Knowledge and attitude of artificial intelligence (AI) technology among clinical researchers in the Kingdom of Saudi Arabia

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***Abstract*---**Background: Artificial intelligence (AI) has grown in popularity over the last few decades, and its application in clinical trials is on the rise around the world. Despite Sophie, the world's first humanoid robot to be awarded personality and citizenship by Saudi Arabia, and AI Arabic bots designed to improve customer service, the Saudi region is yet to completely embrace the AI Revolution. Over the last few years, the clinical usage of AI systems in medicine has grown in popularity. Several surgical AI platforms have been tested and found to improve preoperative diagnostic and decision making, outcome prediction, surgical planning, and intraoperative surgical guidance. This study examines clinical researchers' knowledge and attitudes toward Artificial Intelligence (AI) technology in Saudi Arabia. Objective: To find out knowledge about artificial intelligence among clinical researchers of Saudi Arabia and their attitude towards the same. Materials and methods: This study was carried out utilising an online questionnaire-based survey that was created with Google forms and emailed to clinical researchers in the friend circle. A total of 118 people replied to the survey, and the sample population was chosen using a convenience sampling technique. They were asked about their demographics, knowledge of AI, and attitudes toward it. Results: Out of 118 participants, 64 %(n=54) were males and 46 %(n=54) were females. The age group shows that most of the participants comes under the age group of 41-50 and majority of them 43%(n=51) were having 11-20 years of experience. Majority of the clinical researchers replied "Yes" as they attended or viewed talks or lectures on AI. Regarding knowledge of AI, individuals were questioned about the basic concept of AI, its subtypes i.e., (machine learning (ML) and deep learning ML and DL(DL), and its applications. It was observed that

they had familiarity with AI and had the ability to succeed as a clinical researcher. Concerning the role of AI in clinical research, most of them strongly agreed that artificial intelligence may be beneficial in the clinical research field. Conclusion: Although the majority of clinical researchers are unaware about AI and its uses, they have a good attitude towards AI in clinical trials and are prepared to accept it. AI could address our future clinical needs and craft strategies to support clinical decisions holds that transformative potential for improving our health care systems

Keywords---artificial intelligence, knowledge, attitude, clinical researchers.

Introduction

In the realm of healthcare, AI has made significant progress and has been able to tackle a variety of problems that have arisen when providing medical services(Kansal et al., 2022). Medicine is transitioning from being data-driven to being AI-driven, allowing for more direct engagement with patients. Huge amounts of data from diverse sources and AI applications will soon be available in healthcare(Wood et al., 2021).

Artificial intelligence has been used in medicine for a variety of purposes, ranging from diagnostic applications in radiology and pathology to more therapeutic and interventional uses in cardiology and surgery(Hashimoto et al., 2019). Artificial intelligence (AI) is an area of computer science that can analyse large amounts of medical data. In many clinical contexts, this technology aids in the diagnosis, treatment, and prediction of outcomes(V et al., 2021). Indeed, AI's promise to reduce costs, improve treatment, and boost healthcare accessibility is likely to be tremendously beneficial. Accenture, for example, estimates that AI applications may save the US healthcare industry $150 billion each year(Castagno & Khalifa, 2020).

