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ChatGPT-4 Use During Diabetes Knowledge Testing and AI Readiness Characteristics in Nursing and Midwifery Students

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The authors declare that they have no conflicts of interest.

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The study was carried out in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Clinical Research of Ankara Medipol University (No:2024-75).

INFORMED CONSENT
All students were informed about the study and provided informed consent

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ABSTRACT

Background: ChatGPT has gained attention for its role in accessing health information, supporting clinical decisions, and educating patients.

Materials and Methods: This study aimed to evaluate nursing and midwifery students' readiness for artificial intelligence (AI) and their diabetes knowledge using ChatGPT-4. A randomized controlled experimental design was used with 105 students (intervention=53, control=52) between April and June 2024. Data were collected using the Information Form, Medical Artificial Intelligence Readiness Scale for Medical Students (MAIRS-MS), and the Diabetes Knowledge Scale for Adults (DKSA). Students in the intervention group used ChatGPT-4 to answer the DKSA, while those in the control group completed it independently without technology.

Results: No significant difference was found between groups in MAIRS-MS scores. However, the intervention group had significantly higher DKSA total and sub-dimension scores for risk factors and symptoms (p=0.003; 0.000; 0.002).

Conclusion: Using ChatGPT-4 significantly improved diabetes knowledge among nursing and midwifery students.

Keywords: artificial intelligence, ChatGPT, diabetes, nursing, midwifery

Introduction

Chat Generative Pre-trained Transformer (ChatGPT) is one of the large language models developed by OpenAI. OpenAI released the free GPT 3.5 series in 2022, paid GPT-4 on March 14, 2023, and released its first version.[1] Since its launch, ChatGPT 4 has reached more than 180.5 million users in 2024.[2] ChatGPT has built its language capability on a system of various books, articles, and websites.[3] ChatGPT can understand the content of a conversation and generate appropriate responses in different styles and languages.[4] For this reason, ChatGPT has been used in education, healthcare, and many other fields.[2]

Integrating ChatGPT into nursing and midwifery education can offer a personalized and interactive learning environment for students.[2,5] ChatGPT is an advantage in terms of providing students with ready and fast information on the subjects they are curious about in their courses. In addition, information about the nursing process, treatment guidelines, and clinical approaches can be easily obtained with ChatGPT.[3,4,6,7] Seney et al. suggested that ChatGPT could be used in various teaching strategies to enhance students' clinical judgment skills.[8] They proposed that students could create case studies using ChatGPT, a process that could strengthen their abilities to identify assessment cues, recognize problems, and develop intervention plans. At this point, it is important to ensure that the inevitable and widely used ChatGPT is used consciously and correctly. They need to understand the potential uses, benefits, challenges, disadvantages, and limitations of ChatGPT.[3,4,9]

There are only a limited number of studies that directly investigate how nursing and midwifery students use ChatGPT and how this use affects their learning outcomes.[10] In these existing studies, students were main-

ly asked about their perceptions and attitudes toward artificial intelligence tools, including ChatGPT.[5,11,12] In contrast, the literature contains a larger number of commentaries and review articles discussing the potential role of ChatGPT in nursing education.[2,3,6,7,9] Furthermore, there are also studies focusing on ChatGPT in the context of diabetes, such as those evaluating its role in increasing diabetes awareness[13] and its performance[14] in assessing or supporting diabetes management.[15, 16]

To our knowledge, no study has been encountered regarding the application of ChatGPT to nursing and midwifery students in the context of a chronic illness. Based on this gap, the aim of this study is to evaluate the performance of nursing and midwifery students in responding to questions on the Diabetes Knowledge Scale (DKSA) using ChatGPT-4 and to determine their readiness for AI-assisted education.

