Styles

Participants reported that the virtual exchange enhanced their self-awareness and appreciation of different leadership styles.

> "*The virtual experience gave me the opportunity to develop greater self-awareness and a better understanding of different leadership styles without judgment*."

Furthermore, participants recognized that different leadership styles influence workplace interactions and the ability to provide culturally competent care.

> "*…Reflecting on my leadership style helped me understand how it influences my workplace experience and my understanding of other people's cultures. I also realized how different leadership styles can be integrated to address a sentinel event in the workplace*."

> "*Reflecting on leadership styles and cultural sensitivity made me realize that some leaders are not coping well in leadership positions because they lack the ability to lead with cultural competence*."

Theme 2: Increasing Awareness of Cultural Competence

Participants reported an increased understanding of cultural competence and cultural diversity, along with new insights into diverse cultural perspectives.

Subtheme 2.1: Understanding Cultural Competence and Cultural Diversity

Participants viewed cultural competence as an awareness of and respect for the values, beliefs, and preferences of individuals from diverse cultural backgrounds.

> "*I believe that being culturally competent…includes understanding language barriers at both the local and international levels and working to overcome them*."

> "*The healthcare setting is a dynamic environment that serves people from all walks of life. Being aware of the values, beliefs, and preferences of individuals and groups is essential for nurses to provide culturally congruent care*."

Subtheme 2.2: Gaining New Cultural Perspectives

Through the virtual exchange, participants gained new insights into shared experiences, diverse cultural perspectives, and commonalities across cultures.

> "*After listening to everyone's thoughts and perspectives about the cultural barriers they had overcome, I realized that we all experience many of the same challenges*."

Theme 3: Global Citizenship in Nursing

Participants emphasized the importance of understanding global citizenship, recognizing its relevance to healthcare, patient safety, and applying its principles in nursing practice.

Subtheme 3.1: Understanding Global Citizenship

Participants described global citizenship as recognizing one's place within a global community while fostering greater cultural awareness and appreciation of diverse perspectives.

> "*Global citizenship means being part of a global community, recognizing and respecting different cultures, and understanding that race, religion, nationality, language, gender, and age all shape our understanding of culture*."

Subtheme 3.2: Importance of Global Citizenship in Healthcare for Patient Safety and Quality of Care

The participants expressed that nurses should be aware of the principles of global citizenship in health care. Furthermore, they indicated that by being aware of cultural differences and respecting one another in health care, nurses can contribute to patient safety and the quality of care.

> "*As a nurse, it is very important to understand global citizenship because we provide care to people from diverse communities around the world, with different educational backgrounds, social challenges, understandings, and perspectives on health. Most importantly, we are global citizens ourselves*."

Subtheme 3.3: Global Citizenship and Cultural Diversity

The participants indicated that practicing global citizenship enhances their awareness of cultural diversity and encourages them to reflect on the broader world. They believed that this awareness helps develop their social and cultural competencies.

> "*I will incorporate the principles of global citizenship into my workplace by reflecting more on the world around me, learning more about global citizenship, and teaching others*."

Discussion

This study demonstrated that providing a synchronous virtual exchange as an educational intervention with participants from multicultural backgrounds produced positive outcomes. The virtual exchange was an effective method for enhancing participants' cultural competence and transcultural self-efficacy. The nursing students indicated that they gained new insights into cultural perspectives and differences, reflecting a deepening of their cultural awareness. These findings align with previous studies suggesting that online approaches are effective for teaching graduate and postgraduate nursing students about cultural diversity.[28,29] The students' recognition of a shared human experience, despite cultural differences, underscores the potential of virtual exchanges to bridge cultural gaps and foster empathy and understanding among healthcare professionals.[30]

Through peer connections, the nursing students in this study reported experiencing personal growth and gaining a better understanding of themselves. They also noted that virtual exchanges helped them develop the skills and leadership styles necessary for effective leadership. These findings are consistent with existing research demonstrating the benefits of cross-cultural interactions for leadership development.[31,32] Exposure to diverse perspectives and opportunities to adapt to different leadership styles may enhance leadership capabilities and ultimately improve the quality of care.[33] The nursing students further emphasized the importance of effective communication skills and intercultural competencies, highlighting the value of virtual exchanges in preparing future nursing leaders for the global healthcare landscape.[34]

The concept of global citizenship encompasses creating space for diverse identities, promoting tolerance, and fostering the belief that individuals can cooperate and collaborate based on humanitarian principles.[7,8] The virtual exchange enabled participants to develop a deeper understanding of global citizenship by emphasizing the importance of recognizing their role in a globalized world, appreciating cultural diversity, and contributing to patient safety and quality of care. Furthermore, it helped participants recognize that, as healthcare providers, they are global citizens who serve diverse communities with varying cultural, educational, and social backgrounds. This understanding was strengthened by the opportunity for students from different countries to interact and engage in meaningful discussions during the virtual exchange. Universities have a responsibility to promote global citizenship by helping students recognize that they are members of a global community and can use their knowledge, skills, and education to contribute to society.[35] This virtual exchange provided such an opportunity. Similar studies involving students from other disciplines have also suggested that virtual exchange can support the development of global citizenship.[36]

These findings provide valuable insights into the transformative impact of virtual exchanges and support a forward-looking approach to nursing education. The results highlight the important role of educational interventions in developing leadership skills and fostering awareness of global citizenship in nursing practice. By fostering these competencies and mindsets, virtual exchanges equip nursing students and professionals with the knowledge and skills needed to navigate culturally diverse healthcare environments. Overall, the educational intervention enhanced participants' knowledge and understanding of leadership, cultural competence, transcultural self-efficacy, and global citizenship in nursing.

Limitations

This study has several limitations. The small sample size and participant characteristics limit the generalizability of the findings. The absence of a control group is another limitation of this study. Due to the small sample size, the subscales of the Transcultural Self-Efficacy Tool could not be analyzed separately. Furthermore, the exclusion of participants who did not complete both the pre- and post-intervention surveys may have influenced the study findings. Student participation may also have been influenced by the nurse educators teaching within their respective programs. Additionally, time zone differences across participating countries posed challenges for recruiting students and facilitating engagement. To minimize the impact of these differences, the research team collaborated to identify mutually suitable times for virtual sessions and learning activities. Despite these limitations, the study generated meaningful findings that may inform the development of nursing curricula, education, and practice.

Conclusion

Virtual exchange programs can provide significant benefits for nursing students by fostering global citizenship and cultural awareness. Through these programs, students can bridge geographical and cultural divides, broaden their perspectives, and develop a deeper understanding of cultural diversity. The benefits of virtual exchanges include increased cultural sensitivity, improved communication skills, enhanced adaptability, and a broader worldview—essential attributes for future healthcare professionals and leaders. Additionally, virtual exchange platforms facilitate collaboration with peers from diverse backgrounds, promoting teamwork and strengthening intercultural communication skills. These competencies are essential in today's increasingly globalized healthcare environment, where healthcare professionals must work effectively with colleagues and patients from diverse cultural backgrounds.

Virtual exchange programs also offer a cost-effective and accessible means of gaining international exposure without the need for extensive travel. This democratization of global learning opportunities enables more nursing students to benefit from international experiences regardless of financial or logistical constraints. As students develop into culturally competent and globally aware nurses, they are better equipped to contribute to more inclusive, equitable, and culturally responsive healthcare. Nevertheless, further research is needed to examine the long-term effects of virtual exchange programs on nursing education and practice. Overall, these findings provide valuable insights into the transformative potential of virtual exchanges and demonstrate their value as an innovative strategy for overcoming barriers to global learning in nursing education.

Ethics Committee Approval: The study was approved by the James Madison University Ethics Committee (Approval Number: 22-3468, Date: 29.08.2022).

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

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Validity and Reliability of the Turkish Version of the Nurses' Spiritual Sensitivity Scale: A Methodological Study

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Abstract

Background: Nurses need a high level of spiritual sensitivity to adequately address the spiritual needs of patients and their families. Therefore, valid and reliable instruments for assessing nurses' spiritual sensitivity are essential.

Aim: This study aimed to evaluate the validity and reliability of the Turkish version of the Nurses' Spiritual Sensitivity Scale and examine the associations between nurses' sociodemographic and professional characteristics and their spiritual sensitivity scores.

Methods: The study included 330 nurses employed at a university hospital between February 20 and May 20, 2024. Data were collected using the Nurses' Introductory Information Form and the Nurses' Spiritual Sensitivity Scale. Statistical analyses included descriptive statistics, content validity analysis, exploratory and confirmatory factor analyses, Cronbach's alpha, intraclass correlation coefficients for test–retest reliability, and multiple linear regression analysis.

Results: The 20-item, two-factor structure explained 59.54% of the total variance. The scale demonstrated high internal consistency (Cronbach's α=0.934).

Conclusion: The Turkish version of the Nurses' Spiritual Sensitivity Scale demonstrated psychometric properties comparable to those of the original instrument. The findings support its validity and reliability for assessing spiritual sensitivity among nurses.

Keywords: Nursing, reliability, spiritual sensitivity, validity

Introduction

Human beings are multidimensional, encompassing physical, psychological, social, and spiritual dimensions. Spirituality influences individuals' interactions, identities, and perceptions of life's meaning, making it an essential component of holistic nursing care.[1] Accordingly, spiritual care is recognized as a fundamental aspect of nursing practice that aims to address patients' spiritual needs.[1,2]

Spiritual nursing care aims to alleviate anxiety, fear, and suffering while fostering hope and inner peace. To provide appropriate spiritual care, nurses must recognize patients' spiritual needs, respect their beliefs, avoid imposing personal values, and demonstrate adequate spiritual knowledge, communication skills, and spiritual sensitivity.[3,4]

Spiritual sensitivity refers to awareness of and responsiveness to others' spiritual values, beliefs, and needs.[5] Akbari et al.[4] described spiritual sensitivity as an inner power that enables nurses to recognize, understand, and respond to the spiritual needs of patients and their families. In nursing, spiritual sensitivity is particularly important because it enables nurses to identify patients' spiritual concerns and respond appropriately while respecting individual religious and cultural beliefs and maintaining professional boundaries.[2,4] Furthermore, spiritual sensitivity supports patient-centered, holistic care by helping nurses recognize their responsibilities in addressing patients' spiritual needs.[3,5] Higher spiritual sensitivity has been associated with more accurate assessments of patients' spiritual needs, stronger nurse–patient relationships, greater patient satisfaction, improved quality of holistic care, and better patient well-being and quality of life.[3,5,6]

Studies conducted internationally and in Türkiye indicate that nurses often feel inadequately prepared to provide spiritual care and require further development of their knowledge, skills, and awareness.[7,8] Assessing nurses' spiritual sensitivity is therefore important for identifying educational needs and evaluating interventions, underscoring the need for psychometrically sound measurement instruments. To address this need, Akbari et al.[4] developed the Nurses' Spiritual Sensitivity Scale (NSSS), which comprises two subdimensions: professional spiritual sensitivity and inner spiritual sensitivity. The original study supported its two-factor structure and demonstrated strong validity and reliability.

Two independent methodological studies have evaluated the psychometric properties of Turkish versions of the NSSS. In a study involving 207 nurses, Tektaş and Şahan[9] found that the original two-factor structure did not demonstrate adequate fit in confirmatory factor analysis (CFA). Following exploratory factor analysis

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(EFA), the 20-item Turkish version was evaluated as a single-factor instrument. In contrast, Korkmaz Binay and Karakurt,[10] in a study involving 267 nurses, found that EFA and CFA supported the original two-factor structure comprising professional spiritual sensitivity and inner spiritual sensitivity.

Evidence of construct validity cannot be established conclusively through a single study. Contemporary psychometric approaches recommend accumulating evidence of construct validity through validation studies conducted with different, independent samples.[11] The identification of both single-factor and two-factor structures for Turkish versions of the NSSS indicates that findings regarding their structural stability among Turkish nurses remain inconsistent. These differences may be related to sample characteristics, institutional and regional contexts, independent translation and cross-cultural adaptation procedures, factor-retention criteria, and model evaluation approaches. Therefore, further evaluation of the factor structure and reliability of the NSSS in independent samples of nurses is needed.

This methodological study aimed to evaluate the psychometric properties of the Turkish version of the NSSS in an independent sample of nurses. Specifically, the study examined whether the original two-factor structure could be supported in a Turkish nursing sample, assessed the scale's validity and reliability, and investigated individual and professional factors associated with nurses' spiritual sensitivity. The findings are expected to strengthen the existing evidence regarding the construct validity of the Turkish version of the NSSS and contribute to a better understanding of the consistency of its measurement properties across different nursing samples.

Research Questions

1. Is the Turkish version of the Nurses' Spiritual Sensitivity Scale a valid and reliable instrument for assessing spiritual sensitivity among nurses?

Materials and Methods

Study Design

This methodological, cross-sectional study evaluated the validity and reliability of the Turkish version of the NSSS and examined sociodemographic and professional factors associated with nurses' spiritual sensitivity. Relevant recommendations from the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) were considered when evaluating and reporting selected measurement properties, including content validity, structural validity, internal consistency, and test–retest reliability.[12]

Study Population and Sampling

The study population comprised 493 nurses employed at a university hospital between February and May 2024. Participants were recruited using convenience sampling. Nurses who met the inclusion criteria and voluntarily agreed to participate were included. A commonly used guideline for determining sample size in scale validation studies recommends 5–10 participants per item, with a participant-to-item ratio of 10:1 frequently recommended. The NSSS comprises 20 items; therefore, at least 200 participants were required based on this guideline. Additionally, sample sizes of 200–300 participants are generally recommended to support robust factor analysis.[13] Accordingly, the minimum target sample size was set at 300 nurses. To account for potential data loss, the target was increased by 10%, resulting in a final sample of 330 nurses.

The inclusion criteria were employment as a nurse at the university hospital where the study was conducted, active employment during the data collection period, age 18 years or older, ability to read and understand Turkish, voluntary agreement to participate, and complete responses to the data collection forms. The exclusion criteria were participation in the pilot study, incomplete or incorrectly completed data collection forms, and withdrawal from the study at any stage.

Data Collection Instruments

Data were collected using the Nurses' Introductory Information Form and the NSSS.

Nurses' Introductory Information Form: This form included questions about participants' sociodemographic and professional characteristics.

Nurses' Spiritual Sensitivity Scale: The NSSS was developed by Akbari et al.[4] to assess nurses' levels of spiritual sensitivity. The original instrument comprises 20 items distributed across two subdimensions: Nurses' Professional Spiritual Sensitivity and Nurses' Inner Spiritual Sensitivity. The findings of the present validity and reliability study indicated that the Turkish version of the scale retained the structure of the original instrument. The Turkish version comprises two subdimensions: Nurses' Professional Spiritual Sensitivity, consisting of 12 items (Items 1–12), and Nurses' Inner Spiritual Sensitivity, consisting of eight items (Items 13–20). The NSSS uses a five-point Likert-type response format ranging from 0 (never) to 4 (always). A score of 0 indicates the absence of spiritual sensitivity, whereas a score of 4 indicates a high level of spiritual sensitivity. No items require reverse scoring. The total possible score on the NSSS ranges from 0 to 80. Raw scores are converted to a standardized 0–100 scale using the following formula:

[(Raw Score – Minimum Possible Score) / (Maximum Possible Score – Minimum Possible Score)] × 100.

Standardized scores are classified as very low (0–20), low (20.1–40), moderate (40.1–60), high (60.1–80), or very high (80.1–100) spiritual sensitivity.[4] Akbari et al.[4] reported a Cronbach's alpha coefficient of 0.927 for the original scale. In the present study, Cronbach's alpha coefficients were 0.934 for the total Nurses' Spiritual Sensitivity Scale, 0.921 for the Nurses' Professional Spiritual Sensitivity subscale, and 0.913 for the Nurses' Inner Spiritual Sensitivity subscale.

Cross-Cultural Adaptation and Content Validity

Forward Translation: The original NSSS was independently translated into Turkish by four native Turkish speakers fluent in English. A reconciliation meeting was held to discuss and resolve discrepancies among the translations, resulting in Translation Version 1 (TV1).

Back-Translation: Four additional bilingual translators, who were blinded to the original NSSS, independently back-translated TV1 into English. The research team compared the back-translations with the original NSSS and the revised Turkish version to assess conceptual equivalence, resulting in Translation Version 2 (TV2). The original version, TV1, and TV2 were reviewed for clarity, inconsistencies, semantic errors, and differences in wording. The review indicated that the translated items were culturally appropriate and preserved the intended meanings of the original items.

Expert Panel Review: Following Lawshe's approach to content validation, TV2 was evaluated by a panel of 10 PhD-prepared academic nurses specializing in internal medicine nursing and fundamentals of nursing, all of whom had experience in scale validity and reliability assessment.[13] Some panel members also had prior experience in scale development, adaptation, and psychometric evaluation. The panel assessed linguistic equivalence by examining the clarity of item wording and the appropriateness of commonly used expressions in Turkish healthcare settings.

Cognitive Debriefing: Following the assessment of linguistic and content validity, the NSSS and the introductory information form were administered to 20 nurses to evaluate item clarity. No concerns or suggestions for revision were reported; therefore, the translated items were retained without further modification.

Data Collection

Data were collected by the first researcher through in-person contact with nurses in the hospital's clinical units after institutional approval had been obtained. Before data collection, participants were informed about the study objectives and procedures. Informed consent was obtained from nurses who agreed to participate. Completing the questionnaires took approximately 8–10 minutes. To assess the test–retest reliability, 55 nurses completed the NSSS twice, with a 14-day interval between administrations.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 26.0 and IBM SPSS AMOS version 24.0 (IBM Corporation, Armonk, NY, USA). Participants' sociodemographic and professional characteristics were summarized using frequencies, percentages, means, and standard deviations. Normality was assessed using skewness and kurtosis values, with values between -2 and +2 considered acceptable.[14] Content validity was evaluated by calculating the content validity ratio (CVR) for each item and the overall content validity index (CVI) according to Lawshe's (1975) procedure.[15] For a panel of 10 experts, a CVR of ≥0.62 was considered acceptable. Construct validity was assessed using EFA and CFA. The suitability of the data for factor analysis was examined using the Kaiser–Meyer–Olkin measure and Bartlett's test of sphericity. Principal

component analysis was used as the extraction method, followed by Varimax rotation with Kaiser normalization. Factors with eigenvalues greater than 1 were retained, and no items were removed. In CFA, model fit was evaluated using χ^2/df, root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), incremental fit index (IFI), comparative fit index (CFI), goodness-of-fit index (GFI), and Tucker–Lewis index (TLI). The following thresholds were considered indicative of acceptable model fit: χ^2/df ≤5, GFI ≥0.85, IFI/CFI/TLI ≥0.90, and RMSEA/SRMR ≤0.08. Internal consistency was assessed using Cronbach's alpha. Temporal stability was evaluated using a two-way mixed-effects, absolute-agreement, single-measure intraclass correlation coefficient (ICC). ICC values were interpreted as poor (<0.50), moderate (0.50–0.75), good (0.75–0.90), or excellent (>0.90).[16] Variables were selected based on their theoretical relevance and evidence from previous studies and were entered simultaneously into the regression model. Categorical variables were dummy-coded, with undergraduate education and liking the nursing profession serving as reference categories. Binary variables were coded as 0 and 1. Before the multiple linear regression analysis, autocorrelation and multicollinearity were assessed. The Durbin–Watson statistic was 1.732, indicating no substantial autocorrelation. Variance inflation factor (VIF) values below 10 and tolerance values above 0.10 were considered indicative of the absence of problematic multicollinearity.[17] All tolerance and VIF values met these criteria. Statistical significance was set at p<0.05.

Ethical Considerations

Ethical approval was obtained from Zonguldak Bülent Ecevit University Human Research Ethics Committee (Approval Number: 411654, Date: 08.02.2024). Written institutional permission was also obtained from the university hospital where the study was conducted (E-16734702-622.99-416684). Written and verbal informed consent was obtained from all participating nurses. Permission to evaluate the validity and reliability of the Turkish version of the NSSS was obtained by email from Akbari, the scale's developer, on July 4, 2023. All study procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Results

A total of 330 nurses participated in the study. Of these, 87% were female, 75.5% held a bachelor's degree, 40.3% had more than 10 years of professional experience, and 57.3% were married (Table 1).

Table 1. Sociodemographic and professional characteristics of the nurses (n=330)

Characteristic	n	%
Age (years)		
≤25	78	23.6
26–30	87	26.4
31–35	52	15.8
≥36	113	34.2
Sex		
Female	287	87
Male	43	13
Educational level		
Vocational high school (healthcare)	24	7.3
Associate degree	32	9.7
Bachelor's degree	249	75.5
Postgraduate degree	25	7.6
Professional experience		
Less than 5 years	126	38.2
5 to less than 10 years	71	21.5
10 years or more	133	40.3
Marital status		
Married	189	57.3
Single	141	42.7

Content Validity

According to Lawshe's method, the minimum acceptable CVR value for a panel of 10 experts is 0.62. Item-level CVR values for the NSSS ranged from 0.80 to 1.00. The overall CVI, calculated as the mean of the item-level CVR values, was 0.93. These findings indicate a high level of expert agreement and support the content validity of the Turkish version of the NSSS.

Validity Results

Exploratory Factor Analysis

Before evaluating construct validity, sampling adequacy and the suitability of the correlation matrix for factor analysis were assessed using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity. The KMO value was 0.915, indicating excellent sampling adequacy. Bartlett's test yielded $\chi^2(190)=4828.84$ (p<0.001), indicating that the data were suitable for factor analysis (Table 2).

The factor structure and item loadings are presented in Table 2. Factor loadings ranged from 0.617 to 0.850 for the Nurses' Professional Spiritual Sensitivity subscale and from 0.549 to 0.850 for the Nurses' Inner Spiritual Sensitivity subscale. The 12-item Nurses' Professional Spiritual Sensitivity factor explained 33.02% of the total variance, whereas the eight-item Nurses' Inner Spiritual Sensitivity factor explained 26.52%. Together, the two factors comprised all 20 items and accounted for 59.54% of the total variance, which is considered acceptable in scale development and validation studies.

Confirmatory Factor Analysis

The 20-item, two-factor model demonstrated the following fit indices: χ^2/df=2.267, GFI=0.870, IFI=0.927, TLI=0.909, CFI=0.926, RMSEA=0.073, and SRMR=0.074. Overall, these values indicated acceptable model fit (Table 3).

The path diagram and factor loadings for the two-factor model are presented in Figure 1. All reported path coefficients for the Nurses' Professional Spiritual Sensitivity and Nurses' Inner Spiritual Sensitivity dimensions were statistically significant (p<0.05) (Fig. 1).

Reliability

Test-Retest Reliability

The NSSS was administered twice, at a 14-day interval, to 55 nurses from an overall study sample of 330 participants. The ICC values indicated excellent test–retest reliability for the total scale (ICC=0.988, 95% confidence interval [CI]: 0.980–0.993), the Nurses' Professional Spiritual Sensitivity subscale (ICC=0.972, 95% CI: 0.953–0.984), and the Nurses' Inner Spiritual Sensitivity subscale (ICC=0.988, 95% CI: 0.979–0.993) (Table 4).

Internal Consistency

Cronbach's Alpha Reliability Coefficient

The 20-item Turkish version of the NSSS demonstrated excellent reliability, with a Cronbach's alpha coefficient of 0.934. High internal consistency was also observed for the 12-item Nurses' Professional Spiritual Sensitivity subscale (α=0.921) and the eight-item Nurses' Inner Spiritual Sensitivity subscale (α=0.913).

Nurses' Spiritual Sensitivity Levels

The mean total NSSS score was 72.36±16.32. The mean scores for the Nurses' Professional Spiritual Sensitivity Nurses' Inner Spiritual Sensitivity subscales were 44.26±9.83 and 28.10±8.30, respectively (Table 5).

The multiple linear regression model examining factors associated with nurses' spiritual sensitivity was statistically significant (F=8.618, p<0.001) and explained 20.4% of the variance in spiritual sensitivity scores (R^2=0.204). Nurses who reported disliking their profession had significantly lower spiritual sensitivity scores than those who reported liking their profession (B=-6.226, standard error [SE]=3.093, β=-0.108, t=-2.013, p=0.045, 95% CI [-12.311, -0.141]). Believing that patients need spiritual care was positively associated with spiritual sensitivity (B=37.281, SE=4.986, β=0.374, t=7.477, p<0.001, 95% CI [27.471, 47.091]). Tolerance values ranged from 0.698 to 0.978, and VIF values ranged from 1.023 to 1.432, indicating no evidence of problematic multicollinearity among the independent variables (Appendix 1).

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Table 2. Factor loadings of the Nurses' Spiritual Sensitivity Scale items obtained from exploratory factor analysis

Item statement	Factor loadings		Explained variance (%)
	Nurses' professional spiritual sensitivity	Nurses' Inner spiritual sensitivity	
I can recognize the spiritual support needs of patients and their families.	0.675		33.02
I can recognize patients' need to fulfill their religious obligations.	0.640		
I can recognize patients' and their families' need for comfort.	0.685		
I can recognize feelings of disappointment in patients and their families.	0.828		
I can recognize patients' feelings of remorse and guilt.	0.850		
I can recognize patients' feelings of sadness.	0.817		
I can recognize patients' and their families' trust in God during illness.	0.673		
I can recognize patients' need for religious education.	0.677		
I share the feelings (e.g., pain and sadness) of patients and their families.	0.617		
I can recognize patients' grief when they are unable to continue their religious practices.	0.701		
I provide spiritual care to patients at the end of life.	0.683		
I feel responsible for addressing patients' spiritual needs.	0.632		
Commitment to spirituality helps me achieve my purpose in life		0.659	26.52
I am committed to fulfilling my religious obligations.		0.837	
Faith helps me understand life events.		0.839	
Spirituality is present in all aspects of my life.		0.850	
I strive to develop spiritually.		0.805	
I try to make time to meet my spiritual needs.		0.808	
I believe that hardships and illnesses lead to the forgiveness of sins.		0.714	
I regard individuals with strong ethical values as role models.		0.549	
		Total	59.54
KMO=0.915; DF=190; χ^2=4828.843; p<0.001			

KMO: Kaiser–Meyer–Olkin test, DF: Degrees of freedom.

Table 3. Fit indices for the Nurses' Spiritual Sensitivity Scale

	Fit index	Good fit (acceptable fit)
χ^2/df	2.267	≤3 (4–5)
GFI	0.870	≥0.90 (0.89–0.85)
IFI	0.927	≥0.95 (0.94–0.90)
TLI (NNFI)	0.909	≥0.95 (0.94–0.90)
CFI	0.926	≥0.95 (0.94–0.90)
RMSEA	0.073	≤0.05 (0.06–0.08)
SRMR	0.074	≤0.05 (0.06–0.08)

χ^2/df: Chi-square-to-degrees-of-freedom ratio, GFI: Goodness-of-fit index, IFI: Incremental fit index, TLI: Tucker–Lewis index, CFI: Comparative fit index, RMSEA: Root mean square error of approximation, SRMR: Standardized root mean square residual.

Table 4. Test–retest reliability of the Nurses' Spiritual Sensitivity Scale assessed using intraclass correlation coefficients

Scale/subscale	ICC (95% CI)
Nurses' Spiritual Sensitivity Scale	0.988 (0.980–0.993)
Nurses' Professional Spiritual Sensitivity	0.972 (0.953–0.984)
Nurses' Inner Spiritual Sensitivity	0.988 (0.979–0.993)

ICC: Intraclass correlation coefficient, CI: Confidence interval. Intraclass correlation coefficients were calculated using a two-way mixed-effects model with absolute agreement for single measurements.

Discussion

Validity and Reliability of the Scale

In this study, the Turkish version of the NSSS demonstrated strong psychometric properties, including content validity, construct validity, and temporal stability. Validity refers to the extent to which a measurement instrument measures the construct it is intended to assess.[18] In this study, validity was evaluated through content and construct validity analyses. The high content validity index indicated a substantial level of expert agreement that all 20 items adequately reflected the concept of spiritual sensitivity within the Turkish cultural context. This finding is consistent with the content validity results reported in the original scale-development study.[4] Furthermore, the high content validity indices reported in two previous Turkish adaptation studies provide additional support for the linguistic and cultural appropriateness of the scale items.[9,10]

Construct validity reflects the extent to which an instrument adequately represents its intended theoretical construct and is commonly investigated using factor analysis.[19,20] Construct validity was assessed using EFA and CFA. EFA supported the original two-factor structure, which accounted for 59.54% of the total variance. CFA indicated an acceptable model fit, providing further support for the proposed two-factor structure among Turkish nurses. These findings are consistent with those of the original scale-development study.[4]

The first Turkish adaptation study recommended a single-factor structure because the original two-factor model demonstrated inadequate fit in CFA.[9] In con-

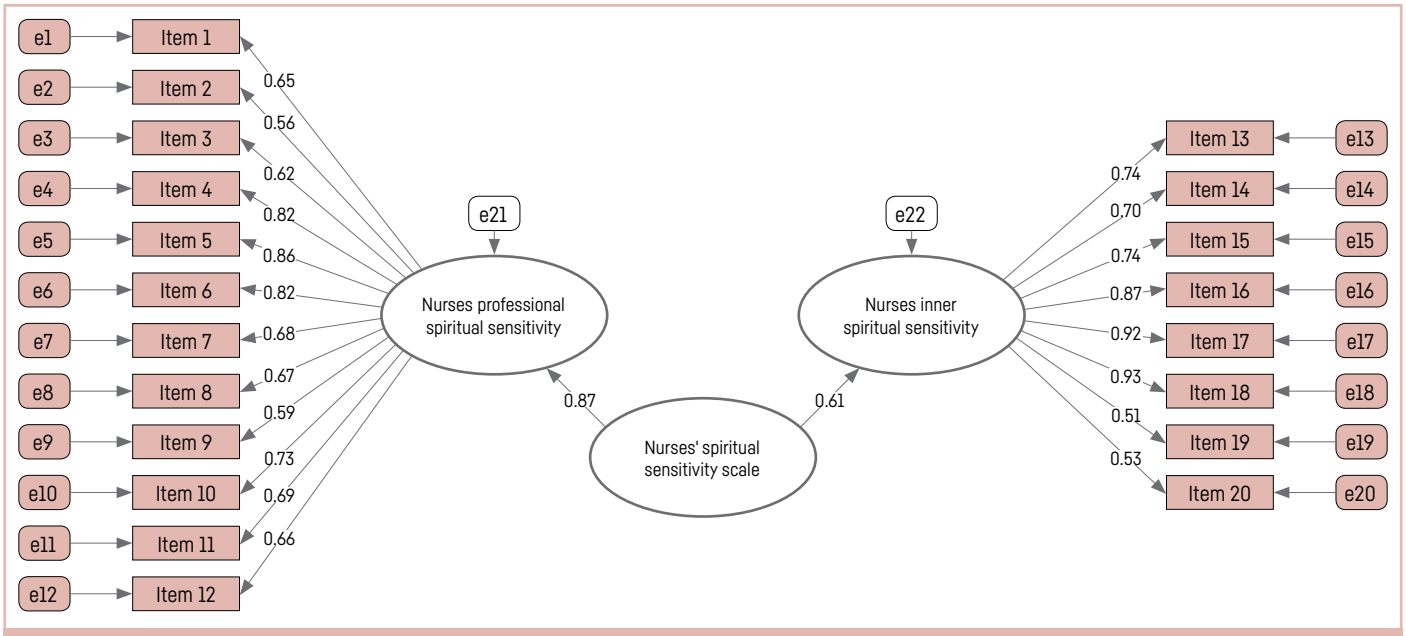


Figure 1. Nurses' Spiritual Sensitivity Scale path diagram.

Table 5. Descriptive statistics for the Nurses' Spiritual Sensitivity Scale

	Mean±SD	Median (min-max)	F1	F2
Nurses' Professional Spiritual Sensitivity	44.26±9.83	45 (0–60)	1	
Nurses' Inner Spiritual Sensitivity	28.10±8.30	28 (0–40)	**r=0.588; p<0.001**	1
Nurses' Spiritual Sensitivity Scale	72.36±16.32	73 (0–100)	**r=0.911; p<0.001**	**r=0.870; p<0.001**

Correlations are Pearson's r. Descriptive statistics are presented as the mean, standard deviation (SD), median (M), minimum (min), and maximum (max). Statistically significant results (p<0.05) are shown in bold.

trast, Korkmaz Binay and Karakurt[10] supported the original two-factor structure using both EFA and CFA, with the two factors explaining 52.254% of the total variance. The present findings are consistent with this those of Korkmaz Binay and Karakurt[10] but differ from those reported by Tektaş and Şahan.9 The two-factor structure was retained because the exploratory analysis supported the original factor structure and the confirmatory analysis demonstrated acceptable model fit. The larger sample used in the present study (n=330) provides additional evidence supporting the original two-factor structure. Although EFA and CFA supported the two-factor structure, both analyses were performed using the same sample. Therefore, the CFA findings should be interpreted with caution and further validated in an independent sample.

Reliability refers to the extent to which an instrument produces consistent measurements with minimal measurement error.[19] In this study, reliability was evaluated through test–retest stability. The NSSS was administered twice at a 14-day interval, yielding an excellent intraclass correlation coefficient of 0.988 for the total scale. An ICC greater than 0.90 indicates that the scale provides highly stable measurements over time.[20] Comparable findings were reported in the original scale-development study and the Turkish adaptation study by Korkmaz Binay and Karakurt.[4,10] Together, these findings indicate that the Turkish NSSS is a reliable instrument that produces consistent results over time and further support its psychometric reliability.

