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Assessing knowledge, attitudes, and skills toward evidence-based practice among Palestinian nursing students

Moath Abu Ejheisheh¹, Ahmad Ayed², Ibrahim Aqtam^{3*}, Ahmad Batran¹ and Mosaab Farajallah¹

Abstract

Introduction Evidence-based practice (EBP) integrates clinical expertise, patient preferences, and research evidence to guide healthcare decisions. Despite its global importance, research on EBP competencies among Palestinian nursing students remains limited. This study aims to explicitly assess EBP competency levels; knowledge, attitudes, and skills, while identifying key predictors and barriers affecting EBP integration.

Methods A cross-sectional study was conducted with 273 nursing students from Palestine Ahliya University using the validated Evidence-Based Practice Competence Questionnaire (EBP-COQ). Data were analyzed using descriptive statistics, Pearson correlation, and multiple linear regression.

Results Participants exhibited moderate evidence-based practice (EBP) competency, with an overall score of 59.4% (mean = 74.3/125). Domain-specific scores revealed knowledge (58%), attitudes (62%), and skills (58%) at comparable levels. Multiple linear regression identified academic progression (fourth-year status: $\beta = 5.982$, $p < 0.001$) and self-directed learning (papers read monthly: $\beta = 3.133$, $p < 0.001$) as strong predictors of higher competency. Notably, prior EBP training showed a significant negative correlation with competency ($r = -0.492$, $p < 0.001$), raising concerns about the quality and effectiveness of existing training programs.

Conclusion This study provides the first systematic assessment of EBP competency among Palestinian nursing students. While academic progression and self-directed learning enhance competency, concerns over the quality of EBP training programs require urgent attention. The findings underscore the need for curriculum reforms, structured mentorship, and improved access to research resources to enhance EBP integration into nursing education and practice in Palestine.

Clinical trial number Not applicable.

Keywords Evidence-based practice, Nursing education, EBP competency, Nursing students, Palestine, Predictors, Barriers

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Introduction

Evidence-Based Practice (EBP) is a cornerstone of modern healthcare, integrating clinical expertise, patient preferences, and the best available research evidence to guide decision-making [1, 2]. Over the past two decades, EBP has evolved into a global imperative for improving patient outcomes, reducing healthcare costs, and standardizing care delivery [3, 4]. However, their adoption has been uneven, particularly in low- and middle-income countries (LMICs), where systemic barriers to training, underfunding of health systems, and resistance at both cultural and individual levels to care based on the best evidence persist [5, 6]. For instance, Jordan and Saudi Arabian studies indicate that only 25–30% of nurses in these countries utilize EBP principles in daily practice due to the fragmented nature of the curricula and lack of mentorship in these countries [7, 8]. However, these problems are further accentuated in Palestine by political turbulence, resource deficits, and the health system exhausted by long-lasting conflict [9, 10]. Recent studies also suggest that less than 25% of Palestinian nurses feel confident to critically appraise research or apply findings to clinical practice [9]. There is no systematic assessment study regarding EBP competencies among the future workforce of Palestinian nursing students, who will be responsible for addressing such systemic gaps.

Undergraduate nursing education thus provides the critical impetus for developing EBP readiness. International studies show that when students are exposed early to EBP principles, there is an improvement in clinical decision-making and patient safety [2, 11]. Nevertheless, institutions from the LMIC face challenges like an overcrowding program, faculty shortage, and inadequate subscription to research databases that negatively affect integrating EBP into their curricula [12, 13]. In Palestine, nursing education is also faced with other challenges: frequent disruptions by political unrest and a lack of institutional infrastructure to support evidence-based training [9]. This condition is further aggravated by the lack of localized data on student competencies, wherein educators do not have any evidence to inform curriculum reforms. The present study fills this critical gap in the literature by assessing knowledge, attitudes, and skills toward EBP among Palestinian nursing students. By identifying predictors of competency and systemic barriers, the findings aim to inform targeted interventions to enhance EBP integration in Palestine's nursing education and healthcare system.

