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Nurses' Attitudes Towards the Use of Artificial Intelligence

Hemşirelerin Yapay Zeka Kullanımına Yönelik Tutumları

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ABSTRACT

This study aimed to determine nurses' attitudes toward the use of artificial intelligence (AI). Designed as a descriptive and cross-sectional study, this research was conducted with 254 nurses working in a public hospital. Data were collected using a sociodemographic information form and the "General Attitudes toward Artificial Intelligence Scale (GAAIS)." Descriptive statistics, the Mann–Whitney U test, Kruskal–Wallis test, Dunn's test (with Bonferroni correction), and Spearman correlation analysis were employed in data analysis. The findings revealed that the nurses' mean total attitude scale score was significantly higher than the neutral value of 60. Overall, participants exhibited positive attitudes toward AI. Notably, Nurses aged 18–25, male nurses, and those with prior knowledge of AI had significantly higher positive attitude scores. Additionally, nurses who did not view AI as a professional threat and who believed that AI enabled nurses to spend more time with patients also reported higher total scores. This study demonstrated that nurses generally hold positive attitudes toward the use of AI in healthcare. Attitudes were associated with variables such as age, sex, and knowledge level. It is recommended that educational programmes be organised to enhance technological adaptation among female and older nurses, in particular, in order to support AI integration. Furthermore, planning inclusive and continuous training in collaboration with professional organisations may contribute to the development of more proactive and adaptive attitudes toward AI.

Keywords: Artificial Intelligence, Attitude, Healthcare services, Nursing, Technology adoption

ÖZET

Bu çalışma, hemşirelerin yapay zekâ (YZ) kullanımına yönelik tutumlarını belirlemeyi amaçlamaktadır. Tanımlayıcı ve kesitsel türde tasarlanan bu araştırma, bir kamu hastanesinde görev yapan 254 hemşire ile yürütülmüştür. Veriler, sosyodemografik bilgi formu ve "Yapay Zekâya Yönelik Genel Tutum Ölçeği" kullanılarak toplanmıştır. Verilerin analizinde tanımlayıcı istatistikler, Mann-Whitney U testi, Kruskal-Wallis testi, Dunn testi (Bonferroni düzeltmesi ile) ve Spearman korelasyon analizi uygulanmıştır. Elde edilen bulgulara göre, hemşirelerin tutum ölçeği toplam puan ortalaması 60.0'lık nötr değerden anlamlı düzeyde yüksek bulunmuştur. Katılımcıların genel olarak YZ'ye yönelik olumlu tutum sergilediği belirlenmiştir. Özellikle 25 yaş altı, erkek cinsiyet ve YZ hakkında ön bilgiye sahip hemşirelerin pozitif tutum puanlarının anlamlı düzeyde yüksek olduğu saptanmıştır. YZ'yi mesleki tehdit olarak görmeyen ve YZ'nin hemşirelerin hastalara daha fazla vakit ayırmasını sağladığını düşünen hemşirelerin toplam puan ortalamaları da daha yüksek bulunmuştur. Bu çalışma, hemşirelerin sağlık hizmetlerinde yapay zekâ kullanımına yönelik genel olarak olumlu tutumlara sahip olduğunu ortaya koymaktadır. Tutumlar; yaş, cinsiyet ve bilgi düzeyi gibi değişkenlerden etkilenmektedir. YZ entegrasyonunun desteklenmesi için kadın ve ileri yaş hemşirelerin teknolojiye adaptasyonunu artıracak eğitimlerin düzenlenmesi önerilmektedir. Ayrıca, mesleki örgütlerle iş birliği yapılarak kapsayıcı ve sürekli eğitimlerin planlanması, YZ'ye karşı daha proaktif ve uyumlu tutumların gelişmesine katkı sağlayabilir.
Anahtar Kelimeler: Yapay Zekâ, Hemşirelik, Tutum, Sağlık Hizmetleri, Teknoloji Benimseme

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INTRODUCTION

Artificial intelligence (AI) refers to programmable systems that mimic human intelligence (O'Connor, 2023). First defined in 1956 under the leadership of John McCarthy from Stanford University (Robert, 2019), AI has since brought about revolutionary transformations in various fields, particularly healthcare. AI plays a significant role in transforming healthcare services, including nursing practices (Alowais et al., 2023). Although AI is claimed to be rapidly adopted in healthcare (Alazzam, Tayyib, Alshawwa & Ahmed, 2022), its application in nursing dates back nearly four decades (von Gerich et al., 2022).

