

Awareness, Knowledge and Perception Towards Artificial Intelligence and Machine Learning Among Medical Students & Healthcare Professionals

A cross-sectional study



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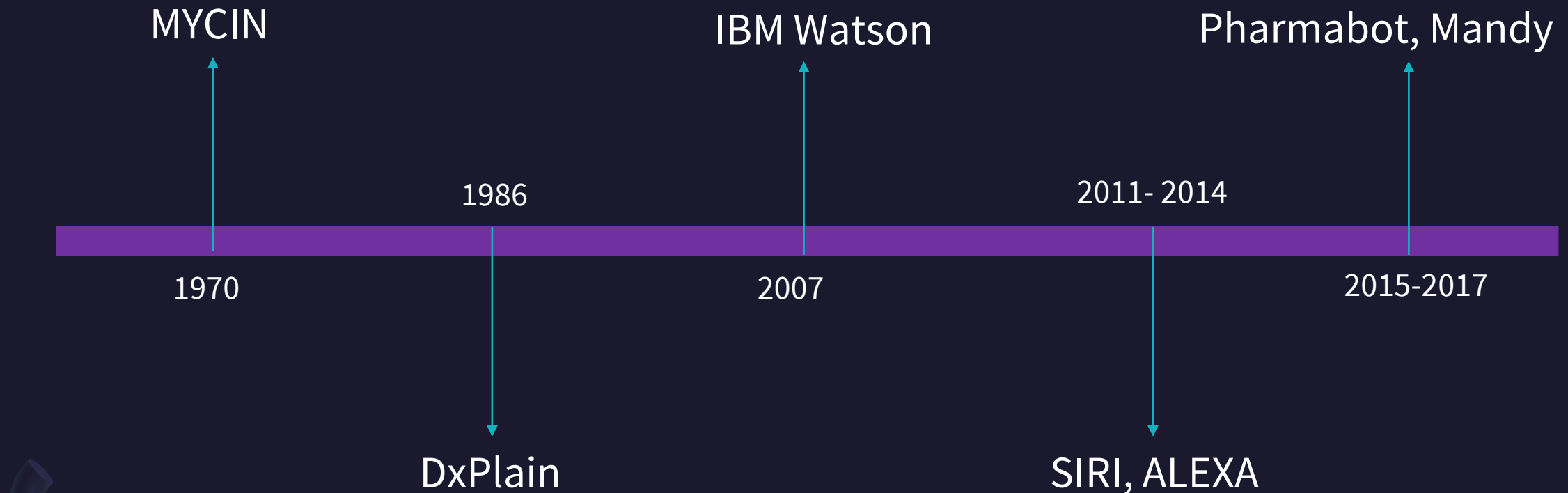


Introduction

- Artificial Intelligence can be defined as a branch of computer science concerned with developing smart machines that are capable of performing activities that typically entail human intelligence.
- While Machine Learning is a type of artificial intelligence that provides the computers the capability to learn and predict future outcomes without being explicitly programmed to do.
- Artificial Neural Network is a collection of algorithms, or a set of rules devised for learning from the responses or inputs based on which outputs are generated just as a neuron network in the human brain.
- Both Artificial Intelligence and Machine Learning in Healthcare are upcoming fields and has drawn attention worldwide due to its potential to revolutionize patient care and assist healthcare professionals in clinical decision as well as administrative functions in hospitals.



History of AI/ML in Medicine



Source : Timeline of development of AI in Medicine, (History of AI in medicine, author- Vivek Kaul et al.)

History of AI/ML in Medicine

- In 1950s, Alan Turing came up with the idea of machine's ability to learn and think.
- The 1970s saw the uptake of AI in the field of medicine to solve biomedical problems but many limitations prevented worldwide acceptance and application. MYCIN was the first AI based system developed to predict the potential bacterial infection and recommend antibiotic treatment as per patient's weight.
- DXplain, was the first clinical decision support software developed by University of Massachusetts, to give information on approximately 500 diseases.
- IBM, a giant technology company, in 2007 invented a question answering software which was easier to use and maintain, used a technology called DeepQA, to analyse the patient's health information in Electronic Medical Records (EMR) to come up with evidence-based treatment options.
- Natural Language Processing used in chatbots have been developed in healthcare space like Pharmabot (2015) and Mandy (2017) for assisting pediatric patients and their guardians in medication and automated patient intake system for primary care practice respectively.