Materials and Methods

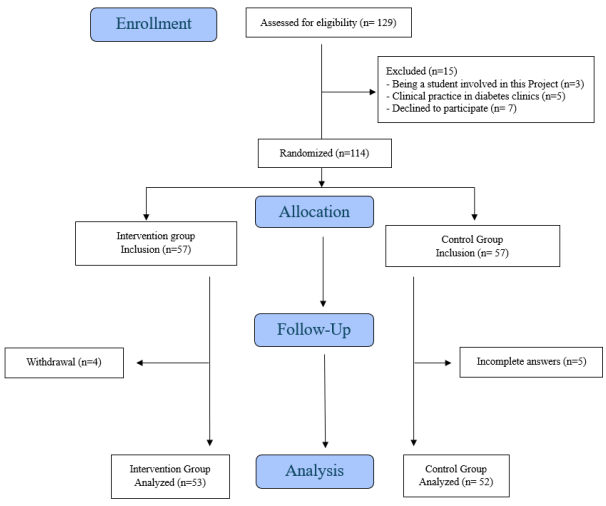
Study design and participants

This study was a randomized controlled trial. The study was conducted in the nursing and midwifery departments of the Faculty of Health Sciences at a university in Türkiye between April and June 2024. Since the internal medicine nursing course is taken by second-year students in these departments, they constituted the study population. The population consisted of 129 students, including 68 nursing and 61 midwifery students. The study was completed with 105 students (intervention group = 53, control group = 52) (Figure 1).

The inclusion criteria were being a second-year nursing and midwifery student, having the technological equipment to use ChatGPT, and agreeing to participate in the study.

The exclusion criteria were having a diagnosis of diabetes, having prior clinical practice experience in diabetes clinics, providing incomplete responses to the study instruments, being a student who was part of the research team, and being actively involved in the design and implementation of the study. Students who were involved in the research process were excluded because they were fully aware of the study aims, the content of the DKSA, and the use of ChatGPT-4, which could have introduced bias in their responses.

Figure 1. The CONSORT chart of the study



Randomization

Students were randomized in a 1:1 allocation ratio, based on a parallel design, into groups either receiving or not receiving ChatGPT-4. Each student's assignment to the intervention or control group was determined using a computer-based randomization table (https://www.random.org/). To prevent selection bias, randomization was performed by another lecturer who was not involved in the project. This study was conducted and reported in accordance with the CONSORT (Consolidated Standards of Reporting Trials) guidelines.

The study was completed with 105 students. Once data collection was completed, the study's power was recalculated using G*Power version 3.1. The results showed a statistical power of 85%, based on a 95% confidence interval.

Instruments

The data were collected using the Information Form, Medical Artificial Intelligence Readiness Scale for Medical Students (MAIRS-MS), and Diabetes Knowledge Scale for Adults (DKSA).

Information Form: This form was created by the researchers by reviewing the relevant literature.[5,11,17] It consists of questions about the sociodemographic characteristics of the students, such as age, gender, etc.

Medical Artificial Intelligence Readiness Scale for Medical Students (MAIRS-MS): The scale was developed by Karaca et al. to determine the medical artificial intelligence readiness level of medical faculty students. The scale consists of 22 items and four sub-dimensions. The items are rated on a 5-point Likert-type scale (1-strongly disagree to 5-strongly agree). Scale sub-dimensions items and score ranges; Cognition Factor (8 -40 points), Ability Factor (8-40 points), Vision Factor (3-15 points), Ethics Factor (3-15 points). Medical Artificial Intelligence Readiness Factor 22-110 points, so the total score ranges from 22 to 110. A high score means a high level of readiness for medical artificial intelligence. In Karaca et al.'s study, Cronbach's alpha reliability coefficient was 0.87.[17] In our study, the Cronbach's alpha value was found to be 0.85.

Diabetes Knowledge Scale for Adults (DKSA): This scale was developed by Yavuz and Erol to determine the knowledge levels of adults. It consists of 28 items and five sub-dimensions.18 The sub-dimensions in the scale are: general knowledge about diabetes; blood glucose measurement value, diabetes Risk Factors, symptoms of diabetes, and diabetes complications. The items in the scale are marked as yes, no, and don't know. Each correct answer is given 1 point, while 0 points are not given for wrong or 'don't know' answers. The total scores range from 0 to 28. The higher the score, the greater the individual's knowledge about diabetes. Yavuz and Erol Cronbach's alpha reliability coefficient was 0.94.[18] In our study, the Cronbach's alpha value was found to be 0.91.

Intervention

The researchers administered all study scales to the students face-to-face in the nursing laboratory. Prior to data collection, both the intervention and control groups had received the same theoretical diabetes-related education as part of their regular semester curriculum, delivered by the same instructor. Topics covered in routine courses included: definition of diabetes, etiology of diabetes, classification, treatment and nursing care, and acute and chronic complications.

The intervention group was allowed to use ChatGPT-4 as an assistive tool while responding to the DKSA. Each student in this group individually accessed ChatGPT-4 on a laboratory computer under the supervision of the researchers. Students were instructed to use ChatGPT-4 freely to help them answer the DKSA questions. Each student completed the questionnaire individually and sequentially, ensuring that responses were not shared among participants.

