

Saudi Medical Students' and Healthcare Workers' Views on the Role, Limitations and Prospects of Artificial Intelligence in Healthcare

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Abstract

Introduction: This paper presents the overall perception of medicine students and healthcare workers regarding Artificial Intelligence. Artificial intelligence has made a significant contribution to healthcare by assisting professionals in their tasks, such as delivering better diagnoses and treatments, early identification of various diseases, improving the quality of services provided, predicting population epidemics, and so on. Despite its promise, employees in the healthcare industry have conflicting sentiments or feelings about the use of AI technologies. **Aims:** This research investigated the role of Artificial Intelligence and its prospect and challenges as well as its importance in healthcare. **Methods:** A quantitative study was conducted among medicine students & healthcare staff from several fields and specialties. Eighty-six (n=86) healthcare staff and medicine students were randomly selected to participate in this research from various healthcare facilities across the kingdom. In order to collect responses from the healthcare staff and students, a bi-lingual questionnaire was distributed for wider coverage. The responses to the questionnaire distributed to healthcare workers and students. **Results:** This study showed most healthcare workers and students acknowledged that AI has a significant role in healthcare, and they were satisfied with the idea of implementing it. Considering the study results, researchers emphasize the implementation of AI technologies in healthcare facilities in order to improve quality, timeliness documentation, support decision making, predict pandemics occurring, and ensure the safety of patient care and healthcare services. **Conclusions:** The outcomes of this study come with support and importance on previous literature review associated with satisfied healthcare staff and health and medical students with the use of AI in the healthcare settings. This study shows most healthcare workers and students acknowledged that AI has a significant role in healthcare, and they were satisfied with the idea of implementing it.

Keywords: Artificial Intelligence, Health AI, Medicine AI, Machine Learning in Healthcare, Healthcare Technology

Introduction

The past few years have witnessed tremendous development in all fields of knowledge, as several names have been given to the current era, including the era of information, the era of the knowledge explosion, the era of the scientific knowledge revolution, and the era of information warfare and other names. In addition to that, the progress of countries has become not only measured by their information yield, but by what they can employ and organize from this information to serve their members. [1] Artificial intelligence (AI) is defined as machine intelligence instead of human or other living species intelligence. AI can also be described as the study of "intelligent agents," which are agents or devices that can see and understand their surroundings and take appropriate action to maximize their chances of attaining their goals. AI also refers to scenarios in which machines can learn and analyze in the same way that humans can, and hence assist in problem-solving. Machine learning (ML) is another term for this type of intelligence. In most cases, AI entails a system that includes both software and hardware. AI is particularly concerned with algorithms from a software standpoint. An artificial neural network (ANN) is a conceptual framework for performing AI algorithms is an artificial neural network. It's a replica of the human brain, consisting of an interconnected network of neurons with weighted communication channels connecting them.[2]

However, the research or notion of AI is not at all new; the tale began in 1300 CE when Roman Lul presented a theory of a "reasoning machine," and subsequently Aristotle's Syllogisms in 300 BC contributed to the AI area. In the field of healthcare, scientists were more interested in developing AI robots that could replace human doctors and perform operations or surgeries on their own. Still, they were not successful, so they instead began researching how to use AI machines to assist doctors, focusing on the domain of assistance, such as diagnosing, suggesting treatments, predicting diseases, monitoring patient reports, and so on. Algorithms based on machine learning or artificial intelligence are widely utilized in the business to mimic

human perception of examinations, the conceptualization of healthcare data, and medical analysis. The primary purpose of AI in healthcare is to look at the links between halt and treatment approaches. From diagnosing disorders to therapy conventions, to medical progress, to recommending tailored drugs based on a patient's medical history.[3]

In order to deliver the best possible health care, health care systems in numerous nations have recently begun to rely on the storage of patient data. Health care information technology systems now have the capacity to hold massive amounts of patient data as a result of rapid technological advancements; nevertheless, proper use of this data is required to improve health care quality, improve decision-making, and lower costs. Artificial intelligence (AI) has made substantial progress in this area during the previous decade. Artificial intelligence technologies have been adopted to provide practical benefits in a variety of fields, including health care. The replication of human intellectual functions is a typical aspect of AI. AI is bringing a "paradigm change to health care, fueled by the rising availability of health care data and quick progress of analytics tools," according to the healthcare industry [4].

