

Association Between Nursing Students' Knowledge and Attitude Toward Fundamentals of Nursing

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Doi: [10.33899/mjn.2025.187798](https://doi.org/10.33899/mjn.2025.187798)

Received: February 16 2025; Revised: 29 April 2025; Accepted: July 01 2025

Abstract

Background and Objectives: Nursing students look at the encounter of developing a wide-ranging thoughtful of and expectations for entering nursing programs, as well as what they will encounter in theoretical situations. Outlines such as the "ways of knowing" help students hypothesize and critically reproduce on significant processes in their specialized learning. Thus, the aim of this study is to assess nursing students' knowledge and attitudes toward the fundamentals of nursing.

Methodology: A cross-sectional design was conducted among 148 baccalaureate nurse students from 2nd and 3rd stages via an online Google Form survey using a purposeful sampling technique. The response rate was 70.9%, considering a 20% dropout rate. Only 105 participants were included and analyzed using appropriate statistical analysis methods.

Results: The findings show a statistically significant ($<0.0001^*$) association between knowledge and attitude. The mean age was (23.06 ± 0.92) and were aged < 25 years. The majority of the participants were females and zankoline system mode registration. However, among students with good knowledge ($n = 65$), the majority (54.29%) also had a good attitude, while only a small percentage (7.62%) showed a poor attitude. In contrast, among students with poor knowledge ($n = 40$), 26.67% maintained a good attitude, but 11.43% had both poor knowledge and a poor attitude.

Conclusions: The study outcomes highlighted a weak positive association between knowledge and attitude among nursing students. Enhancing knowledge through engaging teaching methods and active learning strategies could improve students' attitudes, fostering greater motivation, engagement, and professional commitment in nursing education.

Keywords: *Nursing Students' Knowledge Attitude Fundamentals of Nursing*

Introduction

The fundamentals of nursing are a set of core nursing conditioning that bolster nurse health care capabilities (Halcomb, Stephens, Bryce, Foley, & Ashley, 2016). They include communication, nutrition, hygiene, mobility, rest and sleep, the expression of affection, safety (e.g., forestallment of infections and falls), general comfort (e.g., conservation of acceptable temperature and pain control), and elimination (Pentecost et al., 2020). The fundamentals of nursing are presented within a frame that consists of three disciplines physical(case's physiological requirements), psychosocial(patient requirements related to the environment in which they live, in particular the need to communicate, the need to be involved in the care process, sequestration, quality, cerebral well-being, respect, being educated and informed about their health status, and the need to see their beliefs and values admired), and relational(nurses' conduct in their relationship with cases, similar as active listening, empathy, uniting with the case, being compassionate, supporting cases and their family members, laboriously informing them about the progress made during the period of treatment, and helping them maintain a state of cerebral well- being)(Bagnasco et al., 2022). The fundamentals of nursing involve conduct on the part of the nanny that respect and concentrate on a person's essential requirements to insure their physical and psychosocial well- being (Ilgaz & Gözüm, 2019). These requirements are met by developing a positive and trusting relationship with the person being watched for, as well as their family caregivers (Bourke, Johns, & Martin, 2024). The International Council of nurse (2017) defines nursing as encompassing independent and cooperative care of individualities of all periods, families, groups, and communities, sick or well, and in all settings (Zumstein-Shaha & Grace, 2023). Nursing includes the creation of health, forestallment of illness, and the care of ill, impaired, and dying people, advocacy, creation of a safe terrain, exploration, and participation in shaping health policy (Kirk Koyama, 2018). Henderson defines nursing as aiding the existent, sick or well, in the performance of those conditioning contributing to health or its recovery (or to peaceful death) that they would perform unaided if they had the necessary strength, will, or knowledge (Pineiro, Santo, Chibante, & Pestana, 2016). There's substantiation that the nursing profession has not been suitable to give quality introductory nursing or the fundamentals of care as constantly or adequately as demanded (Feo, Kitson, & Conroy, 2018).

Nursing scholars frequently favor the further specialized aspects of care, but if health care becomes decreasingly specialized, there are serious safety enterprises when fundamentals similar

