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RESEARCH ARTICLE

IMPACT OF APPLYING ARTIFICIAL INTELLIGENCE: HEALTHCARE PROFESSIONALS' INSIGHT (A QUALITATIVE SURVEY STUDY IN HAFR-ELBATIN, SAUDI ARABIA)

Mansour Ali Alyousef[1], Anwar Saleh Al. Enazi[2], Ahmed Hassan Almosilhi[3], Afaf Ahmed Alanazi[4], Khalid Mufdhi Alanazi[5], Badria Madad Aljumaily[6], Saud Mukhailif Alanazi[7], Abdulaziz Ibrahim Alsenaid[8], Fahad Ibrahim Al Mofeez[9], Al Yousef and Ali Sulaiman[10]

1. Consultant Family And Community Medicine, Ministry of Health, Saudi Arabia.
2. Dentist, Ministry of Health, Saudi Arabia.
3. Consultant of Family and Community Medicine, Advisor of National Center of Complementary and Alternative Medicine, Riyadh, Ministry of Health, Saudi Arabia.
4. Nursing Technician, Al-Rabwa Primary Healthcare Centre, Hafr El-Batin, Saudi Arabia.
5. Emergency Specialist, Pediatric and Maternity Hospital, Hafr El-Batin, Saudi Arabia.
6. Head Nurse, Al-Rabwa Primary Healthcare Centre, Hafr El-Batin, Saudi Arabia.
7. Radiography Specialist, Al-Rabwa Primary Healthcare Centre, Hafr El-Batin, Saudi Arabia.
8. General Directorate of Health Affairs in Riyadh, Saudi.
9. General Directorate of Health Affairs in Riyadh, Ministry of Health, Saudi Arabia.
10. Dentist, Tower's Medical Center, Hafar Al Batin, Saudi Arabia.

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Abstract

Artificial intelligence (AI) is branch of data science enable machines to emulate human thinking. Implementation of AI in the medical field provides a great opportunity to change face of healthcare service by improving diagnosis, service quality, and reduce the cost. The aim of this study is to assess the awareness of AI programs among staff working at healthcare field in Hafr-Elbatin, and to investigate their health professionals' insight toward AI applications inhealthcare. Online google form survey targeted healthcare professionals in Hafr El-Batin, Saudi Arabia. Out of 1400 distributed survey, 234 responses were received. The results showed 40.2% of the participants haven't used AI applications in their work, 35.9% didn't know the difference between machine learning and deep learning, only 13.7% use AI applications at work daily. Regarding attitude, 82.1% of participants suspected that using AI may be a serious privacy issue, 76.9% agreed that AI is more dangerous than nuclear weapons, and 73 are worried that AI may replace their jobs in the future, and 88.9% believed that AI could be useful in my area of work. In contrast to agreeing on usefulness of AI in healthcare field, there is a limited knowledge about AI technologies and concern about potential consequence of its implementation in the medical field. Further studies are needed to investigate the attitude regarding AI application, better education and regulatory framework are required as well.

Corresponding Author:- Mansour Ali Alyousef
Address:- Consultant Family And Community Medicine, Ministry of Health, Saudi Arabia.

Introduction:-

Artificial Intelligence refers to a branch of data science, where computers can learn to analyze big data and human interaction. This technology enables machines to emulate human thinking, predict the results, continue learning, and take decisions based on the generated findings.There is evidencesupporting that these computers have performances similar to or superior to humans in a faster and cost-effective manner [1, 2].

Many healthcare systems all over the world are facing the same challenges including predicting and preventing diseases, determining safe and low-cost treatment and providing cost-effective healthcare[3]. Artificial intelligence can help in overcoming these challenges starting from monitoring disease risk, classifying patients, setting appointments, and optimization of resources to enhance services' quality and patients' experience [4, 5].

Although the aforementioned opportunities, applying AI technology inhealthcare is delayed and limited compared to other fields which use online-based services [6]. Recently, there is a great interest and development of AI applications in the healthcare field due to enhance of computing power and the availability of a massive amount of data[7].

AI technology gradually changing the healthcare practice that can be used in diagnosis, rehabilitation, and clinical decision-making. AI technologies can utilize a large volume of data through different modalities to diagnose diseases and guide clinical decisions[8, 9]. AI-assisted analysis of the radiological image is possibly the most successful area of medical AI application [10]. AI-assisted robotic surgery robots can inform new surgical techniques, minimize invasive surgery, and reduce hospitalization using data from past operations [11]. The virtual assistant is a program designed to emulate smart communication in text or spoken environment, it plays an increasingly important role in medical care. Virtual nursingcan work around the day monitoring the patients and answering questions without visiting the hospital [12].

