IJBMC
International Journal of Body, Mind and Culture

Volume 12, Issue 4, pp 51-59
DOI: 10.61838/ijbmc.v12i5.929

Article type:
Original Research

Anxiety Levels Toward Artificial Intelligence Applications among Nurses

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Article history:

Received 30 Jan 2025
Revised 11 Apr 2025
Accepted 18 Apr 2025
Published online 01 Aug 2025

How to cite this article:
Qahtan, M. Y., & Iman Hussein Alwan, I. H. (2025). Anxiety Levels Toward Artificial Intelligence Applications among Nurses. International Journal of Body, Mind and Culture, 12(5), 51-59.

ABSTRACT

Objective: This research was conducted to assess the anxiety levels of nurses about artificial intelligence applications.

Methods and Materials: The research was a descriptive cross-sectional design, conducted with 270 nurses. In collecting data, four tools were used for data collection; Nurses' demographic characteristics data, the artificial intelligence anxiety scale(AIAS), attitude toward artificial intelligence applications, and Information and opinions of nurses about artificial intelligence technology were used The data were analyzed and interpreted through use of the application of Statistical Package for Social Sciences (SPSS), version 26.0. Data were analyzed using descriptive statistics, Kolmogorov–Smirnov, Shapiro–Wilk, Spearman, Mann–Whitney U, and Kruskal–Wallis tests.

Findings: The result was that more than half of the nurses (54.4%) experienced moderate anxiety about artificial intelligence (AI) applications (M±SD= 62.03 ± 12.610), while 38.1% reported severe anxiety and only 7.4% had mild anxiety.

Conclusion: It was determined that the artificial intelligence anxiety levels of nurses were moderate. The study recommended providing continuous training sessions for nursing staff on artificial intelligence technology to improve the quality of care, enhance patient outcomes, and reduce anxiety levels.

Keywords: Artificial intelligence, Anxiety, Nurses

Introduction

Artificial intelligence (AI) is a technological whole that incorporates a set of technologies that have the ability of a machine to imitate intelligent human behavior, including machine learning, computer vision, and natural language processing (Buchanan et al., 2020; McGrow, 2019). Today, with the advances of technology, AI applications find use in many areas, and healthcare is one of the most commonly utilized fields where professionals will delegate their functions to AI in the future (Frith, 2019; Sendir et al., 2019; Yigit & Acikgoz, 2023). Many AI applications, such as telehealth, mobile apps, and smart devices, have been developed for healthcare (Bodur et al., 2018; Buchanan et al., 2020; McGrow, 2019) These applications are valuable in early