AI has the potential to enhance workforce efficiency in nursing practices and improve the quality of patient care processes (Amin, El-Gazar, Zoromba, El-Sayed & Atta, 2024). Through automated systems, vital signs can be continuously monitored, allowing early detection of abnormalities and facilitating prompt intervention. Moreover, digitalisation of administrative tasks enables nurses to focus more on direct patient care (Kumar, Koul, Singla & Ijaz, 2023). In a systematic review conducted by O'Connor et al. (2023), it was shown that the use of AI in nursing is rapidly expanding. For instance, systems that predict the risk of ICU admission in COVID-19 patients (Cheng et al., 2020) and machine learning algorithms that anticipate adverse drug events based on nursing notes (Jeon et al., 2020) were presented as examples of innovative practices.

Despite being seen as a solution in managing healthcare data, only 15–20% of nurses actively use this technology (Akgermen, Yavuz, Kavaslar, Güngör, 2022), raising questions about their adaptability to evolving technological conditions (Liang et al., 2019). Additionally, AI integration raises ethical and professional concerns such as fears that machines may replace nursing tasks and diminish human touch and compassion (Abdullah & Fakieh, 2020). Nurses reportedly experience anxiety regarding job loss, role transformation, and technological adaptation (Labrague, Aguilar-Rosales, Yboa, Sabio & Los Santos, 2023). For example, an analysis from the University of Toronto suggested that automation could eliminate 7.5 million jobs, while Douthit et al. (2020) highlighted uncertainties specific to the healthcare sector. Nevertheless, many nurses speak favourably about the role of AI in reducing workload and improving accuracy in decision-making. Successful integration of AI into nursing practice depends on positioning the technology as a supportive tool that complements human skills rather than replacing them (Douthit, Hu, Richesson, Kim, H., & Cary Jr. ,2020).

Further research is needed to establish standard criteria for evaluating the impact of AI on healthcare services (Pailaha, 2023). Nursing, being based on human-patient interaction, does not yet appear to be fully prepared for this technological transformation. This may weaken the

nurse–patient relationship (Smith & Anderson, 2014). Adoption and effective implementation of AI applications are largely influenced by nurses' attitudes toward technology (Horowitz & Kahn, 2021). A successful integration process is not solely related to technical proficiency but also to the context of use and individual approaches of nurses (Amin et al., 2024).

A review of the literature reveals that both national and international studies examining nurses' attitudes toward AI are limited in number (Kandemir & Azizoğlu, 2024; Tuncer & Tuncer, 2024; Alruwaili et al., 2024). In Türkiye, studies that specifically explore the views and experiences of hospital-based nurses regarding AI are especially scarce (Kandemir & Azizoğlu, 2024). This gap complicates the understanding of nurses' attitudes toward AI and the development of implementation strategies. Understanding nurses' perspectives is particularly important for integrating advancements such as robotic nursing into patient care processes.

In this context, the present study was designed to examine hospital nurses' attitudes toward artificial intelligence technologies and the factors influencing these attitudes. The study is expected to fill an important gap in the literature by providing up-to-date evidence on the attitudes of clinical nurses in Türkiye toward artificial intelligence. Furthermore, the findings are anticipated to guide the development of educational programs that support nurses' adaptation to artificial intelligence applications, contribute to the formulation of technology integration strategies in healthcare institutions, and facilitate the digital transformation of the nursing profession. In this respect, the study has unique value in generating evidence-based knowledge to support the safe, effective, and sustainable integration of artificial intelligence technologies into nursing practice.

Research Questions

1. What are nurses' general attitudes toward artificial intelligence?
2. What are the factors influencing nurses' attitudes toward artificial intelligence?

METHODS

Study Design

This study employed a descriptive and cross-sectional design.

