Gender-Based Differences in Critical Thinking Levels among Nursing Students: A Cross - Sectional Study

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Abstract

Aims: This study aimed to examine gender-based differences in critical thinking levels among nursing students.

Methods: A quantitative descriptive-analytic study with a cross-sectional design was performed. A total of 267 nursing students were included as respondents using a total sampling technique. Data were collected using the Nursing Critical Thinking in Students Questionnaire (N-CT-4). Univariate analysis was used to describe the respondents' characteristics and critical thinking levels. The Mann–Whitney U test was used to compare critical thinking domain scores between male and female students, while the Chi-square test was applied to compare the distribution of critical thinking levels by gender.

Results: The mean age of the respondents was 21.09±0.70 years, with the majority being female (86.9%). Most students demonstrated moderate critical thinking (50.9%). Male students showed higher median scores across all domains of critical thinking, including personal (130 vs. 123), intellectual (148 vs. 145), interpersonal (71 vs. 62), and technical (21 vs. 19) domains. However, the Mann–Whitney U test showed no statistically significant differences between male and female students in the personal (p = 0.396), intellectual (p = 0.759), interpersonal (p = 0.270), or technical (p = 0.523) domains. The Chi-square test showed a significant difference in the distribution of critical thinking levels by gender (x^2=6.276; p=0.043).

Conclusion: Nursing students generally demonstrated moderate critical thinking, with intellectual skills strongest and technical skills weakest. Gender influenced overall level distribution but not domain scores, highlighting the need for adaptive, inclusive, and student-centered learning.

Keywords: Critical Thinking, Gender, Clinical Learning, Nursing Students

Introduction

Critical thinking is a core competency that nursing students must develop. This ability plays a crucial role in clinical decision-making and the performance of daily nursing tasks (Esa et al., 2023). Through critical thinking, nurses can analyze complex clinical situations, systematically evaluate information, and determine safe, effective, and evidence-based nursing interventions (Aldiabat et al., 2021). Accordingly, critical

thinking constitutes a fundamental element of problem-solving processes and serves as an important indicator of nursing professionalism. Conceptually, critical thinking is a cognitive process that involves the analysis and evaluation of information to support sound reasoning, judgment, and decision-making, thereby reducing the risk of errors and optimizing patient care outcomes (Zuriguel-Pérez et al., 2019).

Several studies have demonstrated a significant positive relationship between the level of critical thinking and the clinical decision-making abilities of nursing students (Görücü & Ünal, 2025; Zarzycka et al., 2022). The integration of critical thinking into the nursing curriculum has been shown to enhance students' cognitive, social, and professional competencies. Furthermore, critical thinking skills are strongly associated with nursing students' problem-solving abilities.

In nursing education, critical thinking is not a single general ability but rather a multidimensional construct. The nursing critical thinking in clinical practice framework measures critical thinking through several dimensions, including personal characteristics, intellectual and cognitive skills, interpersonal and self-management skills, and technical skills (Zuriguel-Pérez et al., 2022). These dimensions are theoretically relevant to gender-based differences because variations in learning styles, classroom interaction patterns, clinical exposure, communication confidence, and sociocultural expectations in nursing education may shape students' critical thinking. For example, interpersonal and self-management skills may be influenced by students' participation in classroom discussions and clinical communication, whereas academic engagement, clinical practice opportunities, and confidence in decision making may shape intellectual-cognitive and technical dimensions.

Gender is one factor that may be associated with critical thinking. Several studies have reported differences in cognitive abilities between men and women. Lager et al. (2024) found that males tend to excel in spatial and analytical abilities, whereas females demonstrate superior perceptual speed and attention to detail. Similarly, Giofrè et al. (2024) reported that although general intelligence between men and women is relatively comparable, men tend to perform better on tasks involving spatial manipulation, whereas women show better performance on tasks requiring attentional control and inhibition. A study (Nabilah et al., 2020) also identified gender-based cognitive differences, particularly in memory-related domains. In nursing education, these cognitive and behavioral variations may influence how students analyze patient information, communicate clinical reasoning, respond to learning activities, and engage in reflective or in case-based learning.