Artificial intelligence is gradually changing health practices. With recent advances in computing infrastructure, machine learning (ML), and digital data acquisition, applications of artificial intelligence have expanded to include areas that everyone thought could only be occupied by human experts.[1] Artificial intelligence (AI) will become more widely used in healthcare as the sector becomes more complex and data becomes more abundant. Payers and providers of care, as well as life sciences corporations, are already utilizing various types of AI. Diagnose and treatment recommendations, patient involvement, adherence, and administrative duties are some of the most common types of applications. Although AI can handle many healthcare duties as well as or better than humans in many cases, implementation issues may delay widespread automation of healthcare professional occupations for some time. The use of AI in healthcare

raises ethical concerns.[4] Artificial intelligence (AI) has been used in several aspects Showing a great movement toward better healthcare delivery and patient outcomes. Ranging from data analytics, deep learning, and machine learning to decision support systems, AI has so many varieties of Applications and technologies in medical and health care practices. [5]

Artificial intelligence (AI) plays a very significant role in health care in the treatment and prevention of diseases. AI is important in identifying the multifactorial causes of disease emergence, whether epidemiological or biological, as well as tracking the spread of disease by integrating real-time updates from digital media reports. As for treatment, artificial intelligence helps in organizing the intensive care unit and antibiotics, as well as managing the treatment of infectious diseases. Although AI brings many benefits, it also comes with challenges and limitations such as privacy, developer ownership, data heterogeneity, and quality. AI in healthcare still has a long way to go. [6]

The Covid-19 pandemic is one of the most serious worldwide health crises in recent decades, having far-reaching implications for all countries throughout the world. Because of the virus's high contagiousness and fatality rate, the cost in terms of human lives lost is enormous. Millions of people have been infected, and many of them require ongoing care and monitoring. Smart healthcare technologies and Artificial Intelligence algorithms offer promising alternatives for not just monitoring patient care, but also for assisting in the faster and more accurate diagnosis, prevention, and evaluation of Covid-19. A Research conducted by L. Verde and team, they investigated and compared the effectiveness of the most common machine learning techniques in terms of their capacity to appropriately detect Covid-19 disorders using voice analysis in this research. Several investigations have found that this virus has a major impact on voice production due to the respiratory system's damage. All the analyses have been evaluated in terms of accuracy, sensitivity, specificity, F1-score, and Receiver Operating Characteristic area. These show the reliability of the

Support Vector Machine algorithm to detect the Covid-19 infections, achieving an accuracy equal to about 97%.[7]

Saudi Arabia faces a high cost of treatment and a limited number of specialist facilities and physicians in the face of numerous chronic diseases such as diabetes, heart disease, and cancer. As a result, the Saudi government is supporting programs to promote people to engage in more physical exercise and improve their diets. With AI-based health management systems, health data from the public can be collected and processed. Healthcare experts in the Kingdom are optimistic about the future. Digitalization and AI were 'pleasant to have' before the epidemic, but the change was expedited during the pandemic, and these solutions became 'must-haves. One of Vision 2030's main objectives is to improve the Saudi people's health and well-being. This will entail a coordinated effort involving government ministries, health-tech companies, other IT companies, telecom companies, and healthcare providers, all working together to develop a patient-centric healthcare ecosystem for the Kingdom.[8] It is crucial to correctly store, manage, retrieve, and utilize data and information in order to increase the quality of healthcare because it can greatly aid decision-making on the part of leaders. Healthcare data management is a difficult task due to the numerous risks involved. According to emerging trends in the healthcare sector, the amount of data generated in this sector is continually expanding. [10]