Population and Sample of the Study

The study was carried out between March and June 2024 at a public hospital. The target population of the study comprised all nurses employed at the hospital.Without performing a sample selection procedure, the data were collected using convenience sampling, a non-probability sampling method. The sample size was determined using the G*Power software based on the study by Mohamed et al. (2023), with a 95% confidence interval and 80% statistical power. The required minimum sample was calculated as 203 nurses. Considering potential attrition and the criteria for parametric testing, the study was completed with 254 nurses.

Inclusion criteria: To be a nurse employed at the public hospital where the study is conducted and to be willing to participate in the study.

Exclusion Criteria: Not volunteering to participate in the study.

Data Collection Tools

Personal Information Form: This form was developed by the researchers after reviewing the relevant literature (Kaya et al., 2022; Çoban et al., 2022). It aimed to collect sociodemographic data, participants' knowledge of AI, and their opinions on AI use in nursing.

General Attitudes toward Artificial Intelligence Scale (GAAIS): Developed by Schepman and Rodway (2020), this scale measures individuals' attitudes toward AI. Comprising 20 items, it assesses positive attitudes (items 1–12) and negative attitudes (items 13–20), with the negative items reverse-coded. The Turkish adaptation was conducted by Kaya et al. (2022). The Cronbach's alpha values were 0.82 for positive attitudes and 0.84 for negative attitudes. The split-half reliability coefficients were r = .77 for the Positive GAAIS and r = .83 for the Negative GAAIS. In the current study, the Cronbach's alpha was 0.936 for positive attitudes, 0.891 for negative attitudes, and 0.935 for the total score.

Data Analysis

Data were analysed using SPSS 25.0. For descriptive statistics, frequencies (n) and percentages (%) were calculated for categorical variables, while means (M) and standard deviations (SD) were calculated for continuous variables. Normality was assessed using the Shapiro–Wilk test. The Mann–Whitney U test (for two-group comparisons) and the Kruskal–Wallis test (for comparisons among more than two groups) were used for non-normally

distributed variables. Dunn's post hoc test with Bonferroni correction was applied in cases of statistically significant group differences. Relationships between variables were analysed using Spearman correlation analysis. A significance level of $p < .05$ was adopted for all analyses.

Limitations of the Study

Some limitations of this study should be considered when interpreting and generalising the findings. Firstly, since the data were based on participants' self-reports, there is a possibility that nurses' attitudes toward AI may have been reflected more positively or negatively than they actually are. This introduces the risk of self-report bias. Secondly, the cross-sectional design of the study does not allow for the observation of changes in attitudes and behaviours over time. Therefore, long-term effects of AI or changes in attitudes over time could not be assessed.

Moreover, the fact that the study was conducted in a single hospital limits the generalisability of the results to other healthcare institutions or clinical settings, thereby reducing the external validity of the study. Future research with longitudinal designs, conducted across different institutions and with larger samples, will provide more comprehensive and generalisable results.

Ethical Aspects of the Research

The study received approval from the Ethics Committee of Kilis 7 Aralık University on 26 December 2023 (Approval No: 2023-21). Following ethics and institutional approvals, the study was conducted in accordance with the Declaration of Helsinki. Participants were informed about the purpose and method of the research and that participation was voluntary. Informed consent was obtained. Participants completed the data collection forms face-to-face. Each form was filled out in approximately 10–15 minutes.

RESULTS

The average age of the nurses included in the study was 30.29 ± 7.88. Of the participants, 72.0% were female, 76.4% were university graduates, 55.9% had knowledge about AI, and 33.5% had knowledge specifically about AI use in healthcare. Moreover, 48.4% did not consider AI a professional threat, 68.1% believed it facilitated their work in patient care, 61.4% stated it enabled them to spend more time with patients, and 64.2% thought it was beneficial for patients (Table 1).