In addition to temporal stability, internal consistency was assessed using Cronbach's alpha. A Cronbach's alpha value approaching 1 indicates high reliability.[19,20] The overall Cronbach's alpha coefficient was 0.934, indicating excellent internal consistency and closely approximating the coefficient reported in the original scale-development study (α=0.927).[4] Similarly, previous Turkish adaptation studies reported high internal consistency (α=0.980 and α=0.918).[9,10] These findings indicate that the Turkish NSSS provides reliable and consistent measurements of nurses' spiritual sensitivity and can be used with confidence in both research and clinical practice.

Factors Associated with Nurses' Spiritual Sensitivity

Spiritual sensitivity is an important component of holistic nursing care. Spiritual care may help individuals cope with negative emotions during challenging experiences, such as illness, while fostering peace, meaning, hope, and spiritual well-being. Therefore, spiritual sensitivity is essential for enabling nurses to recognize and respond appropriately to patients' spiritual care needs.[21]

In the present study, nurses demonstrated high levels of spiritual sensitivity. This finding is consistent with the original validation study, which reported a mean score of 76.81, and with the study by Cihan Erdoğan and Doğan,[22] which also reported high spiritual sensitivity among nurses (median=73.75).[4] In contrast, Tavakol et al.[23] reported moderate spiritual sensitivity among Iranian nurses (53.73±16.80). Higher spiritual sensitivity has been associated with a greater ability to recognize the spiritual needs of patients and their families.[22,24-26] Accordingly, the high spiritual sensitivity scores observed in the present study may indicate greater awareness of patients' spiritual care needs among participating nurses. The regression model explained 20.4% of the variance in nurses' spiritual sensitivity scores, suggesting that additional unmeasured factors may contribute to differences in spiritual sensitivity among nurses.

Spiritual sensitivity is also considered an important component of holistic and ethically grounded nursing care because it supports nurses in recognizing patients' spiritual needs, communicating meaningfully, and responding within appropriate professional boundaries.[5,22,27] Previous studies have identified positive associations between nurses' spiritual sensitivity, spiritual care practices, and job satisfaction, suggesting that spiritual sensitivity may be related to professional meaning, motivation, and fulfillment.[22,28,29] Consistent with these findings, nurses who reported disliking their profession had spiritual sensitivity scores that were, on average, 6.226 points lower than those of nurses who reported liking their profession in the present study. Kazemi et al.[5] defined spiritual sensitivity as attending to the spiritual values inherent in a situation and assuming responsibility for responding to them. Previous research has also suggested that nurses who have positive attitudes toward their profession tend to

demonstrate greater ethical sensitivity and sensitivity in providing holistic care.[30] The association observed in the present study may reflect stronger professional motivation and greater attentiveness to patients' spiritual needs among nurses with positive professional attitudes. However, given the cross-sectional design of the study, it cannot be concluded that liking the nursing profession directly increases spiritual sensitivity.

Nursing involves continuous communication and interaction with patients. Therefore, nurses' attitudes toward spirituality and spiritual care may be associated with their sensitivity to patients' spiritual needs. In the present study, nurses who believed that patients needed spiritual care had spiritual sensitivity scores that were, on average, 37.281 points higher than those of nurses who did not hold this belief. This finding is consistent with Akbari et al.,[31] who reported that nurses' spiritual sensitivity was related to their perceptions of the spiritual conditions and needs of patients and their families. That study also reported that negative experiences among patients and their families, including loneliness, fear of death, and an inability to pray, may be associated with nurses' spiritual sensitivity. Furthermore, nurses' religious beliefs have been reported to help them recognize patients' spiritual needs and provide spiritual care.[32] Similarly, nurses with higher levels of spiritual sensitivity have been reported to be more likely to provide spiritual care.[25,33] In this context, recognizing patients' spiritual needs may contribute to care that better aligns with their spiritual values and beliefs, thereby supporting the quality of holistic nursing care.[34] Nevertheless, the association observed in the present study should be interpreted with caution, as both spiritual sensitivity and beliefs regarding patients' spiritual care needs were assessed using self-report measures and may reflect related attitudes toward spiritual care.

Strength and Limitations

A key strength of this study is its larger and more representative sample compared with previous Turkish adaptation studies, allowing for more robust psychometric analyses. Furthermore, the preservation of the original factor structure enhances the methodological rigor of the study and supports the validity of the scale's adaptation to the Turkish nursing context.

This study has several limitations. First, it was conducted at a single university hospital, which may limit the generalizability of the findings to nurses working in other healthcare settings or geographical regions. Second, voluntary participation may have introduced selection and volunteer biases. Third, the use of self-report questionnaires may have increased the risk of response and social desirability biases. Fourth, EFA and CFA were conducted using the same sample, potentially increasing the risk of overestimating the stability of the factor structure. Fifth, criterion-related, convergent, and discriminant validity were not evaluated. Finally, given the cross-sectional design of the study, the observed associations between nurses' sociodemographic and professional characteristics and spiritual sensitivity cannot be interpreted as causal. Given the potential influence of cultural and religious contexts on spiritual sensitivity, future research should examine additional measurement properties, evaluate the factor structure in larger independent samples, and employ longitudinal designs to clarify the observed associations.

Conclusion

The Turkish version of the Nurses' Spiritual Sensitivity Scale demonstrated strong validity and excellent reliability, supporting its use for assessing spiritual sensitivity among nurses. The Turkish NSSS may be a useful instrument for assessing nurses' spiritual sensitivity and informing future research and educational initiatives aimed at strengthening spiritual care in nursing.

Appendix may be accessed through the link: https://jag.journalagent.com/jern/abs_files/JERN-81231/JERN-81231_(0)_00._JERN-976_Esra_Danaci_(appendix).pdf

Ethics Committee Approval: The study was approved by the Zonguldak Bülent Ecevit University Human Research Ethics Committee (Approval Number: 411654, Date: 08.02.2024).

Informed Consent: Written and verbal informed consent was obtained from all participating nurses.

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Infection Prevention Appraisal Scale (IPAS): Cultural Adaptation and Psychometric Properties of the Turkish Version

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Abstract

Background: Healthcare-associated infections remain a major patient safety concern worldwide, and nurses' self-efficacy plays a crucial role in the effective implementation of infection prevention and control practices in clinical settings.

Aim: This study aimed to translate and culturally adapt the Infection Prevention Appraisal Scale (IPAS) into Turkish and evaluate its psychometric properties for assessing nurses' self-efficacy in implementing infection prevention measures during patient care.

Methods: This methodological study employed a cross-sectional design and was conducted between July 11, 2023, and December 25, 2024, among 232 nurses working in surgical units at four hospitals in southern Türkiye. Participants were recruited using convenience sampling. Data were collected through face-to-face administration of the Descriptive Information Form and the IPAS. The psychometric properties of the Turkish IPAS were evaluated using exploratory and confirmatory factor analyses and the intraclass correlation coefficient (ICC).

Results: The Turkish IPAS consisted of 12 items and demonstrated a single-factor structure, explaining 51.481% of the total variance. The scale exhibited high internal consistency (Cronbach's α=0.904). Hotelling's T^2 statistic was 298.771 ($p<0.001$). The mean total score on the Turkish IPAS was 109.60±9.84. Test–retest reliability analysis of the Turkish version of the IPAS yielded an ICC of 0.958.

Conclusion: The Turkish version of the IPAS demonstrated good validity and reliability as an instrument for assessing nurses' self-efficacy in implementing infection prevention and control practices in clinical settings.

Keywords: Adaptation, infection, nurse, prevention, psychometrics, self-efficacy

Introduction

Healthcare-associated infections (HAIs) represent a major public health concern worldwide, including in Türkiye, because of their association with prolonged hospital stays, increased healthcare costs, and higher morbidity and mortality rates.[1] HAIs remain a significant global health problem, affecting approximately 1 in 31 hospitalized patients at any given time,[2] with an estimated 8.9 million cases occurring annually in the European Union and European Economic Area.[3] According to the World Health Organization (WHO), at least 1 in 100 hospitalized patients experiences a healthcare-associated infection, with prevalence rates reaching 7% in high-income countries and 15% in low- and middle-income countries.[4] In Türkiye, 55,952 cases of HAIs were reported in 2022, with infections associated with surgical care among the most frequently reported types, particularly in low- and middle-income settings.[5] The National Database of Nursing Quality Indicators (NDNQI) recognizes HAIs as important indicators of care quality and patient safety and classifies relevant infection-related outcomes as nurse-sensitive indicators.[6] Nurses play a vital role in providing high-quality care and preventing HAIs in surgical settings through continuous patient contact and strict adherence to infection prevention and control measures.[7,8] Although studies indicate that surgical nurses generally possess adequate knowledge of infection prevention and that a substantial proportion of HAIs can be prevented through evidence-based strategies, adherence to standard precautions and continuing education remain essential.[9-12] In this context, assessing nurses' self-efficacy in applying infection prevention knowledge and implementing recommended practices is critical for improving adherence to infection control measures and reducing HAIs.[13] Self-efficacy, defined as an individual's belief in their ability to perform a specific task, is an important determinant of nurses' infection prevention behaviors and adherence to infection control protocols.[14-16] Previous studies have demonstrated that higher self-efficacy is associated with better compliance with infection control practices, including hand hygiene. However, nurses generally demonstrate moderate levels of self-efficacy in infection prevention and control practices, highlighting the need for targeted interventions to strengthen self-efficacy and improve adherence to recommended infection prevention measures.[16-18]

Given nurses' pivotal role in preventing HAIs, evaluating and strengthening their self-efficacy is essential for improving adherence to infection prevention measures, enhancing care quality, and promoting patient safety.[16,17] The Infection Prevention Appraisal Scale (IPAS) is a validated instrument designed to assess self-efficacy in infection prevention practices. However, a culturally adapted and psychometrically validated Turkish version has not previously been available for nurses in Türkiye.[19] Therefore, this study aimed to translate and culturally adapt the IPAS into Turkish and evaluate its psychometric properties.

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Research Questions

1. Is the Turkish version of the IPAS a valid instrument for assessing nurses' self-efficacy in infection prevention practices?
2. Is the Turkish version of the IPAS a reliable measurement instrument?
3. Does the Turkish version of the IPAS demonstrate an acceptable factor structure consistent with that of the original scale?
4. Can the Turkish version of the IPAS be used to assess nurses' self-efficacy in infection prevention practices in clinical settings?

Materials and Methods

Study Design

This descriptive methodological study aimed to evaluate the psychometric properties of the Turkish version of the Infection Prevention Appraisal Scale.

Sample and Setting

The study population comprised nurses working in surgical units at four public hospitals in a province in southern Türkiye between July 11, 2023 and December 25, 2024. The study was conducted in four public hospitals in southern Türkiye, including three state hospitals providing secondary healthcare services and one training and research hospital providing tertiary healthcare services. The study was carried out in the general surgery, orthopedics and traumatology, neurosurgery, cardiovascular surgery, thoracic surgery, plastic, reconstructive and aesthetic surgery, urology, gynecology and obstetrics, otolaryngology, ophthalmology, pediatric surgery, and oncological surgery departments. Nurses working in anesthesiology and resuscitation units, intensive care units, and operating rooms were also included. During the study period, 300 nurses were employed in these units, constituting the target population.

Convenience sampling was used to recruit nurses who met the inclusion criteria and voluntarily agreed to participate. The inclusion criteria were: (1) employment as a nurse in a surgical unit at one of the participating hospitals; (2) at least six months of nursing experience; (3) the ability to understand and communicate in Turkish; and (4) provision of voluntary informed consent. Nurses who were on leave during the data collection period, submitted incomplete questionnaires, or participated in the pilot study were excluded from the final analysis. In methodological studies involving scale adaptation, a sample size of approximately 5–20 participants per scale item is generally recommended.[20] In the present study, a minimum sample size equivalent to 10 participants per item was targeted to ensure an adequate sample for psychometric analysis. Accordingly, a minimum of 140 participants was planned based on the original 14-item IPAS. The study was completed with 232 nurses who voluntarily participated, exceeding the planned minimum sample size. An additional 30 nurses who participated in the pilot study in surgical units were excluded from the final analysis.

Data Collection Tools

Descriptive Information Form

The Descriptive Information Form was developed by the researchers based on the relevant literature.[11,16,17] It consisted of five questions addressing participants' sociodemographic and professional characteristics.

Infection Prevention Appraisal Scale (IPAS)

The IPAS is a unidimensional instrument developed by Lindberg and Lindberg (2023) to assess nurses' self-efficacy in implementing medical asepsis practices in clinical settings. The original scale consists of 14 items rated on an 11-point Likert-type scale ranging from 0 ("not at all confident") to 10 ("completely confident"), yielding total scores ranging from 0 to 140.[19]

Following the Turkish adaptation process, the final version consisted of 12 items with a single-factor structure. Total scores range from 0 to 120, with higher scores indicating greater self-efficacy in infection prevention practices, including hand hygiene, personal protective equipment use, disinfection, and aseptic techniques.

No established cutoff score exists for either the original or Turkish version. Therefore, the IPAS is interpreted as a continuous measure of self-efficacy. Because the scale is unidimensional, subscale scores are not calculated. Total scores may be used to monitor changes following educational programs or interventions.

Data Collection

Following ethics committee approval and the receipt of institutional permissions, the researchers visited the participating units and informed nurses about the study's purpose and expected duration. Participation was voluntary, and written informed consent was obtained from all participants. To achieve the targeted sample size and include nurses working different shifts, data were collected during day, evening, and night shifts. Questionnaire completion took approximately 10–12 minutes.

Data were collected through face-to-face interactions. Participants completed the questionnaires individually in a quiet, suitable environment at a convenient time. No time limit was imposed. A researcher was present to answer questions and ensure consistency in data collection procedures. Completed questionnaires were returned in sealed envelopes to maintain confidentiality. To assess temporal stability, the scale was administered twice to a subgroup of 30 participants, with a four-week interval between administrations.

Linguistic Validity and Cultural Adaptation

Given the absence of a culturally adapted and validated instrument for assessing infection prevention self-efficacy among nurses in Türkiye, adaptation of the IPAS into Turkish was considered necessary. The translation and cultural adaptation process followed internationally recognized guidelines, including the WHO translation protocol and the linguistic validation procedures recommended by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR).[21,22] The adaptation process began after permission was obtained from an original author of the scale. To establish linguistic equivalence, the original English version was independently translated into Turkish by two academics with advanced English proficiency and one professional linguist. The researchers reviewed these translations and synthesized them into a preliminary Turkish version. This preliminary version was subsequently back-translated into English by a language expert who was unfamiliar with the original scale. The back-translated version was compared with the original English instrument, and necessary revisions were made during a joint meeting involving an original IPAS author and the Turkish adaptation researchers. Following these revisions, the Turkish version was finalized for expert evaluation.

Content Validity

Consultation with 3–20 experts is recommended when evaluating the content scope and validity of a measurement instrument.[23] In the present study, the content validity of the Turkish draft version of the IPAS was evaluated by a panel of 11 experts specializing in surgical nursing (n=4), infection control nursing (n=1), public health nursing (n=2), pediatric surgical nursing (n=2), and internal medicine nursing (n=2). The item-level content validity index (I-CVI) and scale-level content validity index (S-CVI) were calculated. The reported I-CVI values ranged from 0.91 to 1.00. An S-CVI of at least 0.90 is generally considered indicative of excellent content validity.[24] In this study, the S-CVI was 0.98, indicating a high level of expert agreement regarding the relevance of the scale items.

Pilot Study

In scale development and adaptation studies, pilot testing with at least 30 participants is recommended. Accordingly, a pilot study was conducted with 30 nurses to assess the clarity and comprehensibility of the scale items.[25] All items were found to be clear and easily understood. Data obtained during the pilot study were excluded from the final analysis.

Data Analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA) and Jamovi version 2.3.21 (The jamovi Project, 2023). Descriptive statistics were calculated, and the distribution and normality of the data were assessed using skewness and kurtosis values. Values within ±1.5 were considered acceptable indicators of acceptable normality.[26]

Construct validity was initially assessed using exploratory factor analysis. Before conducting the analysis, the Kaiser–Meyer–Olkin (KMO) measure, Bartlett's test of sphericity (BTS), and the correlation matrix were examined to assess the suitability of the data for factor analysis. Principal component analysis (PCA) was employed. Items with factor loadings <0.40 were considered for removal. Based on this criterion, two items were removed from the final factor structure due to insufficient factor loadings.[27]

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Table 1. Sociodemographic characteristics of participants (n=232)

Characteristics	n	%
Gender		
Female	122	52.6
Male	110	47.4
Educational level		
High school diploma	20	8.6
Associate degree	16	6.9
Bachelor's degree	185	79.7
Master's or doctoral degree	11	4.7
	Median (Min-max)	**Mean±SD**
Age	31 (23–54)	33.27±8.79
Duration of employment in surgical units (months)	36 (1–396)	63.11±76.52
Total professional nursing experience (months)	84 (6–420)	125.10±114.61

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

Confirmatory factor analysis (CFA) was performed using Jamovi to evaluate the factor structure identified through exploratory factor analysis (EFA). Model fit was assessed using widely accepted fit indices, including the chi-square statistic (χ^2), degrees of freedom (df), chi-square-to-degrees-of-freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), normed fit index (NFI), standardized root mean square residual (SRMR), comparative fit index (CFI), incremental fit index (IFI), Tucker–Lewis index (TLI), goodness-of-fit index (GFI), and relative fit index (RFI). Model modifications were guided by theoretically justifiable modification indices to improve model fit while preserving the conceptual integrity of the scale.

Reliability was assessed using Cronbach's alpha coefficient, the Guttman split-half coefficient, and the Spearman–Brown coefficient. Test-retest reliability was evaluated using intraclass correlation coefficient (ICC) analysis to assess the consistency of measurements obtained four weeks apart. Internal criterion validity was assessed using an independent-samples t-test to compare the upper and lower 27% groups. Item-total score correlations were also examined. Statistical analyses were conducted using a 95% confidence level, with $p<0.05$ considered statistically significant.

Ethical Considerations

During the Turkish adaptation of the scale, permission was obtained via electronic correspondence from Maria Lindberg, one of the original authors of the IPAS. Ethical approval was obtained Akdeniz University Faculty of Medicine Clinical Research Ethics Committee (Approval Number: KAEK-376, Date: 26.04.2023). Institutional permission to conduct the study in the hospital setting was subsequently obtained from the Provincial Directorate of Health (Date: 10.07.2023; Decision No: E-98360293-604.01.02-219364541). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Sociodemographic Characteristics

The mean age of the participating nurses was 33.27±8.79 years; 52.6% were female, and 79.7% held a bachelor's degree. The mean duration of professional nursing experience was 125.10±114.61 months, while the mean duration of employment in surgical units was 63.11±76.52 months (Table 1).

Construct Validity

Exploratory Factor Analysis

The suitability of the data for factor analysis was assessed using the KMO measure and BTS. The KMO value was 0.861, and BTS was statistically significant ($p<0.001$), indicating adequate sampling adequacy and suitability of the data for exploratory factor analysis. Items 6 and 13 of the original 14-item IPAS were removed due to their low factor loadings (0.132 and 0.178, respectively). EFA of the remaining 12 items revealed a single-factor structure explaining 51.481% of the total variance. Although three components had eigenvalues greater than 1, the scree plot showed a pronounced decline after the first component, suggesting a predominant single-factor structure (Fig. 1). Factor loadings ranged from 0.559 to 0.840, while communality values ranged from 0.312 to 0.706 (Table 2). These findings supported a unidimensional, 12-item structure for the Turkish version of the IPAS.

Table 2. Exploratory factor analysis of the Turkish Version of the Infection Prevention Appraisal Scale (IPAS) (n=232)

Items	Factor loading	Communality
Item 1	0.792	0.627
Item 2	0.797	0.634
Item 3	0.750	0.562
Item 4	0.579	0.335
Item 5	0.592	0.351
Item 7	0.840	0.706
Item 8	0.690	0.477
Item 9	0.648	0.420
Item 10	0.774	0.598
Item 11	0.765	0.586
Item 12	0.559	0.312
Item 14	0.754	0.569
Eigenvalue		6.178
Total variance explained (%)		51.481
KMO coefficient		0.861
Bartlett's test		1683.950

Items 6 and 13 were excluded from the scale because of their low factor loadings identified through exploratory factor analysis (EFA).

Confirmatory Factor Analysis

CFA was conducted to confirm the single-factor structure of the 12-item Turkish IPAS. The initial analysis revealed mixed model fit indice (Table 3). Accordingly, modifications were made to improve model fit (Fig. 2). Following these modifications, the model fit indices improved substantially, yielding χ^2/df=1.306, RMSEA=0.036, NFI=0.987, CFI=0.997, IFI=0.997, TLI=0.996, GFI=0.999, SRMR=0.023, and RFI=0.983 (Table 3).

Internal Criterion Validity

Internal criterion validity was assessed by comparing the upper and lower 27% groups based on total scale scores. A statistically significant difference was observed between the groups ($t=-24.09$, $p<0.001$), indicating that the scale effectively discriminated between participants with high and low levels of self-efficacy.

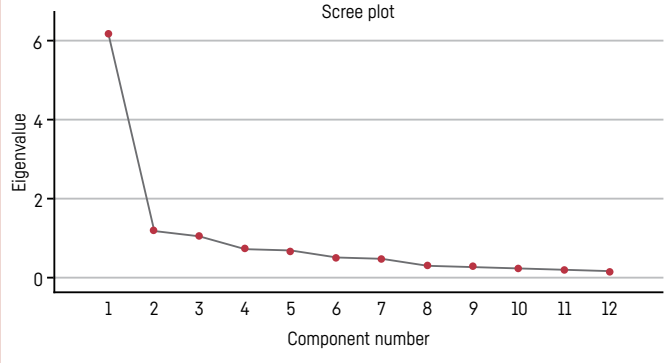


Figure 1. Scree plot.

Table 3. Goodness-of-fit indices (n=232)

Model fit index	χ^2	df	χ^2/df	RMSEA	NFI	SRMR	CFI	IFI	TLI	GFI	RFI
Before modification	235.07	54	4.353	0.120	0.954	0.046	0.964	0.964	0.956	0.995	0.944
After modification	65.29	50	1.306	0.036	0.987	0.023	0.997	0.997	0.996	0.999	0.983

χ^2: Chi-square statistic, df: Degrees of freedom, RMSEA: Root mean square error of approximation, NFI: Normed fit index, SRMR: Standardized root mean square residual, CFI: Comparative fit index, IFI: Incremental fit index, TLI: Tucker–Lewis index, GFI: Goodness-of-fit index, RFI: Relative fit index.

Table 4. Reliability analysis results for the Turkish version of the IPAS (n=232)

	Cronbach's α	Cronbach's α, first half	Cronbach's α, second half	Spearman–Brown coefficient	Guttman split-half coefficient	Correlation between the two halves
Total scale	0.904	0.845	0.834	0.857	0.857	0.750

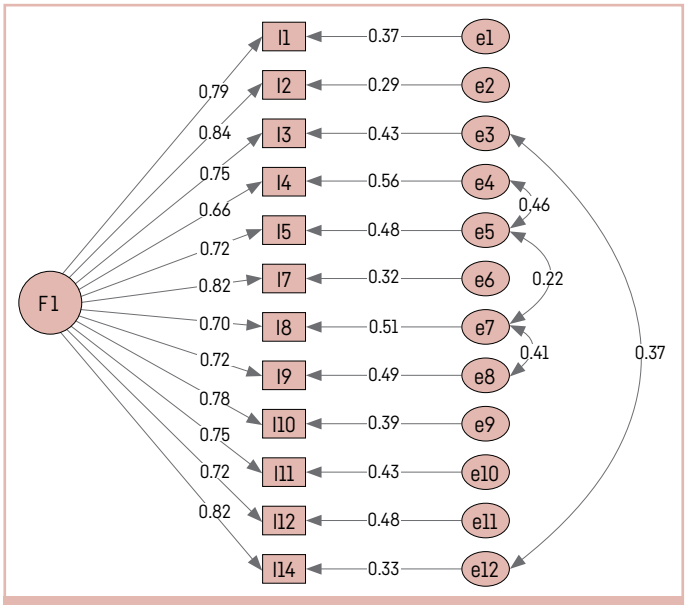


Figure 2. Confirmatory factor analysis.

I: Item.

Table 5. Correlations (n=232)

Item	Mean±SD	Item–total correlation (r)*	Corrected item–total correlation (r)*	Cronbach's α if item deleted
Item 1	9.44±0.89	0.756	0.713	0.894
Item 2	9.52±0.85	0.758	0.717	0.894
Item 3	9.13±1.08	0.747	0.692	0.893
Item 4	8.89±1.45	0.626	0.523	0.903
Item 5	8.65±1.33	0.635	0.543	0.901
Item 7	9.36±1.19	0.815	0.767	0.889
Item 8	8.57±1.24	0.716	0.645	0.895
Item 9	9.13±1.38	0.668	0.579	0.899
Item 10	8.90±1.01	0.749	0.698	0.893
Item 11	9.14±1.34	0.770	0.705	0.892
Item 12	9.44±1.15	0.557	0.467	0.903
Item 14	9.37±0.97	0.734	0.683	0.894

*: p<0.001. SD: Standard deviation.

Reliability Analysis

Internal Consistency

The Cronbach's alpha coefficient for the Turkish IPAS was 0.904. Split-half reliability analysis yielded Cronbach's alpha coefficients of 0.845 and 0.834 for the first and second halves, respectively. The Spearman–Brown coefficient and Guttman split-half coefficient were both 0.857, while the correlation between the two halves was 0.750 (Table 4).

Item Analysis

Mean item scores ranged from 8.57±1.24 to 9.52±0.85. Item–total correlation coefficients ranged from 0.557 to 0.815, while corrected item–total correlations ranged from 0.467 to 0.767, with all correlations reaching statistical significance (p<0.001). The overall Cronbach's alpha coefficient was 0.904, and Cronbach's alpha values following the deletion of individual items ranged from 0.889 to 0.903 (Table 5). Additionally, Tukey's test for additivity yielded a statistically significant result (F=29.990, p<0.001). Hotelling's T^2 value for the Turkish IPAS was calculated as 298.771 (p<0.001).

Test–Retest Reliability

To evaluate the test–retest reliability of the Turkish IPAS, the scale was readministered to 30 nurses four weeks after the initial administration. No statistically significant difference was observed between the mean scores obtained at the two measurement points (p>0.05).

Test–retest reliability was assessed using Pearson correlation analysis, and the correlation coefficient between the two measurements was determined to be r=0.964 (p<0.001). Furthermore, the ICC was 0.958 (95% confidence interval [CI]: 0.904–0.981), excellent temporal stability of the scale.

Participants' IPAS Results

The mean total score on the Turkish IPAS was 109.60±9.84. When total IPAS scores were compared according to gender, male nurses had significantly higher scores than female nurses (t=4.429, p<0.001). No statistically significant differences were observed in total IPAS scores according to educational level (χ^2=1.735, p=0.629). Similarly, no statistically significant correlations were found between total IPAS scores and age (r=0.082, p=0.215), duration of employment in surgical units (r=-0.049, p=0.454), or total professional nursing experience (r=0.037, p=0.572).

Discussion

Self-efficacy is an important determinant of clinical performance, as it influences nurses' confidence in their ability to implement infection prevention measures effectively and consistently. In high-risk clinical environments, such as surgical units, higher self-efficacy may contribute to greater adherence to aseptic principles and infection control protocols. Therefore, assessing self-efficacy is important not only for evaluating nurses' perceived capabilities but also for identifying educational needs and supporting initiatives aimed at improving patient safety outcomes.[7-9,14,16,17] This study aimed to adapt the IPAS into Turkish and evaluate its validity and reliability among surgical nurses. The findings indicate that the Turkish version of the IPAS is a valid and reliable instrument for assessing surgical nurses' self-efficacy in medical asepsis practices. In this study, surgical nurses' self-efficacy levels in

medical asepsis practices were evaluated, and the effects of various demographic and professional variables on IPAS scores examined. The results showed that male nurses had significantly higher IPAS scores than female nurses, while no significant differences or associations were found regarding educational level, age, or professional experience.

Language and Content Validity

The translation and back-translation procedures supported the linguistic equivalence of the Turkish version with the original scale. Content validity was established through expert evaluation using Davis' technique, with a content validity index (CVI) exceeding 0.80. These findings are consistent with the content validity criteria reported in the literature.[28]

Construct Validity

Construct validity assesses what a scale measures, the meaning of participants' scores, and whether the scale scientifically measures the intended concept.[28] Factor analysis is performed in two stages: EFA and CFA.[29] In factor analysis, a KMO coefficient above 0.60 and a significant BTS result are fundamental validity requirements.[29] In this study, the factor analysis results indicated that the sample size was adequate and the data were suitable for factor analysis. These findings support the construct validity of the scale and indicate that its factor structure is statistically appropriate. According to the literature, an explained total variance of 40%–60% and factor loadings above 0.30 are considered acceptable.[20] In this study, the factor analysis results were within the acceptable range, indicating that the scale has an acceptable factor structure. Two items were removed following factor analysis due to low factor loadings, resulting in a 12-item Turkish version of the IPAS. This may be attributed to a lack of alignment with the underlying construct of self-efficacy, as well as context-specific differences in clinical practice. Item 6 reflects institutional practices related to work attire rather than infection prevention self-efficacy, which may have weakened its association with the construct. Item 13, on the other hand, refers to an activity (preparing meal trays) that is not typically part of surgical nurses' routine responsibilities. In surgical settings in Türkiye, such tasks are generally performed by patients' relatives or auxiliary staff. Therefore, this item may have had limited relevance to the participants, leading to reduced variability in responses and lower factor loadings. The adaptation process was initiated with permission from the original scale developer, and ongoing communication was maintained throughout the process. Following the modification, the revised structure was shared with the original developer, and approval was obtained for the final version. The analyses confirmed the structural validity of the Turkish version of the scale. These findings indicate that the Turkish adaptation preserves the properties of the original instrument and demonstrates construct validity.

Confirmatory Factor Analysis

According to CFA results, a χ^2/df ratio below 5 indicates acceptable model fit, while a lower ratio indicates excellent model fit.[20] In this study, the χ^2/df ratio was calculated as 1.306, confirming an excellent fit. According to the literature, an RMSEA value below 0.10 is considered acceptable, while a value below 0.08 indicates excellent model fit.[29] In this study, the RMSEA value placed the model within the excellent fit range. Additionally, an SRMR value below 0.05 indicates excellent fit, while values between 0.05 and 0.10 indicate acceptable fit.[30] In this study, the SRMR value confirmed an excellent model fit. Regarding the GFI, values range from 0 to 1, with values above 0.85 indicating acceptable fit and those above 0.90 indicating good fit.[31] The GFI value in this study confirmed a good model fit. For the TLI, values above 0.90 indicate acceptable fit, while those above 0.95 indicate good fit.[31] In this study, the TLI value indicated a good fit. Similarly, CFI and IFI values above 0.90 indicate acceptable fit, while values above 0.95 indicate excellent fit.[30] In this study, the CFI and IFI values confirmed an excellent model fit.

Reliability

Methods for assessing the reliability of measurement instruments include Cronbach's alpha, split-half reliability, parallel-forms reliability, and test–retest reliability.[29] According to Tavşancıl (2018)28, Cronbach's alpha (α) values are interpreted as follows: 0.00–0.40=unreliable, 0.40–0.60=low reliability, 0.60–0.80=moderately reliable, and 0.80–1.00=highly reliable. The reliability level of the IPAS aligns with the standards reported in the literature, indicating high reliability. In this study, Cronbach's alpha coefficient indicated high internal consistency. Hotelling's T^2 test revealed statistically significant differences among item mean scores.

Test–Retest Reliability

In this study, both Pearson correlation and ICC analyses were employed to evaluate the temporal stability of the scale across repeated measurements. Pearson correlation assesses the strength of the linear relationship between two measurements, whereas the ICC evaluates the reliability of repeated measurements by assessing their consistency or agreement, depending on the model used.[29,32]

The test–retest analysis revealed a very strong and statistically significant relationship between the two measurements. Furthermore, the ICC value, which reflects the stability of the scale over time, indicated a excellent level of reliability.[29] These findings demonstrate that the Turkish version of the scale provides consistent measurements over time and support its reliability.[27–29] In conclusion, the Turkish adaptation of the IPAS largely preserves the measurement properties of the original scale and confirms that it offers similarly high levels of reliability and validity.

Participants' IPAS Results

In the present study, male nurses had significantly higher IPAS scores than female nurses. This finding contrasts with previous research reporting no significant gender differences in infection control-related self-efficacy.[16] This discrepancy may be related to contextual and cultural factors, differences in clinical responsibilities, or variations in perceived professional competence. However, the finding should be interpreted cautiously, as infection prevention practices are strongly influenced by institutional protocols, clinical training, and workplace culture. No statistically significant differences or associations were observed between IPAS scores and educational level, age, duration of employment in surgical units, or total professional nursing experience. Previous studies have reported associations between nurses' self-efficacy and factors such as professional role, problem-solving abilities, and educational level.[33,34] One possible explanation is that previous studies have primarily examined general self-efficacy, whereas the IPAS specifically assesses self-efficacy related to medical asepsis practices. Because infection prevention practices are largely governed by standardized clinical procedures, institutional policies, and professional guidelines, individual characteristics may have a relatively limited influence on IPAS scores in this sample. These findings indicate that the Turkish version of the IPAS produces consistent results across different subgroups and can be used as a reliable instrument in various clinical settings.

