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USE OF AI IN PUBLIC HEATH SURVEILLANCE: AWARENESS AND FEASIBILITY AMONG HEALTHCARE PROFESSIONALS OF INDIA: A CROSS-SECTIONAL SURVEY

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ABSTRACT

Background:
Artificial Intelligence (AI) offers significant potential to enhance public health surveillance through advanced data analytics, real-time monitoring, and predictive modelling. By using vast amounts of health-related data, AI can improve the detection of disease outbreaks and health trends.But, the adoption of AI in public health remains limited, particularly in resource- restrained settings, due to challenges such as low awareness, inadequate infrastructure, data privacy concerns, and lack of policy support. This study aims to assess the awareness and feasibility of AI integration among public health stakeholders for further investments and strategic planning for its implementation.

Objective:
This study aimed to assess the awareness, attitudes, and perceived feasibility of AI integration in public health surveillance among healthcare professionals and students in India, and to recognise key challenges and training needs associated with its implementation.

Methods:
A cross-sectional survey was conducted using a structured questionnaire formed using Google forms, which was distributed electronically via WhatsApp , telegram etc. among 400 healthcare professionals and students (Medical courses and paramedical courses) . The topics of the analysis in the questionnaire were sections regarding demographics, awareness and experience with AI, perceptions of AI in public health, challenges to implementation, and interest in AI-related training.

Results:
Around. 85% if the respondents were aware of AI in healthcare, and 70% agreed that AI can improve public health surveillance. But, only 22% had practical experience using AI tools. According to respondents the main areas of AI application included diagnostics, treatment planning, and health records management . Major barriers included lack of technical training (30%), concerns about data privacy (25%), and limited funding (20%). Notably, 80% expressed interest in learning AI, preferring flexible options like online courses and workshops.

Conclusion:
There is strong awareness and positive perception of AI's potential in public health among healthcare learners and professionals, but practical application remains low. Closing knowledge gaps in training, infrastructure, policy definition, and funding is critical to facilitate effective utilization of AI in public health surveillance systems. These findings offer key recommendations for policymakers and educators to promote AI readiness in the healthcare field.

Introduction

Public health surveillance is defined as the ongoing, systematic data collection, and analysis, including the continual interpretation of data related to a person's health, to help in planning, implementing, and evaluating public health practice. This serves as a foundation for trend spotting, outbreak detection, and timely intervention. Traditional surveillance systems have depended on routine reporting and lapsed data which can slow reaction to public health needs.

With the lack of available large datasets, public health surveillance is of great importance in protecting populations. It enables early recognition of disease outbreaks, closes monitoring of health trends, and aids in forming evidence-based decision-making. With advancements in digital health technology, there is potential to change modern disease detection methods and increase ease of access to AI powered tools that can revolutionize traditional surveillance practices.[1]

AI's capabilities of active observation and predictive analysis can enhance surveillance. The ability to rapidly process data is also a plus. Nonetheless, in many regions, particularly under-resourced areas, the effective implementation of enhanced public health surveillance tools poses a challenge. Insufficient awareness among healthcare workers, poor infrastructure, high concern for data privacy, lack of skilled professionals, and weak policy are some of the reasons.

As a result, low awareness among health practitioners, infrastructural problems, worries over data safety, unavailability of trained personnel, and poor policy frameworks stifle the adoption of such technologies.[2] The goal of the current study has been designed in such a way that analyzes awareness levels of public health surveillance, assesses attitudes towards the integration of modern innovations AI, and explores the primary obstacles and chances for enhancement of surveillance systems.

The modernization of public health surveillance systems has seen the introduction of new technologies such as Artificial Intelligence (AI), machine learning, and big data analytics. These technologies not only allow real-time analysis of huge datasets, and generation of predictive insights but also significantly automate the outbreak detection processes, responsiveness, and accuracy of the system.[3]

The growing interest in the above technologies is fueled by the fast-paced advancement of technology. The incorporation of these tools into health systems comes with a unique set of challenges. There is little to no awareness of public health surveillance, especially the advanced technology-infused versions, particularly in resource-constrained settings.

The adoption of AI systems is further complicated due to inadequate funding, a skilled workforce, available infrastructure, and ethical as well as data protection challenges. [4]

This document surveys the existing awareness within the health care sector, including tertiary health care students (medical and paramedical), analyzes how feasible they think it is to incorporate AI features for surveillance purposes, and examines critical barriers and facilitators within the Indian setting.