Applications of AI/ML in Healthcare



Implications of Research

- Acceptance and awareness among the medical students and healthcare staff is one of the most leading reasons for low penetration rate and utilisation of AI/ML in healthcare in India.
- While on the other hand, increase in digitalization of medical records and the accuracy rates of AI shows great potential in the future of healthcare.
- This study is intended to investigate the awareness, knowledge and perception towards AI/ML in healthcare and also to study the awareness levels among medical students and healthcare staff and their willingness to accept future trends in AI in healthcare.

RESEARCH QUESTION

1. Are medical students and healthcare staff in Nagpur City knowledgeable about artificial intelligence in healthcare and its applications in the field of medicine?
2. What are the perceptions of medical students and healthcare professionals towards the future of AI in healthcare industry?

Aims & Objectives

AIMS

1. To understand how well aware medical students and healthcare professionals practising in Nagpur City are, regarding the use of Artificial Intelligence in healthcare.
2. To know how they feel about the future of medical practice with AI/ML tools and how ready they are to accept these technologies.

OBJECTIVES

1. To determine the awareness level, knowledge and perception towards AI/ML in healthcare among healthcare staff and medical staff in Nagpur city.
2. To assess the perceptions about AI in healthcare, its future and limitations among medical students and practitioners.



Methodology

- STUDY DESIGN : An Observational Cross- Sectional Study.
- RESEARCH TYPE : Primary Research
- STUDY TYPE : Descriptive Qualitative Study
- STUDY SETTING : Nagpur City.
- STUDY POPULATION : Healthcare Professionals and medical students in Nagpur City.
- STUDY TECHNIQUE : Convenience Sampling.
- STUDY DURATION : 03 Months (21/03/22 to 18/06/22)
- STUDY TOOLS : Self-administered questionnaire and rating scale. (A web-based Google Forms) , MS Excel/SPSS for data analysis.
- SAMPLE SIZE : 200

Data Collection Procedure

All pre-requisite permissions and consent was obtained from all the participating medical students and healthcare staff. After consent was given, they were requested to fill the online questionnaire. Data collected using google forms is end-to-end encrypted. Responses were limited to one per device to avoid recording multiple responses from same individual and once submitted, responses could not be changed. The responses collected from the participants are visually represented in the form of graphs (pie, bar or line) using MS Excel.

INCLUSION CRITERIA

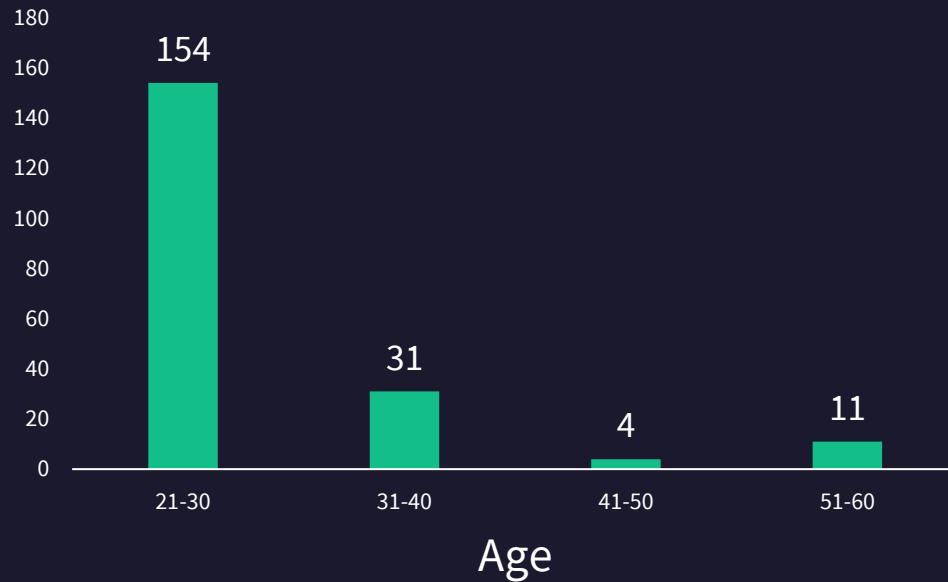
- those willing to participate, Medical Students and Practicing Healthcare staff (Doctors, Dentists, Physiotherapists and Nursing staff)

EXCLUSION CRITERIA

- those who are not willing to participate.