Strengths and Limitations

One of the major strengths of this study is that it addresses the lack of a previously validated instrument in Türkiye for assessing nurses' self-efficacy in medical asepsis practices. Nevertheless, this study has several limitations. First, EFA and CFA were conducted using the same dataset, which may increase the risk of overfitting and limit the robustness of the identified factor structure. Although this approach is sometimes adopted in scale adaptation studies with limited sample sizes, the findings should be interpreted with caution. Future studies should confirm the factor structure using independent samples. Second, the study included only surgical nurses, which may limit the generalizability of the findings to nurses working in other clinical settings. Third, the data were collected using self-report measures, which may be subject to social desirability bias or inaccuracies in participants' responses. Finally, the use of convenience sampling may have introduced selection bias and reduced the representativeness of the sample.

Conclusion

This study demonstrated that the 12-item Turkish version of the IPAS is a valid and reliable instrument for assessing surgical nurses' self-efficacy in medical asepsis practices. The scale can be used in operating rooms, intensive care units, and surgical wards to assess perceived self-efficacy in hand hygiene, the use of personal protective equipment, aseptic techniques, and disinfection practices. Its application may help identify educational needs, inform targeted training interventions, and support evidence-based infection prevention practices in surgical nursing. By facilitating the assessment of nurses' self-efficacy, the Turkish IPAS has the potential to contribute to infection control initiatives aimed at improving patient safety and quality of care. Further studies involving nurses from different clinical settings and other healthcare professionals, preferably using independent samples, are recommended to confirm the scale's psychometric properties and evaluate its broader applicability. Furthermore, the findings of this study may provide a basis for future international comparative research, allowing researchers to compare nurses' self-efficacy in implementing medical asepsis practices in clinical settings across different countries.

Ethics Committee Approval: The study was approved by the Akdeniz University Faculty of Medicine Clinical Research Ethics Committee (Approval Number: KAEK-376, Date: 26.04.2023).

Informed Consent: Written informed consent was obtained from all nurses prior to the study.

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Nursing Students' Clinical Placement Experiences Across Healthcare Settings: A Ten-Year Repeated Cross-Sectional Study

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Abstract

Background: Clinical placements are central to nursing education, yet students' experiences depend on the quality of the clinical learning environment. Although student evaluations are widely used to monitor placement quality, evidence on long-term trends and comparisons across healthcare settings remains limited.

Aim: This study examined how nursing students' clinical placement experiences evolved over 10 years and compared these experiences across healthcare settings.

Methods: A repeated cross-sectional survey was conducted among bachelor's degree nursing students at HOGENT University of Applied Sciences and Arts. Between the 2015/16 and 2024/25 academic years, students completed placement evaluations using the Dutch Clinical Learning Environment and Supervision scale. In total, 5,080 completed evaluations from placements in hospitals, home healthcare, psychiatric care, nursing homes, and preventive health and welfare services were analyzed. Scores were transformed to a 0–100 scale, and nonparametric tests were used to assess trends and differences across settings.

Results: Students rated their placements positively (median overall score: 79.7), with scores improving over time. The total score increased from 75.8 in 2015/16 to 82.8 in 2024/25, with the largest improvements observed in the learning environment and nursing care dimensions. Preventive health and welfare services and psychiatric care received the highest median scores; however, preventive health and welfare services accounted for only 1.2% of evaluations. Nursing homes received the lowest overall scores and the lowest ratings for supervision and the learning environment, although leadership ratings were comparatively high.

Conclusion: Students' evaluations improved over time but varied across settings. Strengthening learning opportunities, supervision, and leadership accessibility, particularly in nursing homes and home healthcare, remains essential to enhancing clinical learning and may support future workforce development.

Keywords: Clinical learning environment, clinical placement, nursing students, student experiences

Introduction

Clinical placement is an essential component of nursing education, exposing students to real-world healthcare environments.[1] In these settings, theoretical components of the curriculum are applied and integrated into clinical practice while students further develop their knowledge, skills, and professional attitudes.[2] Indeed, knowledge, professional skills, and attitudes are acquired through a combination of formal education and hands-on experiences in clinical settings.[3] A wide range of quantitative and qualitative studies have highlighted the importance of clinical placements in fostering clinical competence, caring abilities, clinical reasoning, communication and interpersonal competencies, teamwork, self-confidence, and insight into the nursing role and future career opportunities.[3,4]

The effectiveness of clinical placements and the achievement of learning outcomes are strongly influenced by the quality of the clinical learning environment.[5] Negative or suboptimal learning environments may reduce students' satisfaction with both their clinical experiences and nursing education more broadly, potentially affecting their motivation to continue their studies and indirectly contributing to challenges such as workforce retention and the global nursing shortage.[2] Consequently, increasing attention has been directed toward monitoring and evaluating clinical learning environments. Students' satisfaction is widely regarded as a valuable indicator for assessing quality and identifying factors that facilitate or hinder learning in clinical practice.[6]

Students' satisfaction with the clinical learning environment is influenced by several interacting factors.[7] One important factor is a positive pedagogical atmosphere, characterized by open communication between staff and students, clear and aligned expectations, explicit guidance on ward routines and procedures, opportunities for active participation in clinical activities, and the integration of theory into practice. A supportive environment that allows students to learn from mistakes further contributes to effective learning experiences.[8,9]

Leadership within the clinical setting is another important element. Research indicates that the ward manager's leadership style can significantly influence students' satisfaction by creating a supportive and nonthreatening learning climate. Leaders who are approachable, encourage questions, motivate students, serve as role models, and provide meaningful learning opportunities can enhance the quality of the clinical learning environment.[10,11]

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Strong mentoring and supervision practices are also pivotal to positive clinical learning experiences. These practices include regular interactions between mentors and students, clearly defined learning objectives, opportunities to engage in diverse clinical situations, and periodic assessments to monitor progress. Support during challenging situations and guidance based on clinical expertise further contribute to effective supervision, particularly when accompanied by consistent and constructive feedback.[12,13] Conversely, limited interaction time and unfavorable student-to-supervisor ratios may compromise the quality of supervision and learning opportunities.[7,9,10]

The involvement of teachers from nurse education institutions represents another key element of the clinical learning environment. These teachers contribute by conducting ward visits, facilitating the integration of theory and practice, supporting reflection, and monitoring students' learning processes. They also provide guidance to clinical mentors and help ensure alignment between clinical experiences and intended learning outcomes.[9,14]

Beyond these core dimensions (pedagogical atmosphere, leadership, supervision, and the role of the nurse teacher), additional factors have been associated with high-quality clinical learning environments. These include high standards of nursing care, clearly structured care processes, effective information sharing within teams, reasonable patient-to-nurse ratios, and congruence between theory and practice. Exposure to diverse clinical cases, opportunities for interprofessional collaboration, and being welcomed as valued members of the healthcare team also contribute to positive learning experiences.[9,10]

Building on these factors, numerous survey-based studies have examined nursing students' clinical placement experiences. However, most research has focused primarily on hospital settings.[6,12] As noted by Zhang et al.,[6] further research is needed to explore clinical placements in a broader range of healthcare contexts and to compare students' experiences across different care settings.

Another limitation of existing research is that many studies examine clinical placement experiences at a single point in time or over relatively short periods. Only a few studies have analyzed longer-term trends, such as that by Lansdown et al.,[15] who collected data over a five-year period (2017–mid-2022). Consequently, limited insight is available into how nursing students' clinical learning experiences evolve over extended periods.

To address these gaps, the present study analyzes 10 years of survey data (2015/16–2024/25) on bachelor's degree nursing students' clinical placement experiences across multiple healthcare settings: (a) hospitals, (b) home healthcare, (c) psychiatric care settings, (d) nursing homes, and (e) preventive health and welfare services (e.g., occupational health nursing, child and family health services, and student counseling services). By combining a multi-setting perspective with a ten-year trend analysis, this study aims to provide deeper insight into students' clinical placement experiences.

Research Questions

1. How have bachelor's degree nursing students' clinical placement experiences evolved between 2015/16 and 2024/25?
2. How do students' clinical placement experiences vary across different healthcare settings, including hospitals, home healthcare, psychiatric care settings, nursing homes, and preventive health and welfare services?

Materials and Methods

Study Design

This study used a repeated cross-sectional survey design to examine nursing students' clinical placement experiences over 10 academic years and to compare these experiences across different clinical settings. Data collected between the 2015/16 and 2024/25 academic years were included in the present study.

During this ten-year data collection period, the bachelor's degree nursing program was expanded from three to four years in response to European legislative requirements. The transition began in 2016/17, with the fourth year formally introduced in 2019/20. Table 1 summarizes the number of clinical placements across the different program trajectories, while Table 2 provides a detailed overview of their distribution across program years.

Study Sample

The study included bachelor's degree nursing students enrolled at HOGENT University of Applied Sciences and Arts who undertook clinical placements during the 2015/16–2024/25 academic years.

Hospital placements were primarily undertaken in the second (30.6%) and third years (30.6%) of the curriculum. Most home healthcare placements took place in the second year (76.1%), as did the largest proportion of psychiatric care placements (45.1%). Nursing home placements were predominantly undertaken in the first year (89.1%), whereas placements in preventive health and welfare services occurred mainly in the third year (54.2%). Between 2015/16 and 2024/25, a total of 5,080 questionnaires were completed.

Data Collection Tools

The study used the CLES+NL, a validated and reliable Dutch version of the Clinical Learning Environment and Supervision (CLES) scale developed by Saarikoski and Leino-Kilpi.[16] The instrument was developed through forward and backward translation and validated by De Witte et al.[17] It comprises five dimensions (explained variance: 71.28%): ward atmosphere (12 items), supervisory relationship (6 items), premises of nursing care on the ward (5 items), the ward as a learning environment (4 items), and leadership style of the ward manager (5 items). All items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The terminology used in the CLES+NL items reflects the original wording of the instrument. Accordingly, terms such as "ward" and "ward manager" should be understood as referring more broadly to the clinical placement setting and its leadership and may not correspond literally to all community-based contexts, such as home healthcare or preventive health and welfare services. Further details on the CLES+NL are provided by De Witte et al.[17]

In addition to the CLES+NL items, the survey collected information on students' gender, year of study, and clinical placement setting.

Data Collection

Students were invited to complete the online CLES+NL survey after each clinical placement to report their experiences of the clinical learning environment. At the end of each placement period, students received an invitation link to access the questionnaire through the institutional learning platform. Data were collected between the 2015/16 and 2024/25 academic years as part of the routinely administered clinical placement evaluation survey. Responses were stored in a secure institutional database.

Data Analysis

Descriptive statistics were used to summarize respondents' demographic characteristics and CLES+NL item responses using frequencies and percentages. Five negatively worded items were reverse-coded before subscale and total scores were calculated. For comparability, subscale and total CLES+NL scores were transformed to a 0–100 scale, with higher scores indicating greater satisfaction

Table 1. Clinical placement structure and duration in the three-year and four-year bachelor's degree nursing programs

Year of study	Three-year program (2015/16)	Four-year program (from 2016/17)
Year 1	Clinical placement 1 (3 weeks)	Clinical placement 1 (4 weeks)
	Clinical placement 2 (6 weeks)	Clinical placement 2 (4 weeks)
Year 2	Clinical placement 1 (6 weeks)	Clinical placement 1 (5 weeks)
	Clinical placement 2 (6 weeks)	Clinical placement 2 (5 weeks)
		Clinical placement 3 (5 weeks)
Year 3	Clinical placement 1 (6 weeks)	Clinical placement 1 (6 weeks)
	Clinical placement 2 (9 weeks)	Clinical placement 2 (8 weeks)
Year 4	–	Clinical placement 1 (10 weeks)
	–	Clinical placement 2 (10 weeks)

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Table 2. Distribution of clinical placement experiences by year of study in the bachelor of nursing program (n=5,080)

Year of study	Hospitals		Home healthcare		Psychiatric care		Nursing homes		Preventive health and welfare services	
	n	%	n	%	n	%	n	%	n	%
Year 1	704	22.7	3	0.6	72	19.5	897	89.1	7	11.9
Year 2	949	30.6	413	76.1	167	45.1	22	2.2	1	1.7
Year 3	949	30.6	106	19.5	70	18.9	76	7.6	32	54.2
Year 4	499	16.1	21	3.9	61	16.5	12	1.2	19	32.2
Total	3,101	100.0	543	100.0	370	100.0	1,007	100.0	59	100.0

with the clinical placement. Because all questionnaire items were mandatory, no missing data were present in the dataset.

Because the CLES+NL data were not normally distributed, subscale and total scores are presented as medians with interquartile ranges (IQR). Comparisons across academic years (2015/16–2024/25) and clinical placement settings were conducted using Kruskal–Wallis tests, with epsilon squared (ε^2) reported as the effect size, followed by Dunn's post hoc tests with Bonferroni correction. All possible pairwise comparisons between academic years and between clinical placement settings were examined using two-sided significance tests. Epsilon-squared values of 0.01, 0.06, and 0.14 were interpreted as small, medium, and large effect sizes, respectively.[18] A p value of <0.05 was considered statistically significant. Superscript letters were used to indicate statistically significant pairwise differences across academic years and clinical placement settings. All analyses were performed using SPSS version 31 (IBM Corp., Armonk, NY, USA).

Ethical Considerations

This research is part of routine quality monitoring within the nursing education program. Data were collected anonymously for educational quality improvement purposes, and formal ethics committee approval was therefore not required under institutional regulations. Before completing the survey, students provided informed consent online. Participation was voluntary, and responses were collected anonymously in accordance with the ethical principles of the Declaration of Helsinki.

Results

Students' Characteristics

The majority of respondents were women (83.8%). Regarding year of study, 33.1% of respondents were in the first year, 30.6% in the second year, 24.3% in the third year, and 12.0% in the fourth year. Most completed questionnaires concerned placements in hospitals (61.0%), followed by nursing homes (19.8%), home healthcare (10.7%) and psychiatric care settings (7.3%). A smaller proportion of questionnaires concerned placements in preventive health and welfare services (1.2%) (Table 3).

Table 3. Characteristics of nursing students' clinical placement evaluations (n=5,080)

Characteristics	n	%
Gender		
Female	4,258	83.8
Male	822	16.2
Year of study		
Year 1	1,683	33.1
Year 2	1,552	30.6
Year 3	1,233	24.3
Year 4	612	12.0
Clinical placement setting		
Hospitals	3,101	61.0
Home healthcare	543	10.7
Psychiatric care settings	370	7.3
Nursing homes	1,007	19.8
Preventive health and welfare services	59	1.2

Nursing Students' Clinical Placement Experiences

Based on item-level results, the highest levels of agreement were observed for the items "patients received individual nursing care" (92.2% agreed or strongly agreed) and "overall, the patients received high-quality nursing care" (90.3% agreed or strongly agreed). In contrast, the lowest levels of agreement were observed for the items "feedback from the ward manager could easily be considered as a learning experience" (59.4% agreed or strongly agreed) and "the ward manager was a team member" (63.3% agreed or strongly agreed). A detailed overview of all items is presented in Table 4.

Trends in Clinical Placement Experiences (2015/16–2024/25)

As described in the Methods section, the CLES+NL total score (0–100) and five subscale scores (0–100) were calculated. Across the full dataset covering 10 academic years (2015/16–2024/25), the median total score was 79.7. The leadership style of the ward manager dimension had the lowest median score (75.0), whereas the supervisory relationship dimension had the highest (83.3).

Kruskal–Wallis tests revealed statistically significant differences across academic years for all six scores. Post hoc analyses showed that earlier cohorts (2015/16, 2016/17, 2018/19, and 2019/20) generally reported lower total and subscale scores than more recent cohorts (2020/21, 2021/22, 2022/23, and 2024/25). For example, the median CLES total score increased from 75.8 in 2015/16 to 82.8 in 2024/25, representing an increase of 7.0 points.

At the subscale level, the largest improvements over time were observed in the learning environment and nursing care dimensions. The learning environment score increased from 75.0 in 2015/16 to 87.5 in 2021/22 and 2022/23 (+12.5 points) but declined to 81.3 in 2024/25. The nursing care score increased from 75.0 in 2015/16 and 2019/20 to 85.0 in 2024/25 (+10 points). The ward atmosphere score rose from 77.1 in 2015/16 to 83.3 in 2020/21, 2022/23, and 2024/25 (+6.2 points). The leadership style score increased from 75.0 in 2015/16 to 80.0 in 2020/21 (+5.0 points), with no further statistically significant increases observed in later cohorts. Finally, the supervisory relationship score increased from 79.2 in 2015/16 and 2019/20 to 83.3 in 2020/21, 2021/22, and 2024/25 (+4.1 points). Detailed medians (IQRs) and mean ranks for all subscales across the 10 academic years are presented in Table 5.

Differences in Clinical Placement Experiences Across Settings

CLES+NL total and subscale scores were compared across clinical placement settings. Kruskal–Wallis tests indicated statistically significant differences in the total score and all five subscales (p<0.001). Post hoc analyses showed that students in preventive health and welfare services reported the highest total CLES+NL score (89.8) and the highest scores for four dimensions: ward atmosphere (95.8), supervisory relationship (95.8), learning environment (93.8), and nursing care (85.0). However, this subgroup was small, accounting for only 1.2% of clinical placement evaluations. Scores for ward atmosphere and supervisory relationship in preventive health and welfare services were significantly higher than those in hospitals (79.2 and 83.3, respectively), home healthcare (81.3 and 87.5, respectively), and nursing homes (79.2 and 79.2, respectively). The learning environment score exceeded those

Table 4. Nursing students' evaluations of the clinical learning environment and supervision

Clinical learning environment and supervision	Disagree or strongly disagree	Neutral	Agree or strongly agree
Ward atmosphere (Cronbach's α=0.93)			
1. The staff were not easy to approach.	83.8	7.0	9.1
2. There was a positive atmosphere on the ward.	5.9	11.9	82.2
3. I felt comfortable going to the ward at the start of my shift.	8.0	11.2	80.8
4. Within the team, I was regarded as an equal.	13.4	19.1	67.6
5. There was a strong sense of solidarity among the nursing staff on the ward.	7.7	11.4	80.9
6. The staff got to know the students by name.	11.9	14.5	73.6
7. During staff meetings, I felt comfortable participating in discussions.	11.3	20.2	68.6
8. Mutual respect and acceptance characterized the supervisory relationship.	4.6	8.4	87.0
9. The staff were generally interested in student supervision.	9.3	17.8	72.9
10. The supervisory relationship was characterized by a sense of trust.	4.8	8.4	86.8
11. Supervision was based on a relationship of equality.	4.6	9.9	85.6
12. I would recommend this ward to other students.	8.3	11.5	80.2
Supervisory relationship (Cronbach's α=0.91)			
1. I received continuous feedback from my mentor.	8.5	11.7	79.8
2. I felt that I received individual supervision.	11.4	14.6	74.1
3. The mentor showed a positive attitude toward supervision.	6.7	9.7	83.6
4. Overall, I was satisfied with the supervision I received.	8.0	9.8	82.3
5. I was insufficiently encouraged during supervision.	80.0	9.4	10.7
6. The supervision promoted my learning.	5.1	10.9	84.0
Premises of nursing care on the ward (Cronbach's α=0.77)			
1. Nursing documentation (e.g., nursing care plans and daily records of nursing procedures) was clear.	6.4	14.8	78.8
2. There were problems with the flow of information related to patient care.	72.1	14.8	13.1
3. Overall, patients received high-quality nursing care.	2.6	7.1	90.3
4. Patients received individualized nursing care.	2.1	5.7	92.2
5. The ward's nursing philosophy was clearly defined.	7.1	14.0	78.9
The ward as a learning environment (Cronbach's α=0.81)			
1. There were sufficient meaningful learning opportunities on the ward.	6.9	11.9	81.1
2. The learning situations were multidimensional in terms of content.	5.9	11.3	82.8
3. The ward could be regarded as a good learning environment.	5.6	9.6	84.9
4. The number of learning opportunities was not proportionate to the number of students on the ward.	70.8	13.1	16.2
Leadership style of the ward manager (Cronbach's α=0.82)			
1. The ward manager was a member of the team.	15.0	21.8	63.3
2. The efforts of individual employees were appreciated.	5.6	15.2	79.2
3. Feedback from the ward manager could readily be viewed as a learning experience.	14.6	25.9	59.4
4. The ward manager regarded the staff on the ward as a key resource.	5.8	14.5	79.6
5. Basic orientation was not well organized.	70.1	13.3	16.6

in home healthcare (81.3), psychiatric care (81.3), and nursing homes (75.0). The nursing care score was the highest in preventive health and welfare services (85.0), significantly exceeding scores in all other settings, including hospitals (80.0), home healthcare (75.0), psychiatric care (80.0), and nursing homes (75.0).

Psychiatric care placements also received high scores, particularly for ward atmosphere (89.6), which exceeded scores in hospitals (79.2), home healthcare (81.3), and nursing homes (79.2). In contrast, the lowest scores were generally observed in nursing homes, where the total CLES+NL score (77.3) was significantly lower than in all other clinical settings. The lowest scores for supervisory relationship and learning environment were also observed in nursing homes (79.2 and 75.0, respectively), both significantly lower than those in the other four settings. However, the highest leadership style scores were observed in nursing homes and psychiatric care settings (80.0), significantly exceeding those in hospitals (75.0) and home healthcare (70.0). Detailed median (IQRs) and mean ranks for each setting are presented in Table 6.

Discussion

Positive Trends in Clinical Placement Experiences

Across the study period, students consistently evaluated their clinical placements positively, consistent with previous literature reporting generally favorable perceptions of clinical learning environments.[19] Our findings also indicate a modest upward trend over time in the total score and all five dimensions. However, these improvements should be interpreted cautiously because the effect sizes were small.

Table 5. Dutch Clinical Learning Environment and Supervision Scale (CLES+NL) total and subscale scores, expressed as medians and interquartile ranges (IQRs), across 10 academic years (2015/16–2024/25)

Scale	Total sample (2015/16-2024/25)	GROUP A 2015/16		GROUP B 2016/17		GROUP C 2017/18		GROUP D 2018/19		GROUP E 2019/20	
	Median (IQR)	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank
CLES+NL total score (0–100)	79.69 (68.75–89.84)	75.78^{C,F,G,H,J} (67.97–85.94)	2,261.67	78.12^{F,J} (67.97–88.28)	2,445.10	80.47^{A} (68.75–89.84)	2,562.96	78.91^{F,J} (68.75–89.06)	2,459.25	78.13^{F,J} (67.97–87.70)	2,390.37
Ward atmosphere (0–100)	81.25 (68.75–91.67)	77.08^{F,G,H,J} (66.67–87.50)	2,253.52	79.17^{F,J} (66.67–89.58)	2,414.43	79.17 (68.75–93.75)	2,551.86	79.17^{J} (66.67–91.67)	2,462.13	79.17^{F,J} (66.67–91.67)	2,431.42
Supervisory relationship (0–100)	83.33 (70.83–95.83)	79.17^{F,G,J} (66.67–92.71)	2,300.81	83.33 (70.83–95.83)	2,516.81	83.33 (70.83–95.83)	2,550.07	83.33 (66.67–95.83)	2,490.40	79.17^{F} (66.67–95.83)	2,403.49
Nursing care (0–100)	80.0 (70.0–90.0)	75.0^{C,F,G,H,J} (65.0–85.0)	2,232.67	80.0^{J} (70.0–90.0)	2,449.96	80.0^{A,E} (70.0–90.0)	2,635.69	80.0^{G,H,J} (70.0–85.0)	2,384.25	75.0^{C,F,G,H,J} (70.0–85.0)	2,342.94
Learning environment (0–100)	81.25 (68.75–93.75)	75.0^{G,H,J} (62.5–93.75)	2,322.69	81.25 (68.75–93.75)	2,463.51	81.25 (68.75–100)	2,611.32	81.25 (68.75–93.75)	2,480.98	81.25^{H} (62.50–93.75)	2,412.21
Leadership style (0–100)	75.0 (60.0–90.0)	75.0^{F} (60.0–90.0)	2,418.58	75.0^{F} (60.0–90.0)	2,480.34	75.0 (60.0–90.0)	2,483.10	75.0 (60.0–90.0)	2,500.53	75.0^{F} (60.0–90.0)	2,462.72

	GROUP F 2020/21		GROUP G 2021/22		GROUP H 2022/23		GROUP I 2023/24		GROUP J 2024/25		Effect size (ε^2)	Test result
	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank		
CLES+NL total score (0–100)	82.81^{A,B,D,E} (69.73–90.63)	2,730.39	81.25^{A} (68.75–91.41)	2,613.91	82.42^{A} (71.88–91.41)	2,711.07	79.69 (67.77–90.82)	2,573.95	82.81^{A,B,D,E} (71.88–92.19)	2,759.06	0.009	KW(9)=54.77; p<0.001
Ward atmosphere (0–100)	83.33^{A,B,E} (70.83–93.75)	2,721.52	81.25^{A} (68.75–93.75)	2,604.16	83.33^{A} (70.83–93.75)	2,717.57	81.25 (68.23–93.75)	2,608.88	83.33^{A,B,D,E} (70.83–95.83)	2,793.56	0.010	KW(9)=57.37; p<0.001
Supervisory relationship (0–100)	83.33^{A,E} (70.83–100.0)	2,749.88	83.33^{A} (66.67–95.83)	2,594.77	83.33 (66.67–95.83)	2,616.28	79.17 (70.83–91.67)	2,396.98	83.33^{A} (70.83–100.0)	2,635.56	0.006	KW(9)=37.69; p<0.001
Nursing care (0–100)	80.0^{A,E} (70.0–90.0)	2,632.48	80.0^{A,D,E} (70.0–90.0)	2,665.65	80.0^{A,D,E} (75.0–90.0)	2,775.69	85.0 (68.75–95.0)	2,732.62	85.0^{A,B,D,E} (75.0–90.0)	2.872.23	0.014	KW(9)=81.85; p<0.001
Learning environment (0–100)	81.25 (68.75–93.75)	2,599.41	87.50^{A} (68.75–100.0)	2,627.84	87.50^{A,E} (68.75–100.0)	2,772.75	81.25 (68.75–100.0)	2,636.94	81.25^{A} (68.75–100.0)	2,689.75	0.005	KW(9)=34.33; p<0.001
Leadership style (0–100)	80.0^{A,B,E} (65.0–90.0)	2,730.25	75.0 (60.0–90.0)	2,553.58	75.0 (60.0–90.0)	2,611.17	80.0 (65.0–90.0)	2,626.44	80.0 (60.0–90.0)	2,618.74	0.003	KW(9)=21.71; p<0.01

Superscript letters indicate statistically significant differences between the corresponding groups (p<0.05).

Table 6. Dutch Clinical Learning Environment and Supervision Scale (CLES+NL) total and subscale scores, expressed as medians and interquartile ranges (IQRs), across clinical placement settings

Scale	GROUP A Hospital		GROUP B Home healthcare		GROUP C Psychiatric care settings		GROUP D Nursing homes		GROUP E Preventive health and welfare services		Effect size (ε^2)	Test result
	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank		
CLES+NL total score (0–100)	79.69^{C,D,E} (68.75–89.84)	2,536.99	79.69^{C,D,E} (70.31–90.63)	2,616.95	84.38^{A,B,D} (73.44–92.19)	2,907.70	77.34^{A,B,C,E} (67.19–87.50)	2,322.55	89.84^{A,B,D} (81.25–95.31)	3,438.74	0.012	KW(4)=69.08; p<0.001
Ward atmosphere (0–100)	79.17^{B,C,E} (66.67–91.67)	2,464.84	81.25^{A,C,D,E} (72.92–93.75)	2,695.43	89.58^{A,B,D} (77.08–95.83)	3,154.0	79.17^{B,C,E} (68.75–89.58)	2,402.12	95.83^{A,B,D} (83.33–97.92)	3,605.89	0.022	KW(4)=119.40; p<0.001
Supervisory relationship (0–100)	83.33^{B,C,D,E} (70.83–95.83)	2,534.22	87.50^{A,D,E} (75.0–100.0)	2,810.06	87.50^{A,D} (75.0–100.0)	2,807.49	79.17^{A,B,C,E} (66.67–91.67)	2,267.39	95.83^{A,B,D} (83.33–100.0)	3,376.67	0.015	KW(4)=86.09; p<0.001
Nursing care (0–100)	80.0^{B,D,E} (70.0–90.0)	2,701.46	75.0^{A,E} (70.0–85.0)	2,299.49	80.0^{D,E} (70.0–90.0)	2,529.30	75.0^{A,C,E} (65.0–85.0)	2,132.82	85.0^{A,B,C,D} (80.0–95.0)	3,327.23	0.028	KW(4)=148.62; p<0.001
Learning environment (0–100)	81.25^{C,D} (68.75–100.0)	2,681.10	81.25^{D,E} (68.75–100.0)	2,602.09	81.25^{A,D,E} (62.50–93.75)	2,400.21	75.0^{A,B,C,E} (62.50–87.50)	2,088.35	93.75^{B,C,D} (75.0–100.0)	3,180.90	0.026	KW(4)=143.01; p<0.001
Leadership style (0–100)	75.0^{C,D} (60.0–90.0)	2,474.16	70.0^{C,D} (55.0–90.0)	2,390.0	80.0^{A,B} (65.0–95.0)	2,919.11	80.0^{A,B} (65.0–90.0)	2,680.12	75.0 (60.0–100.0)	2,654.72	0.007	KW(4)=46.53; p<0.001

Superscript letters indicate statistically significant differences between the corresponding groups (p<0.05).

Although this study did not examine the mechanisms underlying changes in clinical learning experiences, several contextual factors described in the literature may be associated with this trend. These include increased attention to supervision, strengthened collaboration between educational institutions and clinical practice settings, and broader developments in healthcare quality, such as advances in evidence-based practice, patient safety, and person-centered care.[19–21] The latter may be reflected in the observed increase in nursing care scores over the ten-year study period. The supervisory relationship dimension showed the smallest increase but had the highest baseline score, leaving limited room for improvement, a pattern consistent with earlier research.[19]

In addition, the study period coincided with a transition from a three-year to a four-year nursing program, which may have influenced students' preparation for clinical placements and contributed to the observed upward trend. However, causal conclusions cannot be drawn because of the repeated cross-sectional design.

Variation in Clinical Placement Experiences Across Settings

Preventive health and welfare services and psychiatric care received the highest median total CLES+NL scores, exceeding those in nursing homes, hospitals, and home healthcare. Although the differences were statistically significant, effect sizes were small, indicating relatively modest variation across settings. These findings align with previous research suggesting that clinical settings may shape distinct learning experiences while also highlighting the scarcity of research beyond hospital contexts.[22]

Gonella et al.[23] were among the few researchers to examine placements outside hospital settings and reported that students rated mental health placements more favorably than other contexts. In their study, the Clinical Learning Environment Quality Evaluation Index (CLEQI) domains of quality of tutorial strategies, learning opportunities, and quality of the learning environment received significantly higher ratings. Our findings partially align with these results: psychiatric placements in our sample received high scores for supervisory relationship and ward atmosphere, exceeding those in hospitals and nursing homes. However, unlike the findings of Gonella et al.,[23] the learning environment dimension in our psychiatric placements received a lower score than in hospitals and preventive health and welfare services.

As highlighted by Bradley et al.,[24] evidence on preventive health and welfare placements remains limited. Their qualitative study identified high-quality supervision, a collegial atmosphere, a strong sense of belonging, and diverse learning opportunities as key strengths of these placements. These characteristics correspond with the higher scores for supervisory relationship, ward atmosphere, and learning environment observed in our study. These settings also received the highest nursing care scores in our sample, which may reflect students' appreciation of their preventive and health-promoting orientation. However, this subgroup was small, and these placements may represent more elective experiences, which could partly explain their higher ratings.

At the same time, differences between settings should be interpreted cautiously because placements are embedded within a broader curricular context. In our study, nursing home placements were typically undertaken early in the program, whereas preventive health and welfare placements occurred more often in later years. Consequently, the observed differences should not be interpreted as direct indicators of the intrinsic quality of each setting, as they may also reflect the timing of placements within the curriculum. Previous studies have reported inconsistent patterns in how clinical experiences evolve during nursing education. Some suggest that students' perceptions improve as they progress through the curriculum,[25] whereas others report the opposite pattern, with first-year students rating placements more positively.[26] This inconsistency is also reflected in our data: although nursing home placements occurred mainly in the first year and received the lowest scores, psychiatric placements received relatively high scores despite most of these placements also occurring early in the program. This suggests that placement experiences are shaped by multiple interacting factors rather than placement timing alone.

Challenges in Clinical Placements

Nursing homes received the lowest scores, particularly for supervision and the learning environment. These findings appear consistent with previous research highlighting pedagogical challenges in this setting, including limited supervisory competence, a scarcity of role models, and structural staffing constraints.[27] Persistent ageist perceptions, characterizing nursing home care as offering fewer oppor-

tunities for "real nursing" and being dominated by routine, task-focused work, may also influence students' evaluations.[28] However, some dimensions, such as ward atmosphere and leadership, were comparable to or higher than those in other settings, suggesting that nursing homes can offer meaningful learning opportunities when supervision and pedagogical support are robust.[22] Nonetheless, our results indicate a need to strengthen learning opportunities because the learning environment dimension continues to lag behind other settings.

As discussed earlier, the timing of placements may partly contribute to students' evaluations. In our curriculum, placements in preventive health and welfare services are more often scheduled in later years, when students have gained more clinical experience. By contrast, nursing home placements predominantly occur in the first year, when students have limited clinical readiness and minimal exposure to gerontological nursing.[29] Consequently, lower scores in nursing homes may partly reflect early-stage training rather than inherent shortcomings of the setting. Adequate preparation and supervision may therefore be particularly important for early placements. Similar considerations apply to home healthcare, where students may experience less structured learning environments than in ward-based settings.[30]

Although home healthcare and hospital placements received the second-lowest total score, the learning environment score for home healthcare was comparable to that for hospitals. These findings do not support the assumption that hospital settings inherently provide superior learning environments.[31] Rather, differences between settings should be interpreted within their broader educational context, as they likely reflect a combination of curricular and contextual factors.