Despite its promise, employees in the healthcare industry have conflicting sentiments or feelings about the use of AI technologies. In Saudi Arabia, a study examined the attitudes and perceptions of healthcare workers towards the development of AI technologies. The research was carried out in four hospitals in Riyadh, Saudi Arabia's capital. Fear of job displacement by AI and a lack of awareness about AI technology were shown to be intermingled in the results. As a result of the findings of this study, there is a need for training on the benefits, challenges, and issues associated with the use of AI in health care, as well as the technologies' potential to improve health care processes and efficiencies. Employees' awareness of AI and appreciation of its

potential in the healthcare business would both benefit from training. Governments and universities can both play a vital role in moving health care forward with AI. Furthermore, the current state of AI utilization in health care in Saudi Arabia offers an appealing market for AI application developers. [4] To raise levels of job satisfaction and organizational commitment, hospital personnel and management must improve the quality of their relationships and technology can be one of the main tools to increase the same. [9] There is currently not enough data available to assess the level of AI awareness in Saudi Arabia. To address this problem, we conducted an electronic questionnaire in Saudi Arabia to measure the attitudes of healthcare workers and students regarding AI applications. This would help us better understand the future of AI in Saudi Arabia's healthcare institutions.

According to a study we are in the time of the spread of the Internet and the continuing expansion of artificial intelligence, which includes machine learning, natural language processing and robotics, according to the National Highway Traffic Safety Administration that 94% of car accidents are caused by human error. So, a plan was put in place to develop vehicle safety features and produce cars powered by artificial intelligence. General Electric noted that machine learning is a process in which computers use algorithms to analyze large data sets. In the field of health care, Stanford University and Harvard are using data analysis, deep learning and genetic sequencing to diagnose and treat rare diseases and save lives for many patients and has succeeded in identifying breast cancer and reducing misdiagnosis and medical errors. The previous study confirmed that service providers must be equipped with educational curricula and trained to use artificial intelligence so that there are no obstacles and consequences. And because of the Corona pandemic, it has changed the future of healthcare and provided an opportunity to fully harness the potential of artificial intelligence.[11]

Methods

The main objective of this research is:

- To measure the knowledge and understanding of AI and its importance among the healthcare staff.
- To discover the shortage of AI knowledge and understanding of healthcare providers.
- To determine the obstacles facing the healthcare facilities preventing them from implementing the AI in their work environment.

Study Area: This is a quantitative study conducted on healthcare staff from several fields and specialties to measure the impact of Artificial Intelligence and assess its challenges.

Study Population: Healthcare staff and medical students were approached for this study.

Sample Size: Total 86 (n=86) healthcare staff and medical students were randomly selected to participate in this research from various healthcare facilities and colleges across the kingdom.

Study Design: The research is targeted for healthcare staff with the aim of studying the role of Artificial Intelligence to determine its challenges and measure the extent of their understanding. It is also to find out the prospects and limitations of it. In order to collect responses from the healthcare staff, a bi-lingual questionnaire was distributed for wider coverage.

Consent: The distributed questionnaire for the data collection includes a consent for participation. The filled questionnaire was considered accordingly.

Data Collection/ Research Instruments: Structured questionnaire was distributed to health care staff and the feedback was obtained accordingly.

Table.1. shows the Questionnaire Testing with the Study Objectives.