Results : Section – 1 : Demographics

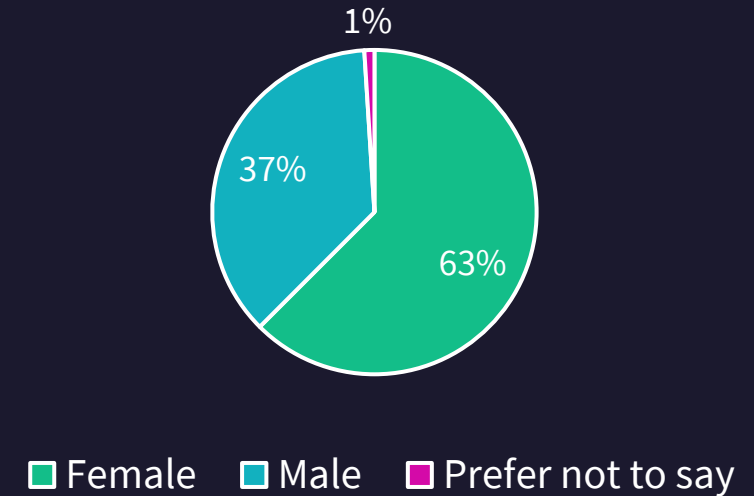
Age Distribution



Interpretation

Majority (154) participants belonged to 21-30 years age group.

Gender Distribution

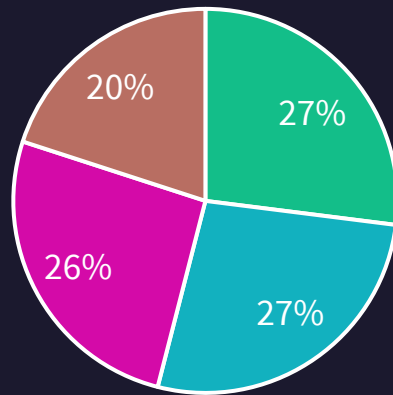


Interpretation

Majority (63%) population identified as females and 375 were males.

Demographics (2/2)

Educational Background

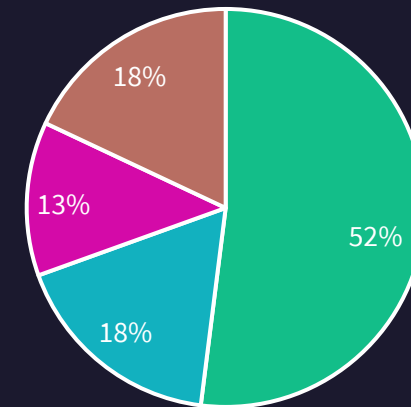


- BPT - Bachelor of Physical Therapy
- MBBS - Bachelor of Medicine & Bachelor of Surgery
- BDS - Bachelor of Dental Surgery
- B.Sc - Nursing

Interpretation

Equal no. of participants were from MBBS and BPT background, 26% were BDS and rest 20% had pursued B.Sc. Nursing

Years of Experience



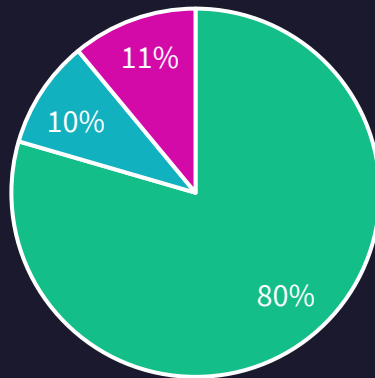
- 0-2 years
- 2-4 years
- 4-6 years
- More than 6 years