Literature review

History of the development of EBP in nursing

EBP came into prominence in the 1980s as a paradigm shift toward data-driven care, an extension of Florence Nightingale's early emphasis on systematic clinical

observation. According to Melnyk & Fineout-Overholt, the seminal work of Sackett et al. defined EBP in 1996 as the conscientious integration of individual clinical expertise, patient values, and the best available research evidence [1, 3]. Over time, the development of frameworks stressed competencies in three domains: knowledge, which involves understanding research methods; attitudes, which encompass valuing evidence in decision-making; and skills, which encompass appraising and applying evidence [14]. These competencies are now seen as crucial to bridging the research-practice gap, especially in nursing, where clinical decisions have direct influences on patient outcomes [15].

Global challenges in EBP implementation

Despite its established benefits, the adoption of EBP remains inconsistent across the globe. Structured training programs and institutional support have upgraded the level of competency among nurses in high-income countries. For instance, in the United States, 75% of the nurses use EBP in practice, and their access to digital libraries and also clinical mentors ensures this [16, 17]. Systemic barriers to EBP are present in LMICs because of scarce resources, poorly financed curricula, and resistance in culture toward evidence-driven care [5, 13]. In Rwanda, only 12% of nursing students demonstrate proficiency in appraising research, attributed to limited faculty expertise and reliance on outdated textbooks [18]. Similarly, studies in Jordan and Saudi Arabia reveal that nursing graduates lack confidence in EBP skills, with curricula prioritizing theoretical knowledge over practical application [7, 8]. These differences in experiences again point to the need for context-specific strategies aimed at redressing systemic inequalities.

EBP within the Palestinian context

Palestine's health system has to grapple with some specific constraints, which include political instability, resource constraints, and fragmentation in governance, among others [9, 10]. Recent studies have underlined significant deficiencies in EBP awareness among Palestinian nurses, with only 22% feeling confident to critically appraise research and 18% routinely applying evidence into practice [9]. Barriers include insufficient training, high patient-to-nurse ratios, and limited access to journals; issues exacerbated by geopolitical challenges such as movement restrictions and funding cuts [12]. While Dabak et al. identified these gaps among ICU nurses; no studies have evaluated competencies among nursing students, who represent the future workforce tasked with overcoming these challenges [9]. This is in contrast to other countries, such as Jordan, where student-centered assessments have driven curriculum changes, including

the incorporation of EBP modules into clinical placements [19].

Unresolved questions and competing evidence

There are contradictions in the literature regarding predictors of EBP competence. Whereas some studies report academic progress as a predictor of increased skill [18], others identify self-directed learning as a more significant predictor [11, 17]. There have been similar divisions regarding the influence of formal training, for example; Melnyk et al. found that structured EBP training enhances competency while Cruz et al. reported no significant improvement in poorly designed programs. Such contradictions indicate the role played by context—that of poor and good quality of training as well as institutional support—those local assessments must be done to present interventions [8, 16].

Research gap

No previous studies have comprehensively assessed EBP competencies among Palestinian nursing students or identified context-specific barriers. While research on EBP competency in LMICs exists, Palestine presents unique structural and geopolitical challenges that hinder EBP integration beyond typical LMIC constraints. Political instability disrupts education (Qadri et al., 2023), resource shortages limit access to research databases [9, 10], and fragmented governance weakens policy enforcement [6]. These factors create an environment where EBP adoption faces distinct obstacles, necessitating localized data to drive effective reforms. Without such research, nursing curricula may remain misaligned with actual barriers faced by Palestinian students, limiting their preparedness for evidence-based practice [5].

This study addresses this critical gap by evaluating knowledge, attitudes, and skills related to EBP among Palestinian nursing students, identifying predictors of competency, and highlighting barriers specific to this setting. Findings will inform tailored strategies to enhance EBP integration in Palestinian nursing education and practice.

Theoretical framework

A well-defined theoretical framework strengthens research by providing a structured approach to understanding and interpreting findings. This study integrates Stevens' Star Model of Knowledge Transformation as a guiding framework. The model conceptualizes EBP as a five-stage process: (1) Discovery Research, (2) Evidence Summary, (3) Translation to Guidelines, (4) Practice Integration, and (5) Evaluation [19]. By applying this model, we assess how Palestinian nursing students engage with EBP knowledge and identify gaps in their ability to translate research into clinical practice.

Additionally, Rogers' Diffusion of Innovations Theory provides insight into the adoption of EBP in nursing education. The theory explains how innovations spread through social systems and identifies factors influencing adoption, including perceived advantages, compatibility with existing practices, and access to resources [20]. This perspective helps contextualize the challenges Palestinian students face in integrating EBP and highlights strategies to accelerate its uptake through curriculum reforms, mentorship, and institutional support.