AI-enabled technologies can actively monitor disease evolution, public opinion, and the spread of misinformation, thereby improving the effectiveness of the response to public health emergencies. [5, 6]

The purpose of this study is to determine how aware people are of the challenges of public health surveillance, identify challenges related to AI technology, and develop approaches regarding training, data protection, and funding to improve these systems.

Measurement of awareness, perception, and other associated factors among students and medical professionals for an evaluation of the implementation of Artificial Intelligence (AI) in public health surveillance is essential. Ascertaining the extent of awareness through knowledge of AI application in public health is essential while evaluating the awareness.

The manner in which these individuals perceive the benefits, risks, and ethical aspects of implementing AI is primarily the focus in evaluating attitudes and opinions. [7, 8]

Identifying the challenges and feasibility of implementing AI also examines the barriers, like the need for specialized education, ethical concerns, and infrastructural limitations. For AI to be effective and implemented in public health surveillance, a number of aspects need consideration.

Materials and methodology

The study design which was adopted for this study was a cross-sectional survey which was conducted using A structured questionnaire which was developed to

assess the awareness, experience, and perceived feasibility of integrating Artificial Intelligence (AI) into public health surveillance. The study was conducted on healthcare professionals and students (Medical courses and paramedical courses) Following this, a simple random sampling technique was used to select participants from the target population in which Participants were randomly chosen from a list of individuals within healthcare professionals and students (Medical courses and paramedical courses).

This gave every healthcare professional and student in the target population an equal chance of being selected for the study. The finalized questionnaire was distributed electronically through email, WhatsApp groups and messages and telegram among healthcare professionals and students (Medical courses and paramedical courses) over a period of four weeks. Prior to participation, individuals were provided with brief information regarding the objectives and nature of the study.

The Inclusion criteria of the study consisted that the participants must be of above the age of 18 years, they should be currently studying or working in the healthcare or public health sector, and the participant should be willing to participate voluntarily.

The exclusion criteria consisted of respondent below the age of 18 years, individuals not involved in the healthcare or public health related fields, respondents who submitted incomplete response, applicants who lacked the access to electronic devices like Phone, et cetera, any individuals who were not proficient in English.

A total of 400 responses were received over a period of 4 weeks.

The questionnaire was divided into five sections, which were demographic data, awareness and knowledge of AI, perceptions, and attitudes towards AI in public health, challenges, and feasibility assessment and training needs.

The first section of demographic data consisted of three questions and captured basic participants details, including age, group, gender, and profession.

The second section of awareness and knowledge of AI included five questions in which the participants were asked about their prior experience using AI tools in academic or professional settings, their self-assessed understanding of AI in public health, their Agreement with the statement: "*Artificial Intelligence has the potential to improve public health surveillance*" and

their Knowledge of AI applications in healthcare like diagnostics, treatment, health records, surveillance, predictive analytics, surgical robotics. the third section of perception and attitude towards AI in public health included for questions which assessed effectiveness of AI in early detection of public health threats.

The participants were asked about the role of AI in resource distribution during public health emergencies, the trust in AI generated insights for public health, decision-making and identified benefits of AI like early detection, accurate predictions, improved resource allocation, indigenous health monitoring. Section 4 evaluated the challenges and feasibility and consisted of three questions in which participants were asked to identify major barriers to AI implementation like lack of technical training, data privacy concerns, insufficient funding, inadequate infrastructure, lack of policy support.

Key infrastructure needs for successful AI adoption like internet access, data storage, processing power, regulatory guidelines, trained workforce and their opinion about to what extent the organisation/government is investing in AI for public health initiatives.

Section 5 of training needs consisted of two questions and explored participants interest in gaining AI related skills for healthcare and their preferred modes of training for the same like online courses, workshops, academic programs, webinars, on-the-job training.

Statistical analysis, a combination of descriptive and inferential statistical methods was employed to thoroughly analyse the collected data. Descriptive analysis involved calculating frequencies, percentages, means, and standard deviations to summarize and describe the key features of the dataset. These metrics effectively demonstrated the distribution and central tendency of the data. Both IBM SPSS Statistics software (version 22.0) and Microsoft Excel were utilized for data processing, analysis, and interpretation. The chi-square test was applied for inferential statistics to assess the relationship between categorical variables. The use of a structured closed-ended questionnaire ensured uniformity, minimized respondent bias, and maintained consistency in responses. A significance level of $p \leq 0.05$ was applied to all statistical tests.