Table 1. Questionnaire Testing with the Study Objectives

Objectives of the Study	Questions
To measure the knowledge and understanding of AI and its importance among the healthcare staff.	A. Are you familiar with the term Artificial Intelligence in Healthcare? B. Is Artificial Intelligence being used in your healthcare facility? 1. Do you think artificial intelligence may be useful in the medical field? 2. Does Artificial Intelligence in healthcare helps healthcare providers with the proper decision tools and support? 3. Do you agree that Artificial Intelligence in healthcare helps in quality improvements? 4. Do you agree that Artificial Intelligence in healthcare helps in Cost reduction of facilities and also cost effective for patients? 6. Do you believe artificial intelligence has the potential to replace your job? 7. Do you agree that in the future, you will always use AI to make medical decisions? 8. Do you agree that artificial intelligence can help in reducing medical errors? 9. Do you believe artificial intelligence has the ability to give massive amounts of therapeutically relevant, high-quality data in real time? 10. Do you think artificial intelligence can help speed up health-care processes? 11. Which will you follow if your medical opinion and an artificial intelligence's judgment differ? 15. Who do you believe will be held responsible for any legal issues that arise as a result of artificial intelligence? 16. Do you agree that Artificial Intelligence in healthcare helps in reducing time for treatment or saving time of healthcare practitioners?
To discover the shortage of AI knowledge and understanding.	5. Do you believe Artificial Intelligence diagnostic abilities is superior to a human doctor's clinical experience? 11. Which will you follow if your medical opinion and an artificial intelligence's judgment differ? 12. Artificial intelligence, in your opinion, will be most useful in which branch of medicine? 13. Do you agree that the healthcare sector is ready to accommodate artificial intelligence machines? 17. Do you agree that the inclusion of Artificial Intelligence Course is essential in medical field of program?
To determine the obstacles facing the healthcare facilities preventing them from implementing the AI in their work environment.	7. Do you agree that in the future, you will always use AI to make medical decisions? 10. Do you think artificial intelligence can help speed up health-care processes? 11. Which will you follow if your medical opinion and an artificial intelligence's judgment differ? 12. Artificial intelligence, in your opinion, will be most useful in which branch of medicine? 13. Do you agree that the healthcare sector is ready to accommodate artificial intelligence machines? 14. The following are some of the reasons why AI may encounter some resistance (Rank in order based on your perspective- 1,2,3,4,5).

Result:

Demographic Data of Respondents: The total (n=86) response to the questionnaire distributed to health care workers, including 1 consultant, 15 specialists, 1 general physician, 4 residents, 4 trainees, 23 medical students, 7

nurses, 7 technicians, 26 others. The response rate was (35%-30) males and (65%-56) females. On the other hand, there were 20-29 years old representing (82.6%) of the respondents. Followed by respondents between the ages of 30-39, representing (12.8%). Followed by respondents

aged 40-49, representing (3.5%). As well as the respondents who are over 50 years old and represent (1.2%). Thus, we can say that the majority of respondents are females,

representing (65%) of the respondents. As for the age group, the majority of respondents are over 20-29 years old and represent (82.6%).

Table.2. Gender Representation

Gender			
		Frequency	Percent
Valid	Male	30	35%
	Female	56	65%
	Total	35	100.0

Table.3. Objective Testing and Verifications

	Response in Percentage					
	Q. No.	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
Objective-1	1.	58.3	28.3	13.3	0	0
	2	36.7	48.3	13.3	1.7	0
	3	51.7	35	13.3	0	0
	4	30	26.7	23.3	16.7	3.3
	6	8.3	20	20	31.7	20
	7	3.3	28.3	36.7	25.0	6.7
	8	20	50	26.7	3.3	0
	9	33.3	50	13.3	1.7	1.7
	10	36.7	51.7	11.7	0	0
	16	23.3	55	18.3	1.7	1.7

Analysis of Table.3: The various questions have been prepared with allocated questions and data has been obtained accordingly. The majority of respondents, according to data collected from healthcare professionals,

agreed with the statement, therefore they concur that AI in the medical industry will be highly helpful. This indicates that the initial goal has been accomplished.

Table.3.1. Objective-1. Testing with various allocated questions

Are you familiar with the term Artificial Intelligence in Healthcare?			
	Yes	No	Total
Frequency	60	26	86
Percent	69.8	30.2	100

Analysis: Total 68.9% of healthcare professionals said they agreed with the statement, while 30.2% disagreed. The majority of healthcare professionals are aware with the idea

of artificial intelligence in healthcare, according to the data collected. This indicates that the initial goal has been accomplished.

Table.3.2: Objective-1. Testing with various allocated questions.

Is Artificial Intelligence being used in your healthcare facility?			
	Yes	No	Total
Frequency	27	59	86
Percent	31.4	68.6	100

Analysis: According to the results, 68.9% of respondents don't use artificial intelligence in their healthcare facilities, compared to 31.4% who do. The majority of healthcare

facilities, according to the data acquired, do not employ artificial intelligence.

Table.3.3: Objective-1. Testing with various allocated questions.