Table 1. Distribution of Participants' Sociodemographic Characteristics and Knowledge Levels Regarding Artificial Intelligence

Variables	N	%
Age	Mean = 30.29	SD = 7.88
18-25	79	31.1
26-30	88	34.6
31-35	30	11.8
36-40	20	7.9
41-54	37	14.6
Sex		
Female	183	72.0
Male	71	28.0
Education		
High school	27	10.6
University	194	76.4
Postgraduate	33	13.0
Do you have knowledge about the concept of artificial intelligence?		
Yes	142	55.9
No	29	11.4
Partially	83	32.7
Do you have knowledge about the use of artificial intelligence in healthcare?		
Yes	85	33.5
No	86	33.9
Partially	83	32.7
Do you perceive the increasing use of artificial intelligence in the nursing profession as a professional threat?		
Yes	46	18.1
No	123	48.4
Partially	85	33.5
Does the use of artificial intelligence in nursing facilitate the nurse's work in patient care?		
Yes	173	68.1
No	19	7.5
Partially	62	24.4
Does the use of artificial intelligence in nursing allow nurses to spend more time with patients?		
Yes	156	61.4

No	41	16.1
Partially	57	22.4
Is the use of artificial intelligence beneficial for patients?		
Yes	163	64.2
No	17	6.7
Partially	74	29.1

%: percentage; SD: Standard Deviation

The mean GAAIS total score was 66.71 ± 8.08, the mean positive attitude subscale score was 43.85 ± 8.89, and the mean negative attitude subscale score was 22.85 ± 6.20 (Table 2).

Table 2. Scores Related to the Scale and Its Subdimensions

Scale and Subdimensions	Minimum	Maximum	Mean ± SD	Cronbach's alpha
Positive attitudes	12.00	60.00	43.85 ± 8.89	0.936
Negative attitudes	8.00	40.00	22.85 ± 6.20	0.891
Total	41.00	95.00	66.71 ± 8.08	0.935

%: percentage; SD: Standard Deviation

Male nurses, those knowledgeable about AI, and those who believed AI enables nurses to spend more time with patients had significantly higher positive attitude scores ($p < .05$). Nurses aged 18–30, those knowledgeable about AI in healthcare, those who did not consider AI a professional threat, and those who believed AI facilitates their work had significantly higher positive attitude and total scores ($p < .05$). Attitudes toward AI varied significantly by age group. Nurses aged 18–30 had the highest scores for both positive attitudes (45.62 ± 8.80 and 44.95 ± 7.80) and total attitudes (67.81 ± 8.30 and 68.30 ± 7.11), while those aged 41–54 had the lowest positive (38.94 ± 10.17) and total scores (62.81 ± 9.15). These differences were statistically significant ($p < .05$) (Table 3).

Table 3. Comparison of Sociodemographic Characteristics with the Scale and Subdimension Scores

		Positive Attitudes **Mean ± SD**	Negative Attitudes **Mean ± SD**	**Total**
Age	18-25[a]	45.62±8.80	22.18±5.73	67.81±8.30[a]
	26-30[b]	44.95±7.80	23.35±6.53	68.30±7.11[b]
	31-35[c]	42.96±8.12	21.73±5.18	64.70±5.84[c]
	36-40[d]	42.50±10.68	23.15±6.60	65.65±9.48[d]
	41-54[e]	38.94±10.17	23.86±6.88	62.81±9.15[e]
		(a,b -e)		(a,b -e)
KW/p		**15.709/0.003**	3.069/0.546	**13.378/0.010**
Sex	Female	42.93±9.03	23.56±7.72	66.50±9.89
	Male	46.22±8.48	22.73±6.16	67.95±6.95
Mann-Whitney U/p		**4950.000/0.010**	5350.500/0.075	5644.500/0.257
Education	High school	40.88±11.29	25.11±8.73	66.00±7.40
	Undergraduate	44.01±8.31	22.70±5.75	66.71±8.26
	Postgraduate	45.36±10.41	21.93±6.10	67.30±7.67
KW/p		4.528/0.140	4.963/0.110	1.443/0.826
Do you have knowledge about the concept of artificial intelligence?	Yes[a]	45.39±9.25	22.08±6.16	67.47±8.13
	No[b]	40.41±10.28	24.10±8.09	64.51±8.96
	Partially[ac]	42.43±7.46	23.74±5.35	66.18±7.57
KW/p		**11.992/0.005**	6.301/0.078	5.383/0.152
Do you have knowledge about the use of artificial intelligence in healthcare?	Yes	46.85±8.39	21.77±6.56	68.63±6.72
	No	40.81±9.38	23.69±5.56	64.51±8.54
	Partially	43.93±8.17	23.09±6.26	67.03±8.39
KW/p		**27.357/0.001**	14.521/0.117	**5.510/0.03**
Do you perceive the increasing use of artificial intelligence in the nursing profession as a professional threat?	Yes	42.54±11.06	24.19±5.65	66.73±10.36
	No	46.44±7.20	21.91±6.49	68.35±7.01
	Partially	40.82±9.07	23.50±5.88	64.32±7.61
KW/p		**21.751/0.001**	8.777/0.051	**13.627/0.004**
Does the use of artificial intelligence in nursing facilitate the nurse's work in patient care?	Yes	46.10±7.59	22.31±6.22	68.42±6.67
	No	38.19±8.90	24.45±5.73	62.64±7.75
	Partially	41.89±12.36	22.57±6.91	64.47±14.09
KW/p		**32.487/0.001**	5.607/0.065	**27.066/0.001**