Limitations

This study has several limitations. First, no distinction was made between specific wards or departments (e.g., medical vs. surgical units), although learning experiences may vary across these contexts. Nevertheless, the inclusion of more than 5,000 surveys from diverse healthcare settings over 10 years provides a broad overview of clinical learning experiences.

Second, comparisons between clinical settings were based on the full dataset rather than being conducted separately for each academic year. Although this limits insight into setting-specific trends over time, it provides more stable estimates and maximizes statistical power. In addition, the repeated cross-sectional design does not allow individual trajectories to be examined or causal inferences to be drawn.

Third, only a limited set of student characteristics was collected, precluding detailed student profiling. Surveys were completed anonymously after each placement and could not be linked at the student level. This limited demographic scope was intentional, as collecting fewer identifying characteristics protected anonymity and may have reduced social desirability bias. Because students were asked to complete the questionnaire after every placement, some may have contributed multiple responses. Consequently, observations may not have been fully independent. However, because of the anonymous nature of the data, analyses accounting for repeated or clustered responses were not possible.

Finally, clinical placement experiences are shaped by multiple interacting curricular and contextual factors. Consequently, differences between settings should not be attributed to the clinical setting alone. Future research, including multisite and qualitative studies, could further explore the underlying mechanisms. Given that nursing homes received the lowest total CLES+NL scores, focused research on this setting, incorporating the perspectives of students, placement hosts or mentors, and nurse teachers, as recommended by Laugaland et al.,[27] remains particularly relevant.

Conclusion

This 10-year analysis provides valuable evidence on nursing students' clinical placement experiences across diverse healthcare settings. Overall, students evaluated their placements positively, with improvements observed over time, particularly in the learning environment and nursing care dimensions. Differences were observed across settings, with especially favorable evaluations in preventive health and welfare services and psychiatric care, whereas nursing homes received the lowest overall scores. These findings should be interpreted in light of the study's methodological limitations.

Strengthening clinical learning environments requires a multifaceted approach that addresses the interrelated factors shaping placement experiences.[32] Particular attention should be given to improving meaningful learning opportunities, mentorship, and supervision, especially in nursing homes and home healthcare. Adequate staffing, qualified role models, and protected supervision time may contribute to more effective clinical learning.[33] The favorable evaluations of preventive health and welfare services warrant further investigation to identify practices that could be transferred to other settings.

Leadership accessibility and communication also deserve attention, particularly in home healthcare, where students and staff often work independently and leaders are office-based.[19,34,35] Maintaining high standards of nursing care and regularly monitoring placement experiences using validated instruments may support continuous quality improvement and students' professional development. Sustained investment in high-quality clinical learning environments may also enhance the attractiveness of different care settings as future workplaces and contribute to workforce development and retention.[23]

Ethics Committee Approval: This research is part of routine quality monitoring within the nursing education program. Data were collected anonymously for educational quality improvement purposes, and formal ethics committee approval was therefore not required under institutional regulations.

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Effectiveness of an Educational Program in Enhancing Preparedness for Large-Scale Earthquakes Among Japanese University Students: A Randomized Controlled Trial

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Abstract

Background: Although many countries worldwide face a high risk of earthquakes, preparedness among younger populations remains alarmingly low, despite their important role in strengthening current and future community resilience.

Aim: This study evaluated the effectiveness of an educational program designed to enhance preparedness for large-scale earthquakes among Japanese university students.

Methods: A two-arm, parallel-group randomized controlled trial was conducted. Japanese university students (n=110) were recruited through convenience sampling using recruitment flyers and randomly assigned to the intervention (n=54) or control (n=56) group. The educational program was based on the cognitive-affective strategies of the Transtheoretical Model of Behavior Change (TTM). Outcomes, including disaster prevention consciousness, stages of behavioral change related to earthquake preparedness, and individual preparedness behaviors, were assessed at baseline and one month after the intervention. Between-group differences were analyzed using chi-square tests and independent-samples t-tests.

Results: At baseline, no statistically significant differences in participant characteristics or outcome measures were observed between the groups. One month after the intervention, the intervention group had significantly higher disaster prevention consciousness scores than the control group. Additionally, the intervention group had a significantly lower proportion of participants in the precontemplation stage and a higher proportion in the preparation stage. Implementation rates were also significantly higher in the intervention group for several key preparedness behaviors related to home safety, safety confirmation and evacuation, and stockpiling essential household supplies.

Conclusion: An educational program based on the cognitive-affective strategies of the TTM improved earthquake preparedness among university students.

Keywords: Earthquake preparedness, educational program, randomized controlled trial, university student

Introduction

Recent seismic activity worldwide has highlighted the widespread risk of earthquakes and the importance of proactive disaster preparedness. Japan is particularly vulnerable because of its geological characteristics and frequent exposure to high-magnitude earthquakes. Although Japan accounts for only 0.25% of the Earth's landmass, it experiences approximately 20% of the world's earthquakes with a magnitude of 6.0 or higher.[1] With nearly 2,000 active faults and its location at the convergence of four tectonic plates (the Pacific, Philippine Sea, Eurasian, and North American plates[2]), Japan remains one of the most seismically active regions worldwide. Historical disasters, including the 1995 Great Hanshin-Awaji Earthquake, which claimed more than 6,400 lives, and the 2011 Great East Japan Earthquake, which resulted in more than 18,000 deaths and missing persons,[1] underscore the severity and unpredictability of seismic events in the region.

In response to growing concerns about anticipated large-scale earthquakes, including the Nankai Trough Earthquake and Tokyo Inland earthquakes,[1] increasing attention has been directed toward disaster mitigation, which aims to minimize damage through proactive measures. Within this framework, individual preparedness has emerged as a cornerstone of national resilience. However, a recent nationwide survey revealed a decline in individual preparedness for large-scale earthquakes compared with the 2013 survey.[3] Preparedness levels were particularly low among young adults.[3] This problem is compounded by a lack of concern among university students, with one study reporting that 40% did not take earthquake risks seriously and nearly 10% expressed no interest in the issue.[4] These findings highlight a critical gap in earthquake preparedness among young people, who are important contributors to current and future community resilience.

Educational programs targeting university students offer an important opportunity to address this gap. Universities serve not only as centers of academic learning but also as settings for promoting disaster awareness and preparedness. Integrating preparedness education into the university experience may increase knowledge, strengthen motivation, and encourage behavioral change, with potential benefits extending beyond university campuses to the wider community. The Transtheoretical Model of Behavior Change (TTM), originally developed to support smoking cessation, has subsequently been applied to various health-related and other behaviors,

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including physical activity and environmentally friendly practices.[5,6] In particular, its cognitive–affective strategies have been shown to facilitate engagement among individuals in the precontemplation and contemplation stages.[7] The TTM may therefore provide an appropriate theoretical framework for earthquake preparedness education among university students, many of whom may be in the precontemplation stage. However, despite its potential, no previous studies have evaluated the effectiveness of TTM-based educational programs in promoting earthquake preparedness among university students. To address this gap, the present study employed a two-arm, parallel-group randomized controlled trial (RCT) to evaluate the effectiveness of an educational program based on the TTM. Specifically, the study aimed to determine whether cognitive-affective strategies could enhance individual preparedness for large-scale earthquakes among Japanese university students.

Research Hypotheses

We hypothesized that, compared with participants in the control group, those receiving an educational program based on the cognitive-affective strategies of the TTM would demonstrate the following improvements at the one-month follow-up:

H1: Increased disaster prevention consciousness.

H2: Progression to more advanced stages of behavioral change.

H3: Increased individual preparedness for large-scale earthquakes.

Materials and Methods

Study Design

This prospective, two-arm, parallel-group, open-label RCT was conducted in Japan in 2023, with a one-month follow-up period. The study was registered with the University Hospital Medical Information Network Clinical Trials Registry (registration number: UMIN000051222) on June 3, 2023, before the start of participant recruitment. The study was reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines.[8] A pilot study was not conducted because the intervention consisted of a brief, minimal-risk, single-session educational program delivered in a routine university setting, with a short follow-up period of one month.

Eligibility Criteria

Participants were recruited through convenience sampling using flyers distributed to university students in the Kansai region between June and October 2023. The inclusion criteria were being a Japanese university student and being aged 18 years or older. The exclusion criteria were inability to provide written informed consent, inability to attend the 90-minute face-to-face session, or inability to complete the Japanese-language self-administered questionnaires at baseline.

Sample Size and Randomization

The required sample size was calculated using Stata IC version 25.0 for a two-sided test comparing two independent proportions, with a 1:1 allocation ratio. Based on previous studies,[3] we assumed that 15% of participants in the control group and 40% in the intervention group would achieve the primary outcome of individual preparedness for large-scale earthquakes. With a significance level of 0.05 and 80% power, the estimated sample size was approximately 100 participants (50 per group). To account for an anticipated dropout rate of 20%, the recruitment target was set at 120 participants (60 per group). No stopping guidelines were specified because of the short follow-up period and minimal-risk nature of the educational intervention.

Students who agreed to participate were randomly allocated to the intervention or control group in a 1:1 ratio according to their enrollment sequence. Randomization was performed by a researcher using Microsoft Excel, with randomly selected block sizes of 2, 4, 6, 8, and 10.

Because this was an open-label trial, neither participants nor the researcher delivering the intervention were blinded to group allocation.

Data Collection Instruments

Demographic Characteristics: Earthquake preparedness has been associated with age, residential location, sources of information about earthquake preparedness, previous participation in preparedness training, and experience of earthquake-related damage.[9–12] Accordingly, the following demographic characteristics and potential confounders of earthquake preparedness were assessed at baseline using a self-administered questionnaire: age; current residential location (inland or coastal area); sources of information on earthquake preparedness (websites of public organizations, such as national and municipal governments; social media and smartphone applications; television; newspapers, magazines, and books; and family members and friends; each assessed as yes/no); previous participation in earthquake preparedness training (home safety, safety confirmation and evacuation procedures, or household emergency stockpiling; yes/no); and personal or family experience of earthquake-related damage, including experiences of other close individuals (yes/no). Earthquake-related damage included personal injuries, property damage (e.g., damage to homes), disruption of essential services (e.g., electricity, gas, or water supply), sheltering at home, and evacuation to designated shelters. Information on participants' departments or fields of study was not collected.

Disaster Prevention Consciousness Scale: Disaster prevention consciousness was measured using the Japanese version of the Disaster Prevention Consciousness Scale, which has demonstrated reliability and validity.[13] The scale consists of 20 items across five subscales: imagination of damage situations, sense of crisis regarding disasters, other-directedness, interest in disasters, and anxiety. Each item is rated on a six-point Likert scale ranging from 1 to 6. Total scores range from 20 to 120, with higher scores indicating greater disaster prevention consciousness.

Individual Preparedness for Large-Scale Earthquakes: Individual preparedness was assessed using items developed from governmental guidelines and recommendations issued by the Cabinet Office and the Fire and Disaster Management Agency of Japan, disaster preparedness books, and relevant previous research.[14–18] Preparedness was categorized into three domains: home safety (e.g., measures to prevent furniture and household appliances from falling and to reduce the risk of earthquake-related fires); safety confirmation and evacuation (e.g., identifying evacuation sites and routes and preparing clothing and other items needed during evacuation); and stockpiling household supplies (e.g., communication devices, drinking water, and food). To improve clarity, items in the home safety domain, including adhesive mats, stoppers, fall-prevention devices, and cabinet-door opening prevention devices, were accompanied by illustrations. For each item, participants indicated whether they had implemented the preparedness measure by selecting "yes" or "no."

Stages of Behavioral Change: Stages of behavioral change were assessed according to the TTM and classified into four categories: precontemplation, contemplation, preparation, and action/maintenance.[7]

Participation in Other Earthquake Preparedness Seminars: Participation in other earthquake preparedness seminars was defined as attendance at seminars provided by organizations or institutions other than the research team between the baseline and one-month follow-up assessments. This information was collected at the one-month follow-up to enable an accurate assessment of the intervention's effectiveness.

Outcomes

Primary Outcome

The primary outcome was individual preparedness for large-scale earthquakes.

Secondary Outcomes

The secondary outcomes were disaster prevention consciousness and stages of behavioral change.

Intervention

Theoretical Framework

A structured educational program was developed to promote individual preparedness for large-scale earthquakes using the TTM. The intervention was based on the model's cognitive-affective strategies, which have been shown to facilitate behavioral change among individuals in the precontemplation and contemplation stages. These strategies promote behavioral change through four key processes: consciousness raising, emotional arousal, self-reevaluation, and environmental reevaluation.[7] Educational materials were developed to support each of these pro-

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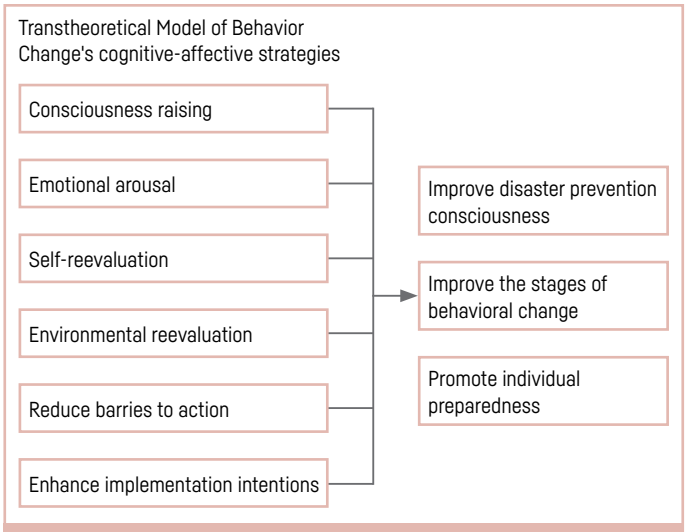


Figure 1. Conceptual framework of the educational program based on the cognitive-affective strategies of the Transtheoretical Model of Behavior Change (TTM).

cesses. The intervention also incorporated materials designed to reduce barriers to action and strengthen implementation intentions, both of which are important for initiating and maintaining behavioral change.[19-21] The overall conceptual framework is presented in Figure 1.

Lecture Materials for Consciousness Raising

To promote consciousness raising, lecture materials were developed to present factual information about the risks and potential consequences of large-scale earthquakes in Japan. The materials emphasized three key points:

- Approximately 18% of earthquakes worldwide with a magnitude 6.0 or higher occur in Japan.
- Japan is located at the convergence of four tectonic plates, making it particularly susceptible to plate-boundary earthquakes.
- Approximately 2,000 active faults are distributed across Japan, contributing to the risk of inland earthquakes.

Scenario-Based Educational Comic Book for Emotional Arousal and Reevaluation

An immersive, scenario-based educational comic book was developed to facilitate emotional arousal, self-reevaluation, and environmental reevaluation. The story features three university students, one of whom has proactively prepared for earthquakes, whereas the other two have not, expressing attitudes such as "I'll do it eventually." In the fictional scenario, a major earthquake occurs. The prepared student responds safely and calmly, whereas the unprepared students encounter serious difficulties, including an inability to use their smartphones or access tap water. These challenges create uncertainty and prompt the students to ask themselves, "What should I do?" On the final page, readers are encouraged to reflect on and record the personal benefits of earthquake preparedness (self-reevaluation) and its potential benefits for their families and communities (environmental reevaluation).

Practical Guide and Checklist to Reduce Barriers

According to the Cabinet Office of the Government of Japan,[22] common barriers to earthquake preparedness include insufficient information, financial costs, time constraints, and limited opportunities to take action. To address these barriers and encourage participants to develop concrete preparedness plans, the following educational materials were created:

- A comprehensive checklist of essential preparedness measures, enabling participants to assess their current preparedness status.
- A practical guide entitled "How to Prepare for Large-Scale Earthquakes," presenting feasible, low-cost, and time-efficient preparedness strategies, such as maintaining rotating stocks of emergency food and water and arranging household furniture safely.

The guide was designed to be simple, accessible, and practical. It also included a planning worksheet encouraging participants to specify when, where, and how they intended to implement each preparedness activity.[20,21]

Session Format and Delivery

The intervention was delivered face-to-face in a single 90-minute session. Immediately before the session, participants received a folder containing the educational materials described above. The session comprised three components: a brief orientation (5 minutes); a lecture using visual materials illustrating potential human, structural, and utility-related damage from a large-scale earthquake, followed by an exercise using the scenario-based comic book (40 minutes); and an exercise focusing on essential preparedness measures and practical implementation strategies (45 minutes). The intervention was delivered by a researcher specializing in earthquake-related studies who had more than 10 years of university-level teaching experience. After data collection was completed, participants in the control group were offered the same intervention upon request.

Data Collection

Data were collected between June and December 2023 using self-administered questionnaires. Assessments were conducted at two time points: baseline (before the intervention) and one month after the intervention. No large-scale earthquakes occurred in the Kansai region during the data collection period.

Statistical Analysis

All statistical analyses were performed using SPSS version 29 (IBM SPSS Japan, Tokyo, Japan). Baseline participant characteristics were summarized as means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Continuous variables were compared using independent-samples t-tests, whereas dichotomous and categorical variables were compared using chi-square tests or Fisher's exact tests, as appropriate.

Disaster prevention consciousness scores, including total and subscale scores, were compared between the intervention and control groups at baseline and one month after the intervention using independent-samples t-tests. The distributions of participants across the stages of behavioral change were compared between groups at both time points using chi-square tests or Fisher's exact tests. Similarly, implementation rates for individual preparedness behaviors were compared between groups at both assessments using chi-square tests or Fisher's exact tests. Effect sizes were calculated to quantify the magnitude of between-group differences.

Analyses were conducted using both intention-to-treat (ITT) and per-protocol (PP) approaches. The primary analysis followed the ITT principle and included all randomized participants. The PP analysis included participants who completed both the baseline and one-month follow-up assessments and had not attended any other earthquake preparedness seminars during the study period. An additional ITT subgroup analysis was restricted to participants classified as being in the precontemplation or contemplation stage at baseline. In all ITT analyses, missing data were imputed using the baseline observation carried forward method.[23]

All statistical tests were two-sided, and p values <0.05 were considered statistically significant.

Ethical Considerations

The study protocol was developed in accordance with the Declaration of Helsinki and approved by Institutional Review Board of Osaka Metropolitan University (Approval Number: 2023-06, Date: 30.05.2023). Participants received written information explaining the study's purpose, procedures, and confidentiality measures. Written informed consent was obtained from all participants, and participation was voluntary. Study data were securely stored on password-protected devices and used exclusively for the purposes of this study. Neither participants nor members of the public were involved in the design, conduct, or reporting of the study.

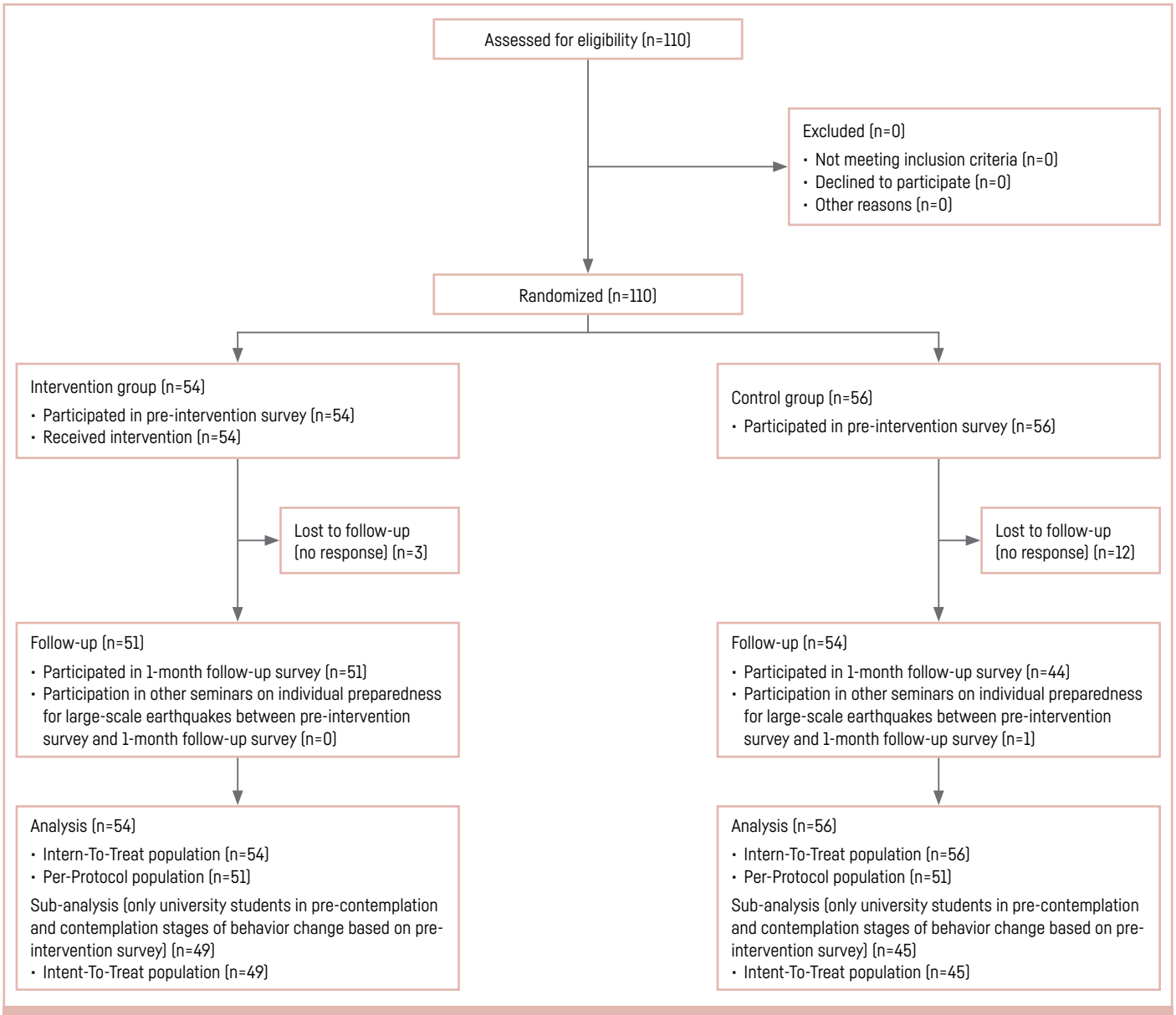


Figure 2. Consolidated Standards of Reporting Trials (CONSORT) flow diagram.

Results

Participant Flow

A total of 110 university students were randomized to the intervention (n=54) or control (n=56) group (Fig. 2). At the one-month follow-up, retention rates were 94.4% (51/54) in the intervention group and 78.6% (44/56) in the control group. One participant in the control group attended another earthquake preparedness seminar during the study period. All randomized participants were included in the primary ITT analysis (n=110). The PP analysis included 94 participants after excluding those lost to follow-up (n=15) and the participant who attended another seminar (n=1). The ITT subgroup analysis included 94 participants who were in the precontemplation or contemplation stage at baseline. No intervention-related adverse events were reported.

Participant Characteristics

The mean age (standard deviation) was 20.2 (1.4) years in the intervention group and 19.9 (0.9) years in the control group (Table 1). Most participants in both groups were women and lived in inland areas. Regarding information sources on individual preparedness for large-scale earthquakes, more than half of the participants in both groups reported obtaining information from websites of public organizations, social media and smartphone applications, and television. No statistically significant differences in baseline characteristics were observed between the groups. Similar findings were obtained in the PP analysis and ITT subgroup analysis (Supplementary Tables 1, 2).

Effects on Disaster Prevention Consciousness

At baseline, no statistically significant differences in total or subscale scores were observed between the groups (Table 2). At the one-month follow-up, the intervention group had significantly higher total disaster prevention consciousness scores than the control group, with a moderate-to-large effect size. Among the subscales, scores for "imagination of damage situations" and "interest in disasters" were significantly higher in the intervention group. No statistically significant between-group differences were observed for "sense of crisis regarding disasters," "other-directedness," or "anxiety." Similar findings were observed in the PP analysis and ITT subgroup analysis (Supplementary Tables 3, 4).

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Table 1. Baseline characteristics of participants in the intervention and control groups (intention-to-treat population)

	Intervention group (n=54)	Control group (n=56)	p
Age (years)	20.2 (1.4)	19.9 (0.9)	0.173
Women	52 (96.3)	53 (94.6)	>0.999
Current residential location			0.714
Inland area	50 (92.6)	53 (94.6)	
Coastal area	4 (7.4)	3 (5.4)	
Sources of information on preparedness for large-scale earthquakes*			
Websites of public organizations (e.g., national and municipal governments)	38 (70.4)	38 (67.9)	0.776
Social media and smartphone applications	32 (59.3)	35 (62.5)	0.728
Television	44 (81.5)	43 (76.8)	0.545
Newspapers	5 (9.3)	4 (7.1)	0.740
Magazines and books	2 (3.7)	1 (1.8)	0.615
Family members and friends	23 (42.6)	23 (41.1)	0.872
Previous participation in earthquake preparedness training*			
Home safety	16 (29.6)	19 (33.9)	0.628
Safety confirmation	14 (25.9)	21 (37.5)	0.193
Evacuation	37 (68.5)	39 (69.6)	0.898
Stockpiling household supplies	26 (48.1)	30 (53.6)	0.569
Personal experience of earthquake-related damage†	17 (31.5)	20 (35.7)	0.639
Earthquake-related damage experienced by family members or close acquaintances†	30 (55.6)	35 (62.5)	0.459

Continuous variables were analyzed using t-tests and are presented as means (standard deviations). Categorical variables were analyzed using chi-square tests or Fisher's exact test, as appropriate, and are presented as n (%). *: Multiple responses were permitted, †: Earthquake-related damage included personal injuries, property damage (e.g., damage to homes), disruption of essential services (e.g., electricity, gas, water, or communication services), sheltering at home, or evacuation to designated shelters.

Table 2. Disaster prevention consciousness scores at baseline and one-month follow-up in the intervention and control groups (intention-to-treat population)

	Baseline (pre-intervention)			One-month follow-up (post-intervention)			
	Intervention group (n=54)	Control group (n=56)	p	Intervention group (n=54)	Control group (n=56)	p	Effect size (Cohen's d)
Disaster Prevention Consciousness Scale (total score)	81.9 (7.7)	81.3 (9.1)	0.709	87.7 (8.2)	81.6 (9.4)	<0.001	0.70
Imagination of damage situations	14.4 (3.1)	14.5 (3.1)	0.800	18.2 (2.8)	14.9 (2.9)	<0.001	1.14
Sense of crisis regarding disasters	19.7 (1.8)	19.5 (2.1)	0.617	19.9 (2.1)	19.8 (2.0)	0.657	0.09
Other-directedness	16.2 (3.9)	15.4 (3.9)	0.251	16.0 (4.3)	15.7 (4.2)	0.645	0.09
Interest in disasters	15.5 (2.7)	15.6 (2.9)	0.869	17.0 (2.8)	15.1 (3.2)	0.001	0.63
Anxiety	16.1 (3.9)	16.3 (3.6)	0.766	16.6 (3.7)	16.2 (3.5)	0.528	0.12

Continuous variables were analyzed using t-tests, and results are presented as mean (standard deviations). The Disaster Prevention Consciousness Scale comprises 20 items rated on a six-point Likert scale ranging from 1 ("strongly disagree") to 6 ("strongly agree"). The total scores range from 20 to 120, with higher scores indicating greater disaster prevention consciousness.

Table 3. Distribution of stages of behavioral change in earthquake preparedness at baseline and one-month follow-up by study group (intention-to-treat population)

	Baseline (pre-intervention)			One-month follow-up (post-intervention)			
	Intervention group (n=54)	Control group (n=56)	p	Intervention group (n=54)	Control group (n=56)	p	Effect size (Cramer's V)
Stages of behavioral change in individual preparedness for large-scale earthquakes			0.495			<0.001	0.57
Precontemplation	35 (64.8)	32 (57.1)		7 (13.0)	35 (62.5)		
Contemplation	14 (25.9)	13 (23.2)		19 (35.2)	9 (16.1)		
Preparation	1 (1.9)	2 (3.6)		21 (38.9)	3 (5.4)		
Action/maintenance	4 (7.4)	9 (16.1)		7 (13.0)	9 (16.1)		

Categorical data were analyzed using the chi-square test at the one-month follow-up and Fisher's exact test at baseline. Results are presented as n (%).

Effects on Stages of Behavioral Change

At baseline, the distribution of participants across the stages of behavioral change did not differ significantly between the groups (Table 3). At the one-month follow-up, a statistically significant between-group difference was observed, with a large effect size. Compared with the control group, the intervention group had a lower proportion of participants in the precontemplation stage and a higher proportion in the preparation stage. Similar findings were obtained in the PP analysis and ITT subgroup analysis (Supplementary Tables 5, 6).

Table 4. Individual preparedness measures for large-scale earthquakes at baseline and one-month follow-up by study group (intention-to-treat population)

	Pre-intervention survey			One-month post-intervention survey			
	Intervention group (n=54)	Control group (n=56)	p	Intervention group (n=54)	Control group (n=56)	p	Effect size (φ)
[Home safety preparedness]							
Prevention of furniture and household appliances from falling							
Use of adhesive mats, stoppers, or similar devices beneath furniture and appliances	13 (24.1)	12 (21.4)	0.741	18 (33.3)	14 (25.0)	0.336	0.09
Installation of fall-prevention devices on furniture and appliances	12 (22.2)	16 (28.6)	0.445	13 (24.1)	16 (28.6)	0.593	-0.05
Storage of heavy items on lower shelves or in lower compartments	28 (51.9)	31 (55.4)	0.712	45 (83.3)	32 (57.1)	0.003	0.29
Avoidance of placing furniture or appliances near room entrances	28 (51.9)	33 (58.9)	0.455	45 (83.3)	34 (60.7)	0.008	0.25
Avoidance of placing furniture or appliances near sleeping areas (beds or futons)	26 (48.1)	24 (42.9)	0.577	40 (74.1)	25 (44.6)	0.002	0.30
Prevention of falling objects							
Installation of devices to prevent cabinet doors and drawers from opening	4 (7.4)	7 (12.5)	0.373	6 (11.1)	7 (12.5)	0.822	-0.02
Avoidance of storing objects on top of furniture or appliances	7 (13.0)	9 (16.1)	0.644	22 (40.7)	9 (16.1)	0.004	0.27
Prevention of glass breakage							
Application of shatterproof film to glass surfaces (e.g., windows and cupboard doors)	0 (0.0)	3 (5.4)	0.243	2 (3.7)	5 (8.9)	0.438	-0.11
Prevention of earthquake-related fires							
Identification of the location of the circuit breaker	42 (77.8)	47 (83.9)	0.412	47 (87.0)	47 (83.9)	0.644	0.04
Knowledge of how to turn off the circuit breaker	36 (66.7)	33 (58.9)	0.401	41 (75.9)	35 (62.5)	0.128	0.15
Identification of the location of nearby fire extinguishers	24 (44.4)	22 (39.3)	0.583	34 (63.0)	22 (39.3)	0.013	0.24
Knowledge of how to use nearby fire extinguishers	16 (29.6)	15 (26.8)	0.740	30 (55.6)	16 (28.6)	0.004	0.27
[Safety confirmation and evacuation preparedness]							
Safety confirmation							
Establishment of a method for confirming safety with family and friends	12 (22.2)	16 (28.6)	0.445	30 (55.6)	18 (32.1)	0.013	0.24
Knowledge of how to use the Disaster Emergency Message Dial (171) and Disaster Emergency Message Board (web171)	4 (7.4)	6 (10.7)	0.742	28 (51.9)	8 (14.3)	<0.001	0.40
Evacuation sites and routes							
Identification of nearby evacuation sites	43 (79.6)	48 (85.7)	0.399	53 (98.1)	48 (85.7)	0.032	0.23
Identification of routes to nearby evacuation sites	29 (53.7)	35 (62.5)	0.350	47 (87.0)	37 (66.1)	0.010	0.25
Evacuation equipment available at home							
Helmet	2 (3.7)	3 (5.4)	>0.999	8 (14.8)	3 (5.4)	0.098	0.16
Portable lighting (e.g., headlamp, neck light, or flashlight)	34 (63.0)	39 (69.6)	0.459	38 (70.4)	40 (71.4)	0.903	-0.01
Whistle	8 (14.8)	7 (12.5)	0.724	12 (22.2)	8 (14.3)	0.281	0.10
Emergency supply bag	17 (31.5)	19 (33.9)	0.785	20 (37.0)	19 (33.9)	0.733	0.03
[Stockpiling essential household supplies]							
Valuables							
Emergency cash	31 (57.4)	39 (69.6)	0.182	46 (85.2)	41 (73.2)	0.123	0.15
Copies of identification documents	11 (20.4)	16 (28.6)	0.318	19 (35.2)	19 (33.9)	0.890	0.01

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Table 4. (Cont.)

