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Practicing Medicine in the Age of Machines: Physician's Perspectives on Artificial Intelligence in Chengalpattu – A Cross-Sectional Study

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ABSTRACT

Background: Artificial Intelligence (AI) is reshaping healthcare by enhancing diagnosis, treatment, and patient care. Its successful implementation hinges on physicians' confidence, acceptance, and perceived utility. Understanding these factors is vital to addressing barriers and facilitating integration into clinical practice.

Methodology: A cross-sectional study was conducted among 224 allopathic doctors from hospitals in Chengalpattu district. Participants were selected randomly, and data were collected using a pretested questionnaire with 11 closed-ended questions.

Results: Only 27 participants (12.1%) were familiar with AI. While AI's ability to expedite processes was acknowledged, 84 participants (37.5%) expressed concerns about its inability to empathize with patients. Few participants believed AI was diagnostically superior to doctors (9.8%) or capable of replacing them (17.9%). Gender and experience significantly influenced attitudes, with females and those with over 12 years of experience expressing more negative views. The field of work had minimal impact on attitudes.

Conclusion: The study highlights a significant gap in physicians' awareness and confidence in AI within Chengalpattu district. Targeted education and training are essential to bridge this gap and address concerns. Collaborating with physicians in AI development and integrating human expertise with AI will be critical for fostering trust and acceptance in clinical practice.

Keywords: *Acceptance of AI, AI in healthcare, Artificial intelligence, Physician's attitude*

1. INTRODUCTION

Artificial Intelligence (AI) refers to the simulation of human intelligence by machines, particularly computer systems, that are designed to perform tasks typically requiring human cognition, such as learning, reasoning, problem-solving, and decision-making [1]. In healthcare, AI utilizes machine learning, natural language processing, and data analytics to interpret

complex medical data and assist in clinical decision-making. Its ability to analyze vast datasets quickly and accurately has made it an invaluable tool in public health, where timely data analysis can drive preventive measures, optimize resource use, and improve patient outcomes [2].

Integrating AI into public health transforms how healthcare systems manage diseases, especially in resource-limited settings like India. AI's capacity to analyze real-time data and generate predictive models has been pivotal in improving disease surveillance, facilitating early detection of outbreaks, and supporting swift interventions. Furthermore, AI-powered platforms are enhancing health accessibility by providing diagnostic support to healthcare workers in rural and underserved areas, ensuring that individuals who may not have access to specialized care still receive accurate and timely medical interventions[3].

In India, AI is already making strides through initiatives that focus on public health and disease management. AI-based applications in diagnostics are helping detect diseases like tuberculosis and diabetic retinopathy, reducing diagnostic delays, and improving treatment outcomes [4]. These technologies have also been integrated into telemedicine services to extend healthcare access to remote regions, bridging the rural-urban divide that characterizes Indian healthcare [5]. AI's role in augmenting public health surveillance during the COVID-19 pandemic, by predicting infection hotspots and supporting the Indian Council of Medical Research (ICMR) in planning interventions, is a testament to its potential.

Despite these advances, integrating AI into public health is fraught with challenges. These include ensuring data privacy, mitigating biases in AI algorithms, and developing a regulatory framework that addresses ethical concerns surrounding AI use in healthcare [6]. Building trust in AI technologies is essential, particularly in a diverse healthcare system like India's. Continuous efforts are needed to ensure that AI can be effectively used in public health without compromising data security or exacerbating health inequities [7].

AI's potential in transforming public health is further evidenced by its application in personalized medicine and patient monitoring. By leveraging machine learning algorithms, AI can analyze patient data to provide individualized treatment plans, improving both the efficiency and efficacy of care. This approach is particularly relevant in managing chronic diseases such as hypertension and diabetes, which require long-term, personalized interventions. AI-powered tools can analyze patient histories, medication adherence, and lifestyle factors to recommend personalized treatment adjustments, ultimately enhancing patient outcomes [8]. Wearable devices integrated with AI are also revolutionizing patient monitoring by providing real-time health data to healthcare providers. These devices can continuously track vital signs, allowing for early detection of health deterioration and enabling timely medical interventions, a critical advantage in managing conditions like cardiovascular disease [9].