diagnosis, accelerating treatment processes, reducing workload, improving the quality of care, reducing costs and reducing medical errors.7,8 Rapidly advancing AI studies are shaping the future of the nursing profession. Nurses need to be involved in this work and decide for themselves which The researchers created the data collection form in line with the literature (Betriana et al., 2022; Buchanan et al., 2020; Mathur & Burns, 2019; Oh et al., 2019; Risling & Low, 2019; Sendir et al., 2019; Watson et al., 2020) These systems use learning and adaptive algorithms to fulfil functions such as generating thoughts on a specific theme, making decisions, making risk predictions and providing support for extraordinary situations (Lee et al., 2021). AI applications provide significant advances in disciplines such as medicine, finance, education, and engineering, and offer different approaches to achieve human-like performance (Sayar, 2023). For example, detecting changes in a patient's behavior or speech structure can provide earlier intervention for a health crisis that may arise as a result of dangerous situations.14 In this context, the development and application of AI are of great importance both theoretically and practically. AI, which is actively used in many fields, is widely used in the field of medicine, especially in the protection of physical health and detection of possible problems (Sayar, 2023). (Özel & Aba, 2023) Examples of monitoring include pulse and physical activities, the use of radiological images, and medication monitoring. AI has great potential in protecting the mental health of the individual, detecting possible problems, and making necessary interventions (Ray et al., 2022). Methods such as analysis of voice and facial expressions for early detection of mood disorders, mobile applications for monitoring current and visible indicators, and natural language processing for correcting possible errors in therapy sessions can be actively used in the field of mental health (Ülker & Akkan, 2023). The internalization of professional knowledge, skills, attitudes, values, and standards of ethics, as well as the subsequent incorporation of these traits into one's identity and behavior in nursing education and practice, is what leads to the development of a professional identity. Medical health nurses with a strong sense of professional identity understand that their position fully meets these criteria by professional ideals and ethical standards (Kabeel & Eisa, 2017). There is no doubt that the application of AI will continue to increase in healthcare practice and education. Prosperous implementation of AI into clinical practice requires a thorough understanding of the attitudes and behaviors of the nurses as end-users towards the existing and future AI applications. Moreover, assessing the present knowledge of AI among nurses is basic to identify future training requirements, as they are the technology users and have direct contact with patients (O'Connor, 2021). Because of a need for properly designed tools to measure Artificial Intelligence Anxiety Scale (AIAS) levels of individuals, Wang & Wang (2019) recently developed an AIAS with four factors (i.e., sub-dimensions), namely, learning, job replacement, sociotechnical blindness, and AI configuration. A learning dimension similar to the computer-anxiety construct is used to measure how anxious people are about learning the applications of AI techniques and products in their field. In today's technology-driven era, learning AI-related technologies is crucial for professionals to stay current, as they may be required to update their skills constantly. Another dimension is job replacement, which is used to measure anxiety levels of individuals who can lose their jobs with the development of AI techniques and products. The sociotechnical blindness dimension is used to measure anxiety levels of individuals who cannot properly realize that AI can only work with the combination of people and social institutions (Johnson & Verdicchio, 2017). Anxiety is a prevalent mental disorder in Western societies (Asad & Majeed, 2024). This is a misconception that AI technology in the future can operate independently without human involvement. Lastly, the AI configuration dimension, similar to the robot-anxiety construct, can be attributed to anxiety levels in individuals who perceive humanoid AI techniques/products as scary and intimidating (Wang & Wang, 2019). Nursing students' intention to use AI in practice is an important predictor of successful integration because it demonstrates their readiness and willingness to adopt AI tools into their future clinical roles. Various factors influence intention to use AI, including knowledge, attitudes, and views of the technology, as well as exposure to AI in educational contexts (Al Omari et al., 2024).

Methods and Materials

Study design and participants: To achieve the aims of the study, a cross-sectional, quantitative descriptive methodology was employed.

Study Setting: The study was conducted in Baqubah Teaching Hospital and AL-Batool Teaching Hospital in Diyala city, which are central general hospitals in the city. These hospitals are located in the middle of the city.

A probability sample of 270 nurses was selected for convenience and distributed into two hospitals, chosen by simple random sampling, from a pool of nine hospitals that represented the target population of 2500 nurses. Sample size calculation was performed based on the Richard Geiger equation, with a margin of error set at 5% and a confidence level of 95%. The minimum estimated sample size required was 334 respondents. Twenty-four nurses refused to participate, 20 nurses did not return sheets, and 20 did not complete the sheets.

Tools of the study: three tools were used for data collection:

Part 1: The socio-demographic characteristics of the nurses:

This part is concerned with the collection of demographic data obtained from the nurses through a questionnaire sheet, which includes (7) items relative to age, gender, marital status, educational level, years of experience in nursing, workplace, and day/night shift.

Part 2: Information and opinions of nurses about artificial intelligence technology:

Part 3: Artificial Intelligence Anxiety Scale (AIAS) was adapted from Wang & Wang (2019). It consisted of 18 items to evaluate nurses' anxiety toward partnering with artificial intelligence in providing nursing care through a five-point Likert Scale ranging from strongly disagree (1) to strongly agree (5). The main issues covering the items of the tool were about anxiety of nurses regarding the development of AI techniques & products, using, dealing with, and interacting with AI techniques & products, fear of dependence, and replacing humans, etc. The tool has been modified and translated into Arabic to make it suitable for nurses.