Methods

Study design and setting

This study assessed evidence-based practice (EBP) competencies among undergraduate nursing students at Palestine Ahliya University, Bethlehem, Palestine, using a descriptive cross-sectional approach. Data collection occurred from September to October 2023 during the first academic semester. A cross-sectional design was chosen for its ability to measure knowledge, attitudes, and skills at a single point in time, facilitating the identification of gaps and predictors of competency.

Participants and sampling

Target population

The study targeted second-, third-, and fourth-year Bachelor of Nursing students ($N=800$). First-year students were excluded as EBP courses were not included in their foundational curriculum.

Sampling strategy

A convenience sampling method was employed due to practical considerations beyond logistical constraints, including political instability, which frequently disrupts academic schedules, making probability sampling difficult [10]; limited research infrastructure, a common challenge in LMICs, where convenience sampling is a feasible alternative [5]; and ensuring a high response rate (95.8%), capturing a broad representation of nursing students across different academic years.

Sample size calculation

Using Raosoft's sample size calculator, a 95% confidence level, 5% margin of error, and 50% response distribution required a minimum sample of 260 students. To account for non-response and incomplete data, 285 students were invited, and 273 provided complete responses (response rate: 95.8%).

Inclusion criteria

- Enrollment in the second, third, or fourth year of the Bachelor of Nursing program.
- Provision of written informed consent.

Exclusion criteria

- First-year students, diploma students, and master's candidates.
- Incomplete questionnaires or missing consent.

Instrumentation

Demographic questionnaire

A self-completion questionnaire collected participant characteristics, including age (years), gender (male, female, or other, with an open-response option), and academic year (second, third, or fourth), self-directed learning (number of peer-reviewed papers read per month: 0, 1–2, 3–4), and prior EBP training (yes/no for formal workshops, courses, or seminars in the last year).

Evidence-based practice competence questionnaire (EBP-COQ)

The EBP-COQ is a validated 25-item tool measuring three EBP competency domains: knowledge (6 items), assessing understanding of research methodologies and EBP principles (e.g., study design comprehension); attitudes (13 items), evaluating the perceived value of EBP in clinical decision-making (e.g., “EBP improves patient care”); and skills (6 items), measuring the ability to critically evaluate and apply research evidence (e.g., synthesizing findings into practice). Responses were measured on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Negatively worded items were reverse-scored to minimize response bias. Scores ranged from 25 to 125, with higher scores indicating greater competency. Subscale scores were reported as percentages of the total possible score (e.g., knowledge score of $2.9/5 = 58\%$ competency).

The EBP-COQ has been previously used among nursing students in Saudi Arabia and Oman [21], countries that share cultural and educational similarities with Palestine. The test–retest reliability values for EBP-COQ subscales were 0.95 for attitudes, 0.93 for skills, and 0.96 for knowledge.

Table 1 Demographic characteristics of participants (N = 273)

Variable	Mean (SD)	Frequency (%)
Age (years)	20.7 (1.3)	—
Gender		
Male	—	141 (51.6%)
Female	—	132 (48.4%)
Academic Year		
Second Year	—	87 (31.9%)
Third Year	—	91 (33.3%)
Fourth Year	—	95 (34.8%)
Papers Read Monthly	2.3 (0.9)	—
Prior EBP Training (Yes)	—	60 (22.0%)

Data collection procedures

Paper-based questionnaires were distributed during scheduled lectures by trained researchers, who provided participants with written and verbal explanations of the study's purpose, confidentiality measures, and voluntary participation. The questionnaire distributed in English version as the study of nursing in Palestine in English. Completed questionnaires were secured in locked cabinets, and the data were digitized and stored as password-protected files using Advanced Encryption Standard (AES).

Statistical analysis

Data were analyzed using SPSS 26, with descriptive statistics (mean, standard deviation, and frequencies) used to summarize participant characteristics and competency scores. Pearson's correlation was applied to examine associations between age, papers read monthly, and EBP competency, while independent t-tests compared competency scores based on gender and prior EBP training. One-way ANOVA was conducted to assess differences in EBP competency across academic years. To identify significant predictors of competency, multiple linear regression analysis was performed. Multicollinearity was checked using variance inflation factors (VIFs), ensuring all values remained below 10, and statistical significance was set at $p < 0.05$. Incomplete questionnaires ($n = 12$) were excluded, and no data imputation was performed.

