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Short Communication

Exploring healthcare professionals' knowledge and perceptions of artificial intelligence: Implications for the future of healthcare.

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Abstract

Background: Artificial intelligence (AI) holds immense potential to revolutionize various sectors of the economy, including healthcare, by serving as a catalyst for innovation. In recent times, AI has garnered significant attention for its ability to analyze vast datasets, generate forecasts, and aid healthcare professionals in decision-making processes, thereby reshaping the landscape of the healthcare industry.

Methodology: This study employed a cross-sectional research design utilizing an online survey approach. A convenient sampling technique was employed, involving 315 participants from diverse healthcare backgrounds, including medical doctors, pharmacists, physiotherapists, and nurses. Data analysis was conducted using SPSS tools to explore various variables within the dataset.

Results: The findings indicate that a majority of respondents with substantial knowledge of AI fall within the 20-30 age group, with pharmacists demonstrating a higher level of AI knowledge compared to other healthcare professionals. Interestingly, while 17.6% of pharmacists express firm beliefs that AI may replace them, over 30% of nurses share similar concerns.

Conclusion: The study highlights a prevailing apprehension among respondents regarding the extensive use of AI in the medical profession, with a significant proportion expressing concerns that surpass even those associated with nuclear weapons. Despite this apprehension, 60% of respondents emphasize the critical importance of AI tools in healthcare. It is evident that while there exists a fear surrounding the potential replacement of humans by AI, there is also a recognition of the invaluable contribution that AI can make to the field of healthcare.

Keywords

Artificial Intelligence, Healthcare Professionals, Public Health.

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Introduction

The healthcare sector is undergoing rapid transformation due to the rapid advancement of artificial intelligence (AI), presenting significant promise and potential benefits. AI's ability to analyze vast datasets, including medical images, test results, and patient records, has become a valuable tool for early disease detection, encompassing conditions such as diabetes, cancer, and heart problems. This capability not only contributes to improved patient outcomes but also facilitates early interventions. Notably, AI has revolutionized medical imaging by enhancing the speed and accuracy of anomaly detection in CT, MRI, and X-ray scans. Moreover, its capacity to identify and predict trends in extensive datasets is streamlining drug discovery, offering the potential for reduced costs and shorter development timelines[1].

Beyond diagnostics, AI is reshaping healthcare by elevating care quality, alleviating administrative burdens on medical staff, and enhancing overall healthcare system efficiency through streamlined electronic health data administration[2]. AI-driven robotics and surgical systems are playing a pivotal role in complex medical procedures, ensuring greater accuracy, reduced invasiveness, shorter recovery times, and fewer complications[3,4]. However, amidst the expanding applications of AI in healthcare, there exists a debate within the scientific community regarding its advantages and disadvantages[5]. Concerns include the potential deskilling of physicians and disruption of doctor-patient interactions, while proponents argue that judicious use of AI can significantly benefit patient well-being[6].

In the context of Pakistan, a country experiencing a burgeoning interest in AI applications, this study aims to investigate the level of AI knowledge and awareness among healthcare professionals. Specifically, we seek to understand their familiarity with current AI applications in Pakistan's healthcare landscape and their perspectives on its future potential[7-10]. This study, unique in its exploration of healthcare professionals' opinions in Karachi, Pakistan, encompasses diverse roles, including pharmacists, medical doctors, physiotherapists, and nurses. As AI continues to gain prominence globally, its integration into the healthcare system becomes crucial for expediting diagnosis and treatment processes while optimizing resource utilization[11-13]. Looking ahead, healthcare professionals anticipate a profound impact of AI on patient care. This study aims to gauge their awareness of AI technologies, providing valuable insights into their attitudes and perceptions surrounding AI applications in healthcare.

Methodology

Study Design

The present study adopts a cross-sectional research design conducted over a two-month period from February to March 2023. The primary objective is to comprehensively assess the acceptance and level of skepticism surrounding the gradual integration of artificial intelligence in the healthcare system. The study aims to dispel prevalent misconceptions surrounding AI in healthcare, focusing on its potential applications in research, drug designing, patient data management, medication dosage, scheduling, and telemedicine.

Setting

This research employed an online survey methodology facilitated through "Google Forms" to ensure participants' anonymity and ease of access. Informed consent was diligently obtained from each participant upon submission of their responses. Medical professionals were recruited for participation through targeted invitations distributed via Email and WhatsApp. The survey sought responses from healthcare professionals across diverse fields, and participants were sent two to three reminders during the data collection phase to maximize response rate. The questionnaire was designed to elicit perceptions of AI in healthcare, and all responses were treated with strict confidentiality.