However, findings regarding the relationship between gender and critical thinking remain inconclusive. Studies conducted in Taiwan (Liu et al., 2019) and Portugal (Santos et al., 2025) reported that gender does not significantly influence nursing students' critical thinking skills. In contrast, studies from Iran (Ali-Abadi et al., 2020) and Vietnam (Van Nguyen & Liu, 2021) identified significant gender-related differences in critical thinking ability. A study in the United Kingdom (Harrison, 2019) further suggested that gender role orientation, rather than biological sex, plays a more influential role in shaping nursing students' critical thinking skills. Additionally, a study conducted in Malaysia (Ruslan & Ruslan, 2024) found a significant association between gender and critical thinking levels.

In Indonesia, evidence of critical thinking among nursing students has started to emerge, but it remains limited. Previous Indonesian studies have examined critical thinking levels among nursing students in private nursing institutions and found that many students still had a moderate level of critical thinking (Adelia et al., 2024). Another study reported the development of critical thinking skills across academic semesters, suggesting that students' critical thinking may vary according to academic progression and learning exposure (Adelia, Alwi, et al., 2026). More recently, demographic and academic factors, including gender and academic characteristics, were found to be related to critical thinking skills among Indonesian nursing students (Adelia, Pérez, et al., 2026). Nevertheless, these studies have not fully clarified how gender is specifically positioned in relation to critical thinking levels among Indonesian nursing students. Therefore, there is still a need for evidence from Indonesia and Southeast Asia to explain whether gender-based differences in critical thinking exist and how such findings can inform a more inclusive nursing pedagogy.

Beyond gender-related factors, various instructional strategies, such as active learning, concept mapping, simulation, problem-based learning, and case-based studies, have been shown to enhance students' critical thinking abilities (Zarzycka et al., 2022). However, there is limited empirical evidence to guide gender-sensitive educational strategies in nursing education, particularly in Indonesia. This gap is important because nursing educators need evidence to design learning approaches that provide equal opportunities for male and female students to develop critical thinking, clinical reasoning, communication, and decision-making skills. Therefore, this study adds to the existing body of knowledge by providing empirical evidence of gender-based differences in critical thinking levels among nursing students in the Indonesian context. The findings are expected to support nursing educators in developing more inclusive, responsive, and effective pedagogical strategies to strengthen critical thinking as a foundation for professional nursing practice.

Based on this background, this study aimed to analyze gender-based differences in critical thinking levels among nursing students. The findings are expected to contribute to nursing education by providing evidence for the development of gender-sensitive learning strategies that promote critical thinking, improve clinical decision-making readiness, and support the preparation of competent future nurses.

Methods

This study employed a quantitative approach with a cross-sectional design to examine the relationship between gender and critical thinking abilities among nursing students. This study was conducted in August 2025 at a private nursing education institution in Indonesia. The study population comprised all undergraduate nursing students who had completed the Comprehensive Clinical Skill Examination (CCSE), totaling 270 students. A total sampling technique was used because the entire population was accessible and met the study's criteria. Of the total population, 267 students completed the questionnaire, yielding a response rate of 98.8%.

The inclusion criteria were as follows: students who were actively enrolled in the nursing program, had completed the CCSE, and were willing to participate by signing an informed consent form. The exclusion criteria were students who did not complete the questionnaire and those who refused or withdrew from the study during the data collection process. The respondents completed the questionnaire independently within approximately 15–20 minutes. Although the instrument consisted of 109 items, each

item was brief, used a consistent four-point Likert response format, and was presented in a structured sequence, allowing respondents to complete the questionnaire within the stated time frame. To maintain data quality, the respondents were given clear instructions before completing the questionnaire. In addition, the data collection process was monitored by the researcher and trained research assistants to ensure response completeness. Incomplete questionnaires were excluded from the final analyses.