The control group completed the DKSA independently, without any technological assistance. The use of electronic devices such as mobile phones, computers, or internet-based resources was strictly prohibited during data collection. This procedure allowed for a clear comparison between tool-assisted response performance and non-assisted response performance on the DKSA.

Data analysis

Statistical analyses were conducted with SPSS® software version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the data, including mean ± standard deviation (SD), percentages, and ranges. The normality of continuous variables was assessed using the Kolmogorov–Smirnov and Shapiro-Wilk tests. The Chi-square test was used for the analysis of categorical data. The comparison between these two groups was performed using the independent t-test. A p-value below 0.05 within the 95% confidence interval was regarded as indicating statistical significance.

Ethical considerations

The study was carried out in accordance with the Declaration of Helsinki 2013 and was approved by the Ethics Committee of Clinical Research of Ankara Medipol University (No:2024-75). All students were informed about the study and provided informed consent.

Table 1. Sociodemographic characteristics of students

Sociodemographic characteristics	Intervention (n=53)	Control (n=52)	p value
Age			
18-20	24 (45.3%)	22 (42.3%)	0.759
21-25	29 (54.7%)	30 (57.7%)	
Gender			
Woman	49 (92.5%)	48 (92.3%)	0.978
Man	4 (7.5%)	4 (7.7%)	
Family History of Diabetes			
Yes	13 (24.5%)	13 (25.0%)	0.955
No	40 (75.5%)	39 (75.0%)	

Results

Sociodemographic

The two groups had homogenous socio-demographic characteristics (Table 1). 43.81% of the students who participated in the study were between the ages of 18 and 20; 97% were female; 24.8% had someone with diabetes in their family; and none had a diagnosis of diabetes.

Medical artificial intelligence readiness scale for medical students (MAIRS-MS)

No statistically significant differences were observed between the intervention and control groups with respect to the Cognitive, Ability, Vision, and Ethics sub-dimensions, nor in the total MAIRS-MS score ($p > 0.05$) (Table 2).

Diabetes Knowledge Scale for Adults (DKSA)

The intervention group's scores in the DKSA and sub-dimensions of diabetes risk factors, symptoms of diabetes were higher than those of the control group, and the difference was found to be statistically significant (respectively p=0.003, p=0.000, p=0.002) (Table 3).

Discussion

In our study, the intervention and control groups had similar MAIRS-MS scores. The students' MAIRS-MS scores were above the scale averages. However, no statistically significant difference was found between the intervention and control groups. These findings are consistent with previous studies reporting generally positive attitudes of nursing students toward artificial intelligence.[2,5,11,19]

The important finding here is that the intervention group used ChatGPT. And this is how students improved their knowl-

Table 2. Comparison of MAIRS-MS scale scores of intervention and control groups

Group	MAIRS-MS sub-dimension				Medical Artificial Intelligence Readiness Factor (Total Factor)
	Cognition Factor Mean ± SD	Ability Factor Mean ± SD	Vision Factor Mean ± SD	Ethics Factor Mean ± SD	
Intervention (ChatGPT group)	23.69± 6.01	26.71 ±6.55	9.45 ± 2.46	10.05 ± 2.45	69.96 ±15.02
Control Group	25.21±6.18	29.09±6.69	10.09±2.68	10.80 ±2.77	75.21 ± 16.24
Within-group p-value	0.206	0.069	0.204	0.142	0.090

edge scores about diabetes, including diabetes risk factors and symptoms, using ChatGPT-4. They reflect tool-assisted performance during test completion, as participants were allowed to use ChatGPT-4 while answering the DKSA. Similar to the use of a calculator during a mathematics test, ChatGPT-4 appears to have enhanced response accuracy at the time of assessment, rather than improving conceptual understanding. In parallel with our research, Makhlouf et al. found that nurses' knowledge of knowledge-based chatbot systems increased significantly with an artificial intelligence-based robot.[12] The use of ChatGPT in nursing and midwifery education in chronic diseases such as diabetes can be used as an auxiliary tool by providing academic support, answering questions, and promoting learning through interactive conversations. It improves educational outcomes in chronic diseases and care by providing personalized learning experiences based on students' understanding and learning style.[2,5,9] Although artificial intelligence has many applications in nursing and midwifery, the majority of studies have focused on clinical practices, with limited research in the field of education.[10,20] Therefore, we were unable to find studies with which to directly compare our results. However, articles on the clinical use of ChatGPT in diabetes diagnosis, management, and patient guidelines are consistent with our results.[14-16]