Despite the initial promising results, the public and scientific community are still confused about AI technologies and their applications. There is a disagreement about the benefits and risks of AI technologies and their capabilities. On the other side, some are worried about AI may replace human intelligence and become uncontrolled [13]. There is a great concern that applying machine learning technology in the medical field may not accepting by physicians and negatively affect the doctor-patient relationship [14, 15]. Although this concern, there is a belief that the appropriate use of AI in the medical field can be beneficial and greatly improve medical and health care [16, 17].

This study aimedto evaluate the awareness of AI technology among the medical staff working in Hafr El-Batin, Saudi Arabia.

Material And Methods:-

We evaluated the knowledge and opinions of health professionals in Hafr El-Batin about applying AI technology in the medical field. For this purpose, we used the cross-sectional-based online questionnaire. The questionnaire was created using "google forms" platform and sent to the medical staff through the work email.

Study participants

The only healthcare professionals in Hafr El-Batin, Saudi Arabia were targeted by this questionnaire. The study was conducted in the period from October to November 2022.The responses were recorded after the participant pressed submit button at the end of the questionnaire. The questionnaire allowed a single response from each participant, and all questionnaire bands were mandatory. Any responses from non-healthcare professionals were excluded.

Ethics approval

The study was approved by the Health Ethics committee at the general directorate of health affairs in Hafr El-Batin, Saudi Arabia. The study didn't include a sensitive subject with no informational risk or psychological harm.The study was performed according tothe principles of the Declaration of Helsinki. Informedconsent was added to the survey, by pressing submit button the participant acceptsfilling out the survey.

Survey

The survey was created in light of the study checklist for reporting results of the electronic survey (CHERRIES), and the previous study conducted at theRoyal Free London NHSFoundation Trust [18, 19]. The questions were

categorized into three parts; the first part included two questions investigated the profession and age of each participant, the second part was from the third to the fifth question assessing the knowledge of healthcare professionals on AI, the third part was from the sixth to the ninth question evaluating the attitude and worries about its current and future applications in the medical field.

Statistical analysis

SPSS version 25.0 was used to analyze the data. The survey result was analyzed as numbers and percentages. Subgroup analysis was conducted using the Kruskal-Wallis test followed bypost-hocpairwise Mann-Whitney U tests with Bonferronicorrection formultiple tests to examinethe source of variance in knowledge andattitudes between different healthcare professions.

Results:-

A total of 234 responses were received from 1400 distributed surveys (response rate 16.5%). Out of eligible (90.5%) out of 234received responses,212 were eligible, and 22 responses were excluded because they were received from non-healthcare professionals. The study population included 48 physicians, 114 nurses, and 50 other healthcare staff. Participants' ages ranged from 20 to 50 years **Table 1**.

Table 1:- Frist part of the survey, Distribution of profession and age in the study population.

Profession distribution of the participants	
Profession	**Number of responses**
Physician	48
Nurse	114
Therapist	6
Physician associate	10
Manager	18
Pharmacist	4
Laboratory Specialist	2
Physician associate	10
Total	212
Age distribution of the participants	
Age/years	**Number of responses**
20-30	36
30-40	64
40-50	82
More than 50	30
Total	212

Knowledge regarding AI

Analysis of the second part of the survey reported 40.2% of the participants haven't used AI applications in their work, 35.9% didn't know the difference between machine learning and deep learning, only 13.7% use speech recognition or transcription applications at work daily, on other hand nearly third the participants 28.2% never used these applications **Figure 1**.

Attitude regarding AI

Regarding attitude, the third part of the survey showed most respondents 82.1% suspected that using AI may be a serious privacy issue, 76.9% agreed that AI is more dangerous than nuclear weapons, and 73 are worried that AI may replace their jobs in the future. In contrast, most of the participants 88.9% believed that AI could be useful in my area of work**Figure 2**.

Subgroup analysis

Subgroup analysis was conducted to evaluate the significant differences in the results according to profession and age; questions from Q6 to Q8 showed significant differences according to profession, and only Q5 according to the Age **Table 2**. The Source of variance in question showed significant differences were investigated bypost-hoc analysis pairwise using Mann-Whitney U tests with Bonferroni adjustment tocorrect for multiple tests**Table 3**. The subgroup analysis, Q5 showed a significant difference between the more than 50-year group and other groups. This

means that young participants prefer using the AI applications "use speech recognition or transcription applications", with 70% of daily use responses coming from participants aged between 20-40years. The physician group showed a positive impression regarding AI as they are less worried about privacy issues; only 17% of the physicians' group agreed with the statement "Artificial intelligence could be useful in my area of work" and its risks as 22% of physicians' group agreed the statement "AI is more dangerous than nuclear weapons".

