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Assessing Healthcare Professionals' Knowledge and Awareness of Artificial Intelligence-Based Telemedicine for Enhancing Remote Diagnosis: A Systematic Review

Barman Mridusmita*
Assistant Professor
Department of Allied Health Sci.
Jagannath University
Email: mridubar8@gmail.com

Bhat Sanjana
Assistant Professor
Department of Allied Health Sci.
Jagannath University

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Barman Mridusmita
Bhat Sanjana

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Abstract

The incorporation of Artificial Intelligence (AI) in telemedicine has revolutionized remote diagnosis, enhancing the accessibility and quality of healthcare. This systematic review sought to evaluate healthcare professionals' (HCPs) awareness and knowledge of AI-based telemedicine, and factors that contributed to its uptake and use. A thorough literature search was undertaken, and studies were chosen based on predetermined criteria. The review highlights the current gaps in HCPs' awareness and knowledge to look after how these would guide future training and education to ensure the optimal application of AI-based telemedicine.

Keywords

Artificial Intelligence, Telemedicine, Healthcare, Systematic Review

Introduction:

Telemedicine is likely one of the most advanced methods of healthcare that utilizes digital communication technology to deliver remote consultation, diagnosis, and monitoring. Telemedicine provides increased convenience in healthcare by avoiding the necessity of visiting the hospital physically, especially for people in rural areas or for people with mobility disabilities. Telemedicine has also been a crucial tool for the delivery of healthcare services during global pandemics such as the COVID-19 pandemic when lockdown made in-person consultations challenging. The primary issues concerning healthcare access in rural and urban areas are high cost of treatment and the lack of accessibility. Another primary issue is the unavailability of healthcare professionals and inability to adapt to the rapid advancement of technology. AI consequently serves as the right resolve to prevent the spread of disease and provide a faster, affordable treatment.

Due to factors like geographical remoteness, inadequate healthcare infrastructure, and lack of medical experts, rural populations continue to lack access to quality healthcare, thereby furthering health inequities. Telemedicine and AI have been game-changing answers to these issues that have accelerated healthcare delivery innovation. The two technologies have the potential to improve patient outcomes, fill treatment gaps, and improve the quality of diagnostics; yet, there is a need for further research to determine their effectiveness and rural reach in totality.

Telemedicine is one of the most striking achievements and milestones of ICTs. This e-business service can potentially be the next big thing in maintaining and building societies in poor nations. Even though the idea of artificial intelligence (AI) was born over 60 years ago, the sudden growth of AI-based technology and applications started in the 2010s with further advances in graphic processing units. Currently, AI-based algorithms can replicate human high-order judgment and behaviour with similar, if not better, accuracy and consistency. Now, AI, along with other technological breakthroughs like the Internet of Things (IoT) and big data, are driving the fourth industrial revolution of mankind and are now influencing our daily lives.

AI-based application in telemedicine can contribute to enhancing the quality of healthcare by medical practitioners, improving patient satisfaction, and providing better health outcomes. With its ability to provide and make accessible coordinated/ unified healthcare throughout all stages of a person's lifecycle, artificial intelligence (AI) can make significant contributions through speeding up the processes of disease

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screening and diagnostics, improving diagnosis accuracy and personalization, and reducing face-to-face interaction. For the care of chronic conditions, AI-augmented remote care can intensify relationships and interactions among healthcare delivery's various dimensions, making it possible for medical practitioners to collaborate and form a database of knowledge on managing patients.

Materials and Methods:

This was a cross-sectional questionnaire survey conducted through Google Forms. The population was healthcare professionals such as doctors, nurses, radiologists, medical technologists, and healthcare administrators at various stages of their careers ranging from students, interns, junior professionals, and senior professionals. Convenience sampling was used, and participants were recruited through professional contacts, emails, and social media.

The questionnaire employed open-ended questions for demographic data, awareness level, perceived benefits, drawbacks, and willingness to adopt AI-based telemedicine. Descriptive statistics were employed for the analysis, and qualitative responses were analysed for thematic analysis. Ethical standards were maintained by ensuring voluntary response, anonymity, and response confidentiality.

The target population included healthcare professionals working in different sectors, and included professionals at different career stages: Students & Interns, Junior Professionals (1–5 years of experience), Mid-Level Professionals (6–10 years of experience) and Senior Professionals (10+ years of experience).