Participants

The study participants comprised medical professionals, including doctors, pharmacists, nurses, and physiotherapists, of both genders,

aged eighteen years and above. Individuals involved in teaching medical and related professions were excluded to ensure a focus on practitioners actively engaged in clinical settings. Participation in the survey was voluntary, and measures were in place to guarantee the confidentiality of participants' responses.

Variables

The study examined various variables related to the perceptions and attitudes of healthcare professionals towards the integration of artificial intelligence in healthcare delivery. Key variables included acceptance levels, doubts, and misconceptions regarding AI adoption, as well as perceptions of its potential applications across different healthcare domains.

Data Sources/Measurement

Data for this study were collected through a structured online survey administered via "Google Forms." The survey instrument was meticulously designed to capture relevant information pertaining to participants' perceptions of AI in healthcare. Informed by established literature and expert input, the survey questions were crafted to ensure comprehensive coverage of the study objectives while maintaining clarity and relevance to the target audience.

Bias

Efforts were made to minimize potential biases throughout the study. Measures such as anonymous participation, voluntary involvement, and confidentiality assurances were implemented to encourage candidate's responses and mitigate response bias. Additionally, the survey instrument was carefully constructed to avoid leading questions and to provide balanced representation of perspectives regarding AI in healthcare.

Study Size

The study aimed to recruit a sample size of 500 participants, determined through rigorous calculation based on confidence intervals and standard deviations across the target healthcare fields. A convenient sampling method was employed to facilitate efficient participant recruitment within the stipulated timeframe.

Quantitative Variables

Quantitative variables included in the analysis encompassed demographic characteristics of participants (such as age, gender, and professional background) as well as responses to survey items assessing perceptions of AI in healthcare. These variables were subjected to rigorous statistical analysis to derive meaningful insights and identify potential patterns or associations.

Statistical Methods

Data analysis was conducted using SPSS version 25.0. Descriptive statistics were employed to summarize variable distributions. To assess statistical relationships between variables, the Chi-square test was utilized, with significance set at a level of less than 0.05 and 95% confidence intervals applied to the findings.

Results

Participants

Out of the initially targeted 500 healthcare professionals, 315 participants completed the survey and were included in the data analysis. The participants comprised a diverse range of healthcare professions, with pharmacists representing the largest group (39.68%), followed by nurses (25.1%), physiotherapists (22.54%), and medical doctors (12.69%). The majority of participants were female (54.30%), and the most common age group was 20–30 years (44.1%). The participants were primarily affiliated with government organizations (52.38%) as opposed to private institutions (47.61%).

Descriptive Data

The survey revealed interesting insights into the knowledge and perceptions of healthcare professionals regarding artificial intelligence (AI) in healthcare. Approximately 46% of participants demonstrated agreement and a good understanding of AI, while a significant portion (50.79%) could not distinguish between deep learning and machine learning. Notably, 40.31% of

participants reported never encountering applications of AI in their work.

Outcome Data

Among the responses, a notable finding was that 51.11% of participants agreed or strongly agreed with the statement "AI is more dangerous than nuclear weapons," indicating a perception among healthcare professionals that AI poses significant risks. Additionally, a majority (67.17%) expressed concerns about potential privacy issues associated with the use of AI in healthcare.

Main Results

The chi-square analysis provided further insights into the general responses of healthcare professionals regarding various aspects of AI in healthcare. While significant associations were observed for some statements, such as the belief that AI could replace participants' jobs (p-value = 0.014), other factors like the superiority of AI abilities to human experience did not show statistically significant associations.

Table 1: Online questionnaire on the perceptions of AI within health professionals.

Variable		N(%)
Profession	Pharmacist	125(39.68)
	Medical doctor	40(12.69)
	Physiotherapist	71(22.53)
	Nurses	79(25.07)
Knowledge level about AI	Strongly Agree	26(8.25)
	Agree	119(37.7)
	Strongly disagree	25(7.93)
	Disagree	26(8.25)
	Neutral	119(37.7)
Machine learning and deep learning?	Not at all	160(50.79)
	I only know one term	90(28.57)
	I know both terms but the difference is not clear	40(12.69)
	I know both terms and the difference are clear to me	25(7.93)
Do you think there may be serious privacy issues with the use of AI?	Strongly Agree	49(15.5)
	Agree	147(46.67)
	Strongly disagree	10(3.17)
	Disagree	42(13.33)
	Neutral	67(21.26)
AI is more dangerous than nuclear weapons	Strongly Agree	51(16.19)
	Agree	110(34.92)
	Strongly disagree	18(5.71)
	Disagree	52(16.5)
	Neutral	84(26.67)
AI could be in your area of work?	Extremely useful	20(6.34)
	Useful	43(13.65)
	Limited use	87(27.61)
	No use at all	165(52.38)
	Extremely worried	6(1.90)