Results

Participant characteristics

The sample consisted of 273 nursing students, with an average age of 20.7 years (SD = 1.3). Males accounted for 51.6% of the sample ($n = 141$). Participants were distributed across academic years as follows: second year (31.9%, $n = 87$), third year (33.3%, $n = 91$), and fourth year (34.8%, $n = 95$). Only 22.0% ($n = 60$) reported previous formal EBP training, indicating limited structured exposure to EBP education. On average, participants read 2.3 peer-reviewed research papers per month (SD = 0.9) (Table 1). Given the relatively low proportion of students with prior EBP training, further exploration of the quality and content of these training programs is warranted.

EBP competency scores

Table 2 presents the evidence-based practice (EBP) competency scores among Palestinian nursing students, showing a moderate overall competency (59.4%, Mean = 74.3/125) with domain-specific disparities. Attitudes toward EBP were the strongest domain (62%, Mean = 40.3/65), reflecting students' recognition of EBP's value in clinical decision-making, while knowledge (58%, Mean = 2.9/5 per item) and skills (58%, Mean = 2.9/5 per

Table 2 Evidence-based practice competency scores

Domain	Mean (SD)	Percentage
Overall	74.3 (8.8)	59.4%
Knowledge	2.9 (0.7) per item	58%
Attitudes	40.3 (8.4)	62%
Skills	2.9 (0.5) per item	58%

Table 3 Association between EBP competency and demographic variables

Variable	Test statistic (value)	p-value
Age	$r = 0.818$	< 0.001*
Gender	$t = 1.21$	0.089
Academic year	$F = 14.72$	< 0.001*
Papers read monthly	$r = 0.709$	< 0.001*
Prior EBP training	$t = -3.02$	0.003*

Note: Statistical tests were applied as follows: Pearson's correlation for Age and Papers Read Monthly. Independent t-test for Gender and Prior EBP Training. One-way ANOVA for Academic Year

* $p < 0.05$ indicates statistical significance

item) lagged behind, indicating comparable gaps in students' ability to critically appraise and apply evidence.

Students demonstrated a foundational understanding of EBP principles, such as research methodologies, but the lower knowledge and skills scores suggest persistent challenges in translating theoretical concepts into practice. A mean knowledge score of 2.9/5 per item implies limited mastery of advanced EBP topics, such as critically evaluating study designs or synthesizing findings, while the identical skills score highlights difficulties in executing EBP steps, such as formulating clinical questions or integrating evidence into care plans.

The higher attitudinal scores (62%) underscore students' willingness to adopt EBP but also reveal a critical disconnect: positive perceptions alone do not guarantee competency. These findings highlight the need for targeted interventions, including structured workshops to strengthen critical appraisal and application skills, mentorship programs bridging the gap between theoretical knowledge and clinical practice, and curriculum reforms integrating simulation-based EBP activities. Addressing these gaps can better equip Palestinian nursing students to implement evidence-based care in resource-constrained settings.

Associations between EBP competency and demographic variables

Table 3 showed a significant effect of academic year on EBP competency was observed ($F = 14.72$, $p < 0.001$), with fourth-year students scoring notably higher than those in lower years. Gender differences were non-significant ($t = 1.21$, $p = 0.089$), aligning with previous findings. Interestingly, prior EBP training had a significant but paradoxical effect ($t = -3.02$, $p = 0.003$), as students who had received training reported lower overall competency.

Table 4 Predictors of EBP competency (multiple linear regression)

Predictor	Unstandardized beta (B)	95% CI	Significance (p)
Age	2.602	1.816–3.389	< 0.001*
Study year (fourth)	5.982	4.953–7.011	< 0.001*
Papers read monthly	3.133	2.358–3.909	< 0.001*
Prior EBP training	7.492	5.841–9.143	< 0.001*

* $p < 0.05$ indicates statistical significance

Table 5 Variance inflation factor (VIF) for predictors

Predictor	VIF
Age	1.524
Study year (fourth year)	2.103
Number of papers read in the last month	1.876
Status of receiving education/training on EBP (yes)	2.241

Predictors of EBP competency

A multiple linear regression model explained 83.1% of the variance in EBP competency ($R^2 = 0.831$, $F = 112.4$, $p < 0.001$), indicating a strong predictive model (Table 4). The strongest predictors were fourth-year status ($B = 5.982$, 95% CI: 4.953–7.011, $p < 0.001$) and self-directed learning ($B = 3.133$ for papers read monthly, 95% CI: 2.358–3.909, $p < 0.001$). Age was also a significant predictor ($B = 2.602$, 95% CI: 1.816–3.389, $p < 0.001$).