as communication are overlooked (Clark, 2025). Thus, preceptors, clinical teachers, and instructors play a pivotal part in guiding scholars' attention towards understanding the significance and the multidimensional complexity of the fundamentals of nursing (Tuomikoski, Ruotsalainen, Mikkonen, & Kääriäinen, 2020). This action significantly contributed to substantiation-grounded introductory nursing care by raising mindfulness of the significance of essential nursing conditioning within the class (Stevens, 2013). Being substantiation in undergraduate nursing education suggests only low-to-moderate pupil knowledge about palliative care. One explanation may be that undergraduate nursing classes give limited and/or inconsistent content about palliative and end-of-life care (Dimoula et al., 2019). Where theoretical and practical training on palliative care has been completely integrated into undergraduate nursing programs, it has not only advanced scholars' knowledge but also led to further liberal stations towards death, dying, and end-of-life care. This can indeed alleviate the goods of factors similar as scholars' age, gender, or former experience of death in the family that can impact how nursers develop positive or negative stations towards palliative and end-of-life care and preferences and clinical circumstances in decision-timber (Jiang, Lu, Ying, & Zhao, 2019). A harmonious finding in the literature is that nursers particularly warrant confidence and chops in relation to the exploration element of substantiation-grounded practice (EBP) and may hold negative stations toward exploration (Li, Cao, & Zhu, 2019). This is an important issue since faculty in EBP requires nursers to be complete in a range of exploration knowledge chops, including relating knowledge gaps, searching applicable literature effectively, and assessing exploration substantiation (Shamsaee, Mangolian Shahrabaki, Ahmadian, Farokhzadian, & Fatehi, 2021). Although cohesion between clinical and academic tutoring surrounds is crucial to undergraduate nursing education, exploration has yet to explore whether patterns of EBP relinquishment, perpetration, and walls are similar across similar surrounds (Fiset, Graham, & Davies, 2017). Likewise, there's a lack of exploration exploring nanny preceptors' EBP biographies across countries' healthcare systems (Skela-Savič et al., 2020). The positive station of nursers toward nursing scholars is significantly involved in the socialization of these scholars (Matsumori & Kageyama, 2021). likewise, proper communication between nursers and nursing scholars could ameliorate the relations between healthcare centers and universities. On the other hand, a negative station of nursers toward nursing scholars could negatively affect their education and lead to a nursing staff deficit (Aydogdu, 2024). Also, in aiming at reaching and assuring high situations of patient safety, strategies are continuously designed, tested, and enforced in clinical settings (Braithwaite,

Marks, & Taylor, 2014). This is where nursing scholars are exposed to a complicated world told by numerous factors socially, economically, and politically (Llop-Gironés et al., 2021). It's important to note that stress has been honored as a psychosocial factor in the clinical literacy terrain that may affect the well-being of nursing scholars (He, Turnbull, Kirshbaum, Phillips, & Klainin-Yobas, 2018). Prior to examining ways of knowing in nursing, it's important to establish the philosophical base of knowledge in nursing as a whole (Weaver & Olson, 2006). Nursing is a practice-grounded discipline that has a professional and societal accreditation to use a body of knowledge and chops aimed at furnishing quality case care (Sherwood, 2024). The term "knowledge" refers to knowing that can be communicated to others (Fussell & Krauss, 1992). Knowledge is particular, involves patterns of recognition, and is a function of both the bystander and the miracle being viewed (Faye, 2023). Knowing is also a dynamic process that refers to ways of perceiving and understanding the tone in the environment of the terrain (Woods, Rudd, Robertson, & Davids, 2020). In a discipline similar as nursing, knowledge represents what's taken to be a participated understanding of the world as it's known by its members (Jones, Willis, Amorim-Lopes, Drach-Zahavy, & 15208, 2019). Knowledge is abecedarian to logic and decision-timber and, thus, central to professional practice (Loughran, 2019). Hampton, D., et al. (2017) compared the literacy preferences of nursing scholars in a traditional undergraduate baccalaureate nursing program with accelerated nursing scholars who had earned a former degree (Hampton, Pearce, & Moser, 2017). They set up that scholar in the accelerated program spent further time in medication for class than those in the traditional nursing program (El-Banna, Whitlow, & McNelis, 2017). Conditioning for class medication were analogous between the two groups, with utmost scholars reporting assigned readings or handbooks, completing study attendants or written assignments, and reviewing handouts as their primary means of medication (Han & Klein, 2019). Preferred learning styles were also analogous in the two groups, with 50 of the scholars indicating a desire for a multimodal approach, while 9- 16 of the scholars indicated a preference for either an audible, visual, read/write system of literacy, or a kinesthetic system (El-Aziz El Naggar, 2016). Other studies support the fact that scholars bring a variety of learning styles with them to the educational experience (Costa, Souza, Valentim, & Castro, 2020).

