A Study On Perceptions of Medical Professionals on Utilizing Artificial Intelligence Tools for Diagnosing Respiratory Diseases

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ABSTRACT

Although the use of artificial intelligence (AI) in respiratory medicine has been growing, there are still implementation issues. The purpose of this research is to investigate how medical professionals feel about the use of AI tools, as well as to investigate the many difficulties associated with putting these tools into practise in the context of diagnosing and treating respiratory disorders in tertiary care settings. At Tamil Nadu's tertiary care hospitals, a mixed method of research was carried out. with 104 medical specialists chosen at random. The quantitative data were gathered using a semi-structured routine. The same technique, two narrowly focused group talks were employed for brainstorming (FGD). The use of descriptive statistical measures such as percentages, mean values, and standard deviations was carried out. 67.3 % agreed that AI can be useful in respiratory medicine, and 69.4% felt AI implementation hurdles. Response from the negative

Keywords—Artificial Intelligence, machine learning, deep learning, Respiratory Medicine, X-Ray.

I INTRODUCTION

Many recent advances in technology, such as AI, have benefited the healthcare industry (AI). 1 AI, or artificial intelligence, is the emulation of human intelligence in machines through the application of machine and deep learning techniques and algorithms to achieve the same results. Machine learning (ML) and deep learning (DL) are subsets of AI that are used to implement AI intensively. 2

Machine learning (ML) is an application of artificial intelligence (AI) that gives systems the capacity to automatically learn from experience and get better over time without being explicitly programmed. 2 Deep learning (DL), which uses several neural networks and a good algorithm, makes machine learning (ML) more useful in medicine. An algorithm is a set of rules or instructions given to an artificial intelligence (AI) software, neural network, or other machine to aid in its autonomous learning. The foundation of AI is essentially well-designed algorithms. 3

Numerous industries employ AI, including chatbots, which facilitate conversations via chat, e-commerce, which allows customers to select a product for purchase, workplace communication, which uses an intelligent virtual assistant, human resource management, logistics and supply chain, the sports betting industry, transportation, and healthcare. 4,5 AI will soon alter the healthcare industry and how corporations use it. With regard to quality and patient safety, AI increases dependability, predictability, and consistency. 6

Although the use of AI in pulmonary medicine has been growing, there are still implementation issues. 7,8 More research is necessary to pinpoint algorithmic bias themes, lessen brittleness and increase generalizability, and provide strategies for a seamless AI implementation. 9,10 This research will therefore seek to ascertain the opinions of healthcare providers on the use of AI tools.

II AIM & OBJECTIVE

To investigate medical practitioners' opinions of using AI technologies, as well as the different hurdles associated with using these techniques in diagnosing and managing respiratory disorders in tertiary health care settings.

III MATERIAL AND METHODS

This cross-sectional study used a combination of qualitative and quantitative methodologies. Both public and commercial tertiary care hospitals in Salem, TamilNadu, were considered for this project. Three months of research, literature review, data collection, compilation, analysis, and report writing. First, using the saturation coverage method, two focused group discussions (FGD) were held in each of the chosen health facilities. For the quantitative portion, 104 medical physicians were chosen using the Convenience Sample approach.

From this literature research, we were able to compile a list of potential topics for the FGDs. Uses of technology in health, advantages and downsides of technology, knowledge on AI, role of AI, how AI may be utilised in medical care, risks of AI, obstacles in implementing AI, and alternative methods of implementing AI dominated the discussions. A questionnaire was created to collect data based on the FGDs' input. A general view of artificial intelligence, the benefits and drawbacks of AI, its use in health care and the treatment of respiratory diseases, the difficulties associated with implementing AI in health care settings, and potential solutions to those difficulties were covered. Preliminary testing of the instrument led to the finalisation of a Linkert's scale of agreement. To further categorise your responses, we have created five distinct options for each overarching category: Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree. Prior to use, the tool was pretested.

People interested in joining the focus group preliminarily filled out the necessary consent paperwork. Prior to starting the study, institutional approval was sought, and a quiet location was carefully selected. The FGDs begin with the moderator's opening introduction. Every participant had an equal opportunity to win, and there was sufficient time for them to contemplate and respond to the question. Without skipping a beat, the full sessions were recorded for transcription.