A convenience sampling method was used, where participants were recruited through professional networks, institutional contacts, WhatsApp groups, LinkedIn, and email.

The study addressed the following research question:

"What is the level of awareness, perception, and readiness of healthcare professionals regarding AI-based telemedicine for remote diagnosis?"

Studies were selected based on the following inclusion and exclusion criteria:

Inclusion Criteria:

- Peer-reviewed studies published from 2020 onwards.
- Articles that assessed awareness, perception, or knowledge of healthcare professionals regarding AI-based telemedicine.
- Studies involving doctors, nurses, radiologists, medical technologists, and healthcare administrators.
- Publications in the English language.
- Studies that employed quantitative, qualitative, or mixed-method approaches.

Exclusion Criteria:

- Studies that focused only on AI technology development without evaluating healthcare professionals' awareness.
- Non-peer-reviewed articles, editorials, and conference abstracts.
- Studies that focused solely on patient perspectives.
- Studies that did not specifically address telemedicine applications.

Search Strategy:

The systematic review was conducted using electronic databases, including: PubMed, Scopus, Web of Science, IEEE Xplore, Google Scholar. The search strategy included keywords such as: ("Artificial Intelligence" OR "AI") AND ("Telemedicine" OR "Remote Diagnosis") AND ("Awareness" OR "Perception") AND ("Healthcare Professionals").

Results:

The present study aimed to critically assess the knowledge, awareness, and attitudes of healthcare professionals towards AI-based telemedicine in a single university institution. 155 volunteers were included in the study, covering different stages of career and professional departments. The sample was categorized into 42 students, 14 interns, 31 junior professionals, 45 mid-professionals, and 23 senior professionals. 80% were from the commercial healthcare sector, and 20% were from government sector.

The survey showed high heterogeneity in awareness of telemedicine. While 29% were highly aware, indicating an in-depth understanding of its concepts and applications, 33% were partially aware, indicating spotty knowledge. A staggering 38% were not exposed to telemedicine. Contrary to this lack of awareness, 69% of the respondents have employed AI-based healthcare solutions, including diagnostic platforms, decision-support systems, and automated clinical apps. Conversely, 31% have never employed AI-enabled technology in their professional practice.

The most common way of information gathering was self-learning through electronic media such as online sources, academic journals, and social media. A minority of the respondents were exposed to knowledge through formal education or systematic training programs, which indicates the need in academic curriculum for AI-based telemedicine. When asked about their views on AI-based remote healthcare, 68% believed that it will improve diagnostic accuracy and use of remote healthcare services in India. But 32% were doubtful about its effectiveness. Also, 63% viewed AI-integrated telemedicine as safe and reliable for patient care, while 15% were doubtful about its reliability, citing limitations and risks. 22% of the respondents were neutral.

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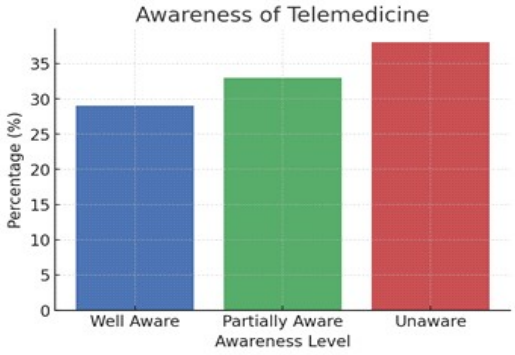
73% of the respondents concurred that telemedicine through AI must be adopted into professional practice, recognizing its transformative potential in contemporary healthcare. However, 27% were in doubt, requiring empirical evidence and policy regulations to guide informed adoption. In spite of growing digital engagement, the study identifies an enormous gap in formal training in AI-enabled telemedicine. Though most respondents acknowledge its value in improving remote diagnosis and clinical productivity, concern about its safety, reliability, and widespread adoption still exists. Institutional training initiatives and evidence-based policies will be essential to facilitate the adoption of AI-enabled telemedicine without a hitch in contemporary healthcare systems.