All societies are going through a life revolution. Inflating the senior's age group will present numerous challenges to the healthcare system (Alqahtani, Almuhaideb, & Jradi, 2022). A better health pool is demanded to meet this demand. Little is known about the knowledge and stations of medical and nursing scholars toward senior care in Saudi Arabia. This study aims to explore medical and

nursing scholars' knowledge about growing and their station toward minding for aged grown-ups (Alamri & Xiao, 2017). Knowledge, stations, and practices of fourth- time nursing scholars regarding the care of people living with HIV/ AIDS(PLWH) are also examined. Despite some notable advancements in HIV/ AIDS reduction or relief, the war against the HIV epidemic is not over, as numerous people are blindly believing currently. An innumerable number of exploration studies have been conducted on nursers' knowledge, stations, and practices when minding for people living with HIV/ AIDS (Kiyene, 2021). The encyclopedically growing demand for reciprocal and indispensable drug (CAM) has attracted preceptors' attention to integrate CAM into conventional nursing programs. This methodical review aimed to understand the status quo of nursing scholars' overall rated knowledge of, stations beliefs toward, and practices former use or experience (KAP) of CAM in checks, as these factors may impact nursing scholars' receptivity to CAM classes and may be of value in guiding the development of effective tutoring strategies (F.-Y. Zhao et al., 2022). Ensuring icing safety in healthcare settings is provoking advancements both in education and clinical practice. still, the studies available have not offered information to date regarding knowledge and capability on patient safety developed by nursing scholars over their academic careers (Stevanin et al., 2015). According to Rycroft-Malone and Stetler (2004), knowledge can be categorized into two discrete categories: propositional and non-propositional. Propositional knowledge is formal and explicit, originates from research and scholarship, and is primarily focused on generalizability. Non-propositional knowledge is informal and implicit, is derived primarily from practice, consists of tacit or professional craft knowledge, and is linked to the individual's life experiences and cognitive resources that enable him or her to think and perform. Non-propositional knowledge is not concerned with transferability (i.e., generalizability) beyond a particular situation. It is evident that multiple sources of both propositional and non-propositional knowledge are integrated and relied upon within the nursing profession(Qualls, 2020). Nursing students' knowledge and attitudes toward the fundamentals of nursing are essential components of their educational journey and professional development. Fundamentals of nursing encompass a wide range of foundational concepts, including but not limited to anatomy, physiology, pharmacology, nursing theory, ethics, communication, and patient-centered care. A strong grasp of these fundamentals is crucial for nursing students as they transition from classroom learning to clinical practice settings, where they must apply theoretical knowledge to provide holistic and evidence-based care to diverse patient populations. The significance of this research topic lies in its potential to identify gaps in nursing education, assess the effectiveness of

educational interventions, inform curriculum development, and ultimately enhance the quality of nursing education programs. By understanding nursing students' knowledge levels and attitudes toward fundamental nursing concepts, educators and policymakers can tailor educational strategies, resources, and support systems to optimize learning outcomes and prepare students for the complexities of modern healthcare environments. Additionally, cultivating a positive attitude toward nursing principles, ethics, and professionalism is crucial for building effective communication skills, fostering patient trust, and promoting a culture of safety in healthcare settings. However, the purpose of this descriptive study was to assess nursing students' knowledge and attitudes toward the fundamentals of nursing at the College of Nursing – University of Duhok. Nevertheless, nursing education is a dynamic and evolving field that plays a pivotal role in preparing future healthcare professionals to deliver safe, effective, and compassionate care. Central to nursing education is the development of nursing students' knowledge and attitudes toward the fundamentals of nursing. Moreover, nursing education plays a crucial role in preparing future healthcare professionals to deliver high-quality care and promote positive patient outcomes. Fundamental knowledge and a positive attitude toward the core principles of nursing are essential components of nursing education. This study aims to assess the nursing students' knowledge and attitudes toward the fundamentals of nursing, highlighting its significance, challenges, and implications for nursing education and practice.

Methodology

A descriptive quantitative study was conducted using a cross-sectional design to assess nursing students' knowledge and attitude toward the fundamentals of nursing. In this study, the undergraduate baccalaureate nursing students were from the College of Nursing at the University of Duhok. The participants were recruited based on criteria including similar students who were taking the fundamentals of nursing subject in the first year of the nursing program. A total of 148 nursing students were enrolled in the study from the academic years 2021-2023 through online Google Form surveys via purposeful sampling techniques, including 2nd and 3rd stages during the whole study from the 1st and 2nd semesters. A purposeful sampling method was used to achieve the main goal of the study. For ethical purposes, an official letter from the dean of the nursing college was approved to conduct data collection from nursing students. A set of questionnaires from earlier studies was adopted and modified using five-point Likert scale questionnaires to assess first-year nursing students' knowledge and attitude toward the fundamentals of nursing subject. An online Google Sheets survey with open-ended question links was sent to 148 nursing students, which consisted of

60 items divided into 3 sections. Only 106 students filled out and responded to the questions, with each response submitted only once per student for any reason. The response rate was 70.9%. One student was excluded due to inadequate information; therefore, only 105 students were included in the study.