In a study evaluating the accuracy of responses to the Diabetes Knowledge Questionnaire (DKQ), the authors suggested that ChatGPT could be a suitable tool for assisting in diabetes education and management.[15] ChatGPT was determined to be able to provide personalized educational content about diabetes management, including dietary recommendations and exercise plans.[16] Jairoun et al. evaluated the benefit-risk scenario of ChatGPT applications in the field of diabetes and metabolic diseases with the participation of 25 endocrinologists and diabetologists.[21] Prominent benefits of ChatGPT include increased diagnostic accuracy, personalized treatment and they found that these elements can improve patient outcomes.[21] In our study, we similarly found that the responses of students using ChatGPT-4 for diabetes symptoms and risk factors were more accurate.

While ChatGPT has these positive aspects, there are also some considerations to be mindful of. ChatGPT may not always provide the most up-to-date or accurate clinical information, which increases the risks of relying solely on artificial intelligence (AI) for health education.[4,15,21] At this point, it is very important for academics to verify the content produced by ChatGPT and AI.[9-11] ChatGPT should not completely replace the education provided in clinical settings with real patients and experienced instructors when it comes to learning about diabetes and its symptoms. While AI can be a useful supplementary tool for education, the hands-on experience and human interaction in clinical training are irreplaceable for developing a deeper understanding of complex conditions like diabetes.

This research had some limitations. The first limitation of the study is the use of unequal information sources between the intervention and control groups. While the intervention group was allowed to use ChatGPT-4 as an external information support when responding to the DKSA, the control group answered the same scale without access to any technological assistance. Therefore, the results might reflect tool-assisted response performance rather than students' independent acquisition of diabetes knowledge. Second, the study was conducted in a single institution with nursing and midwifery students, which may limit the generalizability of the results to other educational settings or disciplines. Third, students' familiarity with artificial intelligence tools was not measured before the intervention.

Conclusion

The use of ChatGPT-4 can support nursing and midwifery students in answering diabetes-related questions. Our results revealed a positive effect of integrating ChatGPT-4 into learning processes in chronic diseases such as diabetes, suggesting its potential as an assistive tool for learning about chronic diseases. These results may create an awareness for the conscious use of ChatGPT or large language models in internal medicine courses and other systemic disease courses.

References

1. OpenAI. Introduction to ChatGPT. Accessed April 18, 2025. https://openai.com/blog/chatgpt

2. Gunawan J, Aungsuroch Y, Montayre J. ChatGPT integration within nursing education and its implications for nursing students: A systematic review and text network analysis. Nurse Educ Today. Oct 2024;141:106323. doi:10.1016/j.nedt.2024.106323

3. Tam W, Huynh T, Tang A, Luong S, Khatri Y, Zhou W. Nursing education in the age of artificial intelligence powered Chatbots (AI-Chatbots): Are we ready yet? Nurse Educ Today. Oct 2023;129:105917. doi:10.1016/j.nedt.2023.105917

4. Ruksakulpiwat S, Kumar A, Ajibade A. Using ChatGPT in Medical Research: Current Status and Future Directions. J Multidiscip Healthc. 2023;16:1513-1520. doi:10.2147/JMDH.S413470

5. Labrague LJ, Aguilar-Rosales R, Yboa BC, Sabio JB, de Los San-

Table 3. Comparison of DKSA scale scores of intervention and control groups

Groups	DKSA sub-dimension					DKSA Total Score
	General Knowledge About Diabetes Mean ± SD	Blood Glucose Measurement Dimension Mean ± SD	Diabetes Risk Factors Mean ± SD	Symptoms of Diabetes Mean ± SD	Diabetes Complications Mean ± SD	
Intervention (ChatGPT group)	3.62 ± 0.62	4.35 ±0.94	3.37 ± 0.77	7.30 ± 1.08	4.66 ± 0.80	23.32 ±2.62
Control Group	3.42 ±0.82	4.07 ±0.98	2.80 ±0.86	6.80 ±1.65	4.31 ±1.07	21.4 ± 3.08
Within-group p-value	0.165	0.103	0.000*	0.002*	0.006	0.003*

tos JA. Student nurses' attitudes, perceived utilization, and intention to adopt artificial intelligence (AI) technology in nursing practice: A cross-sectional study. Nurse Educ Pract. Nov 2023;73:103815. doi:10.1016/j.nepr.2023.103815