Gender was treated as the independent variable and categorized as male and female, while critical thinking ability was considered the dependent variable and measured using the Nursing Critical Thinking in Students Questionnaire (N-CT-4) developed by (Zuriguel-Pérez et al., 2022). Formal permission to use the instrument was obtained directly from the original authors via e-mail. The instrument was used to assess the critical thinking ability of nursing students. This framework includes four major dimensions of critical thinking: personal characteristics, intellectual and cognitive abilities, interpersonal and self-management competencies, and technical and procedural clinical competencies of nurses. The personal dimension consisted of 39 items, the intellectual and cognitive dimensions consisted of 44 items, the interpersonal and self-management dimensions consisted of 20 items, and the technical dimension consisted of 6 items.

All items were scored using a four-point Likert scale, ranging from 1, “never or almost never,” to 4, “always or almost always,” with higher scores indicating stronger critical thinking skills. The total score was obtained by summing all the item scores, with a possible score range of 109–436. The total score was then categorized into three interpretive levels: low (< 321.5), moderate (321.6–388.4), and high (> 388.5). Previous validation studies reported excellent psychometric performance, with an overall Cronbach’s alpha of 0.96 and subscale reliability coefficients ranging from 0.81 to 0.94, indicating strong internal consistency across all dimensions

Data analysis was conducted using univariate and bivariate statistical methods. Univariate analysis was used to describe the respondent characteristics and the distribution of critical thinking ability in terms of frequency, percentage, mean, standard deviation, median, and interquartile range, according to the type and distribution of the data. As the data were not normally distributed (Kolmogorov–Smirnov test, $p < 0.05$), the Mann–Whitney U test was used to compare continuous critical thinking between male and female students.

In addition to being analyzed as continuous scores, critical thinking scores were categorized as low, moderate, and high to provide a more interpretable description of students’ critical thinking competence. The Chi-square test was used to compare the distribution of critical thinking level categories between male and female students. Both analyses were intended to provide complementary rather than redundant information. The Mann–Whitney U test was used to assess differences in the distribution of total critical thinking scores by gender, whereas the Chi-square test was used to determine whether the distribution of critical thinking level categories differed between male and female students. The level of statistical significance was set at $P < 0.05$. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 26.

This study was conducted in accordance with the principles of research ethics. Participation was voluntary, and respondents were provided with an information sheet explaining the study objectives, procedures, and potential risks and benefits prior to the data collection. Written informed consent was obtained from all participants, and confidentiality was maintained through anonymization and secure data storage of the data. Ethical approval for this study was granted by the Health Research Ethics Committee of IKes Payung Negeri (Reference No. 1055/Ikes PN/F.Kep/03/XI/20240)

Results

Among 270 nursing students who were eligible and invited to participate, 267 completed the questionnaire and were included in the final analysis, resulting in a response rate of 98.8%. Three students were excluded because they did not complete the questionnaire or they declined to participate.

The mean age of the respondents was 21.09 years (SD=0.70), ranging from 19 to 25 years. Most respondents were female (232 students, 86.9%), while 35 students (13.1%) were male. Regarding critical thinking levels, more than half of the respondents were categorized as having a moderate level of critical thinking (50.9%), followed by high (34.1%) and low (15.0 %) levels (Table 1).

Table 1. Characteristics of Respondents and Critical Thinking Levels (n=267)

Variables		Mean	± SD	Minimum	Maximum
Age (years)		21.09	0.70	19	25
				n	**%**
Gender	Male			35	13.1
	Female			323	86.9
Critical Thinking Level	Low			40	15.0
	Moderate			136	50.9
	High			91	34.1

Bivariate analysis was conducted to examine the relationship between gender and the domains of critical thinking among nursing students (Table 2), as well as the relationship between gender and the overall level of critical thinking among nursing students (Table 3).