Does the use of artificial intelligence in nursing allow nurses to spend more time with patients?	Yes	45.99±7.55	22.17±6.34	68.17±7.03
	No	40.46±11.51	23.48±5.53	63.95±9.79
	Partially	40.45±8.92	24.26±6.03	64.71±8.60
KW/p		**21.026/0.001**	6.745/0.073	11.767/0.072
Is the use of artificial intelligence beneficial for patients?	Yes	44.69±8.84	22.54±6.04	67.24±7.98
	No	43.94±11.60	23.16±6.71	67.11±12.59
	Partially	42.00±8.44	23.47±6.44	65.47±6.83
KW/p		8.730/0.101	2.843/0.554	5.629/0.291

SD: Standard Deviation; KW: Kruskal–Wallis H Test; U: Mann–Whitney U Test; $p < 0.05$

DISCUSSION

Attitudes toward artificial intelligence (AI) can significantly influence nursing practices (Kwak et al., 2022). Although AI is noted to enhance nurses' creativity, discussions continue as to whether humanoid robots might eventually replace nurses (Zirar, 2023; Gümüş & Uysal Kasap, 2021). A review of the literature revealed a limited number of studies both nationally and internationally that investigate nurses' attitudes toward AI (Kandemir & Azizoğlu, 2024; Alruwaili et al., 2024). Understanding these attitudes is critical in the integration of robotic technologies into patient care processes. In this context, our study aimed to assess nurses' attitudes toward AI.

The study findings demonstrated that the mean GAAIS score was significantly higher than the neutral value of 60 (Table 2), indicating that nurses generally exhibit a positive orientation toward AI. These results are consistent with the findings of Tuncer and Tuncer (2024) and Serbaya et al. (2024), who reported positive attitudes among healthcare professionals regarding AI (Tuncer & Tuncer, 2024; Serbaya, Khan, Surbaya & Alzahrani, 2024). Participants in the present study displayed strong positive attitudes, with high and reliable positive subscale scores. Negative attitudes were moderate and less dominant than positive ones. Overall, the scale suggested that participants are open to technological changes but approach them with caution. Given the high reliability of the scale, the findings can be considered statistically robust and meaningful.

This study found that nurses aged 18–30 displayed more positive attitudes. Similarly, Kandemir and Azizoğlu (2024) reported more distinct positive attitudes among nurses under the age of 29 (Kandemir & Azizoğlu, 2024). Factors such as difficulties in adaptation, limited exposure to technology, and resistance to change may contribute to less favourable attitudes among older nurses (Özçevik Subaşı et al., 2024). These results imply that AI integration

requires age-sensitive approaches. Younger individuals tend to be more open, accepting, and positive toward AI, while attitudes become more cautious with age. This finding suggests that age-group-specific training and adaptation programs should be developed when planning digital transformation processes in healthcare institutions.

In terms of sex, male nurses showed significantly higher positive attitude scores compared to female nurses. This supports previous studies suggesting that men tend to exhibit more favourable attitudes toward AI (O'Shaughnessy et al., 2022; Kandemir & Azizoğlu, 2024). The generally higher interest in technology among men may negatively affect women's attitudes. Social gender roles associated with science and technology may shape women's perceptions of technology (Kandemir & Azizoğlu, 2024). This result highlights the importance of policies that support equal opportunities in the use of technology in healthcare institutions. Planning AI training to provide equal access for all employees and developing practices that increase confidence in technology use can contribute to reducing potential gender-based disparities.