	Pre-intervention survey			One-month post-intervention survey			
	Intervention group (n=54)	Control group (n=56)	p	Intervention group (n=54)	Control group (n=56)	p	Effect size (φ)
Communication and information devices							
Portable power bank for a smartphone or mobile phone	41 (75.9)	43 (76.8)	0.915	45 (83.3)	44 (78.6)	0.525	0.06
Radio	15 (27.8)	23 (41.1)	0.143	22 (40.7)	24 (42.9)	0.822	-0.02
Drinking water and emergency food							
Drinking water sufficient for at least three days (approximately 9 L)	23 (42.6)	25 (44.6)	0.828	37 (68.5)	26 (46.4)	0.019	0.22
Emergency or nonperishable food sufficient for at least three days (approximately nine meals)	22 (40.7)	24 (42.9)	0.822	39 (72.2)	25 (44.6)	0.003	0.28
Medical and hygiene supplies							
Regularly used medications (e.g., prescription or over-the-counter medications)	29 (53.7)	30 (53.6)	0.989	41 (75.9)	30 (53.6)	0.014	0.23
First-aid kit (e.g., adhesive bandages, dressings, disinfectant, or thermometer)	32 (59.3)	35 (62.5)	0.728	36 (66.7)	37 (66.1)	0.947	0.01
Face masks	44 (81.5)	48 (85.7)	0.549	51 (94.4)	48 (85.7)	0.127	0.15
Alcohol-based hand sanitizer	40 (74.1)	41 (73.2)	0.919	47 (87.0)	41 (73.2)	0.070	0.17
Portable emergency toilet	10 (18.5)	10 (17.9)	0.928	11 (20.4)	10 (17.9)	0.737	0.03
Sanitary products*	42 (80.8)	44 (83.0)	0.765	48 (92.3)	44 (83.0)	0.148	0.14
Cold-weather and rain protection							
Cold-weather supplies (e.g., hand warmers or emergency thermal blankets)	23 (42.6)	26 (46.4)	0.686	37 (68.5)	27 (48.2)	0.031	0.21
Raincoat	21 (38.9)	27 (48.2)	0.324	33 (61.1)	29 (51.8)	0.324	0.10

Categorical data were analyzed using chi-square tests or Fisher's exact tests, as appropriate, and are presented as n (%). *: Data were collected from women only (n=105).

Effects on Individual Preparedness for Large-Scale Earthquakes

At baseline, no statistically significant between-group differences were observed for any preparedness item (Table 4). At the one-month follow-up, the intervention group demonstrated significantly higher implementation rates for several key preparedness behaviors than the control group. These behaviors included home safety measures (e.g., storing heavy items on lower shelves and avoiding the placement of furniture near entrances and sleeping areas); safety confirmation and evacuation measures (e.g., establishing methods for confirming family members' safety, learning how to use the Disaster Emergency Message Dial and web171 services, and identifying evacuation sites and routes); and stockpiling essential household supplies (e.g., drinking water, emergency food, medications, and cold-weather clothing). Effect sizes ranged from small to moderate (φ=0.21–0.40). Similar findings were observed in the PP analysis and ITT subgroup analysis (Supplementary Tables 7, 8).

Discussion

This study is the first to demonstrate that an educational program incorporating the cognitive-affective strategies of the TTM can effectively enhance individual preparedness for large-scale earthquakes among university students. At the one-month follow-up, the intervention group demonstrated significantly higher disaster prevention consciousness scores, more favorable distributions across stages of behavioral change, and greater implementation of several preparedness behaviors than the control group. Specifically, the intervention group had significantly higher total disaster prevention consciousness scores, particularly for "imagination of damage situations" and "interest in disasters." A greater proportion of participants in the intervention group had reached the preparation stage, whereas fewer remained in the precontemplation stage. Furthermore, implementation rates for key preparedness behaviors related to home safety, safety confirmation and evacuation, and stockpiling essential supplies were significantly higher in the intervention group. These findings were generally consistent across the PP and ITT subgroup analyses, supporting the consistency of the observed intervention effects.

Regarding disaster prevention consciousness, the intervention group demonstrated significant improvements in "imagination of damage situations" and "interest in disasters," without significant between-group differences in "sense of crisis regarding disasters" or "anxiety." These findings suggest that the educational program may have increased disaster awareness without increasing self-reported anxiety. Excessive anxiety may lead to avoidance behaviors and hinder preparedness efforts.[24,25] Accordingly, the program emphasized cognitive engagement and a realistic understanding of earthquake risks rather than fear-based messaging. This approach may have encouraged proactive attitudes toward disaster prevention without increasing anxiety.

The observed differences in behavioral change stages suggest that the educational program successfully engaged participants through the cognitive-affective strategies of the TTM. Factual information about the risks of large-scale earthquakes, together with the immersive scenario-based comic book, may have increased participants' awareness of their vulnerability and the potential consequences of inadequate preparedness. Narrative elements designed to promote self-reevaluation and environmental reevaluation may also have strengthened their motivation to take action. These processes are particularly relevant to individuals in the precontemplation and contemplation stages, for whom low personal relevance and limited emotional engagement may hinder behavioral change.[7] By addressing these barriers through consciousness raising, emotional arousal, and reflective processes, the intervention may have facilitated progression toward preparation and action. These findings highlight the value of integrating cognitive-affective strategies into earthquake preparedness education for young adults.

The intervention group also demonstrated substantial improvements in preparedness behaviors, with reported increases in implementation rates of 20%–45% across key measures. The structured intervention sequence—engaging participants through cognitive-affective processes, reducing practical barriers, and supporting action planning—may have contributed to these changes. This finding highlights the benefits of combining motivational strategies with practical tools to translate awareness into concrete preparedness actions. However, at the one-month follow-up, no statistically significant between-group differences were observed for certain preparedness measures, including installing fall-prevention devices, applying shatterproof film, and preparing evacuation supplies, radios, or portable emergency toilets. One possible explanation is the financial cost associated with these items. Unlike low-cost measures, such as rearranging furniture, purchasing fall-prevention devices or shatterproof film may present financial barriers for university students. Furthermore, although emergency food and drinking water can be incorporated into daily routines through rotating stock practices, items such as evacuation supplies, radios, and portable toilets require separate preparation and are not routinely used. Financial constraints have been identified as a barrier to earthquake preparedness,[22] and they may have contributed to the observed differences in implementation rates.

The findings are also consistent with broader international priorities in disaster risk reduction. The Sendai Framework for Disaster Risk Reduction 2015–2030 emphasizes the importance of improving public awareness and understanding of disaster risks through sustained public education and recognizes young people as important agents of change in disaster risk reduction.[26] Similarly, previous research examining global trends in disaster prevention education has suggested a shift from traditional approaches focused primarily on disaster risks and countermeasures toward approaches emphasizing disaster prevention consciousness and the promotion of preparedness behaviors.[27] These developments are consistent with the educational program implemented among university students in this study. Furthermore, the program's single 90-minute session format may make it a feasible educational intervention for university students. Wider implementation of this program could therefore help promote disaster preparedness behaviors among this population.

Limitations

This study has several limitations. First, although only one participant reported attending another earthquake preparedness seminar during the study period, media coverage of earthquakes and disaster prevention may have influenced participants' awareness and behaviors. Nevertheless, no large-scale earthquakes occurred in the Kansai region during data collection, and no earthquakes resulting in casualties were reported across Japan during this period.[28] Second, although 60.9% of participants were in the precontemplation stage at baseline, students who were already interested in or concerned about earthquake preparedness may have been more likely to participate, introducing potential selection bias. Third, the preparedness behaviors of family members living with participants were not assessed. These behaviors may have influenced participants' ability or motivation to implement preparedness measures. Fourth, the follow-up period was limited to one month. Finally, owing to the nature of the educational intervention, participants and instructors could not be blinded to group allocation. However, because the primary outcome focused on the implementation of preparedness behaviors rather than intentions alone, the risk of overestimating the intervention effect was considered relatively low.

Conclusion

This RCT demonstrated that an educational program incorporating the cognitive-affective strategies of the TTM improved preparedness for large-scale earthquakes among Japanese university students at the one-month follow-up. The intervention significantly enhanced disaster prevention consciousness, promoted progression through the stages of behavioral change, and increased the implementation of key earthquake preparedness behaviors. The program's effectiveness may be attributable to its integrated design, which combines fact-based education, emotionally engaging narratives, and practical guidance to reduce barriers and facilitate action planning. Delivered in a single 90-minute session, the intervention demonstrated feasibility and psychological safety, fostering proactive attitudes without increasing anxiety. Furthermore, these findings highlight the important role of nurses in disaster preparedness education and their potential contribution to strengthening community resilience against large-scale earthquakes. Future studies should assess the long-term effects of the program among university students.

Supplementary tables may be accessed through the link: https://jag.journalagent.com/jern/abs_files/JERN-64507/JERN-64507_(0)_978-supp.docx

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Evaluation of Nursing Students' Knowledge of Incident Scene Triage

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Abstract

Background: Triage is a critical component of emergency and disaster response, and nurses' knowledge of triage procedures is essential for rapid and accurate clinical decision-making.

Aim: This study aimed to assess nursing students' knowledge of incident scene triage and examine its associations with sociodemographic and educational characteristics.

Methods: This descriptive, cross-sectional study included 176 fourth-year nursing students at a foundation university. Data were collected between March and June 2025 using a Student Information Form and the Triage Knowledge Scale administered face-to-face. Statistical analyses included descriptive statistics, the Mann–Whitney U test, the Kruskal–Wallis test, and Spearman's correlation analysis. Statistical significance was set at $p<0.05$.

Results: Of the participants, 71% were female, and the mean age was 23.69±2.85 years. Overall, 17% had received extracurricular triage-related training, 38.1% held a first aid certificate, and 6.3% had attended a triage-related seminar or conference. The mean triage knowledge score was 9.99±2.14 (range: 5–14, median: 10), and 54.5% of students demonstrated low knowledge levels. Extracurricular triage-related education ($p<0.001$) and enrollment in emergency and/or disaster nursing courses ($p<0.001$) were positively associated with higher knowledge scores.

Conclusion: Nursing students generally demonstrated low levels of knowledge regarding incident scene triage. Enrollment in emergency and disaster nursing courses, as well as participation in extracurricular triage-related education, emerged as important factors associated with higher triage knowledge levels among nursing students. These findings highlight the importance of systematically integrating triage education into undergraduate nursing curricula to strengthen students' preparedness for emergency and disaster situations.

Keywords: Disaster nursing, emergency nursing, nursing education

Introduction

The effectiveness of healthcare systems depends not only on the quality of treatment but also on the timeliness of emergency responses, the accuracy of patient prioritization, and the efficient allocation of human resources.[1,2] Triage is a systematic process of classifying patients according to the urgency of their healthcare needs to ensure the rational and efficient use of limited healthcare resources.[3,4] The accurate, reliable, and timely implementation of triage is essential for both patient safety and the overall efficiency of healthcare services.[5,6] Triage systems are based on standardized protocols developed at both national and international levels. Organizations such as the World Health Organization (WHO) and the European Society for Emergency Medicine (EUSEM) have developed guidelines for triage models applicable across different healthcare systems.[7] These guidelines emphasize the ethical considerations involved in patient prioritization, particularly in resource-limited settings, and provide algorithms that facilitate rapid decision-making among healthcare professionals. Furthermore, the integration of international standards, electronic decision-support systems, and artificial intelligence-based triage applications may contribute to improvements in patient safety and healthcare efficiency.[8] Thus, triage has become a strategic component of both national healthcare systems and global health policies.

Triage procedures require nurses to make rapid and accurate decisions during initial patient assessment, making adequate knowledge and clinical skills essential. Nurses are not only responsible for implementing triage protocols but also play a central role in patient prioritization decisions.[9,10] However, studies conducted in Türkiye and internationally have revealed deficiencies in nurses' triage knowledge, a lack of standardized education, and insufficient practice-based training.[11,12] These findings highlight the need to develop standardized educational programs at the institutional level and strengthen practice-based teaching methods to enable nurses to fulfill their roles effectively in triage processes. Such educational challenges underscore the importance of evidence-based teaching approaches designed to enhance nurses' knowledge and skills. Previous studies have demonstrated that simulation, virtual reality applications, role-playing, and case-based learning can improve students' clinical reasoning and decision-making skills.[13-15] These evidence-based educational approaches have also been associated with improvements in knowledge levels and clinical decision-making accuracy.[12] Studies conducted in Türkiye indicate that many nurses consider their triage training inadequate, that triage knowledge scores are generally low, and that knowledge gaps may affect clinical practice.[16,17] In this context, the present study aimed to assess undergraduate nursing

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students' knowledge of incident scene triage and determine whether knowledge levels differed significantly according to their sociodemographic and educational characteristics. The findings are expected to contribute to the limited empirical evidence on triage education in Türkiye, where comprehensive triage training has not yet been widely integrated into university nursing curricula, and to inform educational policy and curriculum development in this field. Despite the growing importance of triage systems in emergency and disaster settings, existing evidence indicates that nurses and nursing students often have insufficient knowledge and training in this area. In Türkiye, previous studies have reported low levels of triage knowledge and identified significant deficiencies in both theoretical education and practical training among nurses.[11,12] However, evidence specifically addressing nursing students' knowledge of incident scene triage and the factors associated with their knowledge levels remains limited.[13,14]

Assessing nursing students' knowledge of incident scene triage is particularly important because they represent the future nursing workforce and may be required to make rapid and accurate triage decisions in critical situations. Identifying factors associated with their knowledge levels may contribute to the development of more effective educational strategies and improvements in nursing curricula. Therefore, this study aimed to assess nursing students' knowledge of incident scene triage and examine its associations with their sociodemographic and educational characteristics. The findings are expected to contribute to the existing literature by providing empirical evidence on nursing students' triage knowledge and identifying educational factors that may inform curriculum development in Türkiye.

Research Questions

1. What is the level of nursing students' knowledge regarding incident scene triage?
2. Are nursing students' individual characteristics and educational backgrounds associated with their knowledge of incident scene triage?
3. Is enrollment in emergency nursing and/or disaster nursing courses associated with nursing students' knowledge of incident scene triage?

Materials and Methods

Study Design and Sample

This descriptive, cross-sectional study was conducted among fourth-year nursing students at a foundation university. The required sample size was calculated using G*Power version 3.1.6. An effect size of r=0.24, a significance level of α=0.05, and a statistical power of 1-β=0.90 were assumed for detecting a significant correlation. Accordingly, the minimum required sample size was calculated as 151 participants. To account for potential incomplete or invalid responses, the recruitment target was increased by approximately 20%, resulting in 181 recruited participants. After excluding incomplete or invalid responses, data from 176 participants were included in the final analysis, exceeding the minimum required sample size by approximately 16% (Fig. 1).

The inclusion criteria were enrollment in the fourth year of the nursing program and voluntary agreement to participate in the study. First-, second-, and third-year nursing students were excluded because Emergency Nursing and Disaster Nursing, which are offered as elective courses within the curriculum, are typically taken during the final year of the program.

Data Collection Tools

The Student Information Form and the Triage Knowledge Scale were used for data collection.

The Student Information Form included questions regarding participants' sociodemographic characteristics (age, gender, and marital status), participation in extracurricular triage-related training, attendance at seminars and conferences, participation in first aid certification programs, enrollment in triage-related elective courses (Emergency Nursing and Disaster Nursing), and previous experience with triage practices.

The Triage Knowledge Scale was developed and validated by Afacan and Yazıcı[18] in 2023 to assess nursing students' knowledge of incident scene triage based on the Simple Triage and Rapid Treatment (START)/JumpSTART triage systems . In the original scale development and psychometric evaluation study, the Content Validity Index was 0.920, the Content Validity Ratio was 0.780, and the intraclass correlation coefficient for test–retest reliability over a one-week interval was 0.958 (p<0.001). The Kuder–Richardson Formula 20 (KR-20) coefficient for internal consistency was 0.563. The scale consists of 16 items with three response options (true, false, and undecided) and assesses participants' basic knowledge of incident scene triage. Total scores range from 0 to 16, with higher scores indicating greater knowledge. Knowledge levels were classified as low (0–10 points), moderate (11–13 points), or high (14–16 points), in accordance with the classification reported in the original scale development study by Kaplan Afacan and Yazıcı.[18]

Data Collection

Data were collected between March and June 2025 through face-to-face administration of the study forms by the researchers to fourth-year nursing students who voluntarily agreed to participate. Before data collection, students were informed about the purpose and scope of the study, the voluntary nature of participation, and the confidentiality of their responses. Written informed consent was obtained from all participants before data collection. The Student Information Form and the Triage Knowledge Scale were administered by the researchers in a classroom setting. Completion of both forms took approximately 10 minutes.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as frequencies and percentages for categorical variables and as means, standard deviations, minimum and maximum values, and medians for numerical variables. Because the numerical variables did not meet the assumption of normality, the Mann–Whitney U test (Z value) was used for comparisons between two groups, and the Kruskal–Wallis H test (χ^2 value) was used for comparisons involving three or more groups. Associations between nursing students' individual characteristics and total triage knowledge scores were examined using Spearman's rank correlation analysis. Statistical significance was set at p<0.05. The reliability of the scale was assessed using the Kuder–Richardson Formula 20 (KR-20) coefficient, which was 0.71, indicating acceptable internal consistency.

Ethical Considerations

Ethical approval was obtained from Istanbul Medipol University Ethics Committee for Non-Interventional Clinical Research (Approval Number: 61, Date: 09.01.2025). The study was conducted in accordance with the principles of the Declaration of Helsinki.

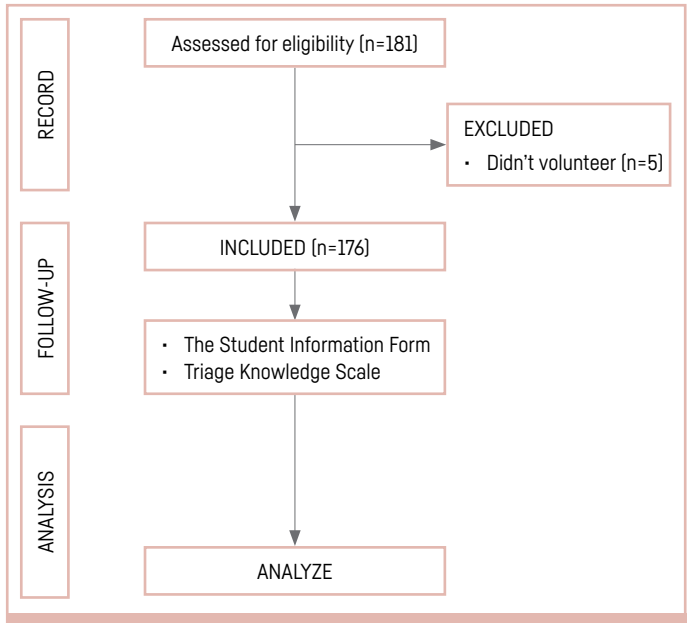


Figure 1. Flow diagram.

Table 1. Comparison of triage knowledge scores according to participants' sociodemographic characteristics and educational experiences (n=176)

Characteristic	n	%	Test	p
Gender				
Female	125	71	Z=-0.008	0.993
Male	51	29		
Marital status				
Married	15	8.5	Z=-0.029	0.976
Single	161	91.5		
Extracurricular triage-related education				
Yes	30	17	Z=-4.046	<0.001*
No	146	83		
Attendance at triage-related seminars or conferences				
Yes	11	6.3	Z=-0.909	0.363
No	165	93.7		
Enrollment in emergency and/or disaster nursing courses				
Emergency Nursing only	23	13.1	χ^2=15.421	0.001*
Disaster Nursing only	29	16.5		
Both courses	24	13.6		
Neither course	100	56.8		
Previous triage experience				
Yes	39	22	Z=-1.471	0.141
No	137	77.8		
Ministry of Health first aid certification				
Yes	67	38	Z=-0.404	0.686
No	109	61.9		

Kruskal–Wallis test, Mann–Whitney U test. *: p<0.05 indicates statistical significance.

Results

A total of 176 nursing students participated in the study. Of these, 71% were female and 91.5% were single. The mean age was 23.69±2.85 years (range: 21–46 years). Regarding extracurricular triage-related education, 17% of participants had received training outside the university curriculum, 6.3% had attended triage-related seminars or conferences, and 38.1% had participated in a first aid certification program provided by the Ministry of Health. Regarding enrollment in relevant elective courses, 13.1% had selected only Emergency Nursing, 16.5% had selected only Disaster Nursing, and 13.6% had selected both courses, whereas 56.8% had selected neither course. Additionally, 22.2% of participants reported previous experience with triage practices (Table 1).

No statistically significant differences in total triage knowledge scores were found according to gender, marital status, previous triage experience, attendance at triage-related seminars or conferences, or possession of a Ministry of Health first aid certificate. However, a statistically significant difference was observed between students who had received extracurricular triage-related education and those who had not (p<0.001). Total triage knowledge scores also differed significantly according to enrollment in Emergency Nursing and/or Disaster Nursing courses (p=0.001). Post hoc analyses revealed significant differences between students who had taken only Emergency Nursing and those who had taken neither course (p=0.023), between students who had taken only Disaster Nursing and those who had taken neither course (p=0.026), and between students who had taken both courses and those who had taken neither course (p=0.001) (Table 1).

The Triage Knowledge Scale was used to assess participants' knowledge of incident scene triage, and the mean knowledge score was calculated based on their responses. The mean total score on the Triage Knowledge Scale was 9.99±2.14, with scores ranging from 5 to 14. Based on the predefined classification criteria, participants generally demonstrated low levels of knowledge regarding incident scene triage, with 54.5% classified as having low knowledge levels (Table 2).

Table 2. Distribution of nursing students according to triage knowledge levels

Triage knowledge level	n	%	Mean±SD	Median (Min–Max)
Low (0–10 points)	96	54.4		
Moderate (11–13 points)	73	41.5		
High (14–16 points)	7	4		
Total	176	100	9.99±2.14	10 (5–14)

Mean±SD: Arithmetic mean±standard deviation; Min: Minimum, Max: Maximum.

Table 3. Correlations between nursing students' characteristics, educational experiences, and total triage knowledge scores (n=176)

Characteristic	r	p
Age	0.112	0.139
Gender	0.001	0.993
Marital status	-0.002	0.977
Extracurricular triage-related education	0.306	<0.001*
Attendance at triage-related seminars or conferences	-0.069	0.365
Enrollment in emergency and/or disaster nursing courses	0.255	<0.001*
Previous triage experience	-0.111	0.142
First aid certification	-0.031	0.687

Spearman's rank correlation analysis; r: Spearman's rank correlation coefficient. *: p<0.05 indicates statistical significance.

Spearman's rank correlation analysis was performed to examine associations between participants' sociodemographic characteristics, educational experiences, and total triage knowledge scores, as the data did not meet the assumption of normality. No statistically significant correlations were found between total triage knowledge scores and age (r=0.112; p=0.139), gender (r=0.001; p=0.993), marital status (r=−0.002; p=0.977), seminar or conference attendance (r=−0.069; p=0.365), previous triage experience (r=−0.111; p=0.142), or first aid certification (r=−0.031; p=0.687). In contrast, extracurricular triage-related education (r=0.306; p<0.001) and enrollment in emergency and/or disaster nursing courses (r=0.255; p<0.001) showed statistically significant positive correlations with total triage knowledge scores. These correlations were weak to moderate in magnitude. Overall, the findings indicate that most sociodemographic characteristics were not significantly associated with triage knowledge levels (Table 3).

Discussion

Triage systems play a critical role in emergency healthcare services by contributing to patient safety and healthcare system efficiency. Structured triage approaches have been associated with reduced mortality and morbidity, shorter patient waiting times, and more efficient resource utilization.[19,20] Effective implementation of triage systems is particularly important in emergency departments with high patient volumes, as accurate prioritization helps ensure that patients receive appropriate and timely treatment.[21] This may contribute not only to improved clinical outcomes but also to greater patient satisfaction and overall healthcare quality.[3,4] The present study revealed that nursing students generally had low levels of knowledge regarding incident scene triage. However, students who received extracurricular triage-related education and those enrolled in Emergency Nursing and/or Disaster Nursing courses demonstrated significantly higher triage knowledge scores. These findings highlight the importance of both curricular and extracurricular education in improving nursing students' triage knowledge.

The literature emphasizes that nurses' active involvement in triage is a key factor influencing the effectiveness of the process. Nurses' knowledge and skills are es-

sential for accurate clinical decision-making, while experience, educational background, and the extent of theoretical and practical training are important factors associated with triage performance.[9,10] In studies conducted in Türkiye, Bal and Gürkan[11] found that most nurses considered their triage training inadequate for a clinical practice, while Çelik et al.[12] reported substantial deficiencies in emergency department nurses' theoretical knowledge and practical application of triage principles. Similar findings have been reported internationally. A study conducted in Indonesia found that, although some nurses demonstrated adequate triage knowledge and decision-making accuracy, a considerable proportion had moderate or low knowledge levels, highlighting the need for advanced training focused on practical triage competencies.[22] A multicenter study also identified insufficient knowledge of triage systems among nurses and emphasized the importance of additional education and training to improve the accuracy of triage categorization.[23] A study conducted in Greece demonstrated that triage education significantly improved nurses' knowledge and decision-making skills[24] Similarly, a semi-experimental study conducted in Iran found that theoretical and practical triage training significantly improved nurses' knowledge and performance scores and enhanced indicators of emergency service quality.[25] A study involving Korean nursing students also emphasized the need for educational programs designed to strengthen emergency nursing competencies, including triage-related skills.[26] The findings of the present study are consistent with this literature, indicating that nursing students generally have low levels of triage knowledge and that knowledge scores differ significantly according to participation in triage-related education. In this context, findings from both national and international studies underscore the importance of standardized educational programs in strengthening nurses' triage knowledge and skills and enhancing the quality of emergency healthcare services.

Nursing students' knowledge of the START system is particularly important for effective patient prioritization during emergencies and disasters. Previous research has emphasized the importance of triage education because of its relationship with the accuracy of triage decisions, highlighting the need to strengthen triage-related content within emergency and disaster nursing education.[27] Kavakli and Konukbay[15] further demonstrated an association between theoretical knowledge and practical triage skills among nursing students. Although a substantial proportion of students reported familiarity with triage concepts, the findings indicated a need to strengthen practical competencies through structured educational strategies and mentoring programs. Other studies have shown that nurses who receive standardized triage training make more accurate and timely decisions than those without such training.[11,12] The literature also highlights persistent gaps in nursing students' triage knowledge and educational preparation, suggesting that existing curricula may not adequately prepare them for complex emergency situations encountered in clinical practice.[13–15,26] The findings of the present study support this evidence, demonstrating positive associations between triage knowledge levels and both extracurricular triage-related education and enrollment in emergency and/or disaster nursing courses. In conclusion, educational status is an important factor influencing nursing students' knowledge levels, and supporting professional and institutional experience plays a critical role in improving the quality of healthcare services.

Integrating triage education into undergraduate nursing curricula is essential for preparing future healthcare professionals to respond effectively to emergencies and disasters. Numerous studies have emphasized the importance of systematically incorporating triage education into nursing programs to strengthen clinical competence and decision-making skills in high-pressure environments.[28,29]

Research evaluating triage education programs has highlighted the contribution of such training to improved clinical performance and decision-making accuracy. Mostafa et al.[30] reported positive effects of triage training on clinical performance, while Huh and Kang[26] emphasized the importance of emergency and disaster nursing education, including triage-related skills, in developing the professional competencies of nursing graduates. Duko et al.[31] found that triage knowledge was associated with work experience, educational background, and previous training and emphasized the need for systematic triage education. Similarly, AlShatarat et al.[32] reported that repeated practice and direct exposure to triage systems could strengthen nurses' knowledge and skills. Razavian et al.[33] also emphasized the importance of formally incorporating triage education into nursing curricula and providing regular training updates. The findings of the present study are consistent with these reports, demonstrating that students who had enrolled in Emergency Nursing and/or Disaster Nursing courses achieved higher triage knowledge scores than those who had not taken either course. These findings suggest that such courses may provide valuable opportunities to strengthen nursing students' knowledge of incident scene triage. Integrating these courses into the curriculum not only enhances students' theoretical knowledge but also strengthens their preparedness for real-life scenarios, thereby supporting clinical decision-making processes.

Limitations

This study has several limitations. First, although the sample comprised final-year nursing students from the target institution, the study was conducted at a single university in Istanbul, Türkiye. Therefore, caution is required when generalizing the findings to nursing students at other institutions or in different educational settings. Second, the cross-sectional design precludes establishing causal relationships between educational experiences and triage knowledge levels. Furthermore, the simultaneous assessment of exposure and outcome variables does not allow the temporal sequence of these associations to be determined. Third, data regarding students' educational experiences and previous triage-related training were self-reported, which may have introduced recall and reporting biases. Finally, the study assessed theoretical knowledge rather than actual clinical triage performance; therefore, the findings may not fully reflect students' practical triage competencies in real emergency or disaster situations.

Conclusion

This study demonstrated that final-year nursing students generally had low levels of knowledge regarding incident scene triage. Students who had completed Emergency Nursing and/or Disaster Nursing courses and those who had participated in extracurricular triage-related education achieved significantly higher knowledge scores. In contrast, no significant associations were found between triage knowledge and age, gender, marital status, previous triage experience, seminar or conference attendance, or first aid certification. These findings suggest that structured triage education within undergraduate nursing programs may contribute to improving students' preparedness for emergency and disaster situations. Strengthening theoretical instruction and practical learning opportunities may help enhance future nurses' triage knowledge and clinical decision-making competencies. Future multicenter and longitudinal studies are recommended to validate and expand upon these findings.

Ethics Committee Approval: The study was approved by the Istanbul Medipol University Ethics Committee for Non-Interventional Clinical Research Ethics Committee (Approval Number: 61, Date: 09.01.2025).

Informed Consent: Written informed consent was obtained from all participants before data collection

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

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The Hidden Patients of Oncology: Unmet Supportive Care Needs and Caregiving Burden Among Family Caregivers of Adults Receiving Chemotherapy

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Abstract

Background: Informal caregivers of adults receiving chemotherapy manage complex outpatient care responsibilities and experience unmet supportive care needs, caregiving burden, and psychological distress. As oncology care increasingly shifts toward ambulatory settings, understanding the multidimensional needs of this "hidden patient" population is essential for developing targeted nursing interventions.

Aim: This study aimed to identify unmet supportive care needs, caregiving burden, anxiety, and depression among informal caregivers and examine associations among these domains.

Methods: This descriptive, cross-sectional study included 120 family caregivers of adults receiving outpatient chemotherapy at a state university hospital in Türkiye between October 2018 and May 2019. Data were collected using researcher-developed caregiver and patient identification forms and three validated instruments: the Caregiver Supportive Care Needs Survey (CSCNS), Zarit Caregiving Burden Scale (ZCBS), and Hospital Anxiety and Depression Scale (HADS). Data were analyzed using descriptive statistics, independent-samples t-tests, analysis of variance (ANOVA), Mann–Whitney U tests, Kruskal–Wallis tests, and Pearson's or Spearman's correlations analyses.

Results: Caregivers (mean age: 48.4 years; 73.3% female; 47.5% spouses of patients) reported the highest levels of unmet supportive care needs in the Work/Social (mean=2.9) and Psychological/Emotional (mean=2.6) domains. The mean ZCBS score was 36.5, indicating mild-to-moderate caregiving burden, while mean HADS anxiety and depression scores fell within the borderline range. Caregiving burden was significantly higher among female caregivers and those who had provided care for 7–11 months. Unmet supportive care needs were positively correlated with caregiving burden (r=0.487), anxiety (r=0.508), and depression (r=0.465).

Conclusion: Informal caregivers of adults receiving outpatient chemotherapy experience unmet supportive care needs, mild-to-moderate caregiving burden, and elevated anxiety and depression symptoms. Nurse-led education on chemotherapy-related toxicities, structured communication, care navigation support, and brief psychoeducation interventions may help reduce caregiving burden and improve caregiver well-being in routine oncology practice.

Keywords: Anxiety, caregiver burden, caregivers, neoplasms, nursing, unmet needs

Introduction

Cancer remains a leading cause of morbidity and mortality worldwide, with approximately 19.3 million new cases reported in 2020 and incidence projected to increase as populations age.[1] In Türkiye, the Ministry of Health has identified cancer as a national public health priority, reporting more than 240,000 new diagnoses annually.[2] Concurrently, oncology care has increasingly shifted toward outpatient and ambulatory settings, transferring greater responsibility for day-to-day treatment management to family members and close friends.