AI algorithms have been shown to be effective in a variety of medical professions, including radiology, ophthalmology, dermatology, pathology, and pulmonary medicine, according to studies(Gillissen et al., 2022).Any system that uses data processing and pattern recognition to simulate cognitive capabilities such as learning and problem solving is referred to as AI. As these systems move closer to clinical use, physicians must comprehend the fundamental concepts of AI in order to interpret the results correctly(Valikodath et al., 2021).Over the last few years, the clinical usage of AI systems in medicine has grown in popularity(Sur et al., 2020). The advancement of medical artificial intelligence (AI) has coincided with the advancement of AI systems aimed at assisting physicians in the formulation of diagnosis, therapeutic decisions and outcome prediction. These programmes assist healthcare professionals with day-to-day chores and tasks involving data and information manipulation(Ali Muhittin Tasdogan, 2020).
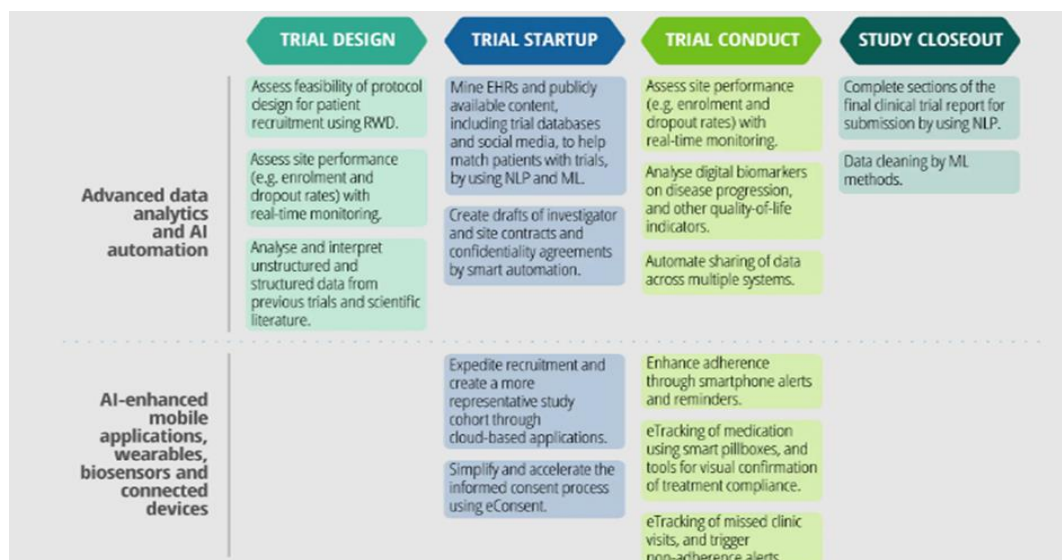
Figure 1: -Application of Artificial Intelligence(AI) enabled technology in clinical trials(Taylor et al., 2020).

The role of Artificial Intelligence (AI)complementing clinical research and trials is evolving more constructive and phenomenal. It varies from diagnostic aids to even analysing complex and extensive medical data(Parkins, 2021). AI enables better communication between the physician and the patient more or less preventing misdiagnosis. It is very unlikely that AI could replace the role of medical doctors. Instead, it implies for more appropriate diagnosis, treatment specifications at an affordable cost, better health care outcomes and addressing patient's medical needs.

With the advancement of machine learning and deep learning algorithms over the last decade, emerging artificial intelligence technologies have achieved tremendous development. This allowed for autonomous learning, as well as novel pattern identification and linkages. Deep learning is now used in a wide range of applications, from virtual assistants and speech recognition on smartphones to self-driving cars. Despite the positive outcomes, these AI platforms are still being tested rather than being implemented in clinical practise(R.Abbing et al., 2022).Artificial intelligence (AI) holds a lot of promise for medical advancement. In recent years, medical AI has progressed from theory to application in clinical practise(Yun et al., 2020).

The home revolution was still in its infancy when the fourth Industrial Revolution began to extend across the Arab World when the Kingdom of Saudi Arabia addressed the problem of entrepreneurship. Despite Sophie, the world's first humanoid robot to be awarded personality and citizenship, and AI Arabic bots designed to improve customer service, the Saudi region has yet to completely embrace the AI Revolution(Ahmed et al., 2022).
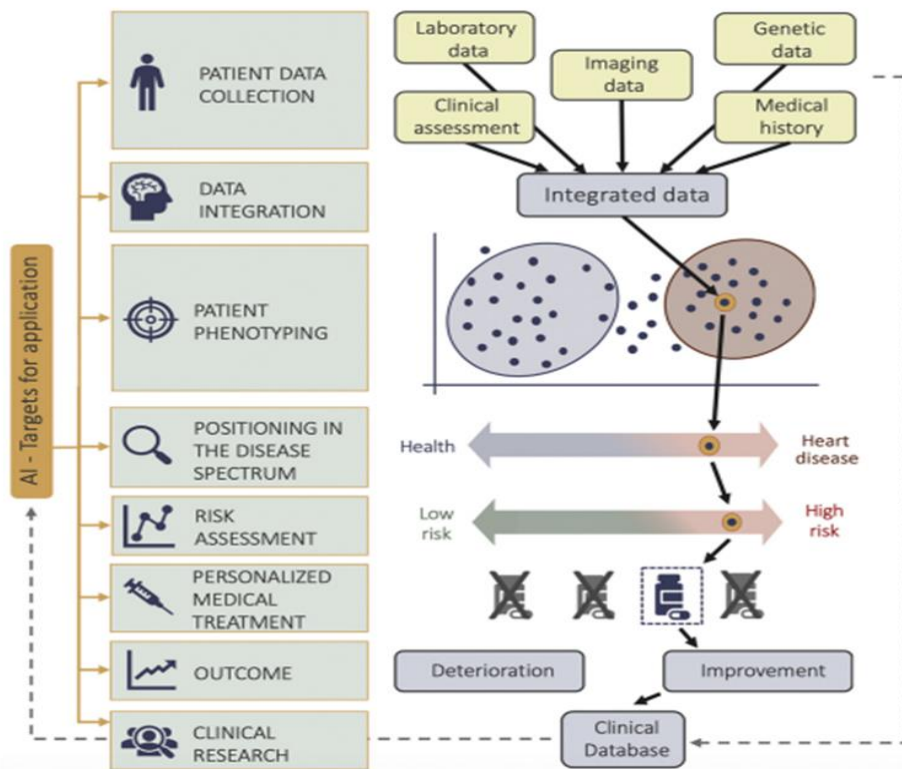
Figure 2: -Artificial Intelligence (AI) Overview- Even though AI also comprises rule-based simpler techniques, Deep Learning (DL) and Machine Learning (ML) are frequently referred to as Artificial Intelligence (AI) in present practice(Kaluarachchi et al., 2021).