Q.15. Who do you believe will be held responsible for any legal issues that arise as a result of artificial intelligence?				
	The Doctor in Charge	The Firm That Invented AI	Patient Who Agreed to Be Guided by AI	Total
Percent	36.7	53.3	10	100

Analysis: The responses included 36.7% of healthcare workers believes that the doctor in charge is responsible, 53.3% believes that the firm that invented AI is responsible, 10% believes that the patient who agreed to be guided by AI is responsible. According to data obtained from healthcare

workers, the majority of respondents believe that the firm that invented AI is responsible for any legal issues that arise as a result. This means that the first objective (to measure knowledge and understanding of artificial intelligence and its importance among health care staff) has been achieved.

Table.4: Objective-2. Testing with various allocated questions.

Objective-2	Response in Percentage					
	Q. No.	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
	5	8.3	10	43.3	20	18.3
	13	8.3	43.3	35	11.7	1.7
	17	28.3	50	16.7	3.3	1.7

Analysis: According to data collected from healthcare professionals, the vast majority of respondents concur that there is a knowledge and understanding gap in the healthcare field regarding artificial intelligence (AI). As a

result, the majority of healthcare professionals believe that AI courses should be included in medical field programs. Thus, the second goal is achieved.

Table.5: Objective-3. Testing with various allocated questions.

Objective-3	Response in Percentage					
	Q. No.	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
	7	3.3	28.3	36.7	25.0	6.7
	10	36.7	51.7	11.7	0	0
	13	8.3	43.3	35	11.7	1.7

Table.5.1: Objective-3. Testing with various allocated questions.

Q.11 Which will you follow if your medical opinion and an artificial intelligence's judgment differ?				
	Doctors Advise	The Viewpoint Of AI	Patients Option	Total
Percent	73.3	10	16.7	100

Analysis: The responses included 73.3% of the respondents will follow the doctor's advice, 10% will follow the point of view of artificial intelligence, 16.7% will follow the patients' choice. According to data obtained from healthcare workers, the majority of the respondents agreed that when the doctor's opinion differs from the artificial intelligence opinion, they will follow the doctor's one. This means that the first objective (to measure knowledge and

understanding of artificial intelligence and its importance among health care staff) has been achieved, And second objective (to discover the shortage of knowledge and understanding of artificial intelligence for health care providers) has been achieved, And third objective (is to determine the obstacles facing health care facilities that prevent them from applying artificial intelligence in their work environment) has been achieved.

Table.5.2: Objective-3. Testing with various allocated questions.

Q.12. Artificial intelligence, in your opinion, will be most useful in which branch of medicine?					
	Identifying The Problem	Choosing The Right Treatment	Treatment in A Direct Manner (Including Surgery)	Research And Development in The Field of Medicine	Total
Percent	18.3	11.7	20	50	100

Analysis: The responses included 18.3% of the respondents who think that AI is useful in identifying the problem, 11.7% in choosing the appropriate treatment, 20% in direct treatment (including surgery), and 50% in research and development in the field of medicine. In their opinion, the majority of respondents agreed that artificial intelligence would be more useful in research and development in the

medical field. This means that the second objective (to discover the shortage of knowledge and understanding of artificial intelligence for health care providers) has been achieved, and third objective (is to determine the obstacles facing health care facilities that prevent them from applying artificial intelligence in their work environment) has been achieved.

Table.5.3: Objective-3. Testing with various allocated questions.

Q.14. The following are some of the reasons why AI may encounter some resistance					
	SA	A	N	DA	SDA
High cost of installation and repairs	20	6	15	7	12
the need of professionals and highly trained staff	13	15	14	7	11
The resistance of using new technologies	15	16	17	6	6
The need for restructuring the facilities	13	19	14	10	4
Lack of privacy and confidentiality of patients' data	22	13	9	6	10

Analysis: The responses included that the first reason (the lack of privacy and confidentiality of patient data and their number reached 22 - the high cost of installation and repair and their number reached 20), the second reason (the need to restructure facilities and their number reached 19), the third reason (resistance to the use of modern technologies and their number reached 17), the fourth reason (the need to

restructure the facilities and their number reached 10), the fifth reason (the high cost of installation and repair, their number reached 12 - the need for professionals and highly trained employees, their number reached 11).