These changes in healthcare delivery have substantial practical implications. Informal caregivers, most commonly spouses, adult children, or other family members, increasingly coordinate complex appointment schedules, manage treatment-related symptoms at home, and provide ongoing emotional and practical support, often without formal training or consistent institutional resources.[3,4] In Türkiye, strong cultural expectations regarding family responsibility mean that informal caregiving is common throughout the cancer care trajectory.2 Validated instruments developed for this population, including the Supportive Care Needs Survey for Partners and Caregivers (SCNS-P&C) and its Turkish adaptation, the Caregiver Supportive Care Needs Survey (CSCNS), enable systematic assessment of caregivers' needs.[5,6]

Informal caregiving is multidimensional and may disrupt employment and social participation, strain family relationships, and contribute to substantial perceived burden.[7,8] Cancer is frequently described as a "family disease" because caregivers actively participate in treatment decision-making, symptom monitoring, and assistance with activities of daily living.[9] As caregiving demands increase, caregivers commonly report anxiety, depression, and deterioration in physical and mental health, leading to their characterization as the "hidden patients" of oncology.[10,11]

Chemotherapy introduces additional stressors that may increase caregiver burden through cumulative emotional strain, physical fatigue, financial difficulties, and social isolation. Studies conducted in Turkish oncology settings have documented mild-to-moderate caregiving burden alongside adverse effects on health-related quality of

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life.[7,12] Kahrıman and Zaybak found that higher perceived social support was associated with lower caregiving burden, highlighting the potential importance of supportive resources in addressing caregiver distress.[13] These observations are consistent with role-strain and stress-coping frameworks, which associate time-intensive and technically demanding caregiving responsibilities with psychological distress.[11,14]

A central concept in this literature is unmet supportive care needs, broadly defined as the gap between the support required to address a specific problem and the support actually received.[11] Across different cancer care settings, caregivers consistently report unmet needs related to healthcare information, psychological and emotional support, and work and social life. In contrast, relatively fewer unmet needs have been reported in the Communication/Family domain when assessed using the SCNS-P&C or CSCNS.[5,6,15,16] Evidence from studies involving caregivers of patients with pancreatic cancer indicates that symptom management is a prominent source of burden. Caregivers also report a need for clearer clinical communication, structured information, and care navigation assistance, alongside elevated levels of anxiety and depression.[17]

Previous research suggests that greater unmet supportive care needs are associated with higher caregiving burden and more severe anxiety and depressive symptoms, although the direction of these relationships remains unclear.[11,15,16] Given the limited evidence from resource-constrained settings and the challenges faced by Turkish families managing chemotherapy-related symptoms at home with limited professional support, assessing caregivers' domain-specific unmet needs and their associations with burden and psychological distress is important.[18–21]

Therefore, this descriptive, cross-sectional study aimed to (a) characterize domain-specific unmet supportive care needs among family caregivers of adults receiving outpatient chemotherapy using the validated Turkish CSCNS; (b) assess caregiving burden using the Zarit Caregiving Burden Scale (ZCBS) and anxiety and depression using the Hospital Anxiety and Depression Scale (HADS); and (c) examine associations among unmet supportive care needs, caregiving burden, anxiety, and depression. Based on previous evidence, we hypothesized that greater unmet needs, particularly in the Health-Care/Information and Psychological/Emotional domains, would be positively associated with greater caregiving burden and higher anxiety and depression scores.[5,6,11,15–17]

Research Questions

1. What are the domain-specific unmet supportive care needs of informal caregivers of adults receiving outpatient chemotherapy?
2. What are the levels of caregiving burden and psychological distress (anxiety and depression) among these caregivers?
3. Are unmet supportive care needs, caregiving burden, and psychological distress significantly associated, and do sociodemographic or caregiving characteristics moderate these associations?

Materials and Methods

Study Design

This study used a descriptive, cross-sectional design. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.

Setting and Sample

The study was conducted in the outpatient chemotherapy unit of a state university hospital in Türkiye between October 2018 and May 2019. Participants were informal family caregivers of adult outpatients actively receiving chemotherapy. An *a priori* power analysis conducted using G*Power version 3.1 indicated that a sample size of 120 participants was required to achieve 90% statistical power at a significance level of α=0.05 for medium effect sizes (Cohen's d=0.5 for group comparisons and r=0.25 for correlation analyses). The inclusion criteria were being the primary unpaid family caregiver of an adult receiving outpatient chemotherapy, being aged 18 years or older, being literate, being able to communicate verbally, and providing written informed consent. Paid or professional caregivers were excluded.

Data Collection Tools

Introductory Identification Forms: Researcher-developed caregiver (18 items) and patient (14 items) identification forms were used to collect sociodemographic and clinical information. The content of the forms was based on previous literature and refined through expert review.[5,6,22]

Caregiver Supportive Care Needs Survey (CSCNS): The CSCNS is the validated Turkish adaptation of the SCNS-P&C, originally developed by Girgis et al.[5] The instrument consists of four subscales: (1) Psychological/Emotional, (2) Health-Care/Information, (3) Work/Social, and (4) Communication/Family. Items are rated on a 6-point Likert-type scale from 0 ("no help needed") to 5 ("high level of help needed"), with higher scores indicating greater unmet supportive care needs. The Turkish psychometric validation conducted by Ergen and Arıkan6 demonstrated excellent reliability and construct validity. In the present study, Cronbach's alpha coefficient was 0.87.

Zarit Caregiving Burden Scale (ZCBS): Originally developed by Zarit, Reever, and Bach-Peterson,[23] the ZCBS is one of the most widely used instruments for assessing subjective caregiving burden. It consists of 22 items rated on a 5-point Likert-type scale ranging from 0 ("never") to 4 ("nearly always"), yielding a total score between 0 and 88. Established severity categories are 0–20 for no or little burden, 21–40 for mild-to-moderate burden, 41–60 for moderate-to-severe burden, and 61–88 for severe burden.[24,25] The reliability and validity of the Turkish version were established by İnci and Erdem.[26] In the present study, Cronbach's alpha coefficient was 0.89. The ZCBS assesses caregivers' perceived burden associated with caregiving responsibilities, making it a suitable instrument for evaluating caregiving burden among family caregivers in outpatient oncology settings.

Hospital Anxiety and Depression Scale (HADS): Developed by Zigmond and Snaith,[27] the HADS is a 14-item self-report instrument designed to screen for anxiety and depression in nonpsychiatric medical populations. It consists of two seven-item subscales: HADS-Anxiety (HADS-A) and HADS-Depression (HADS-D). Each subscale has a possible score range of 0–21. Scores are commonly categorized as normal (0–7), borderline (8–10), or abnormal (11–21). The Turkish version was validated by Aydemir et al.[28] In the present study, Cronbach's alpha coefficients were 0.86 for HADS-A and 0.87 for HADS-D.

Data Collection

Data were collected by the primary researcher through face-to-face interviews in the outpatient chemotherapy unit. Before data collection, caregivers were informed about the study's aims, procedures, and voluntary nature. Their questions were answered, and written informed consent was obtained from each participant. Caregivers were assured that their responses would remain confidential, would be used solely for research purposes, and that they could withdraw from the study at any time. The study was also explained verbally to the patients receiving care. Because some questionnaire items addressed sensitive topics, including caregiving burden, psychological distress, and unmet supportive care needs, caregivers might have been reluctant to respond openly in the presence of patients. Therefore, interviews were conducted individually in a quiet, private area of the unit, separate from the patient's treatment room and without the patient present. The researcher administered each questionnaire item verbally and recorded participants' responses during the interview. Information regarding patients' clinical characteristics was obtained from caregivers' verbal reports and patients' medical records. Completing the questionnaires took approximately 40–45 minutes per caregiver, including the study information and informed consent procedures.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics, version 22.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as means±standard deviations, while categorical variables were expressed as frequencies and percentages. The Kolmogorov–Smirnov test was used to assess normality. Independent-samples t-tests or one-way analysis of variance (ANOVA) were used for group comparisons when parametric assumptions were met. Otherwise, Mann–Whitney U or Kruskal–Wallis tests were applied. Pearson's and Spearman's correlation analyses were used to examine associations among unmet supportive care needs, caregiving burden, anxiety, and depression. All tests were two-tailed, and a significance level of α=0.05 was adopted. Exact p values were reported where applicable (e.g., p=0.002), with values below 0.001 expressed as p<0.001.

Ethical Considerations

Ethical approval was obtained from Hacettepe University Non-Interventional Clinical Research Ethics Committee (Approval Number: GO 18/566, Date: 12.06.2018). Written informed consent was obtained from all participants. The study was con-

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Table 1. Sociodemographic and caregiving characteristics of family caregivers (n=120)

Characteristic	n	%
Caregiver characteristics		
Age range, years (mean±SD)	48.4±12.6 (19–74)	
Sex		
Female	88	73.3
Male	32	26.7
Relationship to the patient		
Spouse	57	47.5
Adult child	42	35.0
Other relative	21	17.5
Educational attainment		
Primary school	53	44.2
Secondary school	20	16.7
University or higher	44	36.7
Caregiving characteristics		
No previous caregiving experience	92	76.7
Caregiving duration of 0–6 months	60	50.0
Daily caregiving duration of 7–12 hours	61	50.8
Reported difficulty managing chemotherapy-related hematologic toxicities at home	113	94.2

SD: Standard deviation.

Table 2. Sociodemographic and clinical characteristics of patients receiving chemotherapy (n=120)

Characteristic	n	%
Sociodemographic characteristics		
Age, years (mean±SD)	57.1±11.83	
Sex		
Male	67	55.8
Female	53	44.2
Disease stage		
Stage IV	50	41.7
Primary cancer site		
Gastrointestinal	68	56.7
Lung	27	22.5
Chemotherapy-related complications		
Hematologic side effects	117	97.5

Table 3. Mean scores on the Caregiver Supportive Care Needs Survey (CSCNS) and its subscales (n=120)

Subscale	Mean±SD	Min	Max
CSCNS total	2.5±0.39	1.9	3.4
Psychological/emotional	2.6±0.35	1.6	3.7
Health-care/information	2.1±0.64	1.0	3.6
Work/social	2.9±0.43	2.0	4.0
Communication/family	1.7±0.67	1.0	3.5

Each item is scored on a scale ranging from 0 to 5.

Table 4. Mean scores on the Zarit Caregiving Burden Scale (ZCBS) and Hospital Anxiety and Depression Scale (HADS) among family caregivers (n=120)

Scale	Mean±SD	Median	Min	Max	Interpretation
ZCBS (0–88)	36.5±14.0	36	6	65	Mild-to-moderate
HADS-Anxiety (0–21)	9.5±3.45	9	1	17	Borderline
HADS-Depression (0–21)	9.8±4.05	10	0	19	Borderline–abnormal

ducted in accordance with the ethical principles of the Declaration of Helsinki, the research ethics and publication policies of the Journal of Education and Research in Nursing (JERN), and the recommendations of the International Committee of Medical Journal Editors (ICMJE).

Results

Among the 120 caregivers, 73.3% were female, and the mean age was 48.4±12.60 years. Nearly half were spouses of the patients (47.5%), 35.0% were adult children, 44.2% had completed primary school, and 76.7% had no previous caregiving experience. Half of the caregivers (50.0%, n=60) had been providing care for 0–6 months, and 27.5% (n=33) had been providing care for 7–11 months and 50.8% provided 7–12 hours/day. Most caregivers (94.2%) reported difficulties managing chemotherapy-related hematologic toxicities at home (Table 1).

The patients had a mean age of 57.1±11.83 years, and 55.8% were male. Stage IV disease was present in 41.7% of patients, and gastrointestinal cancers were the most common cancer type (56.7%). Hematologic side effects were reported in 97.5% of patients (Table 2).

The mean CSCNS total score was 2.5±0.39. Domain-specific mean scores are presented in Table 3. The Work/Social domain had the highest mean score (2.9±0.43), followed by Psychological/Emotional (2.6±0.35), Health-Care/Information (2.1±0.64), and Communication/Family (1.7±0.67). Caregivers providing care for 13–18 hours per day reported higher Work/Social unmet needs than those providing care for 7–12 hours per day ($p<0.05$). Caregivers caring for their parents reported higher Communication/Family unmet needs than those caring for their spouses. Caregivers of patients experiencing chemotherapy-related psychological complications reported higher scores on all CSCNS subscales except Communication/Family (all $p<0.05$). University-educated caregivers reported higher Health-Care/Information unmet needs than caregivers with lower educational attainment ($p=0.03$).

The mean ZCBS score was 36.5±14.0 (median: 36; range: 6–65), indicating mild-to-moderate caregiving burden (Table 4). Female caregivers reported significantly higher burden than male caregivers ($p=0.02$). Caregivers who had provided care for 7–11 months reported significantly higher burden than those who had provided care for 0–6 months ($p=0.013$). Caregivers of patients experiencing chemotherapy-related psychological complications also reported higher burden ($p=0.018$).

The mean HADS-A score was 9.5±3.45 (median: 9; range: 1–17), and the mean HADS-D score was 9.8±4.05 (median: 10; range: 0–19), both falling within the borderline range (Table 4). Caregivers with primary school education reported significantly higher anxiety and depression scores than university graduates ($p=0.03$). Caregivers of patients experiencing psychological complications also had higher scores on both HADS subscales ($p<0.05$).

Moderate-to-strong positive correlations were observed among the study measures (Table 5). The CSCNS total score was significantly positively correlated with ZCBS scores ($r=0.487$, $p<0.01$), HADS-A scores ($r=0.508$, $p<0.01$), and HADS-D scores ($r=0.465$, $p<0.01$). ZCBS scores were also strongly positively correlated with HADS-A scores ($r=0.683$, $p<0.01$) and HADS-D scores ($r=0.681$, $p<0.01$).

Discussion

The findings of this study indicate that family caregivers of adults receiving outpatient chemotherapy experience substantial psychological and practical demands and that greater unmet supportive care needs are associated with higher caregiving burden and psychological distress.

Table 5. Correlations between the Caregiver Supportive Care Needs Survey (CSCNS) total and subscale scores, Zarit Caregiving Burden Scale (ZCBS) scores, and Hospital Anxiety and Depression Scale (HADS) subscale scores (n=120)

Scales	CSCNS psychological/emotional	CSCNS health-care/information	CSCNS work/social	CSCNS communication/family	CSCNS total
Zarit Caregiving Burden Scale	0.410*	0.323*	0.292*	0.499*	0.487*
HADS-Anxiety	0.387*	0.427*	0.226*	0.391*	0.508*
HADS-Depression	0.272*	0.409*	0.196*	0.463*	0.465*

*: p<0.01.

The highest levels of unmet supportive care needs in our cohort were observed in the Work/Social and Psychological/Emotional domains. This pattern is consistent with international evidence. Chen et al.,[15] in a Taiwanese study involving caregivers of patients with advanced lung cancer, similarly identified Work/Social and Psychological/Emotional needs as prominent areas of unmet support. Lee and Cha[16] reported that Korean hospice caregivers prioritized informational and emotional needs over communication and family-related needs. The prominence of Work/Social unmet needs, particularly among caregivers providing care for 13–18 hours per day, highlights the practical impact of outpatient chemotherapy on employment and social roles, consistent with role-strain theory.[14]

The elevated Psychological/Emotional unmet needs are consistent with systematic review evidence identifying emotional support as an important and frequently unmet need among oncology caregivers.[10,11,17] The relatively low level of unmet needs in the Communication/Family domain is also consistent with findings from SCNS-P&C studies conducted in other settings, where caregivers may perceive family relationships as a source of support rather than an area of unmet need.[5,6] An important finding was that caregivers of patients experiencing chemotherapy-related psychological complications reported significantly higher unmet needs across most domains. This association suggests that patients' psychological difficulties may be accompanied by greater supportive care needs among their caregivers, consistent with dyadic models of illness adaptation.[10,17]

The high prevalence of chemotherapy-related hematologic toxicities among patients highlights the need for targeted symptom management education and readily accessible nurse-led triage services. Educational differences were also observed. University graduates reported greater Health-Care/Information unmet needs, which may reflect differences in health literacy or expectations regarding healthcare services.[26] In contrast, caregivers with primary school education had higher anxiety and depression scores, consistent with literature suggesting that lower educational attainment may be associated with increased psychological distress and caregiving burden.[2,3,22,23,28]

The mean ZCBS score indicated mild-to-moderate caregiving burden, comparable to findings from previous Turkish oncology studies. Orak and Sezgin[8] reported similar ZCBS scores among family caregivers of hospitalized patients with cancer. Çeler et al.[7] also observed mild-to-moderate burden among relatives of patients with breast cancer in a Turkish tertiary care setting. Internationally, comparable levels of burden have been reported among caregivers of patients with lung cancer in Taiwan[15] and caregivers involved in palliative care in South Korea.[16] Although the overall mean indicated mild-to-moderate burden, the observed score range of 6–65 suggests that some caregivers experienced moderate-to-severe burden.

Female caregivers reported significantly higher caregiving burden than male caregivers, consistent with previous studies suggesting that gender differences in caregiving burden may be related to sociocultural expectations, unpaid domestic responsibilities, and limited access to support.[10,19,20] Caregivers who had provided care for 7–11 months also reported significantly higher burden than those who had provided care for 0–6 months (p=0.013). This finding is consistent with cumulative stress models suggesting that caregiving burden may increase with prolonged exposure to treatment-related demands.[10,14]

The mean HADS-Anxiety (9.5) and HADS-Depression (9.8) scores fell within the borderline-to-abnormal range based on the Turkish cutoff values (anxiety ≥10; depression ≥8). These findings are consistent with a meta-analytic review reporting clinically significant anxiety and depression among approximately 30%–40% of caregivers of patients with cancer.[10] Caregivers with primary school education reported significantly higher anxiety and depression scores than university graduates. This finding is consistent with previous research suggesting that lower educational attainment, potentially accompanied by limited health literacy and reduced access to psychosocial resources, may be associated with greater psychological vulnerability.[18,21]

The associations identified among unmet supportive care needs, caregiving burden, and psychological distress are consistent with previous research highlighting the relationship between caregivers' unmet needs and psychological well-being. Sklenarova et al.[11] reported significant associations between unmet supportive care needs and mood symptoms among informal caregivers of patients with cancer. Similarly, Park et al.[29] examined the relationship between caregivers' unmet supportive care needs and the quality of cancer care delivered. Taken together, these findings suggest that caregivers' supportive care needs may be worth considering alongside caregiving burden and psychological distress in oncology settings.

Although the cross-sectional design precludes causal inference, the observed associations suggest a potential relationship in which greater unmet supportive care needs are linked to increased perceived caregiving burden and, subsequently, greater psychological distress. Sociodemographic and caregiving characteristics, including educational attainment, gender, and caregiving duration, may also influence these relationships. Longitudinal studies incorporating mediation and moderation analyses are needed to investigate these relationships further. Future research should include prespecified hypotheses, report effect sizes with confidence intervals, consider false discovery rate corrections for multiple comparisons, and collect paired patient–caregiver data.

Strengths and Limitations

This study has several strengths, including the use of validated Turkish-language instruments (CSCNS, ZCBS, and HADS), an *a priori* sample size calculation, and a domain-specific assessment of unmet supportive care needs with practical implications for oncology nursing. Limitations include the single-center, cross-sectional design, which limits generalizability and precludes causal inference; reliance on self-reported measures, which may introduce social desirability bias; multiple comparisons without correction for the false discovery rate; and the absence of reported effect sizes and confidence intervals. Future multicenter, longitudinal studies incorporating paired patient–caregiver data are needed to further investigate these associations.

Conclusion

This study highlights the unmet supportive care needs of family caregivers of adults receiving outpatient chemotherapy, particularly in the Work/Social and Psychological/Emotional domains, alongside mild-to-moderate caregiving burden and borderline levels of anxiety and depression. Greater unmet needs were associated with higher caregiving burden and psychological distress. These findings underscore the importance of recognizing family caregivers as "hidden patients" within comprehensive oncology care and acknowledging their supportive care needs as an integral component of family-centered care. Attending to caregivers' supportive care needs and psychological well-being in oncology nursing practice may facilitate the early recognition of those who could benefit from additional support. Future longitudinal studies are warranted to explore how caregivers' needs, caregiving burden, and psychological well-being change throughout the cancer treatment trajectory. Furthermore, interventional studies are needed to evaluate the effectiveness of targeted, nurse-led support strategies in addressing caregivers' supportive care needs and improving their well-being.

Ethics Committee Approval: The study was approved by the Hacettepe University Non-Interventional Clinical Research Ethics Committee (Approval Number: GO 18/566, Date: 12.06.2018).

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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Intrahospital Transport of Critically Ill Patients: Surgical Nurses' Perspectives on Patient Safety and Associated Risk Factors

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Abstract

Background: Intrahospital transport of critically ill patients is a complex, high-risk process during which adverse events may occur, potentially compromising patient safety.

Aim: This study examined the relationship between problems encountered during the intrahospital transport of critically ill patients and nurses' perceptions of transport safety.

Methods: This descriptive, cross-sectional study included 157 nurses working in surgical clinics and intensive care units. Data were collected using a sociodemographic form, a checklist of transport-related problems, and the Intrahospital Transport Safety Scale (IHTSS). Statistical analyses were performed using nonparametric tests and Spearman's rank correlation analysis.

Results: Equipment- and procedure-related problems were frequently reported during intrahospital transport. A significant negative correlation was identified between the total number of reported problems and perceived transport safety (ρ=-0.253, p=0.001). The strongest correlation was observed between equipment-related problems and perceived transport safety (ρ=-0.387, p<0.001). Physiological changes were not significantly associated with perceived transport safety. Nurses who had received transport-related training and those working in units with dedicated transport teams reported significantly higher perceived transport safety scores (p<0.05).

Conclusion: The findings indicate that problems encountered during the intrahospital transport process may compromise patient safety and are associated with healthcare professionals' perceptions of safety. Preventable technical and organizational problems appear to be more strongly associated with perceived transport safety than physiological changes. These findings highlight the importance of patients' clinical conditions, organizational factors, and process management in ensuring the safe intrahospital transport of critically ill patients.

Keywords: Critically ill patients, intrahospital transport, patient safety, perioperative nursing, safety perception

Introduction

The postoperative period is a critical phase characterized by significant physiological, hemodynamic, and psychological changes. These changes are influenced not only by the progression of the underlying disease but also by factors such as anesthetic techniques, fluid administration, blood transfusions, and the use of implants or prostheses. Furthermore, the physiological stress associated with surgical interventions can result in substantial hemodynamic and metabolic disturbances.[1,2] Rapid fluctuations in hemodynamic parameters during this period require vigilant clinical monitoring. In hemodynamically unstable patients, even minor physiological disturbances may lead to rapid clinical deterioration. Early recognition of physiological instability and timely intervention are therefore essential to preventing further deterioration and optimizing patient outcomes.[2,3] Critically ill patients should be monitored in units equipped to provide both basic and advanced life support, with transfer to specialized clinical areas when necessary.[1]

Intrahospital transport of critically ill patients is commonly undertaken for diagnostic procedures, therapeutic interventions, or transfer to intensive care units (ICU). Transport for diagnostic procedures, particularly radiological imaging, plays an important role in clinical decision-making and patient management.[4-6] However, intrahospital transport involves more than logistical considerations, as it introduces risks that may compromise physiological stability and patient safety. These risks include physiological instability, equipment-related problems, and communication failures.[7] Consequently, intrahospital transport is considered an essential component of critical care that requires careful planning, coordination, and management.[6,8]

Adverse events during intrahospital transport have been reported at rates ranging from 6% to 86%.[3,8] These events include serious complications such as hemodynamic instability, ventilation problems, accidental extubation, and cardiopulmonary arrest.[3,5] The use of multiple medical devices during transport, including monitors, ventilators, suction devices, and intravenous infusion systems, may further increase the risk of complications.6 Additionally, several studies have reported associations between more frequent intrahospital transport and increased rates of delirium, prolonged hospital stays, and higher mortality.[3,8,9]

Transfer to an intensive care unit (ICU) is intended to facilitate specialized clinical care and improve clinical outcomes in critically ill patients. Maintaining adequate monitoring and ensuring patient safety throughout the

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transport process are therefore essential.[3,10] Nevertheless, complications such as monitoring device battery failure, oxygen supply malfunctions, unplanned intubation, and intravenous line dislodgement may occur during transport.[1,8]

Although numerous studies have investigated adverse events and safety concerns during the intrahospital transport of critically ill patients, most have focused on the incidence of adverse events, associated risk factors, and recommendations for safe transport practices.[6-8,11] Relatively few studies have examined this process from the perspective of surgical nurses, particularly their clinical experiences and the challenges they encounter in maintaining patient safety.[12,13] Furthermore, Soyer Er and Okgün Alcan[14] highlighted the limited availability of validated instruments for assessing patient safety during intrahospital transport and adapted the Intrahospital Transport Safety Scale into Turkish.[14] However, evidence remains limited regarding the relationship between transport-related problems encountered by surgical nurses and their perceptions of transport safety. Addressing this gap may contribute to improving transport practices and strengthening patient safety. Therefore, this study aimed to identify the problems encountered by surgical nurses during the intrahospital transport of critically ill patients, determine factors associated with perceived transport safety, and examine the relationship between transport-related problems and nurses' perceptions of transport safety.

Research Questions

1. What problems do surgical nurses encounter during the intrahospital transport of critically ill patients?
2. Which factors are associated with surgical nurses' perceptions of transport safety?
3. Is there a relationship between transport-related problems and nurses' perceptions of transport safety?

Materials and Methods

Study Design

This study employed a descriptive, cross-sectional, analytical design to identify the challenges encountered by nurses working in surgical clinics and ICU during the intrahospital transport of critically ill patients, assess their perceptions of transport safety, and examine the relationships among these variables.

Population and Sample

The study population consisted of nurses employed in the surgical clinics and ICU of a tertiary university hospital in western Türkiye. The hospital is one of the largest referral centers in the region, encompasses all major surgical specialties, and provides care for patients with complex and high-risk conditions. Although several tertiary hospitals are located in İzmir, this hospital was selected because of its high patient volume, broad range of surgical services, and extensive critical care activities.

Due to staff rotations and ongoing organizational changes during the data collection period, the exact number of eligible nurses could not be determined. According to information provided by the nursing administration, the target population was estimated to comprise approximately 250–300 nurses. Therefore, an a priori sample size calculation was not performed.

Convenience sampling based on voluntary participation was used, supplemented by snowball sampling to facilitate participant recruitment. All nurses who met the inclusion criteria and agreed to participate during the data collection period were included in the study. A total of 157 nurses participated, representing approximately half of the estimated target population.

Sample adequacy was assessed using a post hoc power analysis based on the final sample of 157 participants (α=0.05). Statistical power ranged from 0.80 to 0.97 for two-tailed correlation analyses (r=0.20–0.30) and from 0.82 to 0.88 for two-group comparisons with a medium effect size (d=0.50). These estimates indicated adequate statistical power for the specified correlation effects and medium-sized effects in two-group comparisons. However, power was limited for detecting small effects in multi-group comparisons (f=0.10; power=0.22).

Data Collection Instruments

Data were collected using a structured questionnaire comprising a researcher-developed Personal Information and Transport Experience Form and the Intrahospital Transport Safety Scale (IHTSS). The questionnaire included demographic and transport-related variables, items assessing transport-related problems with yes/no responses, and the 24-item IHTSS, which uses a five-point Likert response format.

Personal Information and Transport Experience Form

The Personal Information and Transport Experience Form was developed by the researchers based on relevant guidelines and existing literature.[11,13,14] The preliminary version comprised 43 items and was reviewed for content validity by four academic experts specializing in anesthesia, obstetrics and gynecology nursing, fundamentals of nursing, and surgical nursing. All experts had experience related to the transport of critically ill patients. The form was revised based on their recommendations. The form included questions concerning participants' demographic and professional characteristics, including age, gender, professional experience, and working unit (four items). It also included 12 items addressing equipment-related problems, procedure-related problems, physiological changes observed during transport, organizational characteristics of the transport process, and transport team characteristics. Most questions used yes/no or multiple-choice response formats. For statistical analysis, transport-related problems were classified into three conceptual categories: equipment-related problems, procedure-related problems, and physiological changes. The total number of reported problems was calculated separately for each category.

Intrahospital Transport Safety Scale (IHTSS)

The Intrahospital Transport Safety Scale, originally developed by Bergman et al.[15] and subsequently adapted into Turkish by Soyer Er and Okgün Alcan, was used to assess nurses' perceptions of transport safety.[14] The original scale demonstrated good internal consistency, with a Cronbach's alpha coefficient of 0.88 and subscale coefficients ranging from 0.72 to 0.82. The Turkish version comprises 24 items distributed across four subdimensions: Organization, Equipment and Technologies, Environment, and Team Collaboration. Each item is rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The total score is calculated by summing the scores of all items. No cutoff value has been established, and higher total scores indicate higher perceived patient safety during intrahospital transport. In the present study, the overall Cronbach's alpha coefficient was 0.95. Written permission to use the Turkish version of the scale was obtained from the authors responsible for its adaptation.

Data Collection

Data were collected between September 22, 2025, and February 16, 2026, using an online questionnaire administered through Google Forms. The first page presented an electronic informed consent form, and only participants who provided consent could proceed to the questionnaire. Completion required approximately 10–15 minutes. Participation was voluntary, and participants could withdraw at any time before submitting their responses.

The questionnaire was distributed using convenience and snowball sampling methods. Because of this recruitment approach, the exact number of nurses who received or viewed the survey link could not be determined. A total of 157 completed questionnaires were included in the final analysis. Only fully completed questionnaires were analyzed; therefore, the final dataset contained no missing values.

Statistical Analysis

Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize the data. Problems encountered during intrahospital transport were coded as 1 for "yes" responses and 0 for "no" responses. The number of reported problems was calculated separately for each category. Total and subdimension scores for the Intrahospital Transport Safety Scale were calculated, with higher scores indicating greater perceived transport safety. Internal consistency was assessed using Cronbach's alpha coefficient. The normality of the data distributions was evaluated using the Kolmogorov–Smirnov and Shapiro–Wilk tests. Because the data did not meet the assumption of normality, nonparametric statistical tests were applied. The Mann–Whitney U test was used to compare two independent groups, whereas the Kruskal–Wallis H test was used for comparisons involving three or more groups. Bonferroni-adjusted post hoc analyses were performed when statistically significant differences were identified. Relationships between variables were examined using Spearman's rank correlation coefficient. A post hoc power analysis was conducted to assess the adequacy of the final sample, which demonstrated sufficient statistical power

Table 1. Demographic and professional characteristics of participants (n=157)

Characteristics	n	%
Sex		
Female	128	81.5
Male	29	18.5
Professional experience		
0–5 years	76	48.4
6–10 years	21	13.4
11–15 years	15	9.6
16–20 years	21	13.4
≥21 years	24	15.3
Training in intrahospital transport		
Yes	53	33.8
No	104	66.2
Availability of a dedicated transport team		
Yes	42	26.8
No	115	73.2

Table 2. Descriptive statistics of the Intrahospital Transport Safety Scale (IHTSS) subscale and total scores (n=157)

IHTSS subscale	Mean	SD	Median	Min	Max	α
Organization (7–35)	20.55	5.70	21.0	7	35	0.869
Equipment and Technologies (4–20)	13.57	3.54	14.0	4	20	0.855
Environment (4–20)	11.88	3.78	12.0	4	20	0.850
Team Collaboration (9–45)	31.64	8.21	32.0	9	45	0.946
Total IHTSS score (24–120)	77.64	18.32	78.0	24	120	0.954

SD: Standard deviation, Min: Minimum, Max: Maximum, α: Cronbach's alpha coefficient. Scores were calculated by summing the corresponding item responses.

Table 3. Descriptive statistics of problems reported during intrahospital transport (n=157)

Problem category	Number of items	Possible range	M	SD	Mdn	Min	Max
Equipment-related problems	6	0–6	3.57	1.88	4.0	0	6
Procedure-related problems	10	0–10	4.57	2.87	4.0	0	10
Physiological changes	14	0–14	8.02	4.09	8.0	0	14
Total transport-related problems	30	0–30	16.16	6.99	16.0	0	30

M: Mean, SD: Standard deviation, Mdn: Median, Min: Minimum, Max: Maximum. Each problem was coded as 1 (reported) or 0 (not reported). Category-specific and total problem counts were calculated by summing the corresponding items.

for the planned analyses. All statistical analyses were conducted using R statistical software (R Foundation for Statistical Computing, Vienna, Austria). A p value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from Ege University Medical Research Ethics Committee (Approval Number: 25-9T/51, Date: 04.09.2025). Institutional permission was obtained from the study hospital before data collection. Written permission to use the Turkish version of the Intrahospital Transport Safety Scale was obtained from the authors responsible for its adaptation. Electronic informed consent was obtained from all participants before they accessed the online questionnaire. Participation was voluntary, responses were collected anonymously, and participants could withdraw at any time before submitting the questionnaire. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Table 4. Frequency of problems reported during intrahospital transport (n=157)

Transport-related problems	n	%
Equipment-related problems		
Excessive stretcher weight	102	65.0
Difficulty maneuvering stretchers	124	79.0
Rapid battery depletion	55	35.0
Monitoring equipment connection problems	103	65.6
Oxygen cylinder-related problems	95	60.5
Transport ventilator-related problems	82	52.2
Procedure-related problems		
Intravenous line dislodgement or malfunction	131	83.4
Intravenous infusion flow problems	122	77.7
Nasogastric tube-related problems	85	54.1
Airway device dislodgement	62	39.5
Urinary catheter-related problems	62	39.5
Abdominal drain-related problems	60	38.2
Chest tube-related problems	55	35.0
Orthopedic splint-related problems	50	31.8
Endotracheal tube dislodgement	45	28.7
Central venous or dialysis catheter-related problems	45	28.7
Physiological changes		
Changes in heart rate	123	78.3
Changes in blood pressure	119	75.8
Changes in respiratory status	115	73.2
Changes in oxygen saturation	109	69.4
Feeling faint or lightheaded	106	67.5
Nausea or vomiting	103	65.6
Changes in cardiac rhythm	96	61.1
Palpitations	91	58.0
Changes in level of consciousness	87	55.4
Airway obstruction	86	54.8
Increased external bleeding	66	42.0
Cardiac arrest during transport	59	37.6
Hypothermia	56	35.7
Hyperthermia	43	27.4

Results

Most participants were female (81.5%) and the mean age was 32.06±10.07 years. Nearly half of the participants had 0–5 years of professional experience, and most had not received training in the transport of critically ill patients. Dedicated transport teams were unavailable in most participants' working units (Table 1).

The mean IHTSS total score was 77.64±18.32. Among the subdimensions, Team Collaboration had the highest mean score, whereas Organization had the lowest. The scale demonstrated excellent internal consistency (Cronbach's α=0.954) (Table 2).

Participants reported a mean of 16.16±6.99 transport-related problems. The most frequently reported problems included difficulty maneuvering stretchers, intravenous line dislodgement, and changes in heart rate during transport (Tables 3, 4).