This paper aims at the knowledge and attitude of Artificial Intelligence (AI) Technology among Clinical Researchers in the Kingdom of Saudi Arabia

Methods

This study was conducted using an online questionnaire-based survey and was prepared using Google forms and the questionnaire forms were sent to clinical researchers in the friend circle. The questionnaire was checked and validated by a senior faculty member. There was no personal information collected or stored, and access to the data was authorized to primary investigator only. Duration of minimum 1 month was designated for this process and two to three times reminders were given to fill the questionnaire. A total of 118 individuals responded to the survey and the sample population was selected using a convenience sampling technique and was questioned regarding their demographic details (age, gender, years of practice, clinical specialty, working location), knowledge about AI and its applications, attitude towards AI and its applications and clinical practices involving AI. The inclusion criteria were responders being clinical researchers working in government or private medical organizations. The exclusion criteria were non-clinical researchers and incomplete surveys.

Results and Discussion

Particulars	Variable	Frequency	Percentage
Gender	*Male*	64	54
	Female	54	46
Age	*Below 30 Years*	2	2
	31-40 Years	41	35
	41-50 Years	52	44
	Above 50 Years	23	21
Marital Status	*Single*	5	4
	Married	110	93
	Others	3	3
Years of Practice as Clinical Researcher			
	> 20 Years	16	14
	0-5 Years	3	2
	06-10 Years	48	41
	11-20 Years	51	43

Table 1: Demographic Characteristics of the participants

The Table 1 shows the demographic characteristics of participants of which 64 %(n=54) were males and 46 %(n=54) were females. The age group shows that most of the participants comes under the age group of 41-50 44%(n=52) and the least participants were below 30 years constituting 2%(n=2). The majority of them 43%(n=51) were having 11-20 years of experience whereas 41%(n=48) were having 6-10 years of experience.
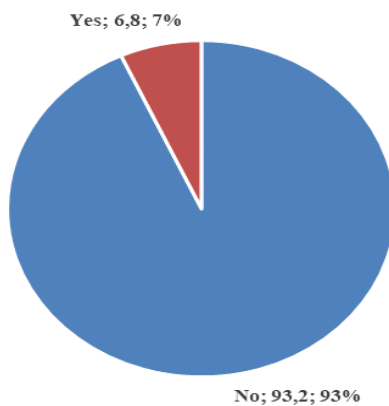

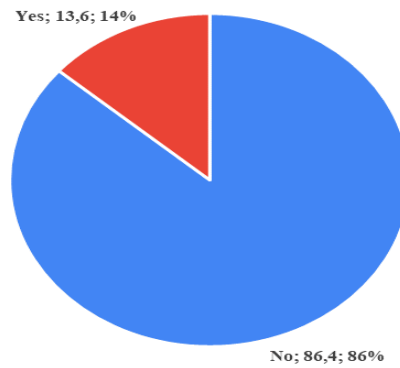Figure 3: Did you undergo any formal education in Artificial Intelligence?