Looking ahead, AI's future in public health depends on addressing several critical challenges. One of the key hurdles is the digital divide, particularly in countries like India, where the infrastructure to support AI-driven technologies in rural areas remains underdeveloped. Strengthening digital literacy and ensuring equitable access to technology are necessary steps to avoid widening the healthcare gap between urban and rural populations [10]. Moreover, there is a need for clear policies that govern the ethical use of AI in healthcare. These policies should address issues of transparency, accountability, and algorithmic fairness, ensuring that AI benefits all segments of society without reinforcing existing biases or inequalities. By overcoming these challenges, AI has the potential to not only improve healthcare accessibility and efficiency but also transform the way public health is approached globally.

2. METHODOLOGY

A cross-sectional study was conducted among physicians of tertiary care hospitals in the Chengalpattu district. The study population consisted of allopathic physicians from various departments of the hospitals. Physicians were approached to participate, and those who provided consent were included in the study.

The study samples were collected using a simple random sampling technique, employing computer-generated random numbers to ensure unbiased selection. The sample size was calculated based on an assumed prevalence of 50%, using the formula $4PQ/d^2$. With a 95% confidence interval and an acceptable error of 7%, the calculated sample size is 204, which is adjusted to 224 after considering a 10% non-response rate.

Data was collected through a questionnaire consisting of 11 closed-ended questions; that documented their socioeconomic status and comorbidities and assessed the physicians' knowledge and attitude toward artificial intelligence (AI).

The sampling method used was a simple random sampling. Physicians from all tertiary care settings in Chengalpattu district were randomly selected using computer-generated random numbers, ensuring equal opportunity for all eligible participants [11]. This process ensures that both the hospitals and the physicians included in the study represent a diverse and unbiased sample from across the district's healthcare settings.

Study tool

A pretested three-part questionnaire adapted from Oh s et al was used for data collection.[12]

Part A focused on gathering the sociodemographic profile of the participants, including information such as participant ID, age, gender, education, occupation, monthly income (both individual and family), marital status, comorbidities, and addiction. This section was designed to capture relevant background information that may influence physicians' perspectives on artificial intelligence (AI) in healthcare.

Part B assessed the knowledge of physicians regarding AI. It consists of multiple-choice questions that cover key aspects of AI applications in healthcare, including advantages such as speeding up processes, reducing medical errors, delivering vast amounts of clinically relevant data, and AI's limitations, including its inflexibility in certain clinical scenarios. The section also includes questions that probe the physicians' opinions on AI's utility in diagnosis, treatment decisions, and other medical fields, as well as their thoughts on legal liability for AI-related errors.

Part C evaluates physicians' attitudes towards AI through a set of statements rated on a five-point Likert scale. This section includes questions on familiarity with AI, perceptions of AI's usefulness in the medical field, concerns about AI replacing human roles, and physicians' willingness to rely on AI for future medical decisions.[12]

Data collection

Data was collected after approval from the Institutional Human Ethics Committee, and written informed consent was obtained from all participating physicians before starting the study.

Statistical analysis

The collected data was entered in MS Office Excel and analysed using SPSS, version 27. Qualitative data was expressed as frequencies and proportions and quantitative data as means and standard deviation. Inferential statistics like the Chi-square tests were conducted to assess the association between physicians' knowledge and attitudes towards artificial intelligence (AI) with their sociodemographic factors. The analysis was done to determine any significant relationships between variables such as age, education, department, or clinical experience and their perceptions of AI in healthcare. A p-value of less than 0.05 was considered statistically significant. The adjusted Odds Ratio and 95% confidence interval were calculated using a multivariate logistic regression analysis

3. RESULTS

Table 1. Demographic characteristics of participants surveyed about physicians and artificial intelligence (N=224).

		FREQUENCY(N)	PERCENTAGE (%)
1.	**AGE (in years)**		
	<35	123	54.9
	>35	101	45.1
2.	**GENDER**		
	Male	129	57.6
	Female	95	42.4
3.	**FIELD**		
	Surgical	118	52.7
	non-surgical	106	47.3
4.	**EXPERIENCE (in years)**		
	<12	105	46.9
	>12	119	53.1

Table 1 describes the demographic and professional characteristics of the 224 participants. Based on a median age of 35 years, 54.9% are aged below 35, while 45.1% are aged 35 or older. Gender distribution shows a slight predominance of males (57.6%) compared to females (42.4%). Regarding their professional field, 52.7% belong to the surgical category, and 47.3% to the non-surgical category. With a median experience of 12 years, 46.9% have less than 12 years of experience, while 53.1% have 12 or more years of experience.