Validity and reliability of the tools: The used tool validity revision was applied by a panel of 10 experts in the field of collage nursing and medical field in hospitals; they agreed and give some of comment The Cronbach's Alpha analysis in this table shows excellent evaluation for "anxiety scale" reflecting that the questionnaires had adequate level of internal consistency and equivalence measurability.

A pilot study was conducted with 10% of the studied nurses from the previously referenced settings to determine the lucidity, clarity, feasibility, and applicability of the used tools. Based on a pilot study, some modifications were made, and those nurses were excluded from the main study.

Inclusion Criteria were as follows: nurses working in healthcare settings within a specific geographic area (e.g., hospitals, clinics), maintain consistency; Nurses who are working in wards and specialized centers; Years of experience of more than six months; Participants must provide informed consent and be willing to complete surveys or interviews regarding their anxiety levels.

Exclusion criteria included individuals who are not registered or licensed nurses (e.g., nursing assistants, medical doctors); participants who do not complete the survey or interview process will be excluded from the final analysis and pilot study sample.

Data Analysis

Analyzing data is an essential step in nursing research, wherein various methods are employed to describe and assess information gathered by the researcher. The choice of analysis method depends on the nature of the collected data, with quantitative research specifically utilizing descriptive and inferential statistics to analyze numerical data (O'Connor, 2020). The data were analyzed and interpreted using the Statistical Package for Social Sciences (SPSS), version 26.0.

Findings and Results

The findings in Table 1 reveal that the majority of the nurses (81.9%) fall within the age group of 20–29 years, with a mean age of 26.7 years (SD ± 5). The sex distribution is nearly balanced, with 51.1% being female and 48.9% male. Regarding marital status, the highest percentage of the nurses is unmarried (55.2%), followed by 41.9% who are married. The qualification in nursing refers to the highest proportion of nurses holding either a diploma (42.5%) or a bachelor's degree (44.1%). However, only a small percentage has pursued a master's degree (1.9%).

Table 1

Distribution of Nurses According to Their Socio-demographic Characteristics

List	Characteristics		f	%
1	Age (year)	20 – 29	221	81.9
	M±SD= 26.7 ± 5	30 – 39	42	15.5
		40 – 49	4	1.5
		50 – 59	3	1.1
		Total	*270*	*100*
2	Sex	Male	132	48.9
		Female	138	51.1
		Total	*270*	*100*
3	Marital status	Married	113	41.9
		Unmarried	149	55.2
		Divorced	6	2.2
		Widowed/er	2	.7
		Total	*270*	*100*
4	Qualification in nursing	Preparatory school	17	6.3
		Diploma	115	42.5
		Bachelor	119	44.1
		Master	5	1.9
		Others	14	5.2
		Total	*270*	*100*

f: Frequency, %: Percentage, M: Mean, SD: Standard deviation

Table 2 shows that more than half of nurses (58.1%) have less than three years of experience, and only 8.9% of nurses have 10 or more years of experience. Concerning the department, a significant portion of nurses work in specialized units, such as the Cardiac Care Unit (19.6%) and Critical Care Unit (18.1%). However, 41.5% are distributed across other departments. A relatively smaller percentage of nurses were observed in the Intensive Care Unit (11.9%) and the Operating Room (8.9%). The duty shift indicates that most nurses (74.8%) are assigned to morning shifts, with only 25.2% working evening shifts.

Table 2

Distribution of Nurses According to Their Professional Characteristics

List	Characteristics		f	%
1	Years of experience	Less than 1	81	30
		1 – 2	76	28.1
		3 – 4	42	15.6
		5 – 9	47	17.4
		10 and more	24	8.9
		Total	*270*	*100*
2	Department	Cardiac Care Unit	53	19.6
		Critical Care Unit	49	18.1
		Intensive Care Unit	32	11.9
		Operation Room	24	8.9
		Others	112	41.5
		Total	*270*	*100*
3	Duty shift	Morning	202	74.8
		Evening	68	25.2
		Total	*270*	*100*

f: Frequency, %: Percentage

Table 3 indicates that more than half of the nurses (54.4%) experience moderate anxiety about artificial

intelligence (AI) applications (M±SD= 62.03 ± 12.610), while 38.1% report severe anxiety and only 7.4% have mild anxiety.