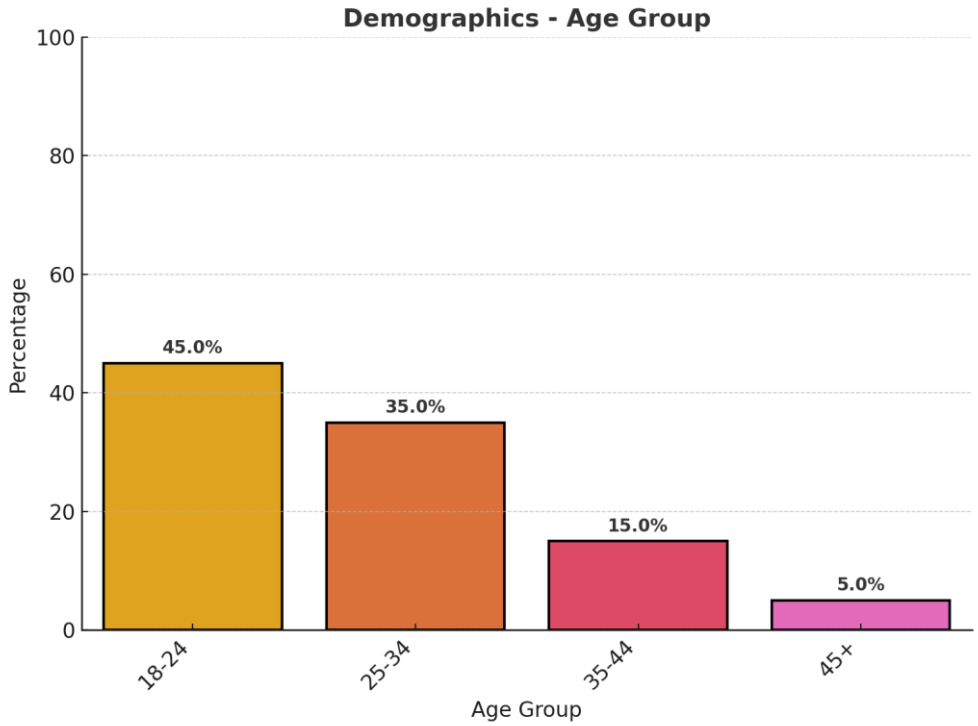
Result

A total of 400 participants responded to the survey. Most were aged between *20–40 years* (Table-1, Graph-1), and a majority identified as *female* (Table-2, Graph-2). The respondents primarily consisted of healthcare *students* (approximately 80%)

and *healthcare professionals* (approximately 20%) (Table-3, Graph-3).

Age Group	**Percentage**	**Frequency**
18-24	45	180
25-34	35	140
35-44	15	60
45+	5	20

Table 1 : Distribution of study participants across age groups (N = 400)