Section A: Socio-Demographic Characteristics

The first section of the questionnaire included a ten-item survey about the socio-demographics that asked students about their age (in years), gender (male, female), mode of student registration (online system, parallel private), marital status (single, married), educational level (2nd year and 3rd year), family monthly income (<1,000,000 IQD., >1,000,000 IQD), city (Duhok, others), place of living (home or accommodation/dorm), student religion (Muslim and Yazidi), and students' preferred teaching language (Kurdish, Arabic, and English). The aim of this section of the questionnaire is to evaluate the distribution of socio-demographic characteristics among the participants.

Section B: Nursing Students' Knowledge

This section consists of twenty-six items that have been modified and improved from prior research instruments used to assess students' knowledge. This part contains questions stated as "Yes" or "No" via open-ended responses. Responses were rated as follows: (1 = "Yes"), (0 = "No"). Zero points were given only for the response "No," and 1 point was given for "Yes." Therefore, the total sum score ranges from 9 to 26 for knowledge and is divided into two groups: (9-17), <17 is considered as poor knowledge, and (18-26), >where scores <17 are considered poor knowledge, and (18-26), where scores >17 are considered good knowledge. Furthermore, the students' knowledge is divided into themes as follows: items (1, 2, 3) cover curriculum structure and content; items (4, 5, 6, 7, 8) cover learning environment and class conditions; items (9, 10, 11, 12, 13, 14, 15, 16, 17, 18) cover teaching methods and effectiveness; items (19, 20, 21) cover language and communication; and items (22, 23, 24, 25, 26) cover teaching innovations and preferences.

Section C: Nursing Students' Attitudes

This section consists of twenty-four items concerning nursing students' attitudes, which include five Likert scale items via open-ended questions asking students. The tools have been modified and improved from prior research instruments. Each item was rated on a 5-point Likert scale ranging from 1 to 5. The five features of the items were rated as follows: (1 = "strongly disagree"), (2 = "disagree"), (3 = "neutral"), (4 = "agree"), and (5 = "strongly agree"). One point was

given only for the response "strongly disagree," and 5 points were given for "strongly agree." Consequently, the total sum score ranges from 41 to 120 and is divided into two groups: <71 is considered as poor attitudes. The (72-120), (41-71), where scores <71 are considered poor attitudes, and (72-120), where scores >71 are considered good attitudes. Additionally, the nursing students' attitudes are divided into themes as follows: items (1, 2, 3, 4, 5, 6) cover perception and importance of fundamentals of nursing; items (7, 8, 9, 10, 11, 12) cover teaching and learning experiences; items (13, 14, 15, 16) cover professional and future perspectives; and items (17, 18, 19, 20) cover innovation and future contributions.

Data Collection and Analysis Procedures

The data collection procedures were conducted via online Google Sheets surveys that were automatically saved in an Excel file, making it easy to transfer to a statistical analysis program. However, this step begins after finalizing the data collection. Proper data arrangement and the definition of variables with continuous or categorical datasets in the research are essential for selecting the most suitable statistical analysis methods and tests, resulting from effective data organization and management. Understanding the various forms of data is critical for accurately describing and presenting them, as well as ensuring the confidentiality of the participants. In this study, the data were coded to protect the identity of the nurses involved. The initial steps of data presentation involve introducing and familiarizing all aspects of data management and treatment, which include coding, entering the raw datasets, and analyzing processes with double checks to identify any missing steps, incorrectly computed entries, or incomplete data. This oversight was conducted by the supervisor. In this study, the JMP version 16 software program was used for statistical analysis. Additionally, the cumulative scores of the tools were recorded as a continuous variable.

Results

The results of the current study are designed to answer all research questions, elaborating and presenting an inclusive summary of the statistical analysis results of the study. A total of 105 nursing students were enrolled in this study, with an overall response rate of 70.9%. The study results were interpreted in the subsequent sections based on the research objectives.

Table. Frequency Distribution of Students' Demographic and Background Characteristics (n = 105)

Variables & Categories	n (%)	Mean \pm SD
Age (years)		23.06 \pm 0.92
< 25 years	99 (94.3)	
\geq 25 years	6 (5.7)	
Gender		
Male	32 (30.5)	
Female	73 (69.5)	
Student Registration Mode		
Parallel (Private)	23 (21.9)	
Zankoline (System)	82 (78.1)	
Marital Status		
Single	103 (98.1)	
Married	2 (1.9)	
Educational Level (Stage)		
Second Class	61 (58.1)	
Third Class	44 (41.9)	
Family Monthly Income (IQD)		
< 1,000,000 IQD	64 (60.9)	
\geq 1,000,000 IQD	41 (39.1)	
City (Town)		
Duhok	57 (54.2)	
Others	48 (45.8)	
Place of Living		
Home	34 (32.4)	
Student Accommodation (Dormitory)	71 (67.6)	
Religion		
Muslim	93 (88.6)	
Yazidi	12 (11.4)	
Preferred Teaching Language		
Arabic	7 (6.6)	
English	8 (7.7)	
Kurdish	90 (85.7)	
Total	105 (100%)	

Note. N = 105; n and (%) represent frequencies and percentages; **SD** = Standard Deviation; **IQD** = Iraqi Dinars.