Table 3

Overall Assessment of Nurses' Anxiety about Artificial Intelligence Application

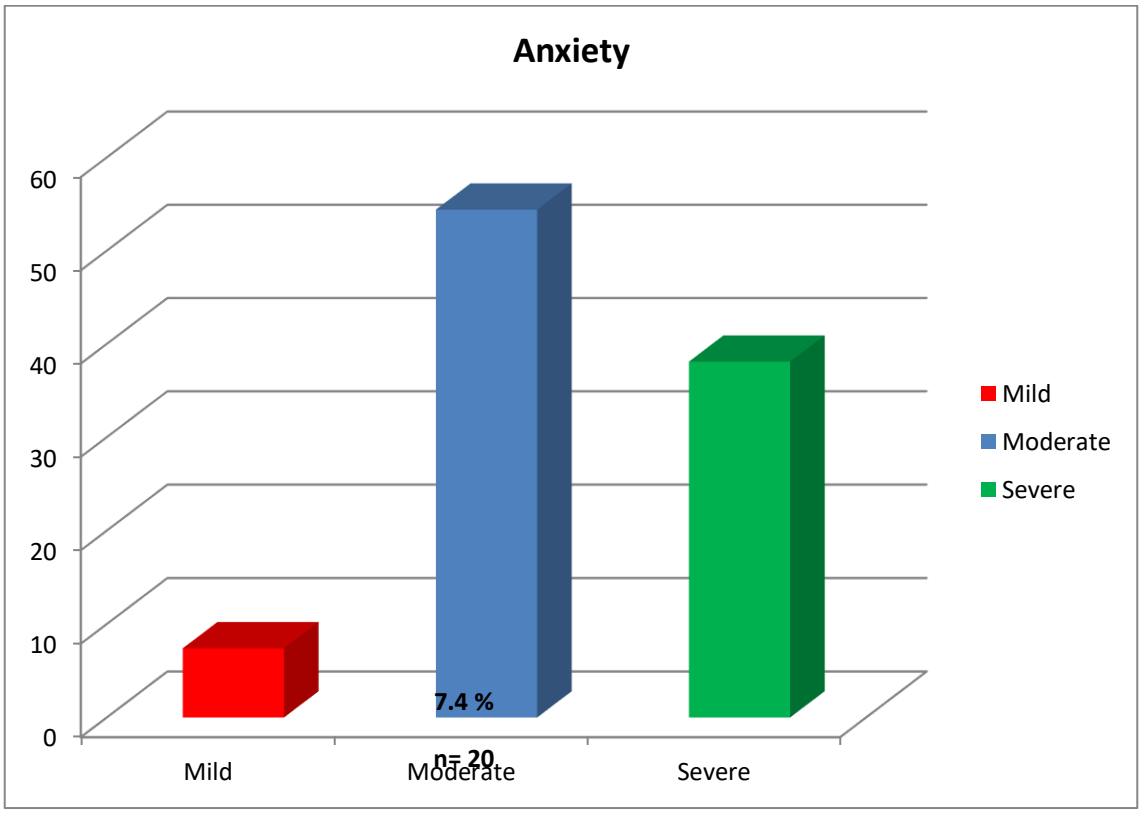
Anxiety	f	%	M	SD	Ass.
Mild	20	7.4	62.03	12.610	Moderate
Moderate	147	54.4			
Severe	103	38.1			
Total	*270*	*100*			

f: Frequency, %: Percentage
M: Mean for total score, SD: Standard Deviation for total score, Ass: Assessment
Mild= 18 – 42, Moderate= 42.1 – 66, Severe= 66.1 – 90

The figure below reveals that 54.4% of nurses are associated with moderate anxiety about AI applications.