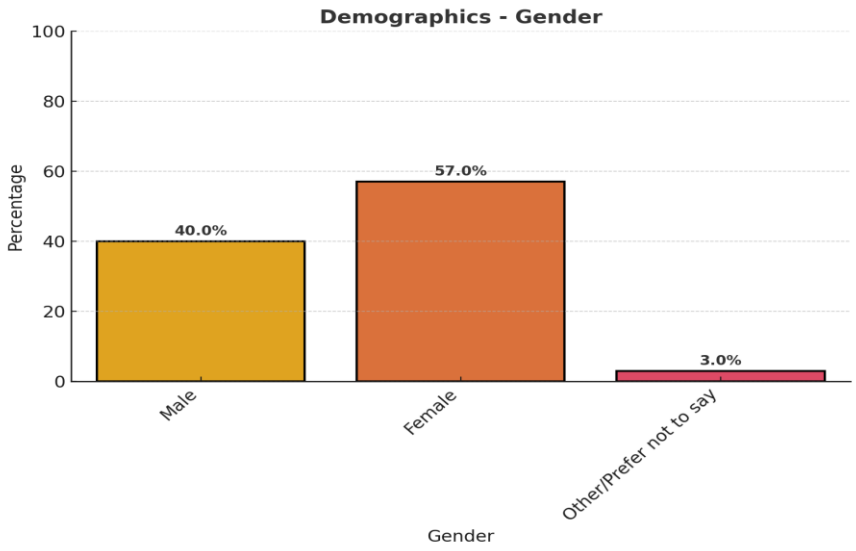


Graph 1: Distribution of study participants across age groups

Gender	**Percentage**	**Frequency**
Male	40	160

Female	57	228
Other/Prefer not to say	3	12

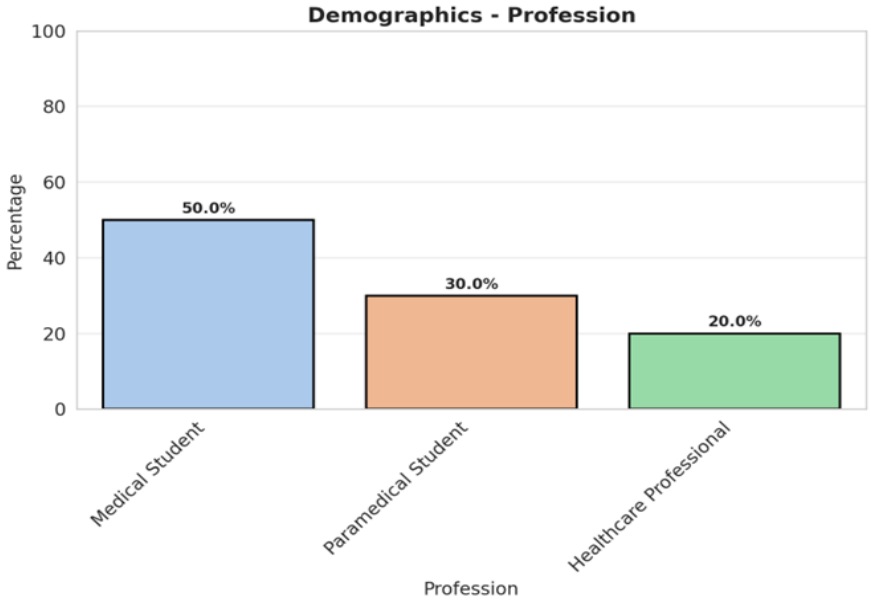
Table 2: Distribution of study participants across gender category



Graph 2: Distribution of study participants across gender category

Profession	**Percentage**	**Frequency**
Medical Student	50	200
Paramedical Student	30	120
Healthcare Professional	20	80

Table 3: Distribution of study participants across professional category



Graph 3: Distribution of study participants across professional category

The study found that more than 85% of participants were aware of Artificial Intelligence (AI), showing that people are becoming increasingly interested in and informed about how AI can be used in healthcare and public health. This high level of awareness is a positive sign, as it indicates that many professionals recognize the potential of AI to improve health systems, disease tracking, and patient care. (Table-4, Graph-4)

However, despite this strong awareness, only 22% of respondents had worked with or used AI tools in their academic studies or professional roles. This shows a clear gap between knowing about AI and being able to apply it in real-life situations. (Table-5, Graph-5)

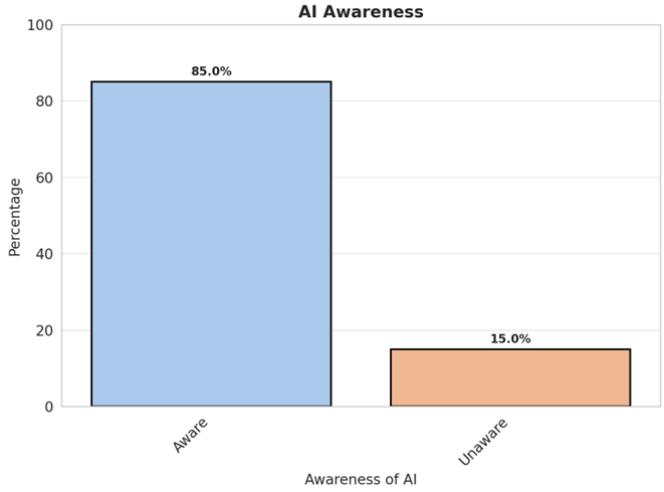
The difference between awareness and practical experience suggests that many professionals are not yet fully prepared to use AI in their daily work. This highlights the urgent need for hands-on training programs that teach people how to use AI tools effectively. Such training should be included in healthcare education and supported by institutions, so that the workforce is better equipped to adopt and benefit from AI in public health.

Diagnostics emerged as the most commonly identified area, followed by treatment recommendations and health records management by the respondents. Other noted applications include epidemiological surveillance, predictive analytics, and robotics in surgery, though the latter was the least mentioned. This

suggests that while awareness of AI in core clinical tasks is strong, its use in advanced or specialized areas like robotics is less familiar to respondents. (Table-7, Graph-7)

Awareness of AI	Percentage	Frequency
Aware	85	340
Unaware	15	60