Figure 1:- The second part of the surveyis regarding the participants' knowledge on AI applications.

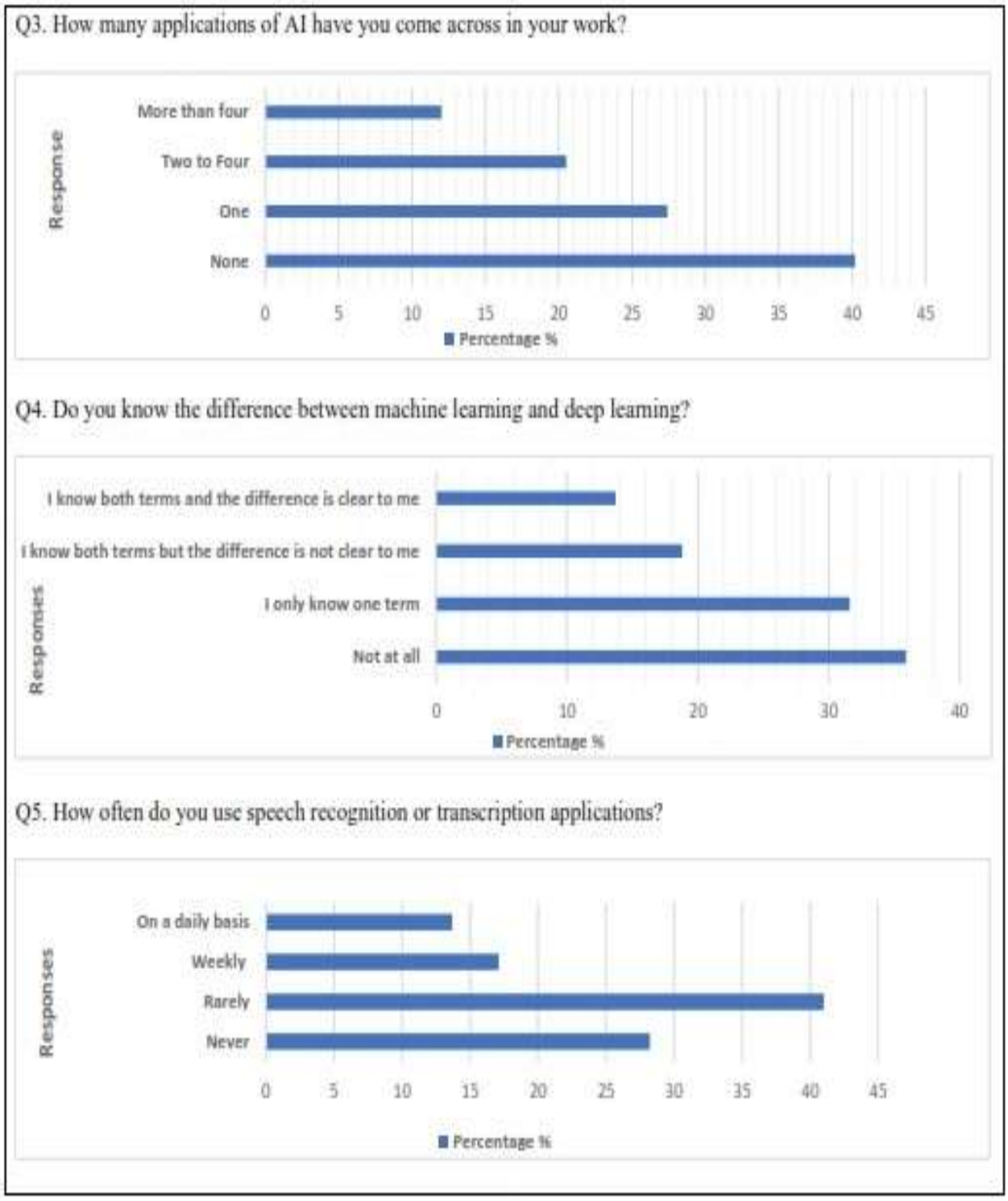

Figure 2:- The third part of the surveyis regarding the participants'behaviortoward AI applications.