Figure 1

Levels of Nurses' Anxiety about Artificial Intelligence Application (N=270)



Ijbmc.org
E-ISSN: 2345-5802

Table 4 reveals varying levels of anxiety across sub-domains related to artificial intelligence (AI) among nurses. The "Learning" sub-domain, encompassing concerns about understanding and interacting with AI, showed a moderate level of anxiety (M=21.05, SD=5.754). However, anxiety levels were severe in the "Job Replacement" (M=22.43, SD=5.475) and "Sociotechnical Blindness" (M=14.91, SD=3.385) sub-domains, indicating significant fears about AI displacing jobs and a lack of awareness regarding its broader social and technical implications. The "AI Configuration" sub-domain reflected moderate anxiety (M=3.64, SD=1.195), suggesting unease about the setup and functioning of AI systems.

Table 4

Mean and Standard Deviations for Sub-Domains of Anxiety about AI among Nurses (N=270)

Anxiety about AI	Score	M± SD	Assessment
Learning	*Low 7 – 16.33* *Moderate 16.34 – 25.66* *High 25.67 - 35*	21.05 ± 5.754	Moderate
Job replacement	*Low 6 – 14* *Moderate 14.1 – 22* *High 22.1 - 30*	22.43 ± 5.475	Severe
Sociotechnical blindness	*Low 4 – 9.33* *Moderate 9.34 – 14.66* *High 14.67 - 20*	14.91 ± 3.385	Severe
AI configuration	*Low 1 – 2.33* *Moderate 2.34 – 3.66* *High 3.67 - 5*	3.64 ± 1.195	Moderate

M: Mean for total score, SD: Standard Deviation for total score

Discussion and Conclusion

The findings reveal that the majority of the nurses 81.9% fall within the age group of 20–29 years, with a mean age of 26.7 years and 15.5% fall within the age group of 30 – 39 years, whilst 1.5% were aged 40 years and beyond while 1.1% fall within the age group 50 – 59 years. According to Mohammed QQ, in 2018, the age group was (20-29) years old (68.5%) (Abbas & Mohammed, 2018), and this study's findings about sociodemographic variables showed that nurses are young, with an age of 20-29 years (Al Bka & Mohammed, 2022). according to this study the age was, 08% were in the age group of 17-18 years, 46% were in the age group of 19-20 years, 39% were in the age group of 21-22 years, 06% were in the age group of 23-24 years and 01 % in the age group 25-26 years (Kadhim & Qassem, 2023; Sheela, 2022) The study's findings indicate that out of the sample population 51.1% being female and 48.9% male. According to Ameen & Hussein (2023), more than half of nurses were women (52.4%) while the remaining were men (47.6%). This result agrees with the present result. The study's findings show that 87.5% of the participants were male. This result agrees with the present result (Mohammed & Abas, 2013). Regarding marital status, the highest percentage of nurses is unmarried (55.2%), followed by 41.9% who are married. According to a study in Iraq, the findings about marital status were 66% married (Mohammed, 2019). Regarding nursing qualifications, the highest proportion of nurses holds either a diploma (42.5%) or a bachelor's degree (44.1%). However, only a small percentage has pursued a master's degree (1.9%). This study aligns with my findings, indicating that the majority of nurses are graduates with a “diploma” in nursing (42.3%), followed by 30% with a “bachelor's” degree in nursing (Hassan & Alwan, 2023). Based on years of experience, the majority of nurses (58.1%) have less than three years of experience, while only 8.9% have 10 or more years of experience. In contrast, in this study, educational background varied, with 60.0% of nurses holding a Baccalaureate degree, 24.5% having a master's degree, and 13.6% possessing a Diploma. Only 1.8% reported having a Doctorate.

In terms of nursing experience, over half of the participants (45%) had a decade or more of experience (Alruwaili et al., 2024).