Interestingly, despite the negative correlation found earlier, prior EBP training showed a paradoxical positive association in regression analysis ($B = 7.492$, 95% CI: 5.841–9.143, $p < 0.001$). This contradiction suggests that while students with prior EBP training may have had lower baseline competency, the training itself still contributed positively when controlling for other factors. This further reinforces the need for qualitative research to assess the quality of these training programs.

The high R^2 value (0.831) raises the possibility of overfitting, potentially due to multicollinearity among predictors. Therefore, a Variance Inflation Factor (VIF) test was conducted to assess collinearity. All VIF values were below the commonly accepted threshold of 10, suggesting that multicollinearity was not a significant concern in this model, as seen in Table 5.

Discussion

Palestinian nursing students demonstrated moderate EBP competency with an overall score of 59.4%. Knowledge (58%), attitudes (62%), and skills (58%) were relatively balanced, indicating the need for holistic educational interventions. Compared to global trends, Palestinian students exhibited lower EBP competency than their peers in high-income countries, where structured curricula and institutional support contribute to significantly higher competency rates [16, 17]. However, their scores were comparable to other LMICs, such as Jordan

and Rwanda, where resource limitations and training gaps hinder EBP readiness [18, 22].

A key finding was the paradoxical relationship between prior EBP training and competency. While training was expected to enhance skills, it showed a negative correlation with competency scores, suggesting potential shortcomings in training quality. This aligns with studies in Saudi Arabia and other LMICs, where EBP training is often theoretical, lacks clinical application, and is not reinforced through mentorship [8]. Several alternative hypotheses could explain this finding. First, Palestinian EBP training programs may emphasize rote learning over hands-on application, leading to minimal skill acquisition. Second, students with weaker baseline competencies may be more likely to seek EBP training, resulting in an inverse correlation in bivariate analysis. Third, if training is not reinforced through practical application, students may struggle to translate theoretical knowledge into real-world decision-making. Finally, students who undergo training may become more aware of their knowledge gaps, leading to lower self-assessment scores, a phenomenon linked to the Dunning-Kruger effect [10]. Future researches should incorporate qualitative methods to assess student perceptions of training effectiveness and identify gaps in content delivery.

The moderate competency levels observed in Palestinian nursing students are consistent with other conflict-affected regions, such as Iraq and Syria, where EBP adoption is hindered by educational disruptions, high patient-to-nurse ratios, and restricted academic resources [2]. However, Palestine's scores remain higher than in some LMICs (e.g., below 50% in Syria), suggesting that despite political instability, some level of EBP integration exists within Palestinian nursing curricula. In contrast, high-income countries such as the United States, the United Kingdom, and Australia report EBP competency rates exceeding 75% [16, 17]. This disparity can be attributed to structural differences, including early exposure to EBP in nursing education, access to digital research tools, and integration of EBP within clinical placements. Additionally, post-pandemic reforms in high-income countries have further emphasized digital literacy and interprofessional collaboration in EBP training. These comparisons highlight the need for structural reforms in Palestinian nursing education to bridge the competency gap.

The multiple regression model explained 83.1% of the variance in EBP competency ($R^2 = 0.831$), a notably high value compared to prior LMIC studies (e.g., 45–60% in Jordan and Rwanda) [18, 22]. While this underscores the model's predictive strength, the strong correlation between age and study year ($r=0.818$) suggests potential overfitting. Future studies should apply cross-validation techniques to confirm the model's generalizability.

Nevertheless, the strong predictive role of academic progression and self-directed learning aligns with global trends observed in post-pandemic nursing education [17]. This suggests that enhancing research engagement and promoting independent learning may be universally effective strategies for improving EBP competency.