IV METHOD OF DATA COLLECTION

In order to conduct a quantitative investigation, individual consent forms were developed. The quantitative data was gathered in under two months using a semi-structured schedule. The answers were gathered both online and in person. The offline data were collected by trained medical students, and online platforms were also utilised to obtain data from other universities. The same method was utilised to conduct focused group discussions for brainstorming (FGD).

V ANALYSIS

The acquired quantitative data was entered into an MS Excel spreadsheet and examined with Epi info. Statistical measures of descriptive nature, such as means and standard deviations, were used. Likert ratings between 1.2 and 2.60 were regarded as low, between 2.6 and 3.40 as moderate, and between 3.41 and 5 as high. Transcripts of focus group discussions recorded on digital voice recorders were evaluated with the qualitative research platform MAXQDA.

VI ETHICS

Institutional Ethics Committee at VMKV Medical College in Salem gave its consent to the study.

VII RESULTS

In the beginning, there were two focus group discussions held in Salem's two medical colleges and hospitals. Each one had 10 and nine participants, and they were separated by one week. With 60% men and 40% women participating in the FGD, several specialist doctors were represented. The quantitative research was carried out at the same sites with the same number of participants, 104. The majority of participants came from the department of general medicine (54%), followed by the department of respiratory medicine (28%), and the rest were from other departments. The participants' average age was 33, with men (75%) being 48 and women (25%) being 16 years old. 37 respondents (or 77%) of the total heard about AI.

Most of them had prior knowledge about this from the Internet (50%), meetings and seminars (28%), friends (10%), other equipment, and chatbots (12%).

Table 2 presents respondents' perspectives of issues and difficulties in using AI for healthcare. "AI is not versatile enough to be applied to every patient," was given as one AI drawback. high mean of 3.11 (SD 2.36), while the top scored item was a moderate response to "AI is costly to create and implement," with a mean score of 4.65. (SD 2.37). "Suspicious Health Data and Privacy is Always There," is one of the remedies to the issues in implementing AI. Rated last with a mean of 3.98 (SD 2.46) and the highest-ranked item was a moderate reaction to "A legislation is to be studied before adopting" with a mean of 4.59. (SD 2.65). Many people, to a considerable extent, concur that AI may be used in hospitals following capacity building and the establishment of specific rules.

Regarding the uses of AI in healthcare and, specifically, its function in respiratory medicine, the responses from respondents are shown in Table 3. Overall, 68% of respondents felt that AI can be helpful in healthcare, with 79% of those citing respiratory care. The belief that "AI can be used in screening, diagnosis, and treatment follow-up" came in first with a high level of acceptance (mean 4.23, SD 2.16), while "I have high hopes about AI applications in the health care sector" came in last with a mean of 3.9 (SD 2.09), which is a moderate level on the Likert scale for health care use. The response, "Automation of electronic health records," received a high score (mean 4.5, standard deviation 2.33), while "Assess mechanical ventilation" received a middling grade (mean 4.43, SD 2.39).

Positive AI responses had a mean of 3.72 (SD 2.29) and negative AI responses had a mean of 4.32, which is generally considered to be moderate responses (SD 2.12). Overall, the response was moderate (3.98 SD) for AI in health and high (4.01 mean) for AI use in respiratory care (SD 2.50).

VIII FINDINGS FROM QUALITATIVE STUDY

Some common applications that use AI or automated results are used by the respondent. ECG machine with automatic reading, BMI calculator, GFR, growth monitoring, vaccine reminders, and other applications for medicine reminders. The attendees were concerned about the development of several algorithms without the input of medical experts and with insufficient data. They preferred that medical professionals oversee the monitoring of AI results. AI was unable to identify any patient cues. While AI can assist doctors, it cannot fully replace them. AI can be used as an alternative to verify a doctor's diagnosis.

IX DISCUSSION

Some common applications that use AI or automated results are used by the respondent. These apps include an ECG machine with automatic reading, a BMI calculator, GFR, growth monitoring, vaccine reminders, and various prescription reminders. The attendees were concerned about the development of several algorithms without the input of medical experts and with insufficient data. They preferred that medical professionals oversee the monitoring of AI results. AI was unable to identify any patient cues. While AI can assist doctors, it cannot fully replace them. AI can be used as an alternative to verify a doctor's diagnosis.