Concerning the department, a significant portion of nurses work in specialized units, such as the Cardiac Care Unit (19.6%) and Critical Care Unit (18.1%). However, 41.5% are distributed across other departments. A relatively smaller percentage of nurses in the Intensive Care Unit (11.9%) and the Operating Room (8.9%) were observed. The duty shift indicates that most nurses (74.8%) are assigned to morning shifts, with only 25.2% working evening shifts. According to Alruwaili et al. (2024), about work shifts, 52.7% of nurses were assigned to day shifts, 44.5% had rotating shifts, and a minority worked night shifts (2.8%). According to Al-Fayyadh (2018) nurses who worked during the morning shift ranked higher than their colleagues who worked during night shift.34 and (Al-Fayyadh, 2018) Examining the type of units in which nurses were stationed, medical/surgical wards emerged as the most common (28.3%), followed by intensive care unit/critical care unit (ICU/CCU) at 22.7%. Obstetric/pediatric units constituted 8.1%, psychiatric units comprised 10.0%, and all other units collectively accounted for 30.9% of the responses (Hassan & Alwan, 2023). The findings indicate that more than half of the nurses (54.4%) experience moderate anxiety about artificial intelligence (AI) applications (M±SD= 62.03 ± 12.610), while 38.1% report severe anxiety and only 7.4% have mild anxiety. In 2022, a study was conducted to evaluate the nurses' anxiety level toward partnering with artificial intelligence in providing nursing care. The study results revealed that nearly one-third of the nurses in medical units had a severe anxiety level, and less than half of the nurses in critical units had a moderate anxiety level pre-implementation. 24 in the present study show varying levels of anxiety across sub-domains related to artificial intelligence (AI) among nurses. The "Learning" sub-domain, encompassing concerns about understanding and interacting with AI, showed a moderate level of anxiety, and anxiety levels were severe in the "Job Replacement" and "Sociotechnical Blindness". Sub-domains, indicating significant fears about AI displacing jobs and a lack of awareness regarding its broader social and technical implications. The "AI Configuration" sub-domain reflected moderate anxiety, suggesting unease about the setup and functioning of AI systems. According to Yigit and Acikgoz (2024), their finding were high levels of artificial intelligence anxiety (51.68 ± 12.32). They had the highest anxiety in the 'sociotechnical blindness' subscale, followed by the 'job replacement' and 'learning' subscales. 'Artificial intelligence configuration' was the subscale that caused the least anxiety. The high level of anxiety in the sociotechnical blindness subscale is related to the students' belief that artificial intelligence will have a negative impact on social relationships (Yigit & Acikgoz, 2024).

Anxiety levels are often measured through self-reported questionnaires, which can be subject to bias. Participants may underreport or exaggerate their anxiety due to social desirability or lack of self-awareness. The study uses a cross-sectional design; it captures a snapshot of anxiety levels at one point in time. This approach does not account for changes in anxiety over time or in response to new AI technologies. Cultural attitudes toward technology and AI can vary significantly. If the study is conducted in a single cultural context, the findings may not apply to nurses in different countries or cultures.

Based on the interpretation and discussion of the findings, the researcher concludes that Nurses exhibit moderate anxiety about AI. Based on the obtained findings, it is recommended to

1. Provide appropriate information about the benefits, challenges, and issues surrounding the implementation of artificial intelligence in nursing settings and the potential of these technologies to improve health care services and efficiencies.

2. holding continuous periodic training sessions to reduce nurses' anxiety levels toward partnering with AI to provide nursing care and support medical and critical care units

3. Adding courses or subjects related to artificial intelligence to the university curriculum and starting to include nurses in the working processes during their student years.

4. It is recommended to expand the knowledge about AI's effects on healthcare practices, which directly and indirectly affect the quality of care provided at healthcare organizations.

Acknowledgments

The authors express their gratitude and appreciation to all participants.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

By the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Authors' Contributions

All authors equally contribute to this study.

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