TABLE 1, shows the result indicating that the study surveyed 105 nursing students, with an average age of 23.06 years. Most were under 25 (94.3%), and the majority were female (69.5%), reflecting global trends in nursing education. 78.1% of the students were enrolled through the public Zankoline system, while 21.9% were in the private parallel system. Nearly all students (98.1%) were single, and the participants were fairly evenly split between second-class (58.1%) and third-class students (41.9%). Economically, 60.9% of students came from families earning less than 1,000,000 IQD a month, indicating a lower-income background for many. Geographically, 54.2% were from Duhok, while the rest came from other regions. Most students (67.6%) lived in dormitories, suggesting that many relocated for their studies. Religiously, 88.6% were Muslim, and 11.4% were Yazidi, reflecting the region's diversity. When it came to language preference, most students (85.7%) preferred Kurdish, followed by English (7.7%) and Arabic (6.6%). In conclusion, nursing students in this study are mainly young, female, and from a mix of economic backgrounds.

TABLE 2 Nursing students' knowledge Themes Frequency Distribution

Themes	Item Numbers	Frequency Distribution		
		Minimum & Maximum	Median	Mean \pm Std Dev.*
§ Curriculum structure and content	(1,2,3)	0-3	2	2 \pm 0.69
§ Learning environment and class conditions	(4, 5,6,7,8)	0-5	3	3.18 \pm 1.37
§ Teaching methods and effectiveness	(9,10,11,12,13,14,15,16,17,18)	0-10	8	7.31 \pm 2.07
§ Language and communication	(19,20,21)	0-3	2	2.20 \pm 0.82
§ Teaching innovations and preferences	(22,23,24,25,26)	0-5	4	3.55 \pm 1.30

Note/ N = 105; Std. Dev.* = Standard Deviation.

TABLE 2, the results indicated that the analysis of nursing students' knowledge themes highlighted key insights into their perceptions of curriculum structure, learning environment, teaching methods, communication, and instructional innovations. Students rated the curriculum structure as moderately effective (mean = 2.00, SD = 0.69), suggesting some concerns with content delivery.

The learning environment received a mean score of 3.18 (SD = 1.37), indicating varied experiences, with some students facing challenges in classroom conditions. Teaching methods were generally seen as effective (mean = 7.31, SD = 2.07), although there was variability in responses, suggesting the need for more consistency. Language and communication were perceived as adequate (mean = 2.20, SD = 0.82), but language barriers remained a concern for some students. Students expressed strong support for teaching innovations (mean = 3.55, SD = 1.30), especially those incorporating technology, though preferences varied. These findings indicated that while students appreciate effective teaching and innovation, improvements in curriculum content, classroom conditions, and communication are needed to enhance the overall learning experience in nursing education.

TABLE 3 Nursing students' Attitude Frequency Distribution

Themes	Item Numbers	Frequency Distribution		
		Minimum & Maximum	Median	Mean \pm Std *
Perception and importance of fundamentals of nursing	(1,2,3,4,5,6)	0-30	21	21.14 \pm 4.95
Teaching and learning experience	(3,4,5,6,7,8,9,10,11,12)	10-50	36	35.27 \pm 7.58
Professional and future perspectives	(17,18,19,20)	4-20	13	13.80 \pm 3.64
Innovation and future contributions	(21,22,23,24)	4-20	15	14.38 \pm 3.64

TABLE 3, the results indicated that the assessment of nursing students' attitudes (N = 105) across four key themes nursing fundamentals, teaching and learning experiences, professional perspectives, and innovation revealed valuable insights. Students generally recognized the importance of nursing fundamentals (mean = 21.14, SD = 4.95); however, some showed differences in confidence or understanding. Their teaching and learning experiences were mostly positive (mean = 35.27, SD = 7.58), but some faced challenges with teaching quality. Regarding professional perspectives, students were optimistic about their careers (mean = 13.80, SD = 3.64), though additional career guidance may be needed. On innovation, students acknowledged the evolving nature of nursing (mean = 14.38, SD = 3.64), but some felt unprepared to contribute to advancements. Overall, while nursing students held positive attitudes, more support in professional development and exposure to innovative practices is needed to better prepare them for the future of nursing.