While this study recommends curriculum reforms, mentorship programs, and improved resource allocation, these initiatives must align with international frameworks to maximize impact. The World Health Organization (WHO) has outlined four key pillars for strengthening EBP in nursing education: First, EBP should be introduced in the first year of nursing education, rather than being delayed to advanced courses. Second, simulation-based training, journal clubs, and problem-based learning should replace passive, lecture-based instruction. Third, experienced clinicians should mentor students to bridge the gap between theory and practice. Fourth, nursing institutions should establish agreements with platforms like HINARI and PubMed Central to provide students with free access to high-quality research. By aligning Palestinian nursing education with WHO recommendations, these reforms can create a sustainable framework for long-term EBP integration [23–25].

Implications for nursing education and policy

Strategic reforms are necessary to enhance EBP competencies among Palestinian nursing students. Key recommendations include: integrating EBP training throughout all academic years and emphasizing hands-on application through simulated clinical appraisals, partnering with NGOs and academic institutions to provide free access to digital research databases, leveraging diaspora networks to connect students with EBP-competent clinicians for guided skill development, and regularly evaluating EBP training quality to ensure alignment with international standards. These interventions will create an enabling environment for sustainable EBP integration in Palestinian nursing education and healthcare systems.

Limitations

This study has several limitations. The cross-sectional design prevents causal inferences, highlighting the need for longitudinal studies to track competency progression. Self-report bias may have inflated competency scores, particularly in attitudes and skills assessments. Convenience sampling may have overrepresented highly motivated students, limiting the generalizability of findings. Political instability and resource shortages, critical barriers in Palestine, were not directly measured but likely influenced competency outcomes. Additionally, this study focused exclusively on second, third, and fourth-year nursing students, excluding practicing nurses from the sample. While this approach provides valuable

insights into EBP competency at the undergraduate level, it limits the study's applicability to real-world clinical settings, where professional nurses may encounter different barriers and facilitators to EBP implementation. Since EBP skills continue to develop beyond undergraduate education, this study does not capture how competency evolves in professional practice. Future research should include expert nurses working in clinical settings to assess how EBP knowledge, attitudes, and skills develop with experience and workplace exposure. Another limitation of this study is the unexpected negative correlation between prior EBP training and competency, which requires further exploration. This finding may be influenced by variations in the quality, duration, and delivery methods of EBP training, as well as students' self-perceived competency before and after training. However, the study did not include qualitative data to assess students' perspectives on the effectiveness of their training. Future research incorporating qualitative insights, such as focus groups or interviews, could provide a deeper understanding of how training quality impacts EBP competency. These limitations highlight the need for cautious interpretation of the findings and further studies addressing these constraints.

Future research directions

To enhance understanding of EBP competencies in Palestinian nursing education, future research should focus on assessing the quality and content of EBP training programs to detect pedagogical gaps, exploring cultural and geopolitical barriers to EBP adoption through mixed-methods research, and conducting comparative studies in other LMICs to distinguish universal vs. context-specific competency predictors. Furthermore, future studies could consider cross-validation techniques or an independent test sample to further confirm the generalizability of the model and mitigate potential overfitting.

Conclusion

This study provides the first comprehensive assessment of EBP competencies among Palestinian nursing students. While academic progress and self-directed learning enhance preparedness, systemic deficits in training quality and resource access require urgent attention. Aligning Palestinian nursing education with WHO strategies, investing in mentorship programs, and improving research accessibility are essential steps toward advancing evidence-based care in Palestine.

Author contributions

M.A.E. initiated the study, developed the research design, and supervised the overall implementation of the project. A.A. provided critical input on the study design, guided the data analysis process, and contributed to the manuscript drafting and revisions. I.A. assisted in refining the methodology, supported data interpretation, and contributed to manuscript editing. A.B. and M.F. participated in data collection, conducted preliminary analyses, and assisted

in preparing the initial draft of the manuscript. All authors reviewed and approved the final version of the manuscript for submission. They agree to be accountable for all aspects of the work, ensuring that any questions related to accuracy or integrity are appropriately addressed and resolved.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Institutional Review Board of Palestine Ahliya University (IRB: CAMS/BSN/2024/123). The study adhered to the principles of the Helsinki Declaration. Written informed consent was obtained from all participants prior to their involvement, with guarantees of anonymity and the right to withdraw at any stage without consequences. Data security protocols aligned with the Palestinian Data Protection Act, 2022 [21].

Consent for publication

We affirm that this work is original and has not been published elsewhere, except as noted in the manuscript.

Competing interests

The authors declare no competing interests.

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