The Knowledge of Students at Bursa Faculty of Medicine towards Artificial Intelligence: A Survey Study

Deniz Güven[1], Elif Güler Kazancı[2], Ayşe Ören[3], Livanur Sever[4], Pelin Ünlü[5]

[1]Department of Pediatrics, Ankara Etlik City Hospital, Ankara, Turkey
[2]Department of Pediatric Hematology Oncology, University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital, Bursa, Turkey
[3]Department of Pediatrics, University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital, Bursa, Turkey

ABSTRACT

Objectives: Artificial intelligence (AI) is being increasingly widely employed in medicine. Various artificial intelligence software solutions will most certainly be available to medical students when they begin their jobs after completing school. The goal of this study was to assess medical faculty students' knowledge and attitudes about AI in medicine.

Methods: In 2020-2021, students at the University of Health Sciences, Bursa Training and Research Hospital participated in an online survey using Google Forms. The survey included sections assessing demographic features and attitudes toward AI in medicine.

Results: The questionnaire was completed by 85 students (57 females and 28 males). 50 medical school students and 35 pediatric medical specialty students completed the questionnaire. The mean time spent on the internet per day was 7.5400 ± 3.67123 hours in MS and 3.1143 ± 2.0547 hours in MA ($p < 0.001$). All of the participants had heard AI before ($p = 0.500$). 62% of MS and 65.7% of MA worried about AI doing many things today; no statistically significant difference was found between the two groups ($p = 0.453$). 56.5% of participants felt "curiosity", 16.4% felt "excited", 11.8% felt "look positive", 15.3% felt "frightened" about the increased use of artificial intelligence in our lives. 24% of the MS and 37.1% of the MA knew AI applications used in medicine; there was no statistically significant difference between the two groups ($p = 0.191$). The most commonly known applications of AI in medicine were in the fields of robotic surgery (10.5%) and radiology (3.6%). While 8% of the MS participated in the project / study related to AI; none of the MA participated, there was a statistically significant difference between the two groups ($p = 0.036$). On the contrary, the use of AI in medicine was 5.7% in MA; it was never possible in MS, there was no statistically significant difference between the two groups ($p = 0.057$). 91.8% of the participants would like to use AI in their future careers as physicians. 68% of MS and 94.3% of MA thought AI could not replace doctors in the future; there was a statistically significant difference between the two groups ($p = 0.004$).

Conclusion: Medical students, who will be the physicians of the future, regarded AI applications positively, and they wanted to gain education and experience in this subject with deep curiosity. Since the knowledge level of future physicians in this field is not sufficient, it is important to provide more AI training in medicine, to participate in more

projects in this field, and to increase the use of AI by medical students in the field of medicine.

Keywords: artificial intelligence, education, medicine, medical students

Machines and systems use artificial intelligence (AI) to solve complicated problems and resemble the intelligence of humans. In 1955, Mc Carthy developed the term AI to define the technology and science of developing computers with intelligence [1]. The aim of these algorithms is to be willing to analyze data from a big database and simulate human choices following a particular set of directions. Medical Sciences, as a complicated scientific discipline, is frequently faced with the difficulties of collecting, analyzing, and using enormous quantities of information [2]. The use with the implementation of large-scale data generation techniques in the field of medicine has become essential. There are also continuing expectations to enhance patient availability of services, reduce operational expenses, and improve outcomes during treatment.

AI in medical treatments has a chance to improve numerous facets of healthcare. The responsibility of adapting the process to ever-changing standards and recommendations increases medical professionals' dissatisfaction and requires highly qualified individuals to work extra time on documents rather than concentrating on caring for patients [3]. Operations are almost impossible for humans to do, such as monitoring patients 24 hours a day, can also be performed safely by AI systems. It can reduce the number of erroneous errors in clinical practice and the differences in judgment among medical professionals. New models discovered by AI through analysis of big data from clinical practice could enable the development of new biomarkers for diagnosis and treatment.

AI tools for medicine often play the role of a virtual assistant for doctors and healthcare systems, helping them provide more accurate and efficient patient care. AI can be designed and used as a virtual assistant for patients and the public in common chronic diseases or primary health care [4]. Counseling on simple health problems or rewriting of chronic drug prescriptions may be possible. If simple but time-consuming work processes are taken care of by AI, it significantly reduces the fatigue of healthcare providers. Doctors can take more care of patients and spend more time concentrating on more complex medical tasks.