6. Gosak L, Pruinelli L, Topaz M, Stiglic G. The ChatGPT effect and transforming nursing education with generative AI: Discussion paper. Nurse Educ Pract. Feb 2024;75:103888. doi:10.1016/j.nepr.2024.103888

7. Yalcinkaya T, Cinar Yucel S. Bibliometric and content analysis of ChatGPT research in nursing education: The rabbit hole in nursing education. Nurse Educ Pract. May 2024;77:103956. doi:10.1016/j.nepr.2024.103956

8. Seney V, Desroches ML, Schuler MS. Using ChatGPT to Teach Enhanced Clinical Judgment in Nursing Education. Nurse Educ. May-Jun 01 2023;48(3):124. doi:10.1097/NNE.0000000000001383

9. Archibald MM, Clark AM. ChatGTP: What is it and how can nursing and health science education use it? J Adv Nurs. Oct 2023;79(10):3648-3651. doi:10.1111/jan.15643

10. O'Connor S, Yan Y, Thilo FJS, Felzmann H, Dowding D, Lee JJ. Artificial intelligence in nursing and midwifery: A systematic review. J Clin Nurs. Jul 2023;32(13-14):2951-2968. doi:10.1111/jocn.16478

11. Kwak Y, Seo YH, Ahn JW. Nursing students' intent to use AI-based healthcare technology: Path analysis using the unified theory of acceptance and use of technology. Nurse Educ Today. Dec 2022;119:105541. doi:10.1016/j.nedt.2022.105541

12. Makhlouf E, Alenezi A, Shokr EA. Effectiveness of designing a knowledge-based artificial intelligence chatbot system into a nursing training program: A quasi-experimental design. Nurse Educ Today. Jun 2024;137:106159. doi:10.1016/j.nedt.2024.106159

13. Khan I, Agarwal R. Can ChatGPT Help in the Awareness of Diabetes? Ann Biomed Eng. Oct 2023;51(10):2125-2129. doi:10.1007/s10439-023-03356-1

14. Barlas T, Altinova AE, Akturk M, Toruner FB. Credibility of ChatGPT in the assessment of obesity in type 2 diabetes according to the guidelines. Int J Obes (Lond). Feb 2024;48(2):271-275. doi:10.1038/s41366-023-01410-5

15. Nakhleh A, Spitzer S, Shehadeh N. ChatGPT's Response to the Diabetes Knowledge Questionnaire: Implications for Diabetes Education. Diabetes Technol Ther. Aug 2023;25(8):571-573. doi:10.1089/dia.2023.0134

16. Şah M, Göğebakan K. Comparing ChatGPT responses with clinical practice guidelines for diagnosis, prevention, and treatment of diabetes. In: EAI/Springer Innovations in Communication. Springer International Publishing; 2024:63–72.

17. Karaca O, Caliskan SA, Demir K. Medical artificial intelligence readiness scale for medical students (MAIRS-MS) - development, validity and reliability study. BMC Med Educ. Feb 18 2021;21(1):112. doi:10.1186/s12909-021-02546-6

18. Yavuz K, Erol S. Developing a Diabetes Knowledge Scale for Adults and its Psychometric Properties. Clinical and Experimental Health Sciences. September 2022;12(3):711-718. doi:10.33808/clinexphealthsci.1014888

19. Pinto Dos Santos D, Giese D, Brodehl S, et al. Medical students' attitude towards artificial intelligence: a multicentre survey. Eur Radiol. Apr 2019;29(4):1640-1646. doi:10.1007/s00330-018-5601-1

20. Montejo L, Fenton A, Davis G. Artificial intelligence (AI) applications in healthcare and considerations for nursing education. Nurse Educ Pract. Oct 2024;80:104158. doi:10.1016/j.nepr.2024.104158

21. Jairoun AA, Al-Hemyari SS, Shahwan M, Al-Qirim T, Shahwan M. Benefit-Risk Assessment of ChatGPT Applications in the Field of Diabetes and Metabolic Illnesses: A Qualitative Study. Clin Med Insights Endocrinol Diabetes. 2024;17:11795514241235514. doi:10.1177/11795514241235514