Some people continue to have a negative attitude toward medical AI for a variety of reasons, the most important of which being a lack of faith in AI as well as the absence of a humanistic care aspect. High dimensionality, heterogeneity, time dependency, sparsity, irregularity, lack of labelling, bias, and multiple algorithms with reliability, interpretability, feasibility, security, and scalability for real-world use or clinical practise are some additional major challenges with data that need to be addressed. Most respondents in a Saudi Arabian study (9,14,15) were clueless about the benefits and most typical hurdles presented by AI applications in the healthcare industry, highlighting the need for education. 16 Multiple algorithms for each function or population, permission, privacy, ethical concerns, data security, cost, legal concerns, bias, transparency, cybersecurity, concerns regarding intellectual property legislation, safety and effectiveness, liability, inadequate standardisation, and evaluation are a few of the difficulties. 17,18

The practitioner might be in a better position to diagnose patients more quickly and accurately by integrating AI into imaging instruments. Clinical productivity may be significantly impacted by AI. 19,20 Due to the possible liability healthcare systems assume when using AI technology for patient care, collaboration and openness with suppliers are crucial for successful implementation of industry-developed AI. After clinical review, healthcare institutions will need human and material resources for intramural AI systems. 21, 22

Recent developments in artificial intelligence offer a fascinating chance to advance healthcare. IBM's chronic disease treatment, Microsoft's cancer treatment choices, Google's cancer, and TenCent's medical services are just some examples of the artificial intelligence algorithms developed by different organisations. 4 India's National Health Policy 2017 calls for the adoption of new technologies like artificial intelligence, the internet of things (IoT), Blockchain, and the cloud, so the country's government has launched the National Digital Health Mission (NDHM). 23 A National Digital Health Blueprint was created with the goal of digitising healthcare in India. 24 The Mission, innovators, healthcare service providers, and customers (as end users) will be able to test products in the alpha, beta, and field thanks to the NDHM Sandbox. 25 This will support the creation of various AI tools and their application.

X CONCLUSION

Although there are benefits to using artificial intelligence in respiratory care, there is still some opposition among medical professionals. Even if AI makes reaching conclusions regarding illnesses easier and quicker, healthcare providers still believe that training, exposure to AI, and laws are required to put into place. AI algorithms are not widely available and are expensive, which limits their potential for usage.

XI RECOMMENDATION

It is possible to build a small-scale algorithm for respiratory conditions using a multidisciplinary participatory approach, and then deploy it in hospitals after educating the personnel who offer medical care.

XII LIMITATIONS OF THE STUDY

The study's small sample size and restricted number of locations prevent it from extending to the entire state of Tamil Nadu.

XIII RELEVANCE OF THE STUDY

Although it is a rapidly developing topic in healthcare, few institutes now apply artificial intelligence. This study examined how medical practitioners felt about AI. This is useful information for any AI projects that are being planned for tertiary care settings.

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Tables:

Table 1: Perceptions of AI and its advantages among participants

Rank	General Views on AI Technology in Health	η	Mean	SD	Agree rate(%)	Agreement Level

1	AI tools helps clinical decision making faster	102	4.13	2.53	65.96	High
4	AI overcomes limitation of human intelligence	104	3.75	2.55	55.17	Moderate

3	AI reduce the health care cost	104	3.76	2.54	57.73	Moderate
6	AI could replace doctors soon	103	2.88	2.53	37.37	Low
2	AI tool not available in wider level	104	3.71	2.37	58.60	Moderate
5	Doctors are ready to accept AI	103	3.55	2.34	51.29	Moderate
Rank	**Advantages of using AI in Health**	**η**	**Mean**	**SD**	**Agree rate**(%)	**Agreement Level**
6	AI can speed up the process of patient care	103	4.13	2.25	65.01	High
2	AI can deliver clinically relevant, vast amounts of high-quality data in real time	103	4.33	2.27	72.57	High
7	AI led potential benefit to patient and doctors	103	4.06	2.29	62.12	Moderate
5	AI can help reduce the number of medical errors	104	4.20	2.30	68.12	Moderate
3	AI has no space-time constraint	103	4.21	2.32	71.31	High
1	AI has no emotional exhaustion or physical limitation	103	4.40	2.30	76.54	High
4	Specific training needed to use the technology time to time?	103	4.24	2.33	69.77	High