As current medical students begin their careers as medical professionals, various AI software tools are likely to be used in clinical practice. When it concerns using AI technology to patients, healthcare providers should be in the driver's position, not in the back seat [5, 6]. The aim of this study was to determine the knowledge and attitudes of medical students and medical specialty education students at the University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital, towards AI in medicine.

METHODS

This cross-sectional, self-administered, survey-based study was conducted by distributing a web-based questionnaire prepared using Google Forms. A web-based questionnaire sent online to 80 students of medicine (MS) and 45 students of medical specialty education studying in the field of pediatrics (MA) at the University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital between 2020 and 2021. Participation in the survey is completely optional and the permission of participants has been obtained. The questionnaire was completed by 50 MS and 35 MA. The literature was used to create the questionnaire. The first 15 questions of the questionnaire evaluated the students' demographic characteristics, technology-related attitudes, and skills. The final section of the questionnaire, which included 15 questions, was designed to assess their knowledge, experience, and attitudes toward AI in medicine. Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 27.0 (released 2020; IBM Corp., Armonk, New York, United States). Descriptive statistics are presented in percentages. Chi-square test and Kruskal–Wallis one-way analysis of variance test was used to examine differences between groups. P-values of < 0.05 were considered statistically significant. Ethical approval was obtained from the ethics committee of University of Health and Science, Bursa Faculty of Medicine (2011-KAEK-25 2021/02-25)

RESULTS

The questionnaire was filled out by 50 MS and 35 MA. 67% of participants were female. While the gen-

Table1. Medical students and medical specialty students' demographic characteristics, technology-related attitudes, and skills. The final section of the questionnaire, which included 15 questions, was designed to assess their knowledge, experience, and attitudes toward AI in medicine.

	Groups			
	Medical Students (MS) (n = 50)	Medical specialty education students (MA) (n = 35)	Total (n = 85)	*p*
Gender				
Female	26 (52%)	31 (88.6%)	57 (67%)	**< 0.001**
Male	24 (48%)	4 (11.4%)	28 (33%)	
Age				
18-25 years	49 (98%)	8 (22.9%)	57 (67%)	**< 0.001**
26-30 years	0 (%0)	22 (62.9%)	22 (25%)	
>30 years	1 (2%)	5 (14.3%)	6 (7%)	
Year in the medical school/speciality education				
First year	34 (68%)	10 (28.6%)	44 (51.7%)	
Second year	3 (6%)	17 (48.6%)	20 (23.5%)	**< 0.001**
Third year	1 (2%)	3 (8.6%)	4 (4.7%)	
Fourth year	12 (24%)	5 (14.3%)	17 (2%)	
Maritial				
Single	50 (100%)	20 (57.1%)	70 (82.4%)	**< 0.001**
Married	0 (0%)	15 (42.9%)	15 (17.6%)	
Family				
Nuclear	42 (84%)	32 (91.4%)	74 (87%)	0.422
Extended	7 (14%)	3 (8.6%)	10 (11,8%)	
Distrubuted	1 (2%)	0 (0%)	1 (1.2%)	
Family income				
High	14 (28%)	14 (40%)	28 (33%)	0.440
Medium	34 (68%)	19 (54.3%)	53 (62.3%)	
Low	2 (%4)	2 (5.7%)	4 (4.7%)	
Mother's education				
Illiterate	2 (4%)	0 (%0)	2 (2.3%)	0.307
Primary education	14 (28%)	7 (20%)	21 (24.7%)	
High school	14 (28%)	9 (25.7%)	37 (43.5%)	
University	20 (40%)	19 (54.3%)	59 (69.5%)	
Father's education				
Illiterate	1 (2%)	0 (0%)	1 (1.2%)	0.451
Primary education	10 (20%)	5 (14.3%)	15 (17.7 %)	
High school	12 (24%)	6 (17.1%)	18 (21.1%)	
University	27 (54%)	24 (68.6%)	51 (60%)	
Mother's work				
Yes	19 (38%)	14 (40%)	33 (38.9%)	0.852
No	31 (62%)	21 (60%)	52 (61.1%)	
Father's work				
Yes	37 (74%)	26 (74.3%)	63 (74%)	0.976
No	13 (26%)	9 (25.7%)	22 (26%)	
Living place				
With family	41 (82%)	8 (22.9%)	49 (57.6%)	**< 0.001**
Own home	7 (14%	27 (77.1%)	34 (40%)	
Dorm	2 (4%)	0 (0%)	2 (2.4%)	
Access to internet				
Yes	49 (98%)	34 (97.1%)	83 (97.6%)	< 0.798
No	1 (2%)	1 (2.9%)	2 (2.4%)	
Time spent on the internet per day (mean ± SD)	7.5400 ± 3.67123	3.1143 ± 2.0547	5.7176 ± 3.791	**< 0.001**
Computer knowledge level				
Bad	3 (6%)	1 (2.9%)	4 (4.7%)	0.557
Little	4 (8%)	7 (20%)	11(12.9%)	
Moderate	22 (44%)	13 (37.1%)	35 (41.1%)	
Good	16 (32%)	11 (31.4%)	27 (31.8%)	
Excellent	5 (10%)	3 (8.6)	8 (9.5%)	
Computer-related training				
Yes	7 (14%)	6 (17.1)	13 (15.3%)	0.459
No	43 (86%)	29 (82.9%)	72 (84.7%)	