Survey Analysis: AI-Based Telemedicine Awareness and Perception

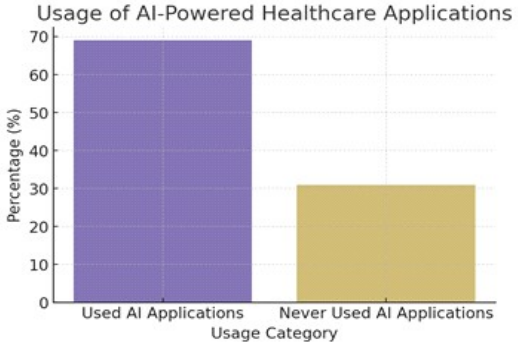
1. Awareness of Telemedicine

This graph represents the awareness levels of participants regarding telemedicine.



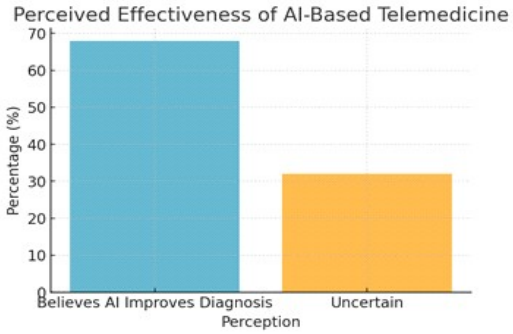
2. Usage of AI-Powered Healthcare Applications

This graph shows the percentage of participants who have used AI-powered healthcare applications.



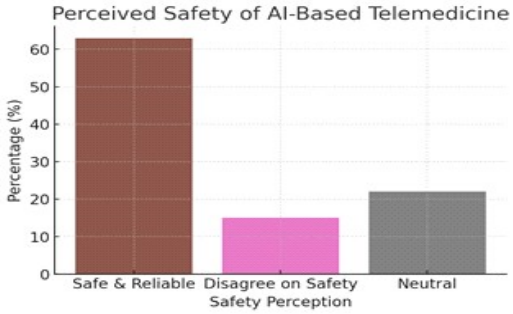
3. Perceived Effectiveness of AI-Based Telemedicine

This graph illustrates the participants' perception of AI-powered telemedicine in enhancing remote diagnosis.



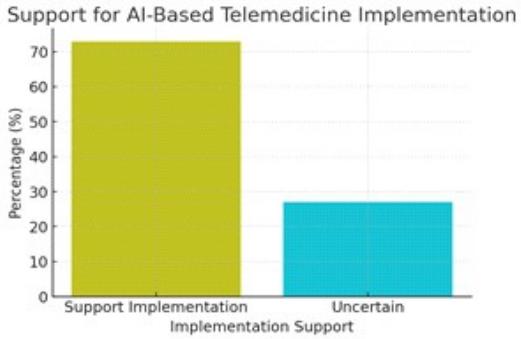
4. Perceived Safety of AI-Based Telemedicine

This graph highlights the participants' opinions on the safety and reliability of AI-integrated telemedicine.



5. Support for AI-Based Telemedicine Implementation

This graph presents the percentage of participants who support the future implementation of AI-driven telemedicine.



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Discussion:

This research indicates a glaring absence of awareness and training in the case of AI telemedicine among medical professionals. While 29% of the respondents showed a high degree of awareness of telemedicine, 38% had no exposure. This lack of awareness is contrasted with the observation that 69% of the respondents have used AI-based healthcare technologies, including diagnostic assistance and clinical decision-support systems, which suggests that AI is being increasingly used in professional work. However, 31% have never used AI in professional work, which indicates the patchy integration of the technology.

Most of the participants had learned about AI-based telemedicine through self-education with the help of the internet, academic journals, and social media platforms. Some had embraced formal education or systematic teaching, and this indicated a significant need for the inclusion of AI-related subjects in medical and healthcare courses.

32% of the respondents questioned the role of AI in healthcare, whereas 68% of the respondents thought it would increase diagnostic accuracy and telemedicine facilities in India. Likewise, 63% of the respondents thought AI-based telemedicine was safe and reliable, although 15% of the respondents doubted it because of questions about the potential drawbacks.

While recognizing the potential advantages, an overwhelming majority (73%) favoured the use of AI-based telemedicine in practice. Yet, 27% were reluctant and hoped for more evidence and standards before embracing it whole-heartedly.

Conclusion:

Overall, while medical professionals recognize the potential of artificial intelligence to enhance remote diagnosis and operational effectiveness, there still is a need to develop formal education, research-based guidelines, and regulatory frameworks to provide the secure and effective application of these technologies.

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