Overall, male students demonstrated higher median scores across all the domains compared to female students (Table 2). In the personal domain, male students had a median score of 130 (IQR=31), compared with 123 (IQR=21) among female students. In the intellectual domain, the median score for male students was 148 (IQR=45), whereas female students had a median score of 145 (IQR=36). In the interpersonal domain, male students achieved a median of 71 (IQR=20), and that of female students was 62 (IQR=18). Similarly, in the technical domain, male students had a median score of 21 (IQR=6), compared to 19 (IQR=6) among female students Analysis using the Pearson Chi-square test revealed a statistically significant relationship between gender and the level of critical thinking (x^2=6.276, df=2, p=0.043) (Table 3).

Table 2. Comparison of Critical Thinking Domain Scores by Gender Among Nursing Students (n = 267)

Variable	Gender	n	Median (IQR)	Range	Mean Rank	p-value
Personal Domain	Male	35	130 (31)	39–156	144.31	0.396
	Female	232	123 (21)	77–156	132.44	
Intellectual Domain	Male	35	148 (45)	88–176	137.71	0.759
	Female	232	145 (36)	88–176	133.44	
Interpersonal Domain	Male	35	71 (20)	37–80	147.13	0.270
	Female	232	62 (18)	40–80	132.02	
Technical Domain	Male	35	21 (6)	12–24	141.46	0.523
	Female	232	19 (6)	8–24	132.88	

Note: The Mann–Whitney U test was used to compare critical thinking domain scores between male and female students. Statistical significance was set at $p < 0.05$.

Table 3. Distribution of Critical Thinking Levels by Gender Among Nursing Students (n = 267)

Level of Critical Thinking	Male n (%)	Female n (%)	Total n (%)	p-value
Low	8 (22.9%)	32 (13.8%)	40 (15.0%)	
Moderate	11 (31.4%)	125 (53.9%)	136 (50.9%)	0.043*
High	16 (45.7%)	75 (32.3%)	91 (34.1%)	
Total	35 (100%)	232 (100%)	267 (100%)	

Note: Pearson Chi-square test was used to compare the distribution of critical thinking levels between male and female students. *$p < 0.05$ indicates statistical significance

Discussion

This study provides empirical evidence of gender-based patterns of critical thinking among nursing students in the Indonesian nursing education context. The results revealed critical thinking using two complementary approaches: domain-level scores and categorized critical thinking levels. Most respondents demonstrated a moderate level of critical thinking, suggesting that their critical thinking competence was still developing. In nursing education, a moderate level of critical thinking suggests that students may be able to understand clinical information, apply nursing concepts, and engage in basic clinical reasoning; however, the students may still need further support to strengthen reflective judgment, prioritization, and decision-making in complex clinical situations.

The findings of this study are consistent with previous research reporting that nursing students generally demonstrate moderate levels of critical thinking (Basco-Prado et al., 2024; Hashish et al., 2018; Nes et al., 2023). However, studies from Iran have reported lower levels (Shirazi & Heidari, 2019), whereas research from Portugal, Malaysia, and Canada has found higher levels of critical thinking among nursing students (Aldiabat et al., 2021; Ruslan & Ruslan, 2024). These differences may reflect variations in curriculum design, teaching approaches, clinical learning experiences, assessment methods, and educational or cultural contexts. In Indonesia, several studies have shown that innovative learning strategies, such as mentoring programs, the 5E learning cycle with Case-Based Learning, and Problem-Based Learning, can effectively enhance nursing students' critical thinking (Kusumawati et al., 2019; Sihaloho et al., 2025; Sulaiman & Azizah, 2020).