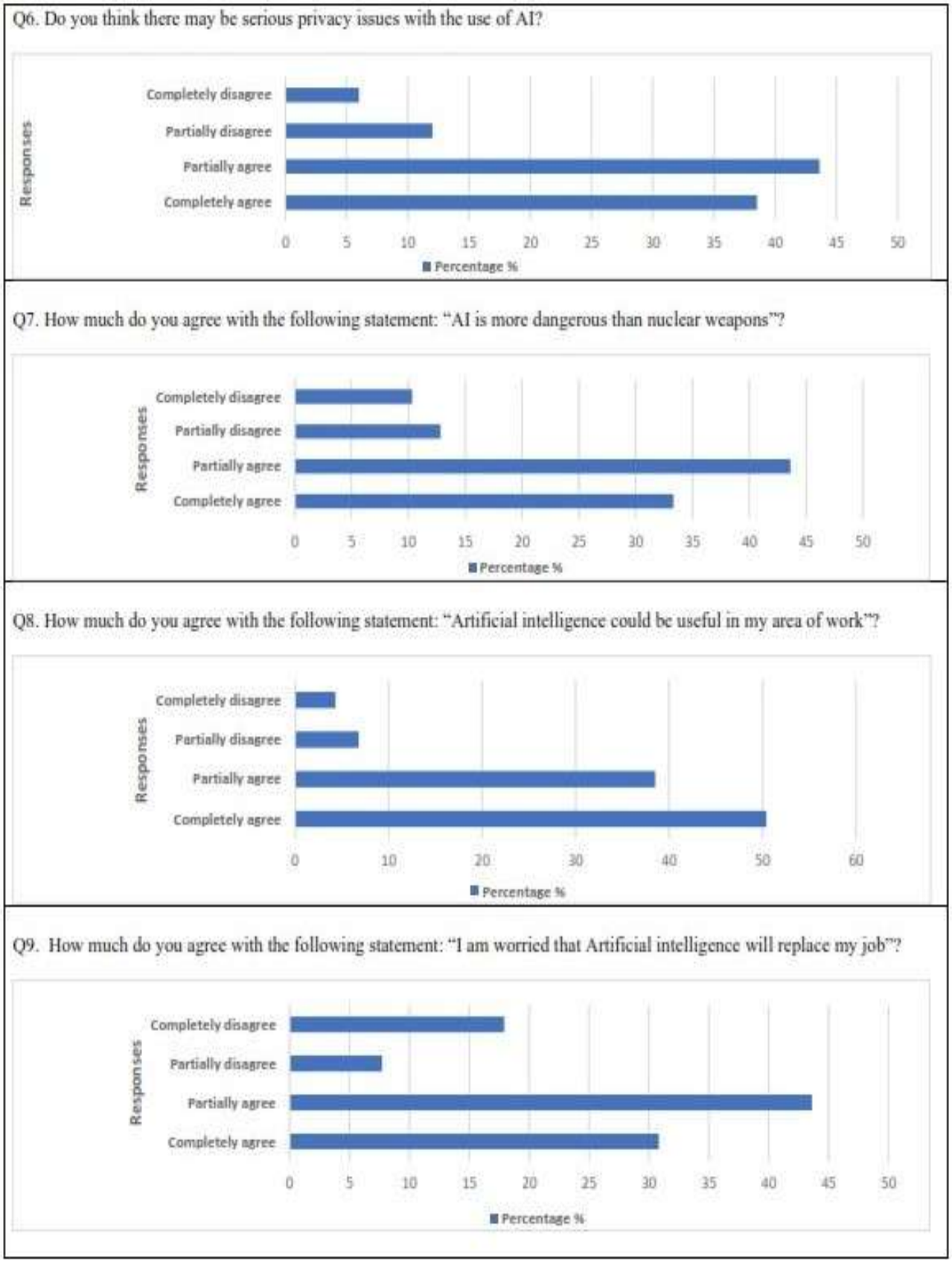

Table 2:- Subgroup analysis by the Kruskal-Wallis test, P-value was calculated and distributed according to participants' profession and age.

Question	p-value	
	Profession	Age
Q3. How many applications of AI have you come across in your work?	0.78	0.76
Q4. Do you know the difference between machine learning and deep learning?	0.48	0.57
Q5. How often do you use speech recognition or transcription applications?	0. 32	0.02
Q6. Do you think there may be serious privacy issues with the use of AI?	0.01	0.023
Q7. How much do you agree with the following statement: "AI is more dangerous than nuclear weapons"?	0.033	0.041
Q8. How much do you agree with the following statement: "Artificial intelligence could be useful in my area of work"?	0.005	0.01
Q9. How much do you agree with the following statement: "I am worried that Artificial intelligence will replace my job"?	0.63	0.72

Table 3:- Post-hocanalysis according to participants' professions and ages.