Table 2. Participant's knowledge on artificial intelligence (AI), (N=224)

		Frequency	Percentage
1.	**What are the advantages of using artificial intelligence?**		
	AI can speed up processes in healthcare	50	22.3
	AI can help reduce medical errors.	15	6.7
	AI can deliver vast amounts of clinically relevant high-quality data in real-time	109	48.7
	AI has no space or time constraint	36	16.1
	AI has no emotional exhaustion or physical limitation	14	6.3
2.	**In which field of medicine do you think artificial intelligence will be most useful?**		
	Making a diagnosis	81	36.2
	Making treatment decisions	34	15.2
	Direct treatment (including surgery)	12	5.4
	Biopharmaceutical research and development	44	19.6
	Providing medical assistance in underserved areas	6	2.7
	Development of social insurance program	47	21.0
3.	**Which sector of health care do you think will be the first to commercialize artificial intelligence?**		
	Public health centers	45	20.1
	Primary care in private clinics	21	9.4
	Specialized clinics (spine, knee, obstetrics, and gynecology, etc)	49	21.9
	Medical college Hospitals	109	48.7
	Possible risk:		
4.	**It cannot be used to provide opinions in unpredicted situations due to inadequate**		
	Information	27	12.1
	It is not flexible enough to be applied to every patient	13	5.8
	It is difficult to apply to controversial subjects	45	20.1
	The low ability to sympathize and consider the emotional well-being of the patient	84	37.5
	It is developed by a specialist with little clinical experience in medical practice	55	24.6

5.	**Who do you think will be liable for legal problems caused by artificial intelligence?**		
	Doctor in charge	106	47.3
	The company that created the Artificial Intelligence	48	21.4
	Patients who consented to follow artificial intelligence's input	70	31.3
6.	**If a doctor's medical judgment and an artificial intelligence's judgments differ, which will you follow?**		
	Artificial intelligence's opinion	2	.9
	Doctor's opinion	202	90.2
	Patient's choice	20	8.9

Table 2 describes the participant's knowledge of artificial intelligence in medical field. The most recognized advantage is AI's ability to deliver vast amounts of clinically relevant, high-quality data in real-time (48.7%), significantly aiding clinical decision-making. In instances where AI and a doctor's judgment differ, a substantial majority (90.2%) would prefer to follow the doctor's opinion, underscoring trust in human expertise over technology. Physicians believe AI will be most useful in making diagnoses (36.2%) and anticipate that medical college hospitals (48.7%) will be the first sector to commercialize AI. Concerns about AI's limitations are evident, with 37.5% citing its low ability to empathize with patients, and 24.6% noting that it may be developed by specialists lacking extensive clinical experience. Regarding liability for AI-induced legal issues, 47.3% of respondents believe the doctor in charge should be held accountable, reflecting the complexity of integrating AI into clinical practice**.**