Figure 4: Have you attended any workshop related to Artificial Intelligence?
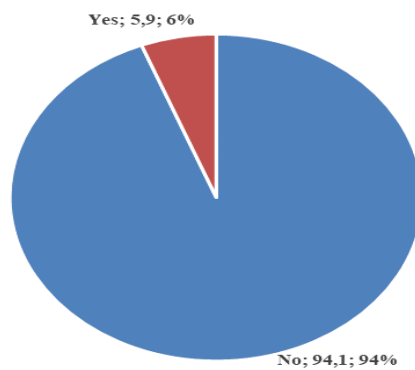

Figure 5: Did you complete any course where Artificial Intelligence (AI)/ Machine Learning (ML) / Deep Learning (DL) were taught or discussed?
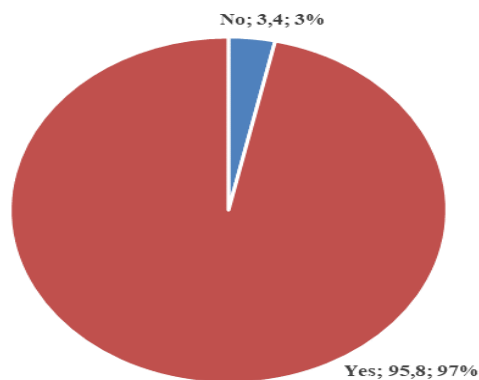

Figure 6: Did you attend or have viewed any talks or lectures on AI?

The question of "Did you undergo any formal education in Artificial Intelligence?", It is observed from figure 3 that majority of them 93% replied "No" while 7% replied with "Yes". The 14% of the clinical researchers replied as "Yes" to the question of "Have you attended any workshop related to Artificial Intelligence?" (Figure 4). In figure 5, 94% said "No" to "Did you complete any course where Artificial Intelligence (AI)/ Machine Learning (ML) / Deep Learning (DL) were taught or discussed?". In figure 6, Majority of the clinical researchers replied "Yes" as they attended or viewed talks or lectures on AI.
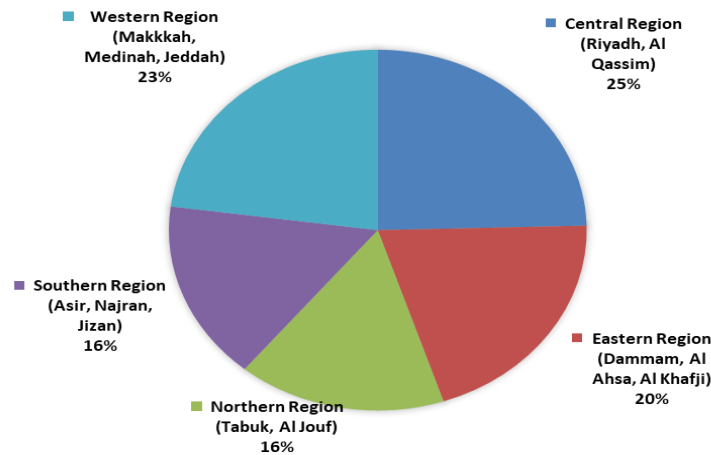
Figure 7: Working Location

Most of the clinical researchers were hailing from central region of Riyadh. The working location shows that 25% were based Riyadh and Al Qassim area where as 16% of the participants were living in southern and northern region respectively (Refer Figure 7).
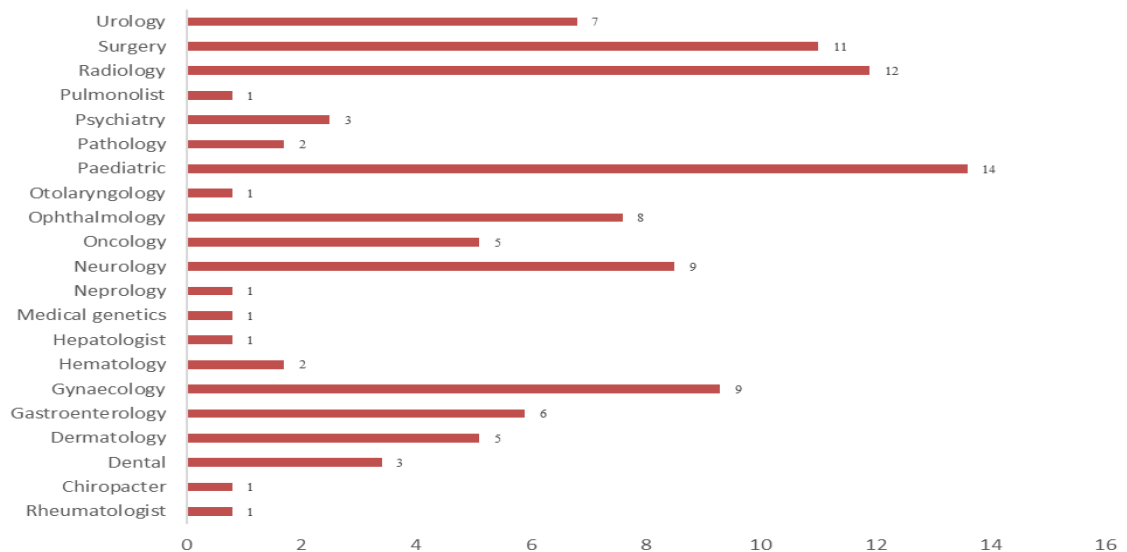
Figure 8: The clinical specialty of the participants.