Table2. Medical students and medical specialty students' knowledge, experience, and attitudes toward AI in medicine

	Groups Medical Students (MS) (n = 50)	Medical Specialty Students (MA) (n = 35)	Total (n = 85)	p
Do you worry about robots entering our lives and communicate with humans?				
Yes	17 (34%)	15 (42.9%)	31 (37.6 %)	0.407
No	33 (66%)	20 (57.1%)	53 (62.4%)	
Have you heard of artificial intelligence before?				
Yes	50 (100%)	35 (100%)	85 (100%)	0.500
No	0 (0%)	0 (100%)	0 (0%)	
Does it worry you that artificial intelligence is doing so many things today?				
Yes	19 (38%)	12 (34.3%)	31(36.4%)	0.453
No	31 (62%)	23 (65.7%)	54 (63.6%)	
How do you feel about the increased use of artificial intelligence in our lives?				
Arouse curiosity	29 (58%)	19 (54.3%)	48 (56.5%)	
Excite	11 (22%)	3 (8.6%)	14(16.4%)	**0.031**
Look positive	2 (4%)	8 (22.9%)	10 (11.8%)	
Frightened	8 (16%)	5 (14.3%)	13 (15.3%)	
Do you know about artificial intelligence applications used in medicine?				
Yes	12 (24%)	13 (37.1%)	25 (29.4%)	0.191
No	38 (76%)	22 (62.9%)	60 (70.6%)	
What are the areas you know about the use of artificial intelligence in medicine?				
• Robotic surgery	4 (8%)	5 (14.2%)	9 (10.5%)	0.379
• Neuralink project for paralyzed patients	1 (2%)	0 (0%)	1 (1.2%)	
• Radiology	3 (6%)	0 (0%)	3 (3.6%)	
• Da Vinci robots	2 (4%)	0 (0%)	2 (2%)	
• X-ray analysis and ECG interpretation for diagnosis	1 (2%)	1 (2.9%)	2 (2%)	
• Pathology	0 (0%)	1 (2.9%)	1 (1.2%)	
• Medical education through patient simulations	0 (0%)	1 (2.9%)	1 (1.2%)	
• None	39 (78%)	27 (77.1%)	66 (77.5%)	
Have you participated in the project regarding AI in medicine?				
Yes	4 (8%)	0 (0%)	4 (4.7%)	**0.036**
No	46 (92%)	35 (100%)	96 (95.3%)	
Have you ever used AI in medicine?				
Yes	0 (0%)	2 (5.7%)	2 (2.3%)	0.057
No	50 (100%)	33 (94.3%)	83 (97.7%)	
Would you like to use AI in your future career as a physician?				
Yes	46 (92%)	32 (91.4%)	78 (91.8%)	0.925
No	4 (8%)	3 (8.6%)	7 (8.2%	
Are hospitals using AI have more advantages in diagnosis?				
Yes	44 (88%)	29 (82.9%)	73 (85.9%)	0.506
No	6 (12%)	6 (17.1%)	12 (14.1%)	
Are hospitals using AI have more advantages in treatment?				
Yes	46 (92%)	28 (80%)	74 (87%)	0.108
No	4 (8%)	7 (0%)	11 (13%)	
Should AI education be provided in medical education?				
Yes	47 (94%)	31 (88.6%)	78 (91.7%)	0.375
No	3 (6%)	4 (11.4)	7 (8.3%)	
Would you like to have AI applications in medical school?				
Yes	49 (98%)	33 (94.3%)	82 (96.5%)	0.365
No	1 (2%)	2 (5.7%)	3 (3.5%)	
Should AI applications be used more in medicine?				
Yes	42 (84%)	32 (91.4%)	74 (87%)	0.305
No	8 (16%)	3 (8.6%)	11 (13%)	
Do you find AI applications used in medicine reliable?				
Yes	37 (74%)	25 (71.4%)	26 (30.6%)	
No	13 (26%)	10 (28.6%)	59 (69.4%)	0.793
Could AI replace doctors in the future?				
Yes	16 (32%)	2 (5.7%)	18 (21.5%)	**0.004**
No	34 (68%)	33 (94.3%)	69 (78.5%)	

