

ARTIFICIAL INTELLIGENCE IN HEALTHCARE: PERCEPTION OF DOCTORS IN A TERTIARY HOSPITAL OF UTTAR PRADESH

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Received : 20/10/2023
Received in revised form : 24/12/2023
Accepted : 09/01/2024

Keywords:
Artificial Intelligence, Healthcare.

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DOI: 10.47009/jamp.2024.6.1.180

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (1); 915-919



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Abstract

Background: The healthcare sector has actively embraced AI applications to enhance diagnostic accuracy and patient care. The objective is to assess the perception of doctors regarding the use of Artificial Intelligence in healthcare in a tertiary care hospital of Moradabad and to find the association of socio-demographic factors with it. **Materials and Methods:** A cross-sectional study was done which targeted Interns and residents of a tertiary care hospital in Moradabad in October 2023. The research employed a self-designed semi-structured, self-reported questionnaire adapted from the Indian Council of Medical Research (ICMR) Ethical Guidelines for the Application of Artificial Intelligence in Biomedical Research and Healthcare, 2023. **Result:** Out of 184 respondents, 54.9% were male and 45.1% females. The mean age of the participants was 36.2+147.3. Our study found that 63.6% of respondents perceived AI to be useful and 59.8% felt it to be reliable. Forty-four (44.6%) of the respondents agreed that AI technology reduces the time to establish diagnosis whereas 43.5% of respondents agreed that AI in healthcare may improve diagnostic accuracy and surgical safety. One-third (75.5%) of the respondents were also of the opinion that there is a need for the training of doctors for using AI. Of all the respondents, 47.8% felt that AI may improve healthcare access where experts are not available which was a positive finding. More than half (63%) of the participants responded that AI may lead to privacy risks like data leaks etc. A significant proportion of participants also felt that AI may negatively affect the doctor-patient relationship adversely. More females (82%) feel that there is a need for training of doctors as compared to males (70.3%). More (81.5%) postgraduates have heard about the use of AI in healthcare as compared to interns (62.3%) which was found to be statistically significant (p=0.01). **Conclusion:** Most of the doctors had heard about AI and its use in healthcare and found it useful but gender disparities were found regarding the need for training for AI in healthcare. Also level of education had a significant impact on differing opinions on who should be held liable for errors caused by AI technology.

INTRODUCTION

Artificial Intelligence (AI) is defined as “a system’s ability to correctly interpret external data and to use those learnings to achieve specific goals and tasks through flexible adaptation”.^[1] Artificial intelligence

(AI) can be a groundbreaking development in modern medicine. It is a valuable tool for skilled physicians for safer and enhanced patient care.^[2] The integration of AI in healthcare brings about numerous opportunities. However, it also faces several early-stage implementation challenges such as data

security, privacy risks, ethical concerns, physician acceptance and high costs etc.^[3] Addressing these challenges requires collaboration between healthcare professionals, technologists, policymakers, and other stakeholders to create a balanced and effective framework for the integration of AI in healthcare services. Once these barriers are removed, AI has the potential to revolutionize medicine by improving diagnostic accuracy, alleviating physician burnout, and refining treatment approaches.^[4] Furthermore, it is crucial for all the stakeholders in delivering healthcare to understand the state of AI technologies and the ways that such technologies can be used to improve the efficiency, safety, and access to health services, supporting the digital transformation of healthcare.^[5] Hence, this study was conducted to understand healthcare professionals' perspectives on AI due to the limited existing literature on the subject.

MATERIALS AND METHODS

A cross-sectional study was conducted among interns and residents of Teerthanker Mahaveer Medical College and Research Centre (TMMC & RC), Moradabad in October 2023. The research employed a meticulously designed semi-structured, self-reported questionnaire adapted from the Indian Council of Medical Research (ICMR) Ethical Guidelines for Application of Artificial Intelligence in Biomedical Research and Healthcare, 2023.^[1] The sample size was estimated based on the assumption that 90% of the doctors had heard about AI^[6] and 5% absolute margin of error was taken. The final sample size was adjusted for 20% of expected non-responses. Data was collected using interviewer interviewer-administered semi-structured questionnaire, and confidentiality was assured to all the participants. Participants who were willing to give written informed consent were included in the study. Section A of the questionnaire contained general information like age, gender, designation etc. Section B contained 10 specific questions to assess perception. All data were coded, entered, and then analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. Collected data was presented as mean and standard deviation, while categorical data was expressed as frequencies and percentages. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 184 doctors participated in the study, of which 52.1% were less than 25 years old and 47.3% were above 25 years of age. Nearly fifty-five per cent (54.9%) were male and 45.1% were females. The mean age of the participants was 36.2 years, with a standard deviation of 2.99. Seventy per cent (70.7%) of participants were interns and most of the respondents had heard about AI. One-third (67.9%) of the participants had heard about the use of AI in healthcare. Our study found that 63.6% of

respondents perceived AI to be useful and 59.8% felt it to be reliable. Nearly forty-four per cent (44.6%) of the respondents agreed that AI technology reduces time to establish diagnosis whereas 43.5% of respondents agreed that AI in healthcare may improve diagnostic accuracy and surgical safety. More than three-fourths (75.5%) of the respondents were also of the opinion that there is a need for training of doctors for using AI. There were differing opinions among the participants regarding who should be liable for the errors caused by AI technology [Table 1].