No significant differences were found in positive or negative attitudes based on education level. Similar findings are reported in the literature (Kandemir & Azizoğlu, 2024; Amin et al., 2024). The lack of significant differences based on educational level suggests that attitudes towards artificial intelligence are shaped not only by formal education but also by factors such as individual experiences, level of exposure to technology, and institutional support. Therefore, it is important that artificial intelligence training is not limited to undergraduate education but is supported by in-service training throughout professional life.

In our study, nurses who had knowledge of the AI concept and its use in healthcare had significantly higher positive attitude scores. Elderiny and Ahmed (2024) noted that approximately 60% of nurses reported a need for more information on AI applications (Elderiny & Ahmed,2024). Karaarslan, Kahraman, & Ergin, (2024) found that while more than half of the nurses were aware of AI use, their general knowledge level was low (Karaarslan, Kahraman, & Ergin, 2024). Participants who were knowledgeable about AI and its applications in healthcare showed more positive attitudes. Nurses who reported having knowledge about AI had more positive attitudes. This result suggests that incorporating more artificial intelligence literacy into undergraduate nursing education and in-service training could increase technology adoption. Therefore, addressing knowledge gaps through education is recommended. Effective educational programmes can enhance knowledge and attitudes, improving healthcare delivery quality.

When evaluating the perception of AI as a professional threat, nurses who did not perceive AI as a threat had significantly higher GAAIS scores than those who did. Abdullah and Fakieh (2020) reported that many participants were concerned that AI might replace human workers (Abdullah & Fakieh, 2020). The potential of AI technologies to outperform human intelligence may heighten the perception of professional threat. The high perception of occupational risk may stem from misunderstandings of artificial intelligence technologies or uncertainties regarding future role changes. However, current approaches emphasize that AI is not a technology replacing nurses, but rather a tool supporting decision-making and care processes. Therefore, healthcare administrators and policymakers developing strategies that highlight the supportive role of AI can reduce employees' concerns about the technology.

Nonetheless, most nurses in our study believed that AI facilitates patient care, and this belief was reflected in their GAAIS scores. Liang et al. (2019) emphasised that robotic technologies helped paediatric nurses by guiding patients, thus saving time (Liang et al., 2019). The fact that nurses believe artificial intelligence will facilitate patient care indicates that these technologies have high potential for adoption in clinical practice. In particular, the effective use of artificial intelligence in patient monitoring, risk assessment, and clinical decision support systems can reduce nurses' workload, contributing to improved quality of care and patient safety.

In this study, nurses who responded “Yes” to the question “Does AI allow nurses to spend more time with patients?” had significantly higher GAAIS scores. This finding suggests that AI contributes positively to time management in nursing practice. Liang et al. (2019) noted that robots meeting patients’ needs in a timely manner positively affected nurse–patient interaction (Liang et al. (2019). Furthermore, AI has been reported to accelerate service delivery and make processes more efficient (Alsharqi et al., 2018; Abdullah & Fakieh, 2020). This result demonstrates that artificial intelligence technologies not only improve operational efficiency in nursing services but also have the potential to enhance the human dimension of care. Reducing routine tasks through automation can allow nurses to dedicate more time to direct care activities such as patient education, psychosocial support, and therapeutic communication. This can contribute to increased patient satisfaction, improved care outcomes, and a more patient-centered approach to healthcare.

CONCLUSION

This study revealed that nurses generally hold positive attitudes toward AI and that AI holds significant potential in healthcare services. Positive attitudes were found to be significantly

associated with sex, age, level of knowledge about AI, and belief in AI's role in facilitating professional tasks. These findings may form a foundation for developing strategies to encourage the adoption of AI technologies among nurses.

Expanding the use of AI in healthcare should be supported not only by technological infrastructure but also through educational, legal, and ethical frameworks. It is particularly important to promote inclusive training programmes that strengthen the attitudes of female and older nurses toward technology. Additionally, educational activities carried out in collaboration with professional organisations and associations may encourage nurses' adaptation to AI applications.

To effectively integrate AI into healthcare, it is significant to create an innovative professional environment that encourages nurses' active participation and technological engagement.

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