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Table 5. Comparison of Intrahospital Transport Safety Scale (IHTSS) total scores according to participant and transport-related characteristics (n=157)

Characteristics		n	Mean±SD	Test	Statistic	p
Sex	Female	128	76.91±17.74	Mann–Whitney U	1590.5	0.231
	Male	29	80.86±20.70			
Training in intrahospital transport	Yes	53	83.77±19.67	Mann–Whitney U	3554.5	0.003**
	No	104	74.52±16.84			
Professional experience	0–5 years	76	79.47±17.52	Kruskal–Wallis H	2.977 (df=4)	0.562
	6–10 years	21	78.81±23.39			
	11–15 years	15	74.67±23.45			
	16–20 years	21	75.81±16.90			
	≥21 years	24	74.29±13.52			
Availability of a dedicated transport team	Yes	42	83.69±18.80	Mann–Whitney U	3056.5	0.011*
	No	115	75.43±17.71			
Personnel responsible for transport	Attending physician	9	89.33±9.62	Kruskal–Wallis H	14.579 (df=4)	0.006**
	Staff	61	79.10±17.98			
	Resident physician	63	78.33±19.92			
	Nurse	21	68.10±13.32			
	Student/intern	3	65.33±11.93			
Patient waiting time at the destination unit	<30 min	84	80.64±20.68	Kruskal–Wallis H	7.953 (df=2)	0.019*
	30–60 min	59	74.97±14.88			
	>60 min	14	70.93±12.95			
Distance between units	Very close	7	–	Kruskal–Wallis H	1.796 (df=4)	0.773
	Close	23	–			
	Moderate	71	–			
	Far	42	–			
	Very far	14	–			
Total transport duration	<30 min	60	–	Kruskal–Wallis H	3.466 (df=2)	0.177
	30–60 min	85	–			
	>60 min	12	–			

The Mann–Whitney U test was used for two-group comparisons, and the Kruskal–Wallis test was used for comparisons involving three or more groups. *: p<0.05, **: p<0.01. SD: Standard deviation, IHTSS: Intrahospital Transport Safety Scale.

Table 6. Correlations between transport-related problem counts and Intrahospital Transport Safety Scale (IHTSS) scores (n=157)

IHTSS subscales	Equipment-related problems	Procedure-related problems	Physiological changes	Total transport-related problems
IHTSQ total	-0.387***	-0.237**	-0.076	-0.253**
Organization	-0.394***	-0.214**	-0.090	-0.256**
Equipment and technologies	-0.358***	-0.202*	-0.123	-0.246**
Environment	-0.366***	-0.214**	-0.086	-0.251**
Team collaboration	-0.275***	-0.200*	0.013	-0.153

Values represent Spearman's rank correlation coefficients. *: p<0.05, **: p<0.01, ***: p<0.001. The correlation between Team Collaboration and total transport-related problems was not statistically significant (p=0.056). IHTSQ: Intrahospital Transport Safety Questionnaire.

Perceived transport safety scores were significantly higher among nurses who had received transport-related training and those working in units with dedicated transport teams. Significant differences in perceived transport safety were also observed according to the personnel responsible for transport and patient waiting time at the destination unit. However, no statistically significant differences were identified according to gender, professional experience, distance between units, or transport duration (Table 5).

A weak but statistically significant negative correlation was identified between the total number of reported transport-related problems and perceived transport safety. Equipment-related problems demonstrated the strongest negative correlation with perceived transport safety. Procedure-related problems were also negatively correlated with perceived transport safety, whereas physiological changes showed no statistically significant correlation. Age was negatively correlated only with the Organization and Environment subdimensions (Table 6).

Discussion

This study examined the challenges encountered during the intrahospital transport of critically ill patients and nurses' perceptions of transport safety. The findings in-

dicate that equipment- and procedure-related problems are frequently encountered and may pose risks to patient safety. Nurses' perceptions of transport safety were associated with transport-related training and organizational characteristics. Furthermore, a greater number of reported transport-related problems was associated with lower perceived transport safety.

The equipment-related problems identified in this study, particularly difficulties maneuvering stretchers, monitoring and oxygen system failures, and problems involving vascular access and infusion lines, suggest that intrahospital transport involves considerably more than the physical transfer of a patient. Rather, it is a complex clinical process requiring continuous risk assessment, careful preparation, and effective management. These findings are consistent with previous studies indicating that inadequate preparation, monitoring limitations, communication failures, and equipment malfunctions contribute to transport-related risks.[7] Serious events, such as loss of vascular access during vasoactive drug infusion, accidental extubation, or airway compromise, may lead to rapid clinical deterioration and potentially life-threatening complications.[5,6] Similarly, previous studies have reported associations between transport-related adverse events, hemodynamic and respiratory instability, and an increased need for emergency interventions.[8,12]

The frequent changes in heart rate, blood pressure, and respiratory status reported in this study further highlight the physiological vulnerability of critically ill patients during transport. Similar findings have been reported in previous studies, in which hemodynamic instability, hypoxia, arrhythmias, and ventilation-related complications were identified as major threats to patient safety during intrahospital transport.[3,16,17] Because critically ill patients often have limited physiological reserve, maintaining physiological stability through continuous monitoring, appropriate equipment, timely interventions, and competent clinical assessment by transport team members is essential for minimizing adverse events and promoting patient safety.[13,18,19] Collectively, these findings emphasize that transport-related problems should be evaluated not only in terms of their frequency but also in relation to their potential clinical consequences.

Nurses who had received transport-related training reported higher perceived transport safety scores, as did those working in units with dedicated transport teams. These findings highlight the importance of organizational support alongside individual clinical competence. Previous studies have suggested that structured transport systems, regular training, clearly defined team roles, and effective multidisciplinary communication can improve patient safety and reduce transport-related errors.[8,11,12,13,18–20] Consistent with this evidence, the present findings support the importance of standardized protocols, continuing education, and organized transport teams as components of safe intrahospital transport.

Perceived transport safety also differed according to the personnel responsible for transport, with higher scores reported when transport was undertaken by more experienced healthcare professionals. Similarly, longer waiting times at the destination unit were associated with lower perceived transport safety, suggesting that delays may reflect organizational challenges and contribute to concerns about transport-related risks. Previous studies and relevant guidelines have emphasized the importance of experienced transport personnel, effective communication, timely coordination between units, and clearly defined responsibilities in reducing adverse events and promoting patient safety.[6,7,14,16,20–23]

A further important finding was the significant negative correlation between the number of transport-related problems and perceived transport safety. Equipment-related problems demonstrated the strongest association with perceived transport safety, supporting previous evidence that deficiencies in technical infrastructure and equipment reliability may compromise patient safety and reduce healthcare professionals' confidence in the transport process.[6,12,13,20] In contrast, physiological changes were not correlated with perceived transport safety, suggesting that nurses may consider such changes as an expected aspect of caring for critically ill patients, whereas preventable technical and organizational problems may have a greater influence on their perceptions of transport safety. Overall, the findings suggest that nurses' perceptions of transport safety are shaped not only by patients' clinical conditions but also by the organizational, technical, and procedural factors involved in the transport process. Improving intrahospital transport safety may therefore require not only effective clinical management but also ongoing improvements in equipment reliability, organizational processes, and transport team performance.

Limitations

Several limitations should be acknowledged. First, the study was conducted at a single tertiary hospital, which may limit the generalizability of the findings to other healthcare settings. Second, reliance on self-reported data may have introduced response bias. Third, the cross-sectional design precludes causal inferences regarding the observed associations. Finally, although the post hoc power analysis indicated sufficient statistical power to detect medium effect sizes, the sample size may have been insufficient to detect smaller effects.

Conclusion

This study demonstrated that the intrahospital transport of critically ill patients is a multidimensional process involving clinical, technical, organizational, and human factors. Equipment- and procedure-related problems were frequently reported, and a greater number of transport-related problems was associated with lower perceived transport safety among nurses. Although physiological changes were commonly reported, they were not significantly associated with perceived transport safety. This finding may suggest that nurses are more sensitive to preventable technical and organizational problems when evaluating the safety of the transport process.

These findings underscore the importance of integrating effective clinical management with systematic organizational strategies to improve intrahospital transport safety. Standardized transport protocols and checklists, regular transport-specific training, reliable monitoring and life-support equipment, experienced transport teams, and effective multidisciplinary communication may contribute to safer transport practices and enhance nurses' perceptions of transport safety.

Ethics Committee Approval: The study was approved by the Ege University Medical Research Ethics Committee (Approval Number: 25-9T/51, Date: 04.09.2025).

Informed Consent: Informed consent was obtained electronically from all participants prior to data collection.

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Turkish Adaptation of the Cyber Hygiene Inventory for Nursing Students: A Validity and Reliability Study

Abstract

Background: In healthcare settings, inadequate cyber hygiene practices may compromise patient safety and data security. Nursing students, as future frontline healthcare professionals, must develop appropriate cybersecurity behaviors during their education. However, a validated instrument for assessing cyber hygiene behaviors among nursing students in Türkiye is currently lacking.

Aim: This study aimed to evaluate the validity and reliability of the Turkish version of the Cyber Hygiene Inventory (CHI) among nursing students.

Methods: This methodological, cross-sectional study was conducted with 323 undergraduate nursing students at a public university in Türkiye between October 1 and December 10, 2025. Data were collected using a Personal Information Form and the Cyber Hygiene Inventory. Linguistic equivalence was established through forward and backward translation, and content validity was assessed using the Davis technique. Construct validity was examined using exploratory factor analysis (EFA) followed by confirmatory factor analysis (CFA). Reliability was evaluated using Cronbach's alpha coefficients, item–total correlations, and split-half reliability analysis.

Results: EFA identified a three-factor structure comprising 16 items and explaining 76.52% of the total variance. The factors were labeled Device and Data Protection Hygiene, Social Media Interaction Hygiene, and Authentication and Email Security Hygiene. CFA demonstrated acceptable model fit, with a chi-square-to-degrees-of-freedom ratio (χ^2/df) of 3.079, a root mean square error of approximation (RMSEA) of 0.080, and a comparative fit index (CFI) of 0.957. The overall Cronbach's alpha coefficient was 0.953, indicating high internal consistency.

Conclusion: The Turkish version of the Cyber Hygiene Inventory (CHI-TR) demonstrated satisfactory validity and reliability for assessing cyber hygiene behaviors among nursing students. The instrument may be used in nursing education and research to identify cybersecurity-related educational needs and inform the development of targeted training interventions.

Keywords: Cyber hygiene, nursing students, reliability, scale adaptation, validity

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Introduction

The World Health Organization recognizes cybersecurity and data privacy protection within digital health systems as essential prerequisites for ensuring patient safety and maintaining healthcare service delivery.[1] The healthcare sector has reported the highest data breach costs for 12 consecutive years, with an average cost of USD 7.42 million per incident. Because patient data are particularly attractive targets, detecting and containing data breaches in healthcare settings often takes longer than in other industries.[2] Furthermore, approximately 93% of healthcare organizations have experienced at least one cyberattack, a substantial proportion of which has been associated with employees' noncompliance with established cybersecurity policies.[3] These findings suggest that cybersecurity risks arise not only from technological vulnerabilities but also from human factors, underscoring the critical role of end-user behavior in maintaining cybersecurity.[4,5]

From a theoretical perspective, cyber hygiene (CH) refers to habitual, preventive behaviors performed by end users that, like hand hygiene in infection control, must be practiced consistently rather than as one-time measures.[5,6] This parallel is particularly relevant to nursing education, in which preventive practices such as handwashing and sterile technique are emphasized from the earliest stages of training. Positioning CH as an extension of this preventive approach therefore provides a conceptual foundation for developing cyber hygiene behaviors during undergraduate nursing education.[7] In healthcare settings, these behaviors support the confidentiality, integrity, and availability of electronic health records and patient data.[7,8] Consistent with this conceptualization, the Cyber Hygiene Inventory (CHI) operationalizes CH through five behavioral domains: storage and device hygiene, transmission hygiene, social media hygiene, authentication and credential hygiene, and email and messaging hygiene. These domains encompass routine practices such as updating devices and software, securely transmitting data, managing privacy on social media platforms, creating and protecting strong passwords, and avoiding risky email and messaging behaviors.[6]

As the largest professional group in healthcare, nurses routinely handle patient data and play an essential role in incorporating CH practices into healthcare delivery.[7,8] Similar to infection prevention measures, CH practices

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can contribute to patient safety by reducing cybersecurity risks.[9] Strengthening CH competencies among nurses and nursing students is therefore essential for promoting patient safety and supporting the long-term security of healthcare systems.[9–11]

The National Core Curriculum for Nursing Education (NCCNE-2022) provides the national framework for undergraduate nursing education in Türkiye. Although NCCNE-2022 does not explicitly address cybersecurity or cyber hygiene, it identifies nursing informatics as a core learning area encompassing health information systems, technology literacy, mobile health applications, and clinical decision support systems. Its national competencies also require graduates to use informatics and healthcare technologies in professional practice, education, management, and research; comply with relevant legislation; and provide care consistent with professional values and ethical principles.[12] Previous studies involving nursing students have indicated that a substantial proportion have not received formal cybersecurity training and demonstrate limited behavioral preparedness for cyber threats.[13] These findings highlight a potential gap between national educational objectives and students' digital security competencies.

Although previous studies have recommended integrating CH into nursing curricula,[10,13,14] cybersecurity continues to be addressed predominantly as an organizational or technical concern, and valid and reliable instruments for assessing individual CH behaviors remain limited.[15] Similarly, instruments developed in Turkish samples, including the Cybersecurity Scale,[16] Cybercrime Awareness Scale,[17] Cybercrime Awareness on Social Media Scale,[18] and Cybersecurity Resilience Scale,[19] primarily assess cybersecurity awareness, practices, or resilience in general populations. To the best of our knowledge, none specifically assesses cyber hygiene behaviors or has been validated among nursing students. Previous research involving Turkish nursing students has also relied on general cybersecurity and cybercrime awareness scales and has been largely descriptive.[13] In contrast, the CHI assesses cyber hygiene behaviors rather than awareness, perceptions, or resilience. It captures the frequency of routine preventive practices across five empirically derived domains and has demonstrated associations with cyber-safety-related outcomes.[6] A valid and reliable instrument could facilitate cybersecurity education planning in nursing programs, help identify students' risky behaviors, and support the development of targeted educational interventions. Therefore, this methodological study aimed to adapt the Cyber Hygiene Inventory into Turkish and evaluate its validity and reliability for use among nursing students.

Research Question

- Is the Turkish version of the CHI a valid and reliable instrument for assessing cyber hygiene behaviors among nursing students?

Materials and Methods

Study Design

This study used a methodological, cross-sectional design to evaluate the psychometric properties of the Turkish adaptation of the CHI.

Study Population and Sample

The target population comprised 1,033 undergraduate nursing students enrolled in the Faculty of Nursing at Ege University, Türkiye, during the 2025–2026 academic year. Students from all years of study were eligible for inclusion. Participants were recruited from the target population using convenience sampling.[20] Students who met the inclusion criteria and voluntarily agreed to participate were included.

Previous research recommends a sample size of at least 5–10 participants per item for scale adaptation studies, with samples of approximately 200–300 participants generally considered adequate for factor analysis. Given that the original inventory contained 18 items, the sample of 323 students was considered sufficient for the planned psychometric analyses.[21] The inclusion criteria were enrollment in an undergraduate nursing program, age 18 years or older, voluntary agreement to participate with written informed consent, and sufficient proficiency in Turkish to read and understand the data collection instruments.

Data Collection Instruments

Personal Information Form: The Personal Information Form was developed by the researchers based on the existing literature[7,13,15] and consisted of 11 items assessing participants' sociodemographic characteristics and technology use. The form collected information on age, gender, year of study, ownership and use of smartphones, tablets, and computers, daily internet use, self-rated computer proficiency, use of security software, previous cybersecurity training, and history of exposure to cyberattacks.

Cyber Hygiene Inventory: The CHI is a multidimensional self-report instrument developed by Vishwanath et al.[6] to assess individuals' cyber hygiene practices related to protecting personal information and maintaining device security in digital environments. The instrument assesses users' awareness of their everyday cybersecurity behaviors and practices.

In the original inventory, items were evaluated using concept mapping and confirmatory factor analysis. Items that did not adequately fit the factor structure were excluded, resulting in a final 18-item inventory. The inventory comprises five subdimensions: "Storage and Device Hygiene," "Transmission Hygiene," "Facebook and Social Media Hygiene," "Authentication and Credential Hygiene," and "Email and Messaging Hygiene." All items are rated on a five-point Likert-type scale ranging from 1 ("never") to 5 ("always"). Total scores on the original inventory range from 18 to 90, with higher scores indicating better cyber hygiene practices.[6] Following psychometric analyses, the final Turkish version of the inventory, hereafter referred to as the CHI-TR, comprised 16 items. Accordingly, total scores on the CHI-TR range from 16 to 80, with higher scores indicating better cyber hygiene practices.

Linguistic Equivalence

The forward–backward translation method was used to adapt the inventory into Turkish and ensure linguistic consistency, in accordance with the recommendations of the International Test Commission (ITC). The original English version of the inventory was independently translated into Turkish by two translators proficient in both languages. The translations were compared, and a consensus-based Turkish draft was developed. The draft was then reviewed by an academic expert in Turkish language to ensure linguistic accuracy, clarity, and appropriateness, and the necessary revisions were made. Subsequently, two independent translators who were blinded to the original inventory back-translated the Turkish version into English. The back-translated versions were compared with the original inventory to assess semantic and conceptual equivalence. Following this process, the Turkish version was considered linguistically and conceptually equivalent to the original instrument and suitable for validity and reliability analyses.[22,23]

Content Validity

Following linguistic adaptation, the 18-item Turkish version of the CHI was submitted to five subject-matter experts to assess its content validity. Expert evaluations were conducted using the Davis technique.[24] Each expert assessed the relevance and appropriateness of each item using a four-point scale: 1=not appropriate, 2=requires major revision, 3=requires minor revision, and 4=appropriate. The item-level content validity index (I-CVI) was calculated for each item by dividing the number of experts who assigned a rating of 3 or 4 by the total number of experts. An I-CVI of ≥0.80 was considered the minimum acceptable threshold for content validity. The scale-level content validity index based on the averaging method (S-CVI/Ave) was calculated as the mean of the I-CVI values across all items. The scale-level content validity index based on universal agreement (S-CVI/UA) was calculated by dividing the number of items rated as appropriate by all experts by the total number of items. The I-CVI values ranged from 0.60 to 1.00, while the S-CVI/Ave and the S-CVI/UA values were 0.97 and 0.89, respectively. All items except Item 6 met the minimum I-CVI threshold of 0.80. Item 6, which had an I-CVI of 0.60, was revised based on expert feedback to improve linguistic clarity and conceptual equivalence. No items were removed at this stage. Following these revisions, the Turkish version was considered suitable for data collection.[24]

Pilot Testing

Following linguistic adaptation and content validation, the inventory was pilot-tested with 30 individuals representative of the target population before the main data collection phase. The clarity and comprehensibility of the items were assessed, and minor revisions were made as necessary.[23] Data obtained during pilot testing were excluded from the main analyses.

Data Collection

Data were collected from nursing students by the third author through face-to-face administration of paper-and-pencil questionnaires between October 1, 2025, and December 10, 2025. Before data collection, participants were informed about the

purpose of the study, and written informed consent was obtained from those who agreed to participate. The questionnaires were administered in a classroom setting, and completed forms were collected during the same session. Completion took approximately 15 minutes on average. Throughout the process, the third author remained in the classroom to answer participants' questions. Incomplete or incorrectly completed questionnaires were excluded from the analysis. The collected data were coded in accordance with confidentiality principles and entered into SPSS software for statistical analysis.

Data Analysis

Data were analyzed using SPSS for Windows, version 25.0, and AMOS, version 26.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data. The normality of data distributions was assessed using skewness and kurtosis values. The suitability of the data for factor analysis was evaluated using the Kaiser–Meyer–Olkin (KMO) statistic and Bartlett's test of sphericity. Construct validity was examined using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA was performed using principal component analysis with Varimax rotation, while CFA model fit was assessed using the chi-square to degrees of freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), comparative fit index (CFI), normed fit index (NFI), incremental fit index (IFI), Tucker–Lewis index (TLI), goodness-of-fit index (GFI), and adjusted goodness-of-fit index (AGFI). Reliability was evaluated using Cronbach's alpha coefficients, item–total correlations, comparisons between the lower and upper 27% groups, and split-half reliability coefficients. Homogeneity of variances was assessed using Levene's test. Independent-samples t-tests were used to compare two independent groups, with Welch's correction applied when Levene's test indicated unequal variances. For comparisons across academic years, the assumption of homogeneity of variances was not met, and group sizes were highly unequal (n=11 for third-year students). Therefore, these comparisons were performed using the Kruskal–Wallis test, followed by Dunn–Bonferroni-adjusted post hoc comparisons. Correlations were examined using Pearson's or Spearman's correlation coefficients, depending on the distributional characteristics of the variables. Statistical significance was set at $p<0.05$.

Ethical Considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from Ege University Medical Research Ethics Committee (Approval Number: 24-10T/8, Date: 07.10.2024). Institutional authorization was subsequently obtained from Ege University (Approval Number: E-27344949-100-2630439, Date: 10.09.2025). Permission to adapt the instrument into Turkish was also obtained from the original developer via email.

Results

Sociodemographic Characteristics of the Participants

A total of 323 students were included in the study. Of these, 75.9% were female, and 71.2% were first-year students. All participants reported using a smartphone, while 32.8% used a tablet and 37.5% used a computer. Security software was installed on the devices of 66.3% of participants, 9% had received cybersecurity training, and 13.9% reported having experienced a cyberattack (Table 1). The mean age of participants was 20.16±3.98 years. The mean daily internet use was 5.25±2.52 hours, and the mean computer skill score was 5.37±1.99.

Table 1. Sociodemographic characteristics of nursing students (n=323)

Characteristic	n	%
Year of study		
First year	230	71.2
Second year	40	12.4
Third year	11	3.4
Fourth year	42	13.0
Gender		
Female	245	75.9
Male	78	24.1
Smartphone use		
Yes	323	100.0
Tablet use		
Yes	106	32.8
No	217	67.2
Computer use		
Yes	121	37.5
No	202	62.5
Use of security software		
Yes	214	66.3
No	109	33.7
Previous cybersecurity training		
Yes	29	9.0
No	294	91.0
Previous experience of a cyberattack		
Yes	45	13.9
No	278	86.1
Total	323	100.0

Psychometric Properties of the CHI

The KMO value was 0.935, indicating that the data were suitable for factor analysis. Bartlett's test of sphericity was statistically significant ($\chi^2(120)=4799.990$; $p<0.001$). These findings confirmed the suitability of the data for factor analysis (Table 2).

Exploratory Factor Analysis

EFA was conducted using principal component analysis with Varimax rotation to determine the factor structure of the CHI. Items were considered for removal if their factor loadings were below 0.40, if they exhibited cross-loadings with a difference of less than 0.10, or if their factor placement was inconsistent with the theoretical structure of the original inventory.[25] Accordingly, Item 11 ("Ensuring the location information is not leaked in posts") was removed because it exhibited similar loadings across all three factors (Factor 1=0.51, Factor 2=0.49, and Factor 3=0.46; loading differences <0.10). Item 16 ("Checking an incoming email's header") was removed because it loaded more strongly on the social media–related factor (0.80) than on its theoretically expected email and messaging–related dimension (0.24). Following repeated analyses, a three-factor structure comprising 16 items was identified, with communalities of the retained items ranging from 0.60 to 0.91. Based on the conceptual content of the items loading on each factor, Factor 1 (7 items) was named "Device and Data Protection Hygiene," Factor 2 (3 items) "Social Media Interaction Hygiene," and Factor 3 (6 items) "Authentication and Email Security Hygiene." In the final 16-item CHI-TR, total scores range from 16 to 80, with higher scores indicating better cyber hygiene practices. The possible score ranges for the subdimensions are 7–35 for Device and Data Protection Hygiene, 3–15 for Social Media Interaction Hygiene, and 6–30 for Authentication and Email Security Hygiene.

The three-factor structure explained 76.52% of the total variance (Factor 1: 30.83%; Factor 2: 19.06%; Factor 3: 26.64%). Factor loadings ranged from 0.63 to 0.92, and no retained items met the cross-loading criterion of a loading difference of less than 0.10 between factors (Table 2). A scree plot was also examined to determine the number of factors. The plot showed a clear breakpoint (elbow) after the third factor, providing further support for the three-factor structure of the inventory (Fig. 1).

Confirmatory Factor Analysis

The three-factor structure identified through EFA was subsequently tested using CFA. The model was statistically significant ($p<0.001$). Examination of the model fit indices yielded the following values: χ^2/df=3.079, RMSEA=0.080, CFI=0.957, IFI=0.957, NFI=0.938, TLI=0.948, GFI=0.892, and AGFI=0.852. Overall, these indices indicated an acceptable model fit.

During model modification, error covariances were added between two pairs of items within the same subdimension (e6–e7 and e15–e16, corresponding to

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Table 2. Exploratory factor analysis of the Turkish Version of the Cyber Hygiene Inventory (CHI-TR)

Item	Communality (h^2)	Factor 1	Factor 2	Factor 3
1. Enabling firewalls on your computing devices	0.812	**0.773**	0.359	0.293
2. Running a virus scan on any new USB or external storage device	0.799	**0.764**	0.359	0.295
3. Monitoring different processes such as CPU, power, or network usage on your device	0.810	**0.824**	0.253	0.258
4. Keeping virus protection updated	0.803	**0.780**	0.333	0.288
5. Checking the quality of the SSL certificate when doing online financial transactions	0.742	**0.739**	0.145	0.418
6. Storing logins and passwords on encrypted online password vaults	0.612	**0.680**	0.089	0.377
7. Placing online alerts from your name or personal information	0.680	**0.717**	0.124	0.387
8. Assessing the authenticity of social media friend/information requests	0.895	0.177	**0.917**	0.148
9. Knowing who you are connected to on social media	0.907	0.259	**0.894**	0.202
10. Reassessing social media friends/connections	0.841	0.312	**0.829**	0.236
12. Changing default username from administrator to something unique on all Internet enabled devices	0.718	0.248	0.127	**0.800**
13. Changing default passwords on all Internet enabled devices	0.797	0.243	0.168	**0.842**
14. Managing how your browser stores passwords	0.780	0.408	0.238	**0.746**
15. Creating new/unique logins and passwords for all your online signins	0.745	0.324	0.123	**0.790**
17. Checking a sender's email domain name	0.708	0.461	0.264	**0.653**
18. Checking to see if email requests have grammatical or typographical errors	0.595	0.374	0.241	**0.630**
Eigenvalue		9.412	1.134	1.698
Explained variance		30.825	19.058	26.641
KMO=0.935; χ^2(120)=4799.990; Bartlett's test of sphericity (p)=0.000				

Total variance explained=76.524%. Extraction was performed using principal component analysis with Varimax rotation and Kaiser normalization. Bold values indicate the primary factor loading for each item. h^2=communality. Factor 1: Device and Data Protection Hygiene (Items 1–7), Factor 2: Social Media Interaction Hygiene (Items 8–10), Factor 3: Authentication and Email Security Hygiene (Items 12–15, 17, and 18). Factor numbering reflects conceptual grouping rather than descending order of explained variance. Item numbers correspond to the original 18-item inventory. Items 11 ("Ensuring the location information is not leaked in posts") and 16 ("Checking an incoming email's header") were excluded during factor analysis.

Items 6 and 7 and Items 17 and 18, respectively). These modifications followed the recommendation that correlated errors be restricted to items within the same subdimension and that the number of modifications be minimized.[25] The modifications were theoretically justified rather than based solely on statistical considerations. Items 17 and 18 assess complementary verification behaviors related to evaluating the trustworthiness of incoming emails, specifically checking the sender's domain name and identifying grammatical or typographical errors. Similarly, Items 6 and 7 address proactive protection of personal information through the use of encrypted credential vaults and the creation of online alerts for personal information. Given the semantic overlap between these item pairs, they may share residual variance beyond that explained by their respective latent factors. Therefore, the correlated errors were considered theoretically justifiable. Standardized factor loadings ranged from 0.651 to 0.963, and all loadings were statistically significant (p<0.01) (Fig. 2).

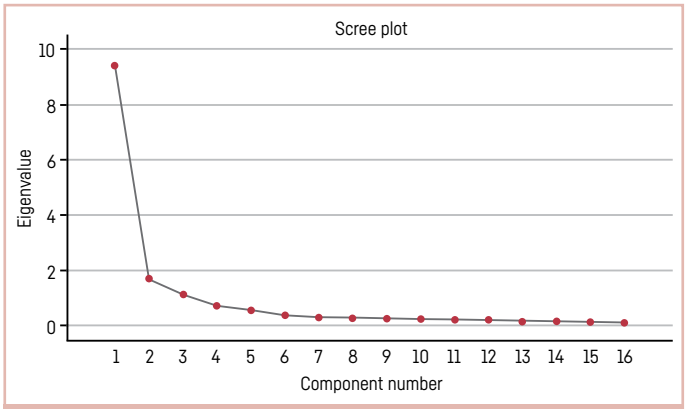


Figure 1. Scree plot of the Turkish Version of the Cyber Hygiene Inventory (CHI-TR).

Reliability of the CHI

Internal consistency was assessed using Cronbach's alpha coefficient. The overall Cronbach's alpha was 0.953, while the coefficients for the subdimensions ranged from 0.917 to 0.940 (Table 3).

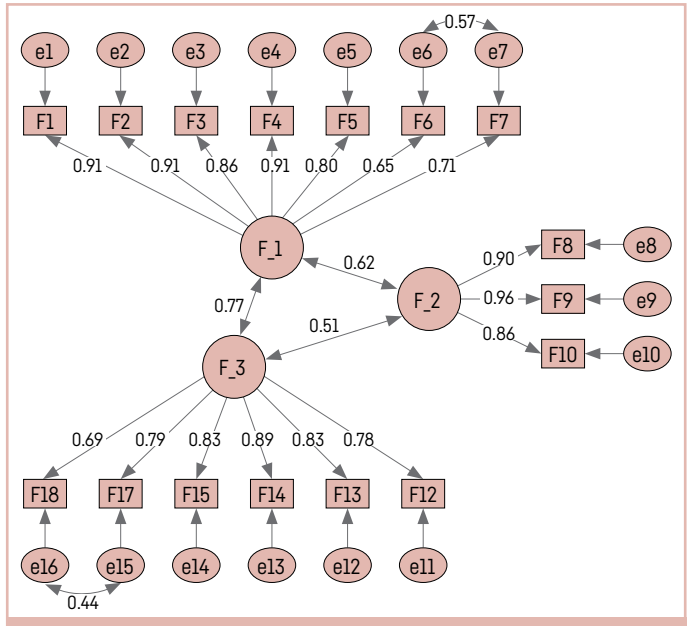


Figure 2. First-order multifactor confirmatory factor analysis model of the Turkish Version of the Cyber Hygiene Inventory (CHI-TR).
χ^2/df=3.079; RMSEA=0.080; CFI=0.957; IFI=0.957; NFI=0.938; TLI=0.948; GFI=0.892, and AGFI=0.852.

Table 3. Reliability analysis of the Turkish Version of the Cyber Hygiene Inventory (CHI-TR) (n=323)

Item	Item–total correlation	t statistic (lower vs. upper 27%)**	p (lower vs. upper 27%)	Cronbach's α
Factor 1				0.940
F1	0.849	-22.528	0.000*	
F2	0.835	-20.346	0.000*	
F3	0.841	-25.835	0.000*	
F4	0.842	-21.681	0.000*	
F5	0.798	-23.267	0.000*	
F6	0.698	-16.241	0.000*	
F7	0.758	-20.087	0.000*	
Factor 2				0.934
F8	0.864	-18.259	0.000*	
F9	0.903	-17.359	0.000*	
F10	0.826	-20.256	0.000*	
Factor 3				0.917
F12	0.733	-20.518	0.000*	
F13	0.797	-19.469	0.000*	
F14	0.824	-20.216	0.000*	
F15	0.775	-21.947	0.000*	
F17	0.783	-18.478	0.000*	
F18	0.701	-19.064	0.000*	
Total				0.953

*: p<0.05, **: n1=n2=87. Factor 1: Device and Data Protection Hygiene (Items 1–7), Factor 2: Social Media Interaction Hygiene (Items 8–10), Factor 3: Authentication and Email Security Hygiene (Items 12–15, 17, and 18).

Item–total correlation coefficients ranged from 0.698 to 0.903, exceeding the recommended threshold of 0.30 for all items. Comparisons between the lower and upper 27% groups revealed statistically significant differences for all items (p<0.001), indicating adequate item discrimination (Table 3).

Split-half reliability analysis yielded a correlation of 0.817 between the two halves. Both the Spearman–Brown and Guttman split-half coefficients were 0.899. Tukey's test of nonadditivity was statistically significant (p=0.031).

Comparisons According to Sociodemographic Variables

The Kruskal–Wallis tests revealed statistically significant differences across academic years in Factor 1 (H=11.828, p=0.008) and Factor 3 (H=22.816, p<0.001) scores. However, Factor 2 scores did not differ significantly across academic years (H=5.915, p=0.116). Dunn–Bonferroni-adjusted post hoc comparisons showed that first- and second-year students had higher Factor 1 and Factor 3 scores than fourth-year students (Table 4).

Participants who used a computer had significantly higher Factor 2 scores than those who did not (p=0.012). Participants with security software installed on their devices had higher Factor 1 and Factor 3 scores than those without security software (p<0.001). No differences in subscale scores were observed according to gender, tablet use, prior cybersecurity training, or prior exposure to cyberattacks (p>0.05) (Table 4).