Interpretation

Approximately half of the respondents were students, 18% has 2-4 years, 13% had 4-6 years and rest 18% had more than 6 years of experience

Section 2 : Knowledge, Awareness regarding AI/ML in healthcare & its Applications

Basic understanding of Artificial Intelligence and Machine Learning Terminologies

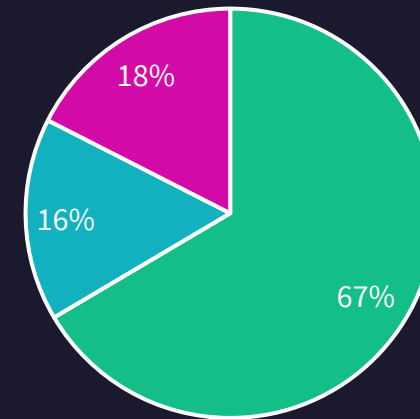


■ Yes ■ No ■ Maybe/Not Sure

Interpretation

When asked if respondents had a basic understanding of terminologies like AI and ML, 80% responded yes.

Applications of AI in Healthcare



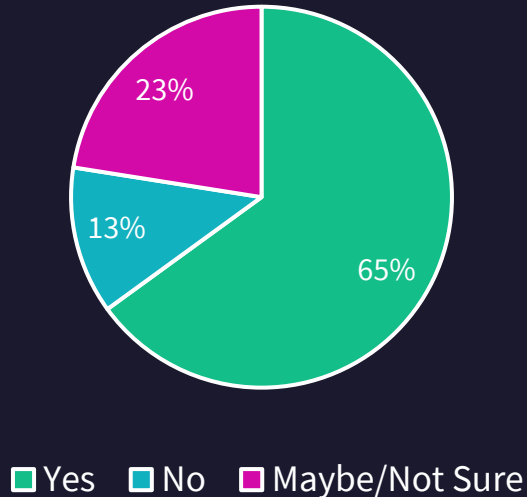
■ Yes ■ No ■ Maybe/Not Sure

Interpretation

When asked if they knew about any applications of AI in healthcare like medical IoT, smart wearables, chatbots etc, 67% said yes & 18% were not sure

Knowledge and awareness (2/3)

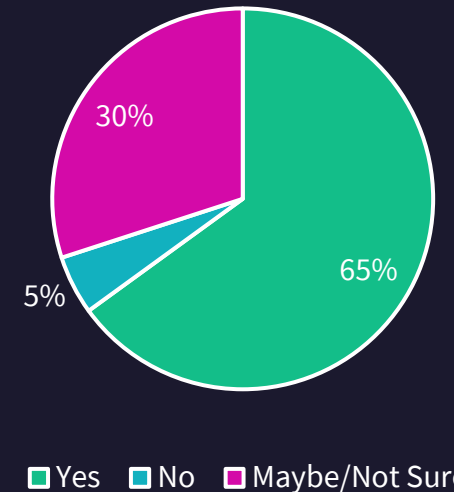
Knowledge about use of AI in drug development and precision medicine



Interpretation

65% were aware about the use of AI in clinical trials for new drug development and precision medicine applications

Knowledge about use of AI in public health (outbreak prevention, disease surveillance)