der distribution of MS is uniform, 88.6% of MA is female (p < 0.001). Although the majority of MS were between the ages of 18 and 25 (98%), the majority of MA was between the ages of 26 and 30 (62.9%) (p < 0.001). 68% of MS were in their first year of medical school, 48.6% of MS were second year of specialty education (p < 0.001). All of the participants in MS were single while 42.9% of MA was married (p < 0.001). 87% of families were nuclear and no statistically significant difference was found between the two groups (p = 0.422). Both groups' family income levels were moderate (62.3%) and most parents had university education, no statistically significant difference was found between the two groups (p>0.05). 38.9% of the mothers and 74% of fathers were working and no significant difference was found between the two groups (p >0.05). While 57.6% of the participants were living with their families, 4% of MS were living in dorm, 77.1% of MA stayed in their own house (p < 0.001). 97.6% of the participants had internet access wherever they lived, there was no statistically significant difference was found between the two groups (p < 0.798). The mean time spent on the internet per day was 7.5400 ± 3.67123 hours in MS and 3.1143 ± 2.0547 hours in MA (p < 0.001). 41.1% of all participants had a moderate level of computer education, and there was no statistically significant difference between the two groups (p = 0.557). Computer-related training was received by 86% of MS and 82.9% of MA, there was no statistically significant difference between the two groups (p = 0.459) (Table 1).

34% of MS and 42.9% of MA were worried about robots entering our lives and communicate with humans, there was no statistically significant difference between the two groups (p = 0.407). All of the participants heard AI before (p=0.500). 62% of MS and 65.7% of MA worried about AI doing many things today, no statistically significant difference was found between the two groups (p = 0.453). 56.5% of participants felt "curiosity", 16.4% felt "excited", 11.8% felt "look positive", 15.3% felt "frightened" about the increased use of AI in our lives. 58% of MS felt "curiosity" while 54.3% of MA, 22% of MS felt "excited" while 8.6% of MA, 4% of MS felt "look positive" while 22.9% of MA,16% of MS felt "frightened" while 14% of MA, respectively and there was statistically significant difference between the two groups (p = 0.03). 24% of the MS and 37.1% of MA were knew AI applications used in medicine, there was no statistically significant difference between the two groups (p = 0.191). The mostly known applications

of AI in medicine were in the fields of robotic surgery (10.5%), radiology (3.6%), the others were, da Vinci robots (2%), X-ray analysis and ECG interpretation for diagnosis (2%), neuralink project for paralyzed patients (1.2%), pathology (1.2%), and medical education (1.2%) through patient simulations. There was no statistically significant difference between the two groups (p = 0.379). While 8% of the MS participated in the project / study related to AI; none of the MA participated, there was a statistically significant difference between the two groups (p = 0.036). On the contrary, the use of AI in medicine was 5.7% in the MA it was never possible in MS, there was no statistically significant difference between the two groups (p = 0.057). 91.8% of the participants would like to use AI in their future career as a physician, there was no statistically significant difference between the two groups (p = 0.925). Although almost all of both groups think that hospitals using AI was more advantageous in diagnosis and treatment; there was no statistically significant difference between the two groups (p > 0.05). 91.7% of the participants thought AI education should be provided in medical education, there was no statistically significant difference between the two groups (p = 0.375). 96.5% of the participants would like to have AI applications in medical school, there was no statistically significant difference between the two groups (p = 0.365). 87% of the participants thought AI applications should be used more in medicine, there was no statistically significant difference between the two groups (p = 0.793). 69.4% of the participants not found reliable AI applications used in medicine, there was no statistically significant difference between the two groups (p= 0.793). 68% of MS and 94.3 % of MA thought AI could not replace doctors in the future; there was a statistically significant difference between the two groups (p = 0.004) (Table2).