Previous studies have shown that a range of educational interventions can effectively improve nursing students' critical thinking abilities. Sihaloho et al. (2025) reported that a mentoring program had a positive and significant effect on students' critical thinking abilities through the use of a standardized nursing language. Kusumawati et al. (2019) showed that integrating the 5E learning cycle model with Case-Based Learning significantly improved students' critical thinking tendencies. Similarly, Sulaiman and Azizah (2020) reported that Problem-Based Learning was effective in promoting the development of critical thinking skills. Other clinical learning strategies, such as clinical conferences, simulations, demonstration models, concept mapping, and nursing rounds, have also been reported to play an important role in strengthening nursing students' critical thinking skills (Patmawati et al., 2018). (Joae et al., 2020) also found that mentoring programs had a significant positive impact on critical thinking abilities

Male students had higher median levels than female students across all four critical thinking domains, but the differences were not statistically significant. Therefore, these findings should be interpreted with caution and regarded as a descriptive pattern that requires confirmation in studies with larger and more balanced samples. For both male and female students, the intellectual domain showed the highest median level, whereas the technical domain showed the lowest, suggesting that students may be stronger in conceptual reasoning than in applying critical thinking during clinical practice. This finding highlights the need for nursing education to strengthen students' ability to integrate critical thinking with technical and procedural skills required for safe and effective patient care.

Similar findings were reported by Nemati-Vakilabad et al. (2023), who reported that nursing students' achieved the highest critical thinking scores in the intellectual-cognitive dimension and the lowest in the technical dimension. Similar results were documented by Martínez-Momblan et al. (2023), who found that the intellectual and cognitive domains received the highest scores, whereas the technical domain received the lowest. These patterns suggest that the conceptual aspects of critical thinking are more strongly developed than technical skills in nursing education. Some studies in the Indonesian context explained that clinical education commonly uses experiential learning and the achievement of clinical learning outcomes depends partly on students' characteristics as inputs that influence the effectiveness of experience-based learning Etlidawati & Yulistika; 2022). Individual, environmental, and curricular factors contribute to the gap between theoretical knowledge and clinical practice in hospital settings (Kurniawan, 2020).

Overall, this study contributes to nursing education by providing Indonesian evidence of gender-based patterns of critical thinking using a multidimensional instrument. The simultaneous examination of domain-level scores and categorical levels offers a nuanced understanding of critical thinking among nursing students. Although domain-level differences by gender were not statistically significant, the significant difference in the distribution of critical thinking levels suggests that gender-related learning patterns require further attention. Future studies should involve larger and more gender-balanced samples, include multiple nursing education institutions, and examine other factors such as academic performance, learning style, clinical exposure, classroom participation, and gender role orientation

Limitations
This study had several limitations that should be considered when interpreting the findings. First, the gender distribution of the participants was unequal, with female students representing the majority of the sample. This imbalance may have affected the comparison of critical thinking levels between male and female students; therefore, gender-related findings should be interpreted cautiously. Second, data were collected using a self-reported questionnaire, which may not fully reflect students' actual critical thinking performance in clinical settings.

Contribution to global nursing practice
This study contributes to global nursing practice by providing empirical evidence of the relationship between gender and critical thinking abilities among nursing students. These findings highlight the importance of understanding individual and demographic factors in the development of critical thinking skills, which are essential for safe, effective, and evidence-based nursing practice. By identifying patterns in critical thinking across genders, this study offers insights that can inform curriculum development, teaching strategies, and learning approaches in nursing education. Furthermore, the results support the need for educational interventions that foster critical thinking in diverse student populations.

Conclusion
This study found that most nursing students demonstrated a moderate level of critical thinking, suggesting that their critical thinking skills are still developing and may require additional educational support. At the domain level, the intellectual domain showed the highest median scores, whereas the technical domain showed the lowest scores, indicating that students may be stronger in the conceptual and cognitive aspects than in the technical or procedural aspects of critical thinking. Although male students had slightly higher median scores across all critical thinking domains, the differences were not statistically significant. However, the distribution of critical thinking levels differed significantly by gender. Nursing educators may need to pay greater attention to students' critical thinking development, particularly in strengthening the integration of clinical reasoning with technical and procedural competencies in the curriculum.

Author Contribution
All authors made significant contributions to the conception and design of the study, acquisition, analysis, and interpretation of data, and drafting and revising the manuscript critically for important intellectual content. All authors have read and approved the final manuscript and have taken responsibility for the integrity and accuracy of the work.

Conflict of interest
The authors declare no conflicts of interest.

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