TABLE 4 Nursing students' knowledge Scores by Themes

Themes	Item Numbers	Inferential Statistics		
		Mean \pm Std Dev.*	R ² (R-squared)**	(Prob<t)** P-value
Nursing students' knowledge Scores by Themes				
§ Curriculum structure and content	(1,2,3)	2 \pm 0.69	0.177	<0.0001
§ Learning environment and class conditions	(4, 5,6,7,8)	3.18 \pm 1.37	0.420	<0.0001
§ Teaching methods and effectiveness	(9,10,11,12,13,14,15,16,17,18)	7.31 \pm 2.07	0.725	<0.0001
§ Language and communication	(19,20,21)	2.20 \pm 0.82	0.282	<0.0001
§ Teaching innovations and preferences	(22,23,24,25,26)	3.55 \pm 1.30	0.458	<0.0001
Note/ N = 105; Std. Dev.* = Standard Deviation; (Prob<t)** = t-test. analysis				

TABLE 4, the results indicated that the analysis of nursing students' knowledge (N = 105) across five key themes—curriculum structure, learning environment, teaching methods, language and

communication, and teaching innovations—revealed important perceptions regarding the effectiveness of nursing education. The curriculum structure scored a mean of 2.00 (SD = 0.69), indicating a basic understanding but with room for improvement in content delivery. The learning environment had a mean of 3.18 (SD = 1.37), and its higher R-squared value (0.420) suggests that improving classroom conditions can significantly impact knowledge acquisition. Teaching methods, with the highest mean score of 7.31 (SD = 2.07), were identified as the most significant predictor of students' knowledge, emphasizing the importance of active learning strategies. Language and communication had a moderate impact on knowledge (mean = 2.20, SD = 0.82), highlighting the need for better clarity and multilingual support. Teaching innovations, with a mean of 3.55 (SD = 1.30), showed students' positive responses to modern educational techniques. Overall, the results indicate that enhancing teaching effectiveness, improving classroom environments, and integrating innovative methods can significantly boost students' knowledge and readiness for clinical practice.

TABLE 5 Nursing students' Attitude Scores by Themes groups

Attitude Themes Scores by Attitude groups	Item Numbers	Inferential Statistics		
		Mean \pm Std Dev.*	R ² (R-squared)**	(Prob<t)** P-value
Perception and importance of fundamentals of nursing				
Good Attitude	(1,2,3,4,5,6)	22.61 \pm 3.94	0.377	<0.0001
Poor Attitude		14.9 \pm 3.80		
Teaching and learning experience				
Good Attitude	(3,4,5,6,7,8,9,10,11,12)	37.61 \pm 5.85	0.407	<0.0001
Poor Attitude		25.35 \pm 5.89		
Professional and future perspectives				
Good Attitude	(17,18,19,20)	14.68 \pm 3.26	0.246	<0.0001
Poor Attitude		10.1 \pm 2.73		
Innovation and future contributions				
Good Attitude	(21,22,23,24)	15.6 \pm 2.64	0.4789	<0.0001
Poor Attitude		9.2 \pm 2.64		
Note/ N = 105; Std. Dev.* = Standard Deviation; R²** ; One-way Anova				

TABLE 5, in order to investigate the nursing students' attitude scores by theme groups, t-test analysis was used, and the results indicated that the analysis of nursing students' attitudes (N = 105) across four themes fundamentals of nursing, teaching and learning experience, professional perspectives, and innovation revealed key insights. Students with a good attitude toward nursing fundamentals scored higher (mean = 22.61, SD = 3.94) than those with a poor attitude (mean = 14.90, SD = 3.80),

indicating that a strong foundation in nursing is linked to greater commitment. Regarding teaching experiences, students with a positive attitude scored higher (mean = 37.61, SD = 5.85) than those with a poor attitude (mean = 25.35, SD = 5.89), emphasizing the importance of engaging, student-centered teaching. In terms of professional and future perspectives, students with a good attitude toward their future careers scored better (mean = 14.68, SD = 3.26) compared to those with a poor attitude (mean = 10.10, SD = 2.73). Finally, the most significant difference was found in attitudes toward innovation, with those having a positive attitude scoring higher (mean = 15.60, SD = 2.64) than those with a poor attitude (mean = 9.20, SD = 2.64). These results highlight the importance of interactive teaching, career support, and fostering innovation to enhance nursing students' engagement and commitment to the profession.