Interpretation

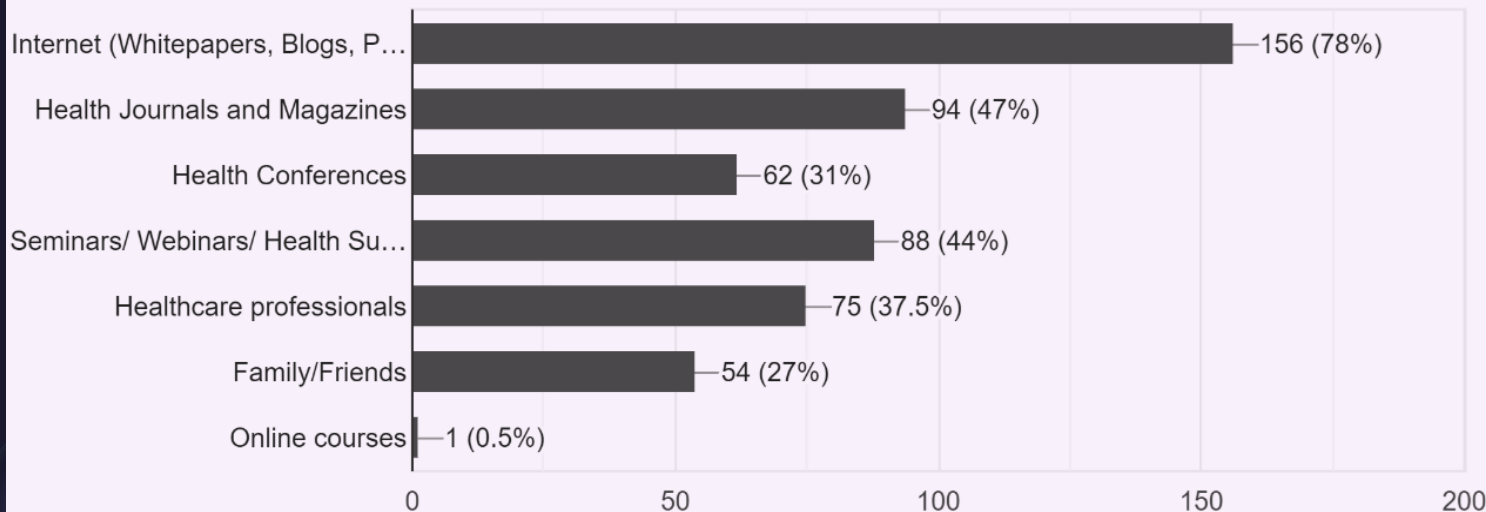
65% were aware about the use of AI in the field of public health for identifying disease pattern and trends, surveillance and outbreak prevention

Knowledge and awareness (3/3)

Interpretation

What is your source of information on Artificial Intelligence in healthcare and other Health IT (Information Technology) topics?

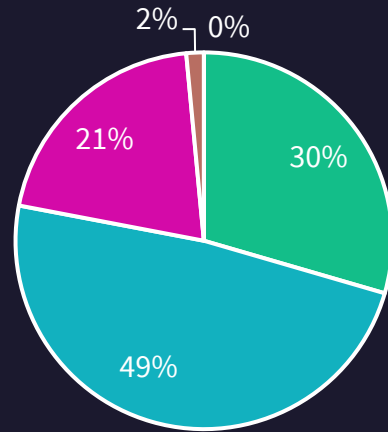
200 responses



- As sources of information can be multiple, this question was designed to accept more than one choice.
- The most common source was from published articles, whitepapers, blogs or podcasts available in public domain on the internet.
- Health journals and seminars also serve as an important source for medical students and healthcare professionals

Section 3 - Perceptions regarding use of AI in healthcare

Perception regarding AI aids in clinical decision making

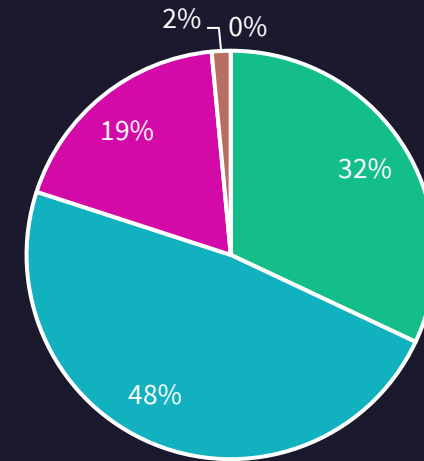


Strongly Agree Agree Maybe Disagree Strongly Disagree

Interpretation

When asked about their perceptions whether they believe AI aids in clinical decision making, 30% strongly agreed and 49% agree.