The majority of the clinical researcher's specialty is paediatric (14%) and radiology is (12%) while surgery specialty is (11%) (Refer Figure 8).

Knowledge of Artificial Intelligence (AI)

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
As a Clinical Researcher, I had good familiarity with Artificial intelligence	0	2(2)	7(6)	81(69)	28(24)
I possess the abilities required to succeed as a Clinical Researcher.	0	1(1)	0	71(60)	46(39)
I had a lot of fun applying all of my clinical research expertise to Artificial Intelligence.	0	1(1)	3(2)	68(58)	46(39)
Artificial intelligence will transform health care and the clinical research industry as a whole.	0	1(1)	0	42(36)	75(63)
Artificial intelligence (AI) has the potential to substantially alter the future of Saudi Arabia's clinical research industry.	0	1(1)	0	54(46)	63(53)
During the coronavirus epidemic, AI technology provided a competitive advantage in the clinical research industry by preserving social distance.	0	1(1)	17(14)	55(47)	45(38)
AI tools offer the promise of transforming crucial steps of clinical trial conduct-study design, planning, and execution	0	1(1)	8(7)	55(46)	54(46)
AI is a collection of technologies that excel at extracting insights and patterns from large sets of data collection.	0	0	4(3)	62(53)	52(44)
AI has the power to analyse and learn about large amounts of data from multiple sources and detect patterns to make future trend predictions.	0	0	3(3)	65(55)	50(42)

Table 2 Clinical Researchers knowledge on artificial intelligence (AI) and its applications

Regarding knowledge of AI, individuals were questioned about the basic concept of AI, its subtypes i.e., (machine learning (ML) and deep learning ML and DL(DL), and its applications. It was observed that 81 (69%) agree with the statement that they had familiarity with AI and had the ability to succeed as a clinical researcher 71(60%). The statement "Artificial intelligence will transform health care and the clinical research industry as a whole" was strongly agreed by 75(63%). The "Artificial intelligence (AI) has the potential to substantially alter the future of Saudi Arabia's clinical research industry" was strongly agreed by 63(53%) whereas the statement "AI tools offer the promise of transforming crucial steps of clinical trial conduct-study design, planning, and execution" by 54 (46%). and "AI has the power to analyse and learn about large amounts of data from multiple sources and detect patterns to make future trend predictions" were agreed by 65(55%) (Refer Table 2)

Attitude towards Artificial Intelligence (AI)

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Do you believe you have a solid understanding of artificial intelligence?	0	34(29)	55(47)	23(20)	6(5)
Do you think artificial intelligence may be beneficial in the clinical research field?	0	40(34)	40(34)	14(12)	24(20)
Do you believe that AI's diagnostic abilities is superior to a human doctor's clinical research experience?	2(2)	66(56)	45(38)	5(4)	0
Do you believe artificial intelligence has the potential to replace your job?	27(23)	43(36)	45(38)	3(2)	0
Do you agree that in the future, you will always utilise AI to make clinical research decisions?	0	44(37)	36(31)	29(25)	9(8)

Table 3: Clinical Researchers attitude towards artificial intelligence (AI) and its applications

Concerning the attitude towards AI in the clinical research, 24(20%) individuals strongly agreed that artificial intelligence may be beneficial in the clinical research field and 29(25%) agreed that in the future, they will always utilise AI to make clinical research decisions. AI's diagnostic abilities is superior to a human doctor's clinical research experience is disagreed by 66(56%) and 43(36%) with the statement artificial intelligence has the potential to replace your job (Refer Table 3).

Conclusion

To summarise, while the healthcare sector is beginning to see AI's potential to dramatically improve patient care, AI applications are still not being integrated

into medicine at the same rate as technology advances. In the realm of healthcare, AI has made significant progress and has been able to tackle a variety of problems that have arisen when providing medical services. Of course, Artificial intelligence happens to be a critical focus for digital health care systems. AI techniques provides profound impacts on studies citing chronic conditions of cancer, diabetes and other life style diseases. How AI could address our future clinical needs and craft strategies to support clinical decisions holds that transformative potential for improving our health care systems. Further studies are required to know the knowledge and attitude of clinical researchers in Saudi Arabia.

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