Discussion

The EFA and CFA results supported a three-factor, 16-item structure for the CHI-TR, with model fit indices indicating an acceptable fit. Furthermore, the consistently high reliability coefficients for the overall inventory and its subdimensions provided evidence of strong internal consistency.

The CHI-TR comprises three subdimensions: Device and Data Protection Hygiene, Social Media Interaction Hygiene, and Authentication and Email Security Hygiene.

Table 4. Comparison of Cyber Hygiene Inventory Scores according to participants' sociodemographic characteristics (n=323)

Characteristic	Factor 1 $\bar{X}$±SD	Factor 2 $\bar{X}$±SD	Factor 3 $\bar{X}$±SD
Year of study			
First year[1]	3.54±1.04	3.92±1.10	3.38±0.87
Second year[2]	3.66±0.94	4.03±1.04	3.50±0.85
Third year[3]	2.96±1.28	4.30±0.46	2.80±1.14
Fourth year[4]	2.80±1.42	4.38±0.56	2.45±1.24
H	11.828	5.915	22.816
p	**0.008***	0.116	**0.000***
Adjusted Bonferroni†	1>4† 2>4†	–	1>4† 2>4†
Gender			
Female	3.38±1.13	4.03±1.00	3.25±0.96
Male	3.63±1.08	3.93±1.13	3.29±1.07
t-test	-1.755	0.784	-0.329
p	0.080	0.434	0.743
Tablet use			
Yes	3.30±1.15	4.14±0.95	3.12±1.08
No	3.51±1.11	3.94±1.07	3.33±0.94
t-test	-1.557	1.599	-1.752
p	0.121	0.111	0.081
Computer use			
Yes	3.59±1.08	4.18±0.87	3.28±0.97
No	3.35±1.14	3.90±1.11	3.25±1.00
t-test	1.826	2.516	0.316
p	0.069	**0.012***	0.752
Use of security software			
Yes	3.71±0.99	4.09±0.97	3.47±0.85
No	2.91±1.19	3.84±1.14	2.84±1.10
t-test	6.016	1.934	5.278
p	**0.000***	0.055	**0.000***
Previous cybersecurity training			
Yes	3.73±1.14	4.15±1.10	3.52±0.93
No	3.41±1.12	3.99±1.02	3.23±0.99
t-test	1.480	0.777	1.480
p	0.140	0.438	0.140
Previous experience of a cyberattack			
Yes	3.53±1.15	4.23±0.93	3.37±0.98
No	3.43±1.12	3.97±1.04	3.24±0.99
t-test	0.561	1.561	0.790
p	0.575	0.120	0.430

*: p<0.05; †: Dunn–Bonferroni-adjusted pairwise comparisons. Subscale scores were calculated as mean item scores (range: 1–5). Bold values indicate statistically significant results. t-test: Independent-samples t-test, H: Kruskal–Wallis H test, $\bar{X}$: Mean, SD: Standard deviation, Factor 1: Device and Data Protection Hygiene, Factor 2: Social Media Interaction Hygiene, Factor 3: Authentication and Email Security Hygiene.

These factors were named based on the conceptual content of the retained items, their factor loadings, and the theoretical domains of the original CHI. The first factor encompasses items related to the secure use of devices, software, and security tools; the second addresses the management of social media connections and on-

line interactions; and the third covers credential management and email verification practices. This structure indicates that CH behaviors encompass both the secure use of technological tools and security practices associated with individual and social interactions in digital environments.

The original CHI was developed as an 18-item inventory comprising five dimensions: Storage and Device Hygiene, Transmission Hygiene, Facebook and Social Media Hygiene, Authentication and Credential Hygiene, and Email and Messaging Hygiene. The reduction from the original five-factor structure to a 16-item, three-factor structure in the Turkish version represents an important structural difference that requires careful interpretation. This finding may be understood in the context of the original conceptualization of cyber hygiene, in which Vishwanath et al.[6] emphasized that its subdimensions may be empirically determined and influenced by the context in which the construct is applied. Variations in factor structure during instrument adaptation may also be associated with cultural differences, sample characteristics, and differences in item interpretation within the target population.[26] In the CHI-TR, the original domains were not entirely eliminated; rather, conceptually related domains converged into broader behavioral dimensions. Items from the original Storage and Device Hygiene and Transmission Hygiene domains were combined into Device and Data Protection Hygiene (Factor 1), while items from Authentication and Credential Hygiene and Email and Messaging Hygiene converged into Authentication and Email Security Hygiene (Factor 3). In contrast, the Facebook and Social Media Hygiene domain remained distinct, forming Social Media Interaction Hygiene (Factor 2).

This structural reorganization was also evident in the item removal process. Item 11 ("Ensuring the location information is not leaked in posts"), originally belonging to the Facebook and Social Media Hygiene domain, was excluded because it exhibited similar loadings across all three factors. Item 16 ("Checking an incoming email's header"), originally belonging to the Email and Messaging Hygiene domain, was removed because it loaded more strongly on the social media–related factor than on its theoretically expected dimension. These findings suggest that the two items may not have functioned consistently within the Turkish nursing student sample. The three-factor structure may therefore suggest that nursing students conceptualize cyber hygiene in terms of broader routine practices involving device and data protection, social media interaction management, and the security of account credentials and email communication, rather than as narrowly defined technical domains. However, this structural difference also suggests that the CHI-TR is not fully equivalent to the original CHI at the subdimension level. Although the retained items continue to represent the broader construct of cyber hygiene, the three-factor structure provides a less detailed representation than the original five-factor model. Consequently, comparisons between the original CHI and the CHI-TR should be interpreted cautiously, particularly at the subscale level. Future studies should investigate whether the three-factor structure remains stable in larger, independent Turkish samples and whether the original five-factor structure can be replicated in different populations of healthcare students and professionals.

Evidence supporting the construct validity of the inventory was obtained through both exploratory and confirmatory factor analyses. Construct validity refers to the extent to which an instrument measures its intended latent construct and produces scores consistent with theoretically expected patterns.[27] Before factor analysis, data suitability and sample adequacy are commonly evaluated using the KMO measure and Bartlett's test of sphericity.[25] The KMO and Bartlett's test results confirmed that the data were suitable for factor analysis. Furthermore, the CFA fit indices indicated an acceptable fit of the three-factor model to the observed data. Together, these findings provide theoretical and statistical support for the construct validity of the Turkish version of the inventory.

Reliability analyses demonstrated high internal consistency for both the overall inventory and its subdimensions. The Cronbach's alpha coefficients exceeded the acceptable and ideal thresholds recommended in the literature, supporting the reliability of the instrument.[28] The similarity between the Cronbach's alpha values obtained in this study and those reported in the original study suggests that the instrument may exhibit comparable psychometric properties across different cultural contexts. Moreover, the high item–total correlations and significant differences between the lower and upper groups for all items provide further evidence of adequate item discrimination and internal consistency.

The findings of this study provide insight into how CH behaviors are conceptualized and organized within the context of healthcare education. The CHI-TR may be considered a culturally adapted, behavior-oriented instrument with strong psychometric properties for assessing CH behaviors among nursing students. The inventory may also be useful in planning, implementing, and evaluating educational programs aimed at enhancing digital security awareness.

Overall, the findings support the validity and reliability of the Turkish adaptation of the CHI among nursing students. However, the results also indicate that the conceptualization of CH may vary according to sample characteristics and contextual factors. Further research involving different groups of healthcare professionals and diverse cultural settings is needed to evaluate the stability and generalizability of its factor structure.

Limitations

This study has several methodological limitations. First, data were collected using self-report measures, which may be subject to social desirability bias and individual response tendencies. Second, the psychometric evidence obtained in this study was limited to internal structure and internal consistency within a cross-sectional design. Therefore, the temporal stability of inventory scores and their associations with external criteria remain to be established. Another important limitation was the use of the same sample for both EFA and CFA. Although the total sample size was considered adequate for the overall psychometric analyses, dividing the sample into two independent subsamples would have resulted in sample sizes considered insufficient for robust EFA and CFA. Consequently, both analyses were conducted using the same sample. This limits the independent confirmatory evidence provided by the CFA and should be considered when interpreting the stability of the factor structure. The use of convenience sampling and recruitment from a single public university may also limit the representativeness of the sample and the generalizability of the findings. Furthermore, because participation was voluntary, the findings may partly reflect the characteristics of students who were more willing to participate. The distribution of participants across academic years was also unbalanced, with only 11 third-year students. Although nonparametric tests were used for the comparisons across academic years, this imbalance may have reduced the statistical power and robustness of these comparisons. Future studies should evaluate the CHI-TR in larger, independent, multicenter, and more diverse samples to confirm its factor structure and further investigate its criterion-related validity and temporal stability.

Conclusion

This study provided evidence supporting the validity and reliability of the CHI-TR for assessing cyber hygiene behaviors among nursing students. The inventory comprises three subdimensions: Device and Data Protection Hygiene, Social Media Interaction Hygiene, and Authentication and Email Security Hygiene. Total scores range from 16 to 80, and the inventory enables the assessment of CH behaviors within a behavior-oriented framework. The psychometric findings suggest that the inventory may be useful in research and educational settings for assessing nursing students' CH behaviors and evaluating interventions aimed at enhancing digital security awareness. CH behaviors, provided that its cross-cultural validity and measurement equivalence are established. Further studies involving different groups of healthcare professionals and more diverse samples are recommended to confirm the validity of the instrument.

Ethics Committee Approval: The study was approved by the Ege University Medical Research Ethics Committee (Approval Number: 24-10T/8, Date: 07.10.2024).

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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Author Contributions: Concept – T.Y., M.T.; Design – T.Y., M.T.; Supervision – T.Y.; Resource – T.Y., M.T., E.Ü.; Materials – T.Y., M.T.; Data Collection and/or Processing – E.Ü.; Analysis and/or Interpretation – T.Y., M.T., E.Ü.; Literature Review – T.Y., M.T., E.Ü.; Writing – T.Y., M.T., E.Ü.; Critical Review – T.Y., M.T., E.Ü.

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The Relationship Between Coping with Premenstrual Syndrome and Self-Care Agency Among Female University Students

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Abstract

Background: Premenstrual syndrome is a common condition characterized by physical and emotional symptoms that may negatively affect female university students' well-being and academic performance. Coping strategies and self-care practices may help manage these symptoms, but the relationship between them remains underexplored.

Aim: This study aimed to investigate the association between coping with premenstrual syndrome and self-care agency among female university students.

Methods: This cross-sectional study was conducted between October and November 2024 among 311 female university students. Data were collected through face-to-face surveys using a sociodemographic information form, the Premenstrual Syndrome Scale, the Premenstrual Change Coping Inventory, and the Self-Care Agency Scale. Data were analyzed using independent-samples t-tests and Pearson's correlation analysis.

Results: The mean age of the participants was 20.44±1.70 years, and the mean age at menarche was 13.47±1.33 years. Most students lived with their families (62.7%), did not smoke (72.7%) or consume alcohol (90%), and did not exercise regularly (84.6%). The mean scores were 146.38±41.45 for the Premenstrual Syndrome Scale, 47.50±11.00 for the Premenstrual Change Coping Inventory, and 94.07±19.76 for the Self-Care Agency Scale. Self-care agency was moderately positively correlated with Premenstrual Change Coping Inventory scores and weakly negatively correlated with certain subscale scores of the Premenstrual Syndrome Scale. Weak positive correlations were also observed between certain subscales of the Premenstrual Change Coping Inventory and the Premenstrual Syndrome Scale.

Conclusion: Premenstrual syndrome is a common health concern among young female university students. Promoting self-care agency and supporting self-care behaviors may be valuable in helping students cope more effectively with premenstrual symptoms.

Keywords: Coping, premenstrual syndrome, self-care agency, university students

Introduction

Menstruation is a natural and cyclical part of a woman's life, often accompanied by physical and psychological changes.[1] Although many women experience only mild changes during the menstrual cycle, some experience more severe symptoms during the luteal phase, resulting in a distressing cluster of symptoms that negatively affect daily life. Premenstrual syndrome (PMS) refers to a collection of physical, cognitive, emotional, and behavioral symptoms that occur during the luteal phase of the menstrual cycle and generally diminish with the onset of menstruation.[2] More than 200 symptoms have been associated with PMS, the most common of which include headaches, fatigue, bloating, lower back pain, breast tenderness, food cravings, anxiety, irritability, social withdrawal, and depression.[3] PMS is a significant health concern affecting 85%–90% of women of reproductive age to varying degrees.[1,4,5] Studies conducted in Türkiye have reported that the prevalence of PMS among university students ranges from approximately 49% to 78%.[6,7]

University life is associated with increased stress resulting from examinations, academic workloads, social pressures, and parental expectations.[8] Moreover, lifestyle changes associated with university life, including academic responsibilities, extracurricular activities, social expectations, and irregular sleep patterns, may exacerbate PMS symptoms.[9] Coping with PMS can be particularly challenging for female university students during this demanding stage of life. PMS has been associated with school absenteeism, reduced academic performance, decreased quality of life, and an increased risk of suicidal ideation.[10,11] Therefore, adopting effective coping strategies is essential, as these strategies may reduce stress severity and alleviate both the physical and psychological effects of PMS, facilitating better adjustment to various stressors.[5]

Identifying and supporting effective coping strategies is therefore important. However, most women perceive PMS as a normal physiological process and believe that no intervention is necessary.[2,12] Understanding university students' social and cultural beliefs regarding coping with PMS, as well as their attitudes toward medication use, seeking social support, and engaging in positive emotional activities, is important because these beliefs may influence their coping strategies.[13] In addition to these social and cultural factors, self-care agency may play an important role in how individuals manage PMS symptoms. Evidence from broader health research indicates that higher self-care agency is associated with more adaptive coping behaviors, better stress management, and improved overall well-being.[14]

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Self-care refers to activities undertaken by individuals to maintain, promote, and manage their health, whereas self-care agency represents an individual's capacity to initiate and sustain these activities. Self-care ability develops throughout the lifespan, from childhood to old age.[15] Self-care activities include practices that help relieve stress, such as personal care, healthy eating, regular exercise, and relaxation techniques.[16] However, previous studies have indicated that the use of self-care skills among young women experiencing premenstrual symptoms is relatively low.[17–19]

PMS manifests through a wide range of symptoms, and the coping behaviors adopted to manage these symptoms may vary considerably among individuals. These differences are particularly evident among female university students experiencing a demanding period of life and may have consequences not only for the students themselves but also for their families and communities.[4,13] Targeted educational interventions and awareness programs have been shown to enhance self-care agency and increase engagement in consistent self-care practices.[20] Nurses play an important role in PMS management by educating students, providing counseling, monitoring symptoms, encouraging lifestyle modifications, and strengthening self-care behaviors.[1]

Although a limited number of international studies have examined the relationship between self-care agency and coping with PMS, [17–19,21] to our knowledge, no study has specifically investigated this association in Türkiye. The findings of this study are expected to guide university health services and educators in developing interventions for PMS management and to inform future research on the role of self-care agency in promoting students' health and well-being. Therefore, this study aimed to investigate the relationship between coping with PMS and self-care agency among female university students.

Research Question

1. Is there a relationship between self-care agency and coping behaviors related to PMS among female university students?

Materials and Methods

Study Design and Sample

This cross-sectional study was conducted at Kastamonu University. The target population consisted of 330 female students enrolled at the vocational school. No sampling method was applied, as the study aimed to include the entire target population. A total of 320 female students agreed to participate. After excluding incomplete or invalid questionnaires, data from 311 participants were included in the final analysis. Female students aged 18 years and older who had no known physical or psychological disorders and provided informed consent were eligible for inclusion. Students who submitted incomplete questionnaires were excluded from the analysis.

Using the finite population correction formula, the minimum required sample size was calculated as 180 participants. However, no sampling procedure was performed, as the study aimed to include nearly the entire target population. A post hoc power analysis indicated that, based on the observed correlation coefficient (r=0.441) and sample size (N=311), the statistical power exceeded 99.9%, indicating sufficient power to detect the observed effect. As this study was primarily exploratory, these results are presented for transparency and descriptive purposes rather than to emphasize post hoc statistical power. The study flowchart was prepared in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational studies.

Data Collection Tools

Data were collected using a Personal Information Form, the Premenstrual Syndrome Scale, the Premenstrual Change Coping Inventory, and the Self-Care Agency Scale.

Personal Information Form: Developed by the researchers, this form consisted of 11 close-ended questions addressing sociodemographic and menstrual characteristics. The sociodemographic section included four questions (age, academic year, place of residence, and living arrangements), the health behavior section included three questions (smoking, alcohol consumption, and exercise), and the menstrual characteristics section included four questions (age at menarche, menstrual cycle length, menstrual regularity, and duration of menstruation). Lifestyle-related variables, including smoking, alcohol consumption, and regular exercise, were included in the analyses based on previous evidence suggesting their associations with PMS symptoms and coping with premenstrual changes.[9,12,17]

Premenstrual Syndrome Scale (PMSS): Developed by Gençdoğan,[22] the Premenstrual Syndrome Scale consists of 44 items across nine subscales and uses a 5-point Likert-type response format. Total scores range from 44 to 220, with higher scores indicating more severe PMS symptoms. According to the theoretical cutoff points, a score of 44 indicates no PMS, scores of 45–103 indicate mild PMS, scores of 104–163 indicate moderate PMS, and scores of 164–220 indicate severe PMS. Cronbach's alpha coefficients for the total scale and subscales ranged from 0.75 to 0.91 in the original study. In the present study, Cronbach's alpha coefficient was 0.98 for the total scale, while the subscale coefficients ranged from 0.83 to 0.95.

Premenstrual Change Coping Inventory (PMS-Cope): Developed by Kaiser et al.[23] and adapted into Turkish by Sarı Çetin and Erbil,[24] this inventory consists of 17 items across three subscales: Seeking Positive Affect, Seeking Support, and Using Healthcare. It uses a 4-point Likert-type response format, with possible total scores ranging from 17 to 68. No cutoff values have been established for this inventory. Higher scores indicate greater use of effective coping strategies and a better capacity to manage premenstrual changes. In the Turkish adaptation study, Cronbach's alpha

Table 1. Sociodemographic, menstrual, and health-related lifestyle characteristics of the participants (n=311)

Sociodemographic characteristics	±SD	Min–Max
Age	20.44±1.70	(18–30)
Age at menarche	13.47±1.33	(9–17)
	n	%
Year of study		
First year	155	49.8
Second year	156	50.2
Place of residence		
Village/town	56	18.0
District	120	38.6
Province	135	43.4
Living arrangement		
With family	195	62.7
Dormitory/student apartment	38	12.2
With friends	70	22.5
Alone	8	2.6
Smoking status		
Yes	85	27.3
No	226	72.7
Alcohol consumption		
Yes	31	10.0
No	280	90.0
Regular exercise		
Yes	48	15.4
No	263	84.6
Duration of menstruation		
Less than 3 days	13	4.2
3–7 days	280	90.0
8 days or more	18	5.8
Menstrual cycle length		
21 days or less	40	12.9
22–34 days	241	77.5
35 days or more	30	9.6
Menstrual regularity		
Always irregular	35	11.3
Occasionally irregular	178	57.2
Always regular	98	31.5

SD: Standard deviation, Min–Max: Minimum-maximum.

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Table 2. Descriptive statistics for the Premenstrual Syndrome Scale (PMSS), Premenstrual Change Coping Inventory (PMS-Cope), and Self-Care Agency Scale (SCAS) scores among students (n=311)

Scale	Mean	SD	Min	Max
PMSS total	146.38	41.45	44.00	220.00
Depressive feelings	24.15	6.90	7.00	35.00
Anxiety	21.38	7.17	7.00	35.00
Fatigue	21.30	6.39	6.00	30.00
Irritability	17.20	5.66	5.00	25.00
Depressive thinking	22.47	7.64	7.00	35.00
Pain	10.29	3.54	3.00	15.00
Appetite changes	10.09	3.72	3.00	15.00
Sleep disturbances	9.91	3.55	3.00	15.00
Bloating	9.54	3.80	3.00	15.00
PMS-Cope total	47.50	11.00	17.00	68.00
Seeking Positive Affect	19.52	4.83	7.00	28.00
Seeking Support	14.51	4.04	5.00	20.00
Using Healthcare	13.46	3.73	5.00	20.00
SCAS total	94.07	19.76	37.00	136.00

SD: Standard deviation, Min–Max: Minimum-maximum.

coefficients ranged from 0.78 to 0.90 for the subscales, while the coefficient for the total scale was 0.86. In the present study, Cronbach's alpha coefficient was 0.92 for the total scale and 0.84, 0.89, and 0.78 for the respective subscales.

Self-Care Agency Scale (SCAS): Developed by Kearney and Fleicher[25] and validated in Turkish by Nahçivan,[26] this 35-item scale assesses individuals' perceived self-care abilities using a 5-point Likert-type response format (0–4). Total scores range from 0 to 140, with higher scores indicating greater self-care agency. No cutoff values have been established for this scale. In the Turkish adaptation study, Cronbach's alpha coefficient was reported as 0.92. In the present study, Cronbach's alpha coefficient for the total scale was 0.91.

Data Collection

Data were collected through face-to-face administration of questionnaires at Kastamonu University between October and November 2024. Students received verbal and written information about the purpose and importance of the study. The questionnaires were administered individually and took approximately 10 minutes to complete.

Statistical Analysis

Data were analyzed using IBM SPSS, version 28.0 (IBM Corp., PA, USA). Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means±standard deviations or medians (minimum–maximum), depending on their distribution. The Kolmogorov–Smirnov test was used to assess normality. Independent-samples t-tests were used to compare normally distributed continuous variables between two groups, and Pearson's correlation analysis was performed to evaluate associations between scale scores. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from Kastamonu University Social Sciences and Humanities Scientific Research and Publication Ethics Committee (Approval Number: 22, Date: 06.08.2024). Students received verbal and written information about the purpose and importance of the study, and written informed consent was obtained from all participants prior to data collection.

Results

The mean age of the participants was 20.44±1.70 years, and the mean age at menarche was 13.47±1.33 years. The remaining sociodemographic, health-related, and menstrual characteristics of the participants are presented in Table 1.

Table 3. Correlations among the PMSS, PMS-Cope, and SCAS total and subscale scores (n=311)

Scale	PMS-Cope total	Positive Affect Seeking	Seeking Support	Using Healthcare	PMSS total	Depressive feelings	Anxiety	Fatigue	Irritability	Depressive thinking	Pain	Appetite changes	Sleep disturbances	Bloating
SCAS total	r=0.441** p<0.001	r=0.471** p<0.001	r=0.309** p<0.001	r=0.355** p<0.001	r=-0.141* p=0.013	r=-0.138* p=0.015	r=-0.142* p=0.012	r=-0.077 p=0.173	r=-0.173** p=0.002	r=-0.206** p<0.001	r=-0.020 p=0.725	r=-0.048 p=0.397	r=-0.108 p=0.056	r=-0.052 p=0.361
PMS-Cope total	r=1 p----	r=0.877** p<0.001	r=0.885** p<0.001	r=0.855** p<0.001	r=0.102 p=0.071	r=0.092 p=0.104	r=0.086 p=0.132	r=0.079 p=0.164	r=0.071 p=0.210	r=0.065 p=0.255	r=0.125* p=0.027	r=0.119* p=0.037	r=0.095 p=0.093	r=0.096 p=0.090
Positive Affect Seeking	r=0.877** p<0.001	r=1 p----	r=0.643** p<0.001	r=0.594** p<0.001	r=-0.011 p=0.846	r=-0.029 p=0.605	r=-0.042 p=0.457	r=0.003 p=0.955	r=-0.037 p=0.516	r=-0.055 p=0.335	r=0.066 p=0.245	r=0.044 p=0.445	r=0.028 p=0.623	r=0.042 p=0.459
Seeking Support	r=0.885** p<0.001	r=0.643** p<0.001	r=1 p----	r=0.693** p<0.001	r=0.151** p=0.007	r=0.174** p=0.002	r=0.121* p=0.032	r=0.116* p=0.040	r=0.134* p=0.018	r=0.124* p=0.029	r=0.127* p=0.025	r=0.143* p=0.012	r=0.103 p=0.069	r=0.108 p=0.058
Using Healthcare	r=0.855** p<0.001	r=0.594** p<0.001	r=0.693** p<0.001	r=1 p----	r=0.152** p=0.007	r=0.122* p=0.031	r=0.175** p=0.002	r=0.103 p=0.069	r=0.113* p=0.046	r=0.128* p=0.024	r=0.145* p=0.010	r=0.138* p=0.015	r=0.133* p=0.019	r=0.113* p=0.046

*: p<0.05, **: p<0.01. r: Pearson's correlation coefficient, PMSS: Premenstrual Syndrome Scale, PMS-Cope: Premenstrual Change Coping Inventory, SCAS: Self-Care Agency Scale.

Table 4. Comparison of PMSS, PMS-Cope, and SCAS total scores according to selected health-related lifestyle behaviors (n=311)

Variable	Group	SCAS Mean±SD	Test value and p	PMS-Cope Mean±SD	Test value and p	PMSS Mean±SD	Test value and p
Smoking status	Yes	88.92±18.43	t=-2.845 p=0.005*	47.55±11.97	t=0.044 p=0.965	149.00±42.99	t=0.681 p=0.497
	No	96.00±19.94		47.49±10.65		145.40±40.92	
Alcohol consumption	Yes	83.12±18.06	t=-3.300 p=0.001*	46.48±11.19	t=-0.545 p=0.586	141.58±46.22	t=-0.680 p=0.497
	No	95.28±19.60		47.62±11.00		146.92±40.95	
Regular exercise	Yes	100.16±21.88	t=2.340 p=0.020*	50.14±11.38	t=1.812 p=0.071	136.89±43.96	t=-1.731 p=0.085
	No	92.95±19.19		47.02±11.00		148.12±40.83	

*: p<0.05. t: Independent-samples t-test, SD: Standard deviation, PMSS: Premenstrual Syndrome Scale; PMS-Cope: Premenstrual Change Coping Inventory, SCAS: Self-Care Agency Scale.

As shown in Table 2, the mean total PMSS score was 146.38±41.45. The mean subscale scores were 24.15±6.90 for depressive feelings, 21.38±7.17 for anxiety, 21.30±6.39 for fatigue, 17.20±5.66 for irritability, 22.47±7.64 for depressive thinking, 10.29±3.54 for pain, 10.09±3.72 for appetite changes, 9.91±3.55 for sleep disturbances, and 9.54±3.80 for bloating. The mean total PMS-Cope score was 47.50±11.00, with mean subscale scores of 19.52±4.83 for Seeking Positive Affect, 14.51±4.04 for Seeking Support, and 13.46±3.73 for Using Healthcare. The mean total SCAS score was 94.07±19.76. Cronbach's alpha coefficients for the scales and their subscales ranged from 0.78 to 0.98, indicating high reliability.

As presented in Table 3, positive correlations were observed between the total SCAS score and the total and subscale scores of PMS-Cope (r=0.309–0.471, p<0.001). In contrast, weak negative correlations were found between the total SCAS score and the total PMSS score (r=-0.141, p=0.013), as well as the PMSS subscales of depressive thinking (r=-0.206, p<0.001), irritability (r=-0.173, p=0.002), depressive feelings (r=-0.138, p=0.015), and anxiety (r=-0.142, p=0.012). Additionally, weak positive correlations were observed between the Seeking Support and Using Healthcare subscales of PMS-Cope and the PMSS total score and several PMSS subscales (r=0.113–0.175, p=0.002–0.046) (Table 3).

Table 4 presents comparisons of SCAS, PMSS, and PMS-Cope scores according to selected health-related lifestyle behaviors. Students who did not smoke or consume alcohol had significantly higher SCAS scores than those who did (t=−2.845, p=0.005; t=-3.300, p=0.001, respectively). Similarly, students who exercised regularly had significantly higher SCAS scores than those who did not (t=2.340, p=0.020) (Table 4).

Discussion

This study examined the relationship between coping with premenstrual syndrome and self-care agency among female university students. The findings highlight that PMS as a common health concern among university students, consistent with previous literature.[13,27-29] A substantial proportion of participants reported PMS symptoms, particularly depressive feelings, anxiety, fatigue, irritability, and headaches, with symptom scores generally higher than those reported in similar studies conducted in Türkiye.[6] Differences in study populations should be considered when interpreting these findings. Similarly, Eshetu et al.[2] identified depressive feelings, abdominal pain, and fatigue among the most common premenstrual symptoms. These findings suggest that, despite sociocultural variations, PMS may substantially affect university students' mental health, potentially influencing academic performance and quality of life. Nurses play an important role in supporting female university students in managing PMS by providing education on self-care strategies, monitoring symptoms, and offering counseling, thereby encouraging students to take an active role in managing their health. Therefore, increasing awareness of PMS management strategies may help young women improve their quality of life.[1]

The mean PMS-Cope and Self-Care Agency Scale scores were above the theoretical midpoints of their respective scales. Compared with previous studies by Sarı Çetin and Erbil[24] and Akın and Erbil,[13] participants in the present study appeared to use more effective coping strategies for PMS. However, these findings should be interpreted cautiously, as differences in study populations and characteristics may have contributed to the observed variations. In the present study, the mean scores for the Seeking Positive Affect, Seeking Support, and Using Healthcare subscales of PMS-Cope were also above their respective theoretical midpoints. Similarly, previous studies have indicated that university students use various coping strategies, including resting, sleeping, and practicing yoga, suggesting that coping methods may vary according to individual preferences and cultural contexts.[2,29]

The findings suggest that self-care agency may play an important role in how female university students cope with premenstrual symptoms. Similarly, a study in which students received an e-book on self-care found that they tended to adopt healthy lifestyle behaviors to cope with PMS, highlighting the relationship between self-care and physical and emotional health and its potential contribution to psychological well-being.[30] Consistent with these findings, previous studies have reported positive associations between self-care abilities, overall health, and psychological well-being.[14,31]

The findings of this study highlight the relationship between self-care agency and the emotional and psychological aspects of PMS, particularly depressive feelings, anxiety, irritability, and depressive thinking. Higher self-care agency may be associated with a lower burden of emotional and psychological PMS symptoms. This interpretation is consistent with previous studies.

The findings of this study suggest that support-seeking behaviors and healthcare utilization are associated with the experience of PMS symptoms, indicating that women experiencing premenstrual symptoms may be more likely to seek support and use healthcare services. Similarly, a recent study reported generally positive attitudes toward seeking psychological help for PMS and identified a positive correlation between PMS severity and help-seeking behaviors.[32] Furthermore, the Using Healthcare subscale was positively associated with specific PMS symptoms, including depressive feelings, anxiety, irritability, pain, appetite changes, sleep disturbances, and bloating. Consistent with these findings, previous research has shown that students with higher anxiety and pain scores used healthcare services more frequently,[13] while some students employed methods such as analgesics or heat application to manage dysmenorrhea.[33] These findings highlight the association between premenstrual symptom experiences, help-seeking behaviors, and the utilization of professional healthcare services.

The findings of this study suggest that healthy lifestyle behaviors, such as avoiding smoking and alcohol consumption and engaging in regular exercise, may be associated with greater self-care agency among university students. A previous study reported that engagement in health-promoting lifestyle behaviors was positively associated with self-care agency.[34] Similarly, a study involving nursing students highlighted the positive association between self-efficacy and health-promoting lifestyle behaviors, emphasizing the importance of promoting healthy lifestyle practices to support students' overall health and well-being.[35] These findings highlight the potential value of promoting self-care skills and healthy lifestyle behaviors to support university students in managing PMS.[14,31] Nurses may provide education, guidance, and psychological support to strengthen students' coping abilities and overall well-being, potentially facilitating better adjustment during stressful periods of university life.

Limitations

This study has several limitations. First, because of its cross-sectional design, the phase of the menstrual cycle was not considered when participants completed the questionnaires. Therefore, the possibility of recall bias regarding premenstrual symptoms cannot be excluded. Second, the sample was limited to students from a single university, which may restrict the generalizability of the findings. Third, the data were collected exclusively through self-reported questionnaires, which may limit the objectivity of the findings. Furthermore, menstrual regularity, lifestyle factors such as dietary and sleep habits, and variations in stress levels may have influenced the results. These factors should be considered in future research.

Conclusion

This study supports the finding that PMS is a common health concern among female university students and may affect their psychological and physical health. The findings suggest that greater self-care agency may be linked to more effective coping with PMS among female university students. Students who reported healthier lifestyle behaviors, including not smoking, avoiding alcohol consumption, and exercising regularly, tended to have higher self-care agency scores. These findings highlight the potential importance of healthy lifestyle habits and self-care skills in relation to coping with PMS. Based on these findings, university health programs should consider incorporating education and guidance aimed at strengthening self-care behaviors and promoting healthy lifestyle habits. Additionally, psychological support and self-care training initiatives may help students manage both the physical and emotional symptoms of PMS, contributing to improved well-being and potentially supporting academic performance. Stakeholders, including educators, healthcare professionals, and policymakers, should consider integrating these strategies into university health services to address PMS as an important student health concern.

Ethics Committee Approval: The study was approved by the Kastamonu University Social Sciences and Humanities Scientific Research and Publication Ethics Committee (Approval Number: 22, Date: 06.08.2024).

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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Corrigendum

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

In the published article entitled “Association Between Diabetes Risk and Attitudes Toward Healthy Eating Among Adults Visiting a Shopping Center in Istanbul” (DOI: 10.14744/Jern.2026.40336), the data collection dates were incorrectly stated as “October 14 and 15, 2024” in the Methods section of the Abstract and under the Data Collection heading.

The correct dates are “December 14 and 15, 2024.”

The authors regret this error.

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