Perception regarding use of NLP and voice recognition in routine administrative tasks



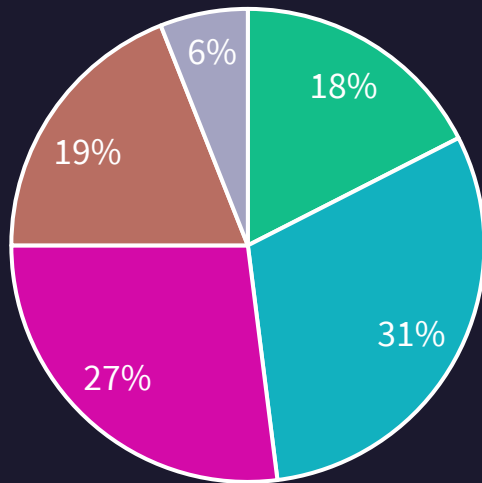
Strongly Agree Agree Maybe Disagree Strongly Disagree

Interpretation

48% strongly agree and 32% agree that the use of NLP tools can save hours of physician's time wasted in routine administrative tasks which could be utilized in care giving.

Perceptions regarding use of AI in healthcare (2/2)

Perception on current medical curriculum
preparing healthcare professionals for future



Strongly Agree Agree Maybe Disagree Strongly Disagree

Interpretation

- When asked if they feel that the existing medical education curriculum in India is preparing healthcare professionals to work alongside AI, only 18% strongly agree and 31% agree.
- 27% were unsure about the question.
- 19% believe that the existing medical curriculum in India lacks to provide the sufficient knowledge and exposure required to prepare doctors to work alongside AI technologies.
- Also, 6% strongly disagree

Discussion

- In the knowledge section of the questionnaire, 80% of medical students and practicing professionals accepted that they had a basic understanding of AI in healthcare and heard of the common terminologies used. Approximately 65% were knowing about the applications of AI in various fields of medicine used for new drug development and public health.
- The most common source of information was through internet and health journals.
- In the perception section of the questionnaire, a significant proportion of population (49%, 48% and 46% resp.) were unsure of the contribution of AI in clinical decision-making, accurate diagnosis and treatment planning, and use of NLP tools to save physician's time.
- Many (25%) disagreed that the current medical curriculum is preparing doctors to work alongside AI in future.



Recommendations

- Though the incorporation of AI/ML as a subject in medical curriculum cannot happen overnight and requires time. But it should be noted that a gap exists between the awareness and knowledge of medical students about such technologies and the actual use of AI in medical practice and its applications.
- The current medical curriculum must be revised to include subjects such as AI in healthcare. Students must be encouraged to learn about a computer language early on during the first or second year of their medical education.
- Students can also be encouraged to take on online courses on any online learning platforms such as coursera or udemy etc which can serve as a great way to be accustomed to any new developments in health-tech industry.
- Participating in Seminars or health conferences, where new topics are discussed, and research papers are presented will also boost knowledge about AI which can break barriers of acceptance among medical students and healthcare professionals.
- Workshops can be conducted as a part of CME programs (Continuing Medical Education) which serve to develop a better understanding of the subject and maintain relationships with instructors which can be helpful for their upskilling.

Conclusion

- Artificial Intelligence in medicine is a topic of decision in the healthcare industry owing to its potential to ease in clinical decision making and accuracy in diagnosis, treatment and surgery. It has the capability to revolutionize patient care and future of medicine. Hence it is of utmost importance that medical professionals are aware about its scope and applications in healthcare as they can then spread awareness among the general mass and influence the acceptance of artificial intelligence technologies in healthcare and hospitals.
- In this study, it was found that medical students and healthcare professionals in Nagpur city are optimistic regarding the current usage of AI/ML in healthcare and the future. Though, there are some barriers to implementation of AI in Indian healthcare systems, the most evident is the responsibility in case of any injury or even death due to AI-based systems.
- Similar studies conducted in India found same results as this study that medical students lack access to technologies or software due to limited resources and opportunities. Perception regarding AI were also comparable with similar studies, medical students were optimistic to learn about AI-based technologies and software but either had never used such technology in practice or came across during internship or education. Given opportunities, and some proactiveness from the students side can make a huge difference and help tackle challenges of unacceptance in doctors, paramedics, dentists and nurses.

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Thank You