Table 2: The Disadvantages and challenges in implementing AI

Rank	**Disadvantages of Using AI**	**η**	**Mean**	**SD**	**Agree rate**(%)	**Agreement Level**
1	AI is costlier to develop and implement	100	4.65	2.37	78.49	High
2	Safety concerns or regulatory issues surrounding this technology is high	102	4.45	2.37	73.10	High
5	AI cannot be used to provide opinions in unexpected situations	102	4.07	2.36	62.53	Moderate
8	AI is not flexible enough to be applied to every patient	104	3.11	2.36	43.69	Moderate
6	AI is difficult to apply to controversial subjects	104	3.90	2.13	61.84	Moderate
4	AI has low ability to sympathize and consider the emotional well-being of the patient	104	4.15	2.11	66.23	High
7	AI was developed by a specialist with little clinical experience in medical practice	103	3.88	2.06	57.56	Moderate
3	AI reduce the physician–patient relationship	103	4.12	2.09	66.74	High

Rank	Challenges in implementing AI	η	Mean	SD	Agree rate (%)	Agreement Level
2	There might be many issues with the usability or practical aspects of the technology	103	4.45	2.51	72.96	High
3	A research that you feel would be needed to address uncertainties in the evidence base	104	4.31	2.46	72.76	High
4	Criteria to assess such tools is not developed	104	4.31	2.54	72.24	High
1	A legislation is to be considered before implementing	103	4.59	2.65	75.89	High
8	Suspicious Health Data and Privacy is always there.	103	3.98	2.46	62.33	Moderate
5	There are ethical issues in implementing AI.	102	4.29	1.96	67.79	High
7	Acceptability from doctors will be less.	103	4.12	0.79	64.53	Moderate
6	Institutional support will be a limiting factor.	101	4.18	0.69	67.20	High
Rank	Way Forward	**η**	Mean	SD	Agree rate(%)	Agreement Level
2	National Medical Commission or universities draw protocol for the use of AI	100	3.88	0.12	58.51	Moderate
1	Include AI in medical curriculum	104	4.05	0.12	64.38	Moderate
3	Govt help to develop open-source AI protocol for wider use	104	3.82	0.14	58.32	Moderate
4	Many Public Private Mix (PPM) can be tried to develop IA protocol.	104	3.85	0.08	58.19	Moderate

Table 3: The application of AI in health care and Respiratory Medicine

Rank	The application of AI in health care	Mean	SD	Agree rate (%)	Agreement Level
4	I have high hopes about AI applications in the health care sector	3.90	2.09	59.70	Moderate
2	It has potential to change the current pathway or clinical outcomes	4.05	2.13	63.48	Moderate
1	AI can be use in Screening, diagnosis, treatment follow-up	4.23	2.16	70.95	High
3	This technology replaces or be an	3.97	2.20	62.85	Moderate

	addition to the current standard of care				
Rank	Role of AI in Respiratory care	Mean	SD	Agree rate (%)	Agreement Level
6	AI can read X ray and CT scan to identify or diagnosis of respiratory diseases	4.02	2.27	65.29	High
5	AFB reading will be easy and accurate	4.13	2.31	65.66	High
3	AI can use in Patient adherence	4.24	2.26	68.34	High
4	Risk analytics of respiratory disease can be done	4.16	2.30	65.99	High
1	Automation of electronic health records	4.50	2.33	75.90	High
8	Asses mechanical ventilation	3.91	2.37	59.90	Moderate
7	Surgical analytics,Robot-assisted surgery	4.09	2.36	63.54	Moderate
2	Assess PFT	4.43	2.39	74.13	High

Table 4: Findings from focused group discussion-Positive and negative aspects, implementation challenges and uses in medicine