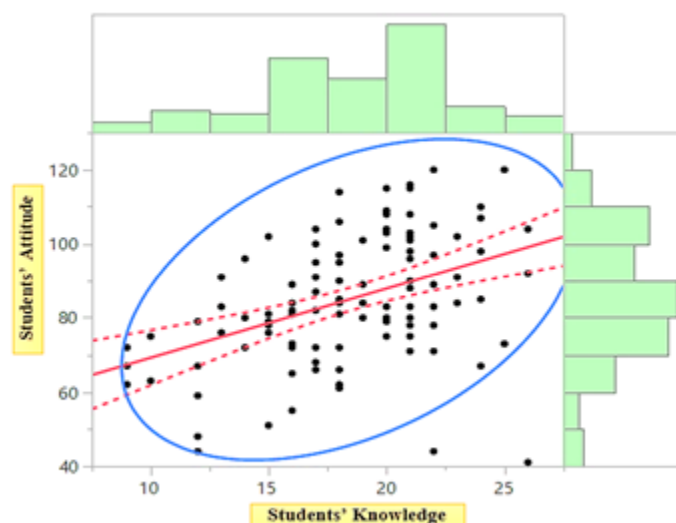


FIGURE 1 Scatterplots shows relationship between students' attitude and knowledge

FIGURE 1, shows a scatterplot graph used prior to observing the present pattern of linearity and providing more information about this relationship. However, the graph shows there is an association between students' knowledge levels and students' attitude variables. Therefore, students' knowledge levels increase at an accelerating rate as students' attitude variable rates increase. However, the outcome of the research demonstrated that there is a weak positive association between students' knowledge levels and students' attitude variables. Furthermore, there is a strong correlation between good knowledge and a good attitude, as indicated by the very low p-value.

TABLE 6 Correlation Between Students' Knowledge Levels and Attitude

Variables	Knowledge Levels n (%) *		P-value**	Total n (%) *
	Good Know.	Poor Know.		
Good Attitude	57 (54.29)	28 (26.67)	<0.0001	85 (80.95)
Poor Attitude	8 (7.62)	12 (11.43)		20 (19.05)
Total	65 (61.90)	40 (38.10)		105

*Note/ N = 105; n (%) * = Frequency & Percentage; Bivariate = p-value** (Pearson correlation coefficient) - chi-square test.*

TABLE 6, to identify the correlation between students' knowledge levels and attitudes, a one-way ANOVA was used. The data indicated that the correlation between students' knowledge levels and their attitudes toward nursing education reveals a statistically significant relationship ($p < 0.0001$). Among students with good knowledge ($n = 65$), the majority (54.29%) also had a good attitude, while only a small percentage (7.62%) showed a poor attitude. In contrast, among students with poor knowledge ($n = 40$), 26.67% maintained a good attitude, but 11.43% had both poor knowledge and a poor attitude. These findings indicate that students with higher knowledge levels tend to have more positive attitudes toward their education and profession, while those with lower knowledge are more likely to have negative attitudes (< 0.0001). Among students with good knowledge ($n = 65$), the majority (54.29%) also had a good attitude, while only a small percentage (7.62%) showed a poor attitude. In contrast, among students with poor knowledge ($n = 40$), 26.67% maintained a good attitude, but 11.43% had both poor knowledge and a poor attitude. These findings indicate that students with higher knowledge levels tend to have more positive attitudes toward their education and profession, while those with lower knowledge are more likely to have negative attitudes.

Discussion

The findings of this study highlight key factors influencing nursing students' knowledge acquisition, aligning with previous research on nursing education. The curriculum structure, with a mean score of 2.00 (SD = 0.69), suggests a foundational understanding but indicates areas requiring

enhancement in content organization and delivery, as supported by Smith et al. (2021), who emphasize the role of well-structured curricula in fostering competency (Daunic et al., 2021). The learning environment ($M = 3.18$, $SD = 1.37$) demonstrated a significant impact on knowledge retention, corroborating studies by Harindintwari, J. (2022), which stress the importance of conducive classroom conditions for effective learning (Harindintwari, 2022).

Teaching methods emerged as the strongest predictor of student knowledge ($M = 7.31$, $SD = 2.07$), reinforcing the findings of Johnson et al. (2019), who advocate for active learning approaches such as case-based discussions and simulation-based training (Jennings et al., 2019). Language and communication ($M = 2.20$, $SD = 0.82$) moderately influenced knowledge acquisition, aligning with the conclusions of Lee et al. (2020), who identified language barriers as a challenge in nursing education, particularly for non-native speakers (Shablack, 2020). Additionally, the positive response to teaching innovations ($M = 3.55$, $SD = 1.30$) supports the work of Patel et al. (2021), highlighting the benefits of integrating technology-enhanced learning strategies (Almisad, Aleidan, & Alsaffar, 2024). Also, the findings of this study underscore the significant relationship between nursing students' attitudes and their academic and professional development. A strong foundation in nursing fundamentals was associated with higher commitment levels, as indicated by students with a positive attitude scoring higher ($M = 22.61$, $SD = 3.94$) than those with a poor attitude ($M = 14.9$, $SD = 3.80$). This aligns with the findings of Suluhan, D., et al. (2020), who emphasize that a solid grasp of nursing principles enhances confidence and professional identity (Suluhan, Gezginci, & Ergin, 2020).