Of all the respondents, almost half (47.8%) felt that AI may improve healthcare access where experts are not available which was a positive finding. Nearly two-thirds (63%) of the participants responded that AI may lead to privacy risks like data leaks etc. A substantial proportion of participants (56.5%) responded that AI may negatively affect the doctor-patient relationship adversely. [Figure 1&2].

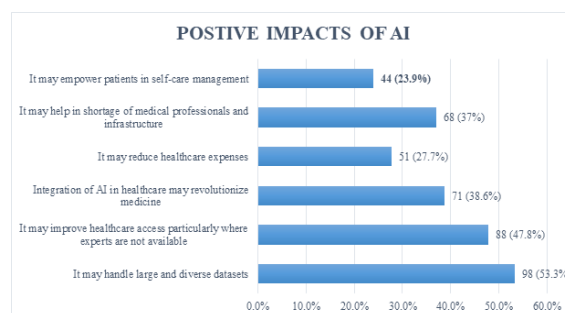


Figure 1 Positive Impacts of AI

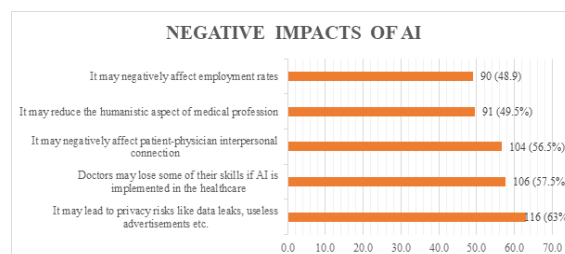


Figure 2 Negative Impacts of AI

Most (94%) of the females had heard about AI as compared to males (85.1%) but a statistically non-significant difference was found ($p=0.056$). More females (49.4%) agreed that AI technology reduces the time to establish a diagnosis as compared to males (40.6%). However, this difference was not found to be statistically significant. As compared to males, more females (82%) feel that there is a need for training of doctors. It was also found in the study that nearly two-thirds (63.4%) of the males were not familiar with ethical guidelines for utilizing AI in healthcare as compared to females (53%). However, these differences were not found to be statistically significant [Table 2].

Out of a total of 54 postgraduates, 81.5% have heard the use of AI in healthcare whereas out of 130 interns, only 62.3% have heard about AI use in healthcare, and this difference was found to be statistically

significant at $p=0.01$. More (70.4%) postgraduates felt AI useful than interns (60.8 %) but it was not a statistically significant difference. Most undergraduates thought that AI software developing companies should be liable for any errors caused

whereas postgraduates were not sure and chose can't say. Undergraduates and postgraduates had statistically significant differing opinions on who should be held liable for errors ($p=0.004$) [Table 3].

Table 1: Distribution of different variables among participants (n=184)

| Variable | n (%) |
|----------------------------------------------------------------------|-----------|
| Age (in years) | |
| <25 | 97(52.7) |
| ≥25 | 87(47.3) |
| Gender | |
| Male | 101(54.9) |
| Female | 83(45.1) |
| Level of education | |
| Interns | 130(70.7) |
| Postgraduate | 54(29.3) |
| Heard about AI | |
| Yes | 164(89.1) |
| No | 20(10.9) |
| Heard use of AI in healthcare | |
| Yes | 125(67.9) |
| No | 59(32.1) |
| Last experience when used AI | |
| Useful | 67(36.4) |
| Non useful | 117(63.6) |
| Felt AI is reliable (trustworthy) | |
| Yes | 74(40.2) |
| No | 110(59.8) |
| AI reduces time to establish diagnosis | |
| Agree | 82(44.6) |
| Disagree | 34(18.5) |
| Don't know | 68(37.0) |
| AI in healthcare may improve diagnostic accuracy and surgical safety | |
| Agree | 80(43.5) |
| Disagree | 46(25.0) |
| Don't know | 58(31.5) |
| Any need for training of doctors regarding use of AI | |
| Yes | 139(75.5) |
| No | 45(24.5) |
| Recommend use of AI to their family member/ friend/other people | |
| Yes | 80(43.5) |
| No | 104(56.5) |
| Familiar with the ethical guidelines for utilizing AI in healthcare | |
| Yes | 76(41.3) |
| No | 108(58.7) |
| Liability for the errors caused by AI technology | |
| Doctor | 16(8.7) |
| AI software developing company | 71(38.6) |
| Policy makers | 25(13.6) |
| Patient (who consented) | 17(9.2) |
| Can't say | 37(20.1) |
| Don't know | 18(9.8) |