AI will replace you at your job?	Moderately worried	57(18.09)
	Mildly worried	63(20.0)
	Not worried at all	189(60.0)

Discussion

The findings from this study underscore a prevalent lack of knowledge and understanding surrounding AI among healthcare professionals. Merely 7.93% of respondents demonstrated comprehension of the distinction between AI and machine learning, with 50% possessing limited knowledge of machine learning and deep learning concepts. Despite the evident utilization of AI in daily healthcare practices, such as electronic medical records and automatic ECG determinations, nearly two-thirds of participants reported no exposure to AI in their professional roles. Qerem et al. similarly identified a moderate level of familiarity with AI among participants, particularly regarding data prerequisites and obstacles. Attitudes toward AI varied widely, ranging from skepticism regarding its potential to substitute human educators to acknowledgment of its inherent value[14].

This knowledge gap may arise from a general lack of awareness about AI and ambiguity surrounding its definition. The study's data underscore a deficiency in the acceptance of AI tools and methods within the healthcare sector, highlighting a conspicuous proficiency gap among healthcare professionals concerning AI. As AI technologies increasingly integrate into healthcare, a noticeable gap persists in disseminating pertinent knowledge among practitioners. The complex nature of AI algorithms, coupled with the rapid pace of technological development, poses a significant obstacle to comprehensive understanding and proficient application by healthcare practitioners[15-17]. This shortfall underscores the critical need for targeted educational programs and cross-disciplinary collaborations aimed at enhancing healthcare professionals' cognitive grasp of AI principles. Bridging this knowledge gap is imperative for unleashing the full potential of AI in healthcare, facilitating informed decision-making, optimizing clinical workflows, and ultimately improving patient outcomes.

Results indicating that 52.38% of the population is not currently using AI in their area of work may be attributed to uncertainties about responsibility for errors caused by AI tools. This uncertainty arises particularly when errors result from a lack of in-depth understanding of AI tools' behavior. The study suggests that the insufficiency of knowledge among healthcare professionals regarding AI is susceptible to confounding factors hindering comprehensive understanding and integration. Intrinsic complexities associated with AI algorithms, involving intricate data processing and machine learning intricacies, contribute to cognitive barriers among healthcare practitioners[18-19]. Collaborative efforts between healthcare and computational science experts are essential for effective knowledge transfer, given the interdisciplinary nature of AI. Addressing the diverse settings within healthcare, ranging from resource-limited environments to technologically advanced institutions, further underscores the importance of targeted educational strategies to ensure proficiency in AI application.

The study also reveals that 47.6% of participants perceive AI as helpful (extremely useful, useful, and limited use) in the medical field, aligning with previous research findings. Notably, 51% of respondents express concerns about AI's potential dangers, echoing Elon Musk's assertion. Privacy concerns with AI are apparent, with 62% of healthcare professionals acknowledging these concerns[20]. Interestingly, 60% of participants do not express concern about AI replacing their current positions, challenging earlier studies suggesting widespread apprehension about job displacement due to automation[21-23]. This discrepancy may be attributed to the belief that AI lacks the capacity for compassion and emotional understanding crucial for complex patient

interactions, providing a unique insight into the perceived limitations of AI in healthcare. Consistent with recent studies in Pakistan[24], this research underscores the need for further exploration and understanding of healthcare professionals' attitudes toward AI, laying the groundwork for targeted interventions to enhance AI integration and acceptance in the healthcare landscape.

The current study exclusively focused on the integration of artificial intelligence into the healthcare system, neglecting its potential applications in other fields. The omission of AI tools in non-healthcare domains represents a limitation in the scope of this research.

Conclusion

The healthcare sector recognizes the transformative potential of artificial intelligence (AI) in enhancing patient care, yet its adoption within healthcare practices lags behind rapid technological advancements. Despite AI's benefits in reducing costs, improving care quality, and expanding accessibility, our study reveals a pervasive lack of AI knowledge among healthcare professionals, highlighting a critical gap in AI literacy. Clear legal frameworks to delineate roles and responsibilities are imperative, alongside comprehensive education initiatives to enhance healthcare professionals' proficiency in AI principles and applications. Broadening the scope of future research to encompass diverse healthcare professionals and including researchers actively engaged in AI projects will provide a nuanced understanding of differing attitudes and insights. Additionally, exploring perspectives on accountability for positive AI impacts and anticipating ethical and legal challenges arising from AI transformation are essential steps in addressing concerns and leveraging AI's potential to revolutionize patient care and health outcomes.

Conflicts of Interest

The study's authors affirm that there were no financial or commercial ties that might be viewed as having a potential conflict of interest.

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