DISCUSSION

The purpose of this study was to investigate medical students' knowledge, perceptions, and attitudes toward the integration of AI in the medicine. In our study, we found that the majority of participants had heard of the terms "artificial intelligence" while most of them were even aware that it was recently being discussed in medicine. These findings indicate that students have a basic understanding of AI but require deeper comprehension its use in medicine. a similar pattern was observed in other studies conducted from

different countries [7-12].

The majority of students agreed that AI should be part of medical training and most wanted more teaching focusing on AI in medicine. Medical students appeared optimistic regarding the role of AI in medicine, with most agreeing with the statement that AI will improve medicine in general. The majority of medical students were not concerned about the impact of AI on their job security as a doctor. Our research similar with other research conducted before. However student thought that AI could replace doctors in the future were higher in MS than MA [10-14].

In a study conducted in Australia students selected radiology (72.6%), pathology (58.2%), and medical administration (44.8%) as the specialties most likely to be impacted by AI, and psychiatry (61.2%), palliative care (48.5%), and obstetrics and gynecology (41.0%) as the specialties least likely to be impacted by AI. In our study the mostly known applications of AI in medicine were in the fields of robotic surgery (10.5%), radiology (3.6%), the others were, da Vinci robots (2%), X-ray analysis and ECG interpretation for diagnosis (2%), neuralink project for paralyzed patients (1.2%), pathology (1.2%), and medical education (1.2%) through patient simulations [13].

In our study the time spend on the internet were found to be significantly higher in MS. 8% of MS participated in the project regarding AI in medicine while none of MA did. Male and early age participants were much more in MS however the average age was higher and most of them were women in MA. As a result of these differences, the state of interest in AI in medicine may be higher in MS than in MA. This might be attributed to the recent initiation of studies in this newly developing field or to the fact that MS were more open to technology due to their age.

Almost all of our participants stated that they were aware of the benefits of using AI in the field of medicine while they thought that hospitals using AI would be more successful in diagnosis and treatment. Most of them said that they want to use AI much more in their future medical lives. The rate of those who wanted AI training in medicine was found to be very high in both groups. These findings were found to be compatible with current studies [16, 17].

Although modern AI technologies such as deep learning are known to have high accuracy in finding patterns compared to past technologies, they have a strong dependence on training data. The accuracy of their algorithms cannot go beyond the information specific to the datasets they are trained in and cannot avoid errors in their data. This strong data dependency poses a particular concern in the medical field [18, 19]. In our study, most of the participants found AI safe in the medical field and found AI applications used in medicine reliable. Although the general opinion was that the robots cannot replace physicians, the younger generation believed much more that this might happen.

CONCLUSION

As a result; medical students, who will be the physicians of the future, regarded AI applications positively and they wanted to gain education and experience in this subject with deep curiosity. AI will open completely different doors in medical education and medical applications; future physicians will also be the supporter and practitioner of this technology. Since the knowledge level of future physicians in this field is not sufficient, it is important to provide more AI training in medicine, to participate in more projects in this field, and to increase the use of AI by medical students in the field of medicine.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

The protocol of the study was approved by the Medical Ethics Committee of University of Health and Science, Bursa Faculty of Medicine, Bursa, Turkey. (2011-KAEK-25 2021/02-25)

Authors' Contribution

Study Conception: EGKI; Study Design: EGK, DG; Literature Review: DG; Critical Review: EGK; Data Collection and/or Processing: LS, EÜ,; Analysis and/or Data Interpretation: DG; Manuscript preparing: DG.

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