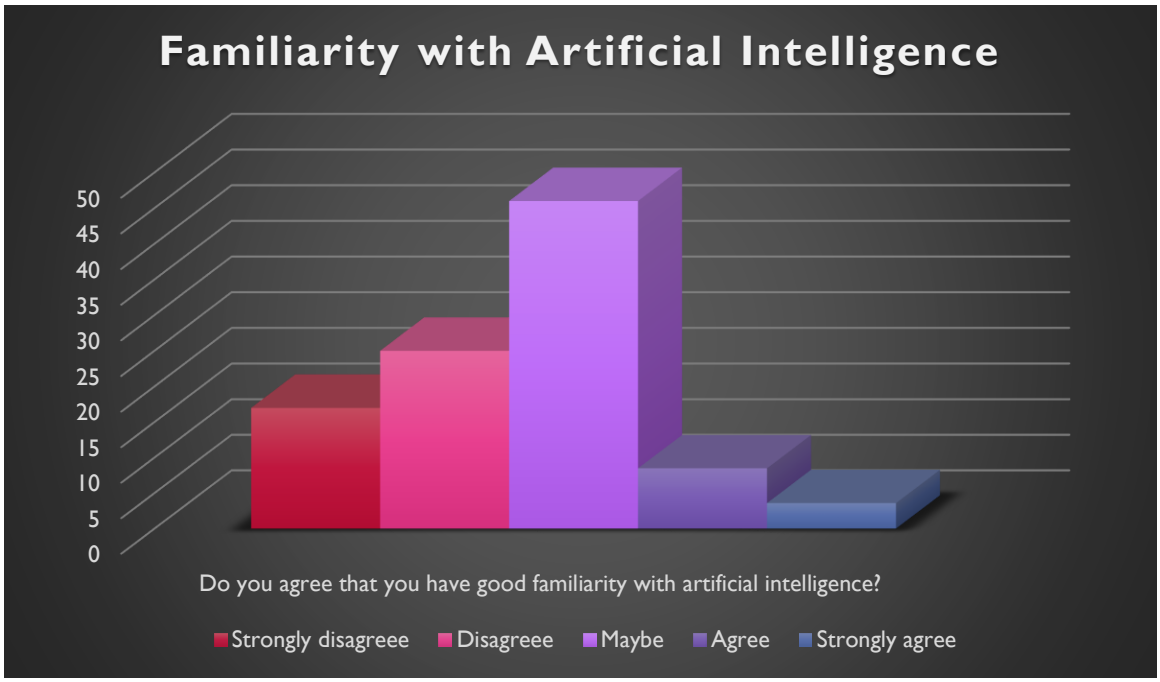

Fig 1: Physician's familiarity with Artificial Intelligence (AI), (N=224)

The study indicates that 46.0% of respondents are uncertain about their familiarity with artificial intelligence, responding with "maybe." Additionally, 42.0% expressed skepticism by either disagreeing or strongly disagreeing, while only 12.1% felt positive about their knowledge of AI. This suggests a significant need for improved education and awareness regarding

AI among participants

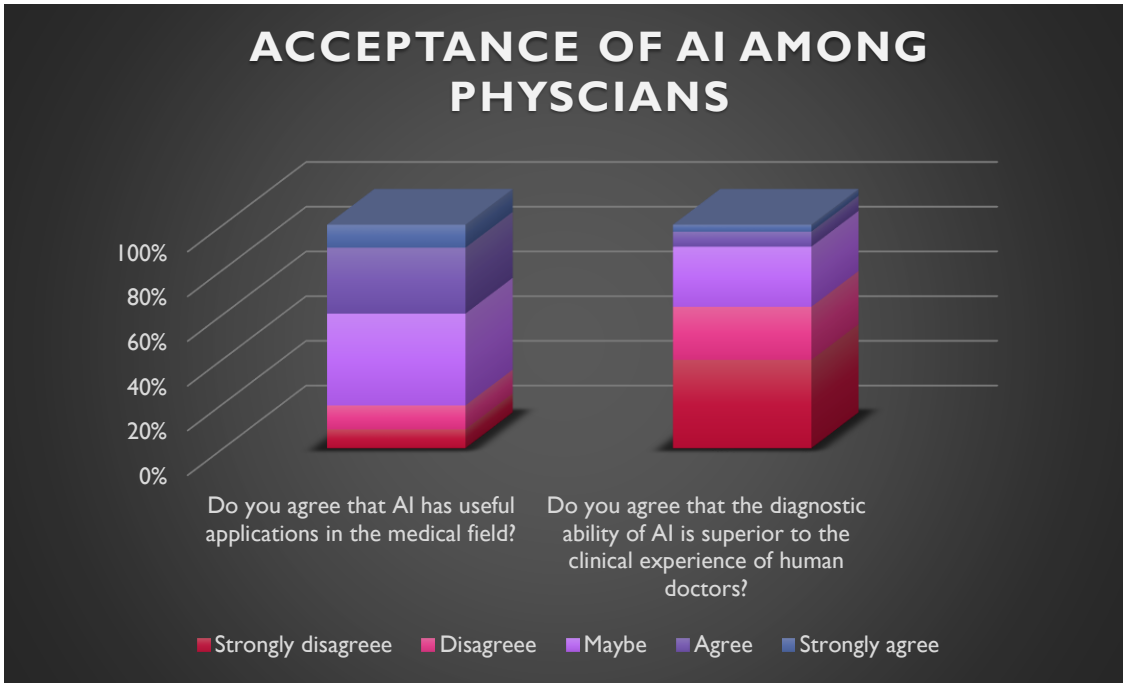

Fig 2: Physician's acceptance with Artificial Intelligence (AI), (N=224)