Positive aspects of AI	Negative aspects of AI
AI can be used in Triage, Screening, First aid room, Rural health centers or rural area for primary care. "It saves the doctors time to arrive the diagnosis." "Human error can be reduced if we use proper AI." "The patient's follow up/monitoring will be easy." It can reduce patient's anxiety mainly children fear of doctor. It is equal to getting an opinion from other doctors. Machines can do complex calculation easily. This can timely give updates to health system if it is integrated with internet ecosystem. AI driven Robots can help to do micro surgeries.	"We may lose doctor -patient relationship" "AI can give differential diagnosis. But finding out the exact diagnosis will not be clear." "Doctor only able to give advice what patients need else machines give list of things." Machines can't do multiple physical examination as desired to arrive the diagnoses." "The patients cannot trust the machines as there won't be doctor to patient interaction. patient always need a human reassurance than a machine" "The empathy component is not there in the machine. " Finding multiple risk factor is not possible by machines.
Implementation Challenges	**Uses of AI in Respiratory Medicine**
The doctor's knowledge and exposure towards the AI is less and public awareness is also low. There is no algorithm available widely, no free algorithm is given by the companies even for the	AI can be used in many fields of medicine especially respiratory Medicine. "We can identify the source of allergy by using the machine."

government programs. Cost of AI is high. If we buy different algorithm for each diseases the cost will be high. So, the treatment cost also jumps. If more hospitals started using, chances are there to reduce the implementation cost. Monitoring the AI and update it is a challenge. Needs technical knowledge and it should be user friendly. No Government recommendation or standardizing mechanisms. There should be some mechanism to keep the data privately There should be a backup for electricity AI should be made available in the UG /PG curriculum itself.	In case of long terms treatment such as TB, we can use the machine for having reminders so adherence can be ensured. AI in heavy air polluted places to assess the lung condition like spirometry lung help. In ICU, it can be used to reduce the workload of the doctor and nurses for constant monitoring of parameters of the patients. Useful in reading X Ray, CT/MRI or USG automatically It can be used in case of bronchoscopy, in cancer screening and detection in different breath sounds, cardiac sounds. It can be used in cardiac autonomic neuropathy as it is difficult to do ECG and diagnose.

Biography of Principal author

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She is currently working as Professor and Head in the Department of Community Medicine at VMKVMCH, Salem, Tamil Nadu, India. She was an Assistant professor in Vinayaka Mission's Medical College,Salem and Associate Professor in Annapoorna medical college,Salem, India. She was selected as Professor and HOD of Community Medicine Department at ESIC Medical College, Chennai and she worked for a period of 1year in Chennai. She completed MBBS from Bangalore Medical College, Bangalore, Karnataka, India in 2001,with gold medal in ENT and Master degree(MD) in Community Medicine from Karnataka Institute of Medical Sciences , Hubli, Karnataka, India in 2006,with state 2nd rank in MD exams. She is interested in Reproductive & Child Health Programme, Artificial Intelligence, Communicable diseases, Non Communicable diseases and Nutrition. She attended as an invited speaker, to share her research experience on ''Community based

study on Reproductive Tract Infections among women'' in an International Conference of Gynaecology and Obstetrics (ICGO-2013),under 1st Annual Global Health Conference, held at Dalian, China from Oct 11th-Oct 15th 2013. She has won best paper presentation award as PG in KACH (Karnataka Association of Community Health) conference and in Indian Association of Public Health conference, Cochin, Kerala, India as a faculty. She has been also awarded Dr APJ Abdul Kalam award for teaching excellence in 2017 by Marina Labs Research and Development, "Dr. Sonaji Jogadand Prize" award in the category of "Occupation/Environmental Health" for her oral presentation in 22nd Annual Maharashtra State Joint Conference of IAPSM & IPHA – 2021 and Best Researcher award 2021 by VMKVMCH, Salem.

She has the credit of conducting an Integrated National Public Health Conference, first time in India, as an Organizing Secretary at VMKV Medical College, Salem, Tamil Nadu on Dec 2nd and 3rd 2017. She is an Editor in Chief for University VMRF (DU) News Letter – VINSAGA. She has 22 published papers in National indexed journals and 10 papers in International indexed journals.

DISCLAIMER

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