Question	p-value		Post-hoc	
	Profession	Age	Profession	Age
Q5. How often do you use speech recognition or transcription applications?	------	0.02	------	A significant difference between A groupof more than 50 years and other groups.
Q6. Do you think there may be serious privacy issues with the use of AI?	0.01	0.023	A significant difference between physicians and others (corrected p-value 0.01).	No significant difference
Q7. How much do you agree with the following statement: "AI is more dangerous than nuclear weapons"?	0.033	0.041	A significant difference between physicians and other groupscorrected p-value 0.02).	No significant difference
Q8. How much do you agree with the following statement: "Artificial intelligence could be useful in my area of work"?	0.005	0.01	No significant difference	No significant difference

Discussion:-

Healthcare leaders all over the world share common aims, including disease prevention and management, and providing sustainable high-quality healthcare services. They are making efforts to reach this aim supported by the development of sciences, technology, and inventions such as vaccines, drug discovery, and telehealth which can facilitate access to healthcare services, and provide vast amounts of data analyzed to reduce the cost of health service, monitor the diseases, and improve the quality of healthcare.

AI is credited with providing a revolutionized healthcare service [20], it allows achieving tasks efficiently and accurately based on emulating human intelligence [21]. Although there is an urgent need for AI tools that assist in disease diagnosis and management [22], the finding of this study showed limited knowledge on AI technologies and awareness of their applications.

More than a third of participants 40.2% had never used AI applications such as speech recognition or transcription in their work, and 35.9% didn't know the difference between machine learning and deep learning. These findings are

consistence with the study performed on 98 healthcare professionals of NHS trust, London as 79% of participants didn't know the difference between machine learning and deep learning [18]. This limited knowledge translated as resistance to transfer from typical healthcare [23, 24], and discrepancy about responsibility for errors caused by AI tools, especially when there isn't sufficient training on these tools [21].

This study reported 78.9% of participants consider AI technologycan be useful in the medical field, many studies supported these findings as participants showed a positive attitude towards AI technologies in the medical field [21, 25, 26]. On other hand, the results showed concerns about the safety of using AI in the medical field, with 82.1% of participantsbelieving that using AI may be a serious privacy issue, and 76.9% agreed that AI is dangerous. Consistently, similar findings showed 40% of participants agreed with Elon Musk's statement "AI is more dangerous than nuclear weapons" [18, 27]

Although the Physicians' group demonstrated lower concerns regarding the safety and privacy of using AI in healthcare, 73% of participants are worried that AI may replace their jobs in the future without significant difference between groups. In agreement with our study, 47% of United States jobs are at risk of computerization in near future [28], Two-thirds of Americans expect that robots will do much work within the coming 50 years [29]. In contrast, a study conducted at NHS trust, London demonstrated that 72% of participants denied any concern that AI will replace their jobs in the future [18].

Though AI technologies can emulate human behavior and learning, they can't convey human emotion and express empathy which is important to gain the patient's trust. This provides an acceptable possible explanation for the discrepancy between studies [30]. Additionally, AI technologies are recently applied and there is limited knowledge about their application in the medical field.

In conclusion, there is an agreement among healthcare professionals that AI technologies can change the face of healthcare services by reducing costs and improving diagnosis, quality, and patient experience. The majority of healthcare professionals in this study agreed that AI could be useful in their work. Although, the most of participants responded that using AI may be a serious privacy issue, and dangerous, the physician group is less worried about this. One of the challenges that limit the implementation of AI technologies in the medical field is the lack of knowledge about it. In this context,More than a third of participants never used AI applications and couldn't differentiate between machine learning and deep learning. Additionally, the majority of the participants have a concern regarding the effect of AI on their jobs in the future. More resources are required for the planning and implementation of AI technologies in the medical field and the training of healthcare professionals for applying AI in their daily practice. More further studies should be done to study the attitude of the community, and the impact of the implementation of AI in the healthcare system and other fields.

Our study has limitations. The first limitation is sample size didn't represent all healthcare professionals sufficiently, so we couldn't study the effect of the profession on knowledge attitude toward AI technologies. Secondly, the selection bias is due to the small sample size.

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