The study indicates that 39.8% of respondents believe AI has useful applications in the medical field, while 19.2% express skepticism about its utility. Conversely, only 9.8% feel that AI's diagnostic abilities surpass those of human doctors, reflecting a strong reliance on traditional clinical expertise. A significant majority, 63.4%, disagree with the notion that AI can outperform human diagnostics. This suggests a cautious approach towards integrating AI in clinical settings. Overall, while there is some optimism about AI's applications, concerns about its diagnostic capabilities remain prevalent among respondents.

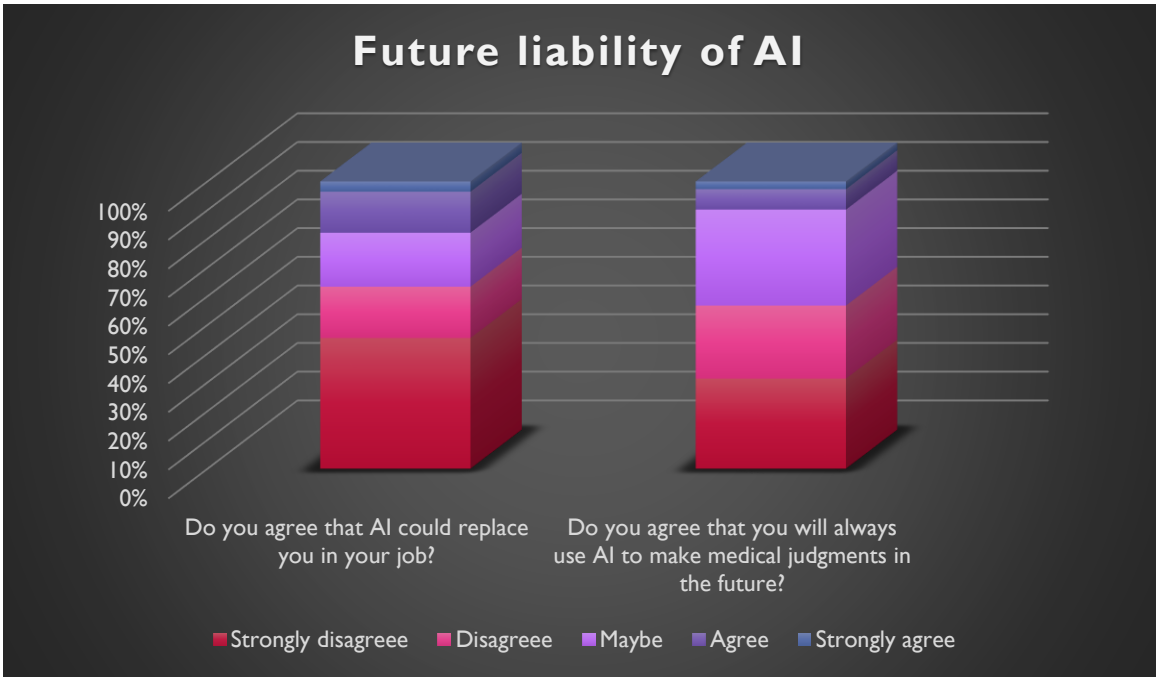

Fig 3: Physician's attitude towards Future liability of Artificial Intelligence (AI), (N=224)

The study shows that 63.4% of respondents believe AI will not replace them in their jobs, indicating a strong confidence in the value of human expertise. Additionally, 56.7% express hesitation about consistently using AI for medical judgments in the future, reflecting a cautious approach toward AI integration in clinical practice. Overall, while there is resistance to the idea of AI taking over roles, there remains uncertainty about its role in decision-making

Table 3: Association between Attitudes Toward AI Among Physicians and demographics among study participants (N=224)