Table 2: Association of gender with different variables (n=184)

| Variable | | Female (%) | Male (%) | p-value |
|--------------------------------------------------------------------|------------|------------|----------|---------|
| Heard of Artificial Intelligence | Yes | 78(94) | 86(85.1) | 0.056 |
| | No | 5(6) | 15(14.9) | |
| AI technology reduces time to establish diagnosis | Agree | 41(49.4) | 41(40.6) | 0.118 |
| | Disagree | 10(12) | 24(23.8) | |
| | Don't know | 32(38.6) | 36(35.6) | |
| Need for training of doctors regarding use of AI | Yes | 68(82) | 71(70.3) | 0.068 |
| | No | 15(18) | 30(29.7) | |
| Familiarity with ethical guidelines for utilizing AI in healthcare | Yes | 39(47) | 37(36.6) | 0.156 |
| | No | 44(53) | 64(63.4) | |

Table 3: Association of level of education with different variables (n=184)

| Variable | | Interns | Postgraduate | p-value |
|---------------------------------------|--------|----------|--------------|---------|
| Ever Heard of use of AI in healthcare | Yes | 81(62.3) | 44(81.5) | 0.011 |
| | No | 49(37.7) | 10(18.5) | |
| | Useful | 79(60.8) | 38(70.4) | 0.584 |

| | | | | |
|-----------------------------------|--------------------------------|----------|----------|-------|
| Last experience when used AI | Not useful | 51(39.2) | 16(29.6) | |
| Liability for errors caused by AI | AI software developing company | 59(45.4) | 12(22.2) | 0.004 |
| | Can't say | 24(18.5) | 13(24.1) | |
| | Doctor | 11(8.5) | 5(9.3) | |
| | Don't know | 14(10.8) | 4(7.4) | |
| | Patient (who consented) | 6(4.6) | 11(20.4) | |
| | Policy makers | 16(12.3) | 9(16.7) | |

DISCUSSION

Out of a total 184 respondents, nearly fifty-five percent (54.9%) were male and 45.1% were females. These findings were consistent with studies done by Pedro AR et al,^[7] (55% males and 45% females) and Ahmed Z et al^[8] (50.9% males and 49.1% females). The mean age of the participants in our study was 36 years (36.17+ 147.30) whereas the mean age in the study done by Pedro et al,^[7] was reported to be 46 years old (46.14 ±15.69). This might be because in our study most of the respondents were interns and residents.^[8]

In our study, nearly ninety per cent (89.1%) of respondents have heard about AI. Also, a greater number of females (94%) have heard about AI than males (85.1%) but this difference was statistically non-significant (p=0.056). Similarly, a study done by Fritsch et al,^[6] stated that more than 90% of the respondents had already heard about AI whereas these findings were inconsistent with the study done by Kansal R et al,^[9] where a significantly higher percentage of female respondents (76.7%) felt unknowledgeable about the basic principles of Artificial Intelligence technology (p = 0.001).

A majority (67.9%) of respondents in our study have heard the use of AI in healthcare and nearly fifty percent (47.8%) felt that AI may improve healthcare access where experts are not available which was a positive finding. This finding can be co-related with the finding in which more than half (53.2%) of respondents favoured the use of AI in medicine or healthcare (Fritsch SJ et al).^[6]

More number of females (82%) feel that there is a need for the training of doctors as compared to males (70.3%). These findings were consistent with the study done by Kansal R et al,^[9] where female respondents (76.7%) were more interested than male respondents (64.3%) to learn about the principles of AI and its applications in healthcare. In our study, 44.6% of the respondents agreed that AI technology reduces the time to establish a diagnosis. A study done by Fritsch SJ et al,^[6] reported a similar figure.

Nearly fifty per cent (47.8%) felt that AI may improve healthcare access where experts are not available which was a positive finding. More than half (63%) of the participants responded that AI may lead to privacy risks like data leaks etc. A significant proportion of participants (56.5%) responded that AI may negatively affect the doctor-patient relationship adversely. This may be because good communication and empathy skills are fundamental to strengthening the (human) doctor-patient relationship and improving healthcare quality (Ha JF et al).^[10] In the

present study, undergraduates and postgraduates had statistically significant differing opinions on who should be held liable for errors. This divergent perception of the use of novel technology in two groups may be due to a lack of information.

CONCLUSION

The study highlights doctor's diverse perspectives on AI use in healthcare. While the majority of the doctors had heard about AI and its use in healthcare, gender disparities were found regarding the need for training in the use of AI in healthcare. Level of education had a significant impact on differing opinions on who should be held liable for errors caused by AI technology. This emphasizes the need for further research to fill the gap before fully implementing AI technology in healthcare.

Recommendations

To enhance knowledge about AI and instruct individuals on utilizing AI-enabled tools in healthcare, it is essential to organize seminars, CME events, workshops, and conferences. These educational initiatives should be accompanied by stringent adherence to guidelines to prevent the misuse of AI. Also, there is a need to formulate proper regulatory and legal frameworks to avoid ethical concerns. Training of doctors in AI can significantly boost its healthcare potential with crucial contributions from governments and universities.

Limitations

This study exclusively incorporated interns and residents, limiting the assessment to the perceptions of individuals in the early stages of their careers. There exists a necessity for numerous robust investigations in the imminent future, encompassing participants across all age cohorts, in order to comprehensively understand the perceptions of individuals in the older age demographic.

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