Teaching and learning experiences also played a critical role, with students who had positive attitudes toward instruction scoring significantly higher ($M = 37.61$, $SD = 5.85$) than their counterparts ($M = 25.35$, $SD = 5.89$). This supports the work of Hoidn, S. and K. Reusser (2020), who highlight the effectiveness of student-centered teaching in fostering engagement and knowledge retention (Hoidn & Reusser, 2020). Similarly, professional perspectives influenced students' career outlook, as those with positive attitudes toward their future roles demonstrated better scores ($M = 14.68$, $SD = 3.26$), consistent with the research of Mikkonen, K., et al. (2022), which suggests that career mentorship and professional support enhance motivation and long-term commitment. The most significant disparity was observed in attitudes toward innovation, with students favoring innovation scoring notably higher ($M = 15.6$, $SD = 2.64$) than those with a poor attitude ($M = 9.2$, $SD = 2.64$) (Mikkonen et al., 2022). This finding reinforces the conclusions of Tiwari, S. P. and A. Fahrudin (2024), who argue that exposure to innovative practices and technology-driven learning fosters adaptability and

readiness for evolving healthcare demands (Tiwari & Fahrudin, 2024). Likewise, the findings highlight a significant correlation between nursing students' knowledge levels and their attitudes toward nursing education ($p < 0.0001$), reinforcing the strong interplay between cognitive and affective learning domains. A majority of students with higher knowledge levels (54.29%) also exhibited positive attitudes, while only a small proportion (7.62%) displayed negative attitudes. Conversely, among students with lower knowledge, a notable percentage (11.43%) demonstrated both poor knowledge and poor attitudes. These results align with the findings of Hai, Q. N., et al., who suggest that well-informed students are more likely to engage positively with their education and future profession. Moreover, the presence of a good attitude among 26.67% of students with lower knowledge suggests that motivation and external support mechanisms may play a role in shaping attitudes despite academic challenges (Hai, Thanh, & Nguyenthingoc). This is consistent with Munna, A. S. and M. A. Kalam (2021), who emphasize the impact of active learning and mentorship in fostering positive student engagement (Munna & Kalam, 2021). The results further support the work of Zhao, W., et al. (2020), who found that interactive teaching methods, such as problem-based learning and clinical simulations, can enhance both knowledge acquisition and professional commitment (W. Zhao et al., 2020).

The findings of this research have several implications for nursing education, including:

Informing curriculum development and instructional strategies that prioritize fundamental nursing concepts, critical thinking skills, evidence-based practice, and interprofessional collaboration.

Enhancing faculty development programs to support educators in adopting innovative teaching methods, integrating technology into education, promoting active learning, and fostering a positive learning environment. Advocating for policy changes, funding support, and accreditation standards that prioritize excellence in nursing education, student success, and patient-centered care within healthcare systems. The study recommended for educational best faculty development initiatives, curriculum revisions, and policy changes aimed at optimizing nursing students' learning experiences, promoting new teachings methods, professional growth, and preparing competent, compassionate, and ethically responsible nurses. This study has several limitations and suggestions for future studies. Its cross-sectional design restricts the ability to determine causal relationships between variables. While purposive sampling aids in recruitment and improves response rates, it may introduce selection bias, thereby affecting the generalizability of the findings. Furthermore, reliance on self-reported data limits external validity. Future research should explore the long-term effects of teaching methods on

nursing education and the impact of knowledge-driven attitude enhancement on classroom performance and critical thinking.

Conclusions

In conclusion, research on nursing students' knowledge and attitudes highlights key aspects of education and practice. Enhancing curriculum design, learning environments, and teaching methods can improve knowledge, engagement, and professional commitment. Collaboration among educators, researchers, and policymakers is crucial for advancing nursing education and patient care through evidence-based strategies.

Ethical statement

Ethical approval was granted by the undergraduate research scientific committee in the College of Nursing at the University of Duhok. Therefore, data collection took place from Saturday, April 6, to Wednesday, April 24, 2024, and the anonymity of all students' submitted documents and information related to the study was preserved electronically. Strict coding measures were employed, and data were reviewed solely by the researcher and supervisors to maintain confidentiality.

Acknowledgements

I would like to extend my sincere appreciation to the 4th. undergraduate stage nursing student's Parekhan Ezat Mahmood, Havin Salih Omer, Ilaf Adnan Azko for their assistance contributions to the research project from College of Nursing at UoD – KRG-Iraq.

Source of Funding

The authors did not receive any specific funding to carry out the work presented in this article. The study was self-funded by the research team.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this work.

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