S.NO	Variable	Physician's attitude		Total (N = 380)	Chi-square	Unadjusted odd's ratio (95% CI)	P Value
		Negative n (%) n = (%)	Positive n (%) n = (%)				
1.	**Gender**						
	female	61(53.0%)	34(31.2%)	95(42.4%)	10.939	2.492	<.001*
	Male	54(47.0%)	75(68.8%)	129(57.6%)		1	
2.	**Work experience**						
	>12	72(62.6%)	47(43.1%)	119(53.1%)	8.536	2.209	.003*
	<12	43(37.4%)	62(56.9%)	105(46.9%)		1	
3.	**Field of work**						
	Non-surgical	54(47%)	52(47.7%)	106(47.3%)	.911	1.031	0.013*
	Surgical	61(53%)	57(52.3%)	118(52.7%)		1	

*Statistically significant (P<0.05)

Attitudes were categorized as positive or negative, with a median split based on participants providing at least three positive responses on the Likert scale, ensuring a standardized classification reflecting overall agreement levels. Females are more likely to have a negative attitude towards AI (53.0%) compared to males (47.0%), with an odds ratio of 2.492 ($p < 0.001$). Those with more than 12 years of experience also show a higher prevalence of negative attitudes (62.6%) compared to those with less experience (37.4%), resulting in an odds ratio of 2.209 ($p = 0.003$). The field of work (surgical vs. non-surgical) significantly impacts attitudes, as indicated by the odds ratio of 1.031 ($p = 0.013$). Although the difference is statistically significant, the field of work (surgical vs. non-surgical) has a very weak association with physician attitude as indicated by an odds ratio near 1.

Table 4: Adjusted Odds Ratios for Attitudes Towards AI Among Physicians by, Gender, Experience and Field of Work (N=224)

S.NO	Variable	P Value	Adjusted Odds Ratio	95% CI
1.	**Gender**			
	Female	**0.001***	2.492	1.44 – 4.30
	Male	R		
2.	**Experience**			
	>12 years	**0.004***	2.209	1.29 – 3.77
	<12 years	R		
3.	**Field of work**			
	Surgical	.911	1.031	.610-1.742
	Non-surgical	R		

* Statistically significant (P<0.05)

Females exhibit a notably higher likelihood (Adjusted Odds Ratio: 2.492, p = 0.001) of holding negative attitudes toward AI compared to males. Physicians with more than 12 years of experience also show a significantly elevated odds ratio (2.209, p = 0.004), indicating a greater tendency toward negative attitudes in this group. The field of work does not significantly influence attitudes, as evidenced by the non-significant odds ratio (1.031, p = 0.911) for surgical versus non-surgical physicians.

4. DISCUSSION

Artificial intelligence (AI) aims to mimic human cognitive functions. It is bringing a paradigm shift to healthcare, powered by the increasing availability of healthcare data and rapid progress of analytics techniques. The present study aimed to assess physicians' attitudes and knowledge towards the medical application of AI in the Chengalpattu district. The results have offered valuable insights into the comprehension and application of AI in the medical field. Artificial intelligence (AI) aims to mimic human cognitive functions. It is bringing a paradigm shift to healthcare, powered by the increasing availability of healthcare data and rapid progress of analytics techniques. The study had a distribution of participants, with 129 males and 95 females. The mean age of the participants was 39 years, with a standard deviation of 13.34, and they had an average of 16 years of experience, with a standard deviation of 13.34, in the medical field.

The findings of this study highlight a significant gap in the familiarity and confidence of physicians regarding the application of artificial intelligence (AI) in healthcare within the Chengalpattu District.

Despite the rapid advancements and integration of AI in various fields of medicine, only 11.6% of the surveyed physicians reported familiarity with AI. This low level of awareness suggests a need for enhanced educational initiatives to bridge the knowledge gap. Education and training programs focusing on AI in healthcare could equip physicians with the necessary skills and understanding to leverage AI technologies effectively. Previous studies have also emphasized the significance of integrating AI education into medical curriculums to promote acceptance and proficiency among healthcare professionals. [13;14].