Overall Impression: According to data obtained from healthcare workers, the majority of respondents agreed that the first reason AI might encounter some resistance is the

lack of privacy and confidentiality of patient data and the high cost of installation and repair. This means that the third objective (is to determine the obstacles facing health care facilities that prevent them from applying artificial intelligence in their work environment) has been achieved.

Discussion

The general objective of this research is to define the role of Artificial Intelligence and its prospect and challenges as well as the importance in healthcare. The study presents a total of 86 healthcare workers e.g., GPs, nurses, and students from different health specialties have participated in this research. According to the research results, 60 respondents (69.8%) were familiar with the term Artificial Intelligence (AI), while the other 26 (30.2%) respondents were not familiar with it, so their participations stopped here. (86.6%) of the participants think that AI will make their work much easier and more effective if it is used in their facilities. Although, (68.6%) of them don't use AI in their facilities. They think that AI helps healthcare providers with the proper decision tools and support, quality improvements, cost reduction, reducing medical errors, give massive amounts of therapeutically relevant, high-quality data in real time, can help speed up health-care processes, reducing time for treatment, and saving time of healthcare practitioners.

Most of them were not afraid of the AI replacing their job, however, they think that they are not going to use it frequently to make medical decisions. In addition, they said if someday they had to choose between the doctor's advice and the AI's as patients, they would follow the doctor's advice, because they don't think that AI diagnostic abilities is superior to a human doctor's clinical experience. They think that AI is better used in research and development in the field of medicine rather than using it in the therapeutic and diagnostic practices. Along with that, they believe that the firm which invented the AI machine should be responsible for any legal issues that arise as a result of using it.

Most of them agreed that the healthcare sector is ready to accommodate AI machines. Consequently (78.3%) of them demonstrate that AI is a "must-have" course in the curriculum of health and medical studies. They think that

the lack of privacy and confidentiality of patients' data, and high cost of installation and repairs are the reasons why AI may face some resistance. Furthermore, these findings are consistent with previous research in the literature study, demonstrating a strong understanding of how AI might improve medical performance. The participants acknowledge the value of AI in medical contexts, such as supporting professionals in duties such as better diagnosis, treatments, early detection of various diseases, enhancing the quality of services offered, anticipating population epidemics, and so on.

As for the challenges, AI may struggle to engage in high-level dialogue or connect with patients in order to acquire their trust, reassure them, or convey empathy. The high cost of installation and the need for adequately qualified personnel, the requirement for architecture, the worry about patient data privacy and confidentiality, and the necessity to provide high-quality and reliable services are all factors to consider. Moreover, the reliability of the results is impacted by the sample size. We intended to aim a sample of more than 100 healthcare workers, but we couldn't acquire more than 86, including medical and health students which may not reflect the actual state.

Further research is required to establish whether the lack of privacy and confidentiality of patients' data, in addition to the lack of knowledge and understanding, are the factors that affect the implementation of AI in healthcare institutions. The researchers recommend developing AI curriculum to add it to the program of health and medical studies. As well as conducting some training campaigns to train the healthcare workers and teach them how to deal with AI machines and how to use them properly to utilize the ultimate benefits of it.

Conclusions

The outcomes of this study come with support and importance on previous literature review associated with satisfied healthcare staff and health and medical students with the use of Artificial Intelligence in the healthcare settings. According to respondents, this study shows most healthcare workers and students acknowledged that AI has a significant role in healthcare, and they were satisfied with

the idea of implementing it. Considering the study results, researchers emphasize the implementation of AI technologies in healthcare facilities in order to improve quality, timeliness documentation, support decision making, predict pandemics occurring, and ensure the safety of patient care and healthcare services, we encourage both public and private health sectors to implement the AI in each region of Saudi Arabia. As far as further research is concerned, researchers suggest that future researchers should expand the research's geographic area, future researchers should study the healthcare workers themselves who work in the healthcare facilities in Saudi Arabia and compare it to other hospitals abroad, its advantages & disadvantages, to utilize it in the best manner here in Saudi Arabia.

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