Interestingly, despite the low familiarity with AI, a significant proportion of participants (39.5%) recognized the potential utility of AI in the medical field. This dichotomy indicates a willingness among physicians to embrace AI-driven solutions, provided they are adequately informed and trained. The perceived benefits of AI, particularly its capacity to expedite healthcare processes, are consistent with existing literature highlighting AI's role in improving efficiency and productivity in clinical settings. [15].

Moreover, identifying biopharmaceutical research and development as the area where AI could be most beneficial (36.2%) highlights a specific domain where AI's potential is widely acknowledged. This preference may be attributed to AI's significant strides in drug discovery and development, as evidenced by its ability to predict molecular behaviour, optimize

clinical trial designs, and personalize treatments [16;17].

However, the concerns regarding AI's lack of flexibility and its applicability to every patient, as cited by 37.5% of participants, warrant careful consideration. These apprehensions reflect a broader scepticism about the adaptability of AI to the nuanced and individualized nature of patient care. The perception that AI lacks the human touch necessary for personalized patient interaction underscores the importance of developing technically proficient AI systems that can integrate with human expertise to provide holistic care [18]

Furthermore, the reluctance of less than half of the participants (9.8%) to view AI as diagnostically superior to human doctors, and the concern that AI could potentially replace physicians (17.9%), reflect deep-seated uncertainties about the role of AI in the clinical decision-making process. These findings are consistent with existing research that highlights the ethical, professional, and existential concerns of healthcare providers regarding AI integration [19;20].

Although the difference in physician attitudes between surgical and non-surgical fields is statistically significant, the weak association, suggests that the field of work has minimal impact. This finding aligns with previous studies showing that individual factors like gender and experience are more influential on attitudes than specialty [21]. Despite some expected differences in approach and priorities, the field of work does not appear to be a major determinant of overall physician attitudes. Other factors, such as work environment or job satisfaction, may play a more substantial role in shaping attitudes. Further research should explore these variables more thoroughly.

To address these concerns, it is imperative to adopt a collaborative approach in developing and implementing AI technologies in healthcare. Engaging physicians in the design, testing, and refinement of AI tools can enhance their acceptance and trust in these technologies. Additionally, fostering a culture of continuous learning and adaptation will be essential in ensuring that healthcare providers remain abreast of technological advancements and are capable of utilizing AI to its full potential [22].

5. LIMITATIONS

The study has several limitations that should be considered. First, the sample size, while representative, may not fully capture the diverse opinions of physicians across different regions, potentially limiting the generalizability of the findings. Additionally, the reliance on self-reported data introduces biases such as overestimation of AI familiarity and social desirability bias, which may skew the true understanding of participants. The study also focuses primarily on AI applications like chatbots, without exploring the reasons behind the limited awareness of broader AI applications in healthcare. A deeper exploration into these knowledge gaps would provide more targeted insights for educational initiatives. Finally, the cross-sectional design limits causal inferences, as it cannot establish how attitudes toward AI might change over time or with increased exposure to the technology.

Conclusions

This study provides valuable insights into physicians' attitudes and knowledge toward artificial intelligence (AI) in healthcare. Gender differences indicate that female physicians are more skeptical about AI, potentially due to limited exposure or training opportunities compared to their male counterparts. Experience also plays a significant role, with more experienced physicians exhibiting cautious attitudes, reflecting their reliance on traditional clinical practices and limited interaction with emerging technologies. Interestingly, the field of work—whether surgical or non-surgical—has minimal impact on attitudes, suggesting that external factors, such as the work environment and access to resources, may have a greater influence on shaping perceptions.

Despite low familiarity with AI among physicians, there is an encouraging recognition of its potential utility, particularly in areas like diagnosis and research. Concerns about AI's limitations, such as lack of flexibility and inability to empathize, highlight the need for improved integration with human expertise. Physicians' preference for human judgment over AI in decision-making further underscores their trust in clinical experience.

Addressing these disparities requires a comprehensive strategy that includes tailored education and training programs, emphasizing the capabilities and limitations of AI. Collaborative efforts involving physicians in AI development can build trust and acceptance. By bridging the knowledge gap and addressing contextual differences, healthcare systems can effectively integrate AI to complement human expertise, ensuring better patient care and outcomes.

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Conflicts of Interest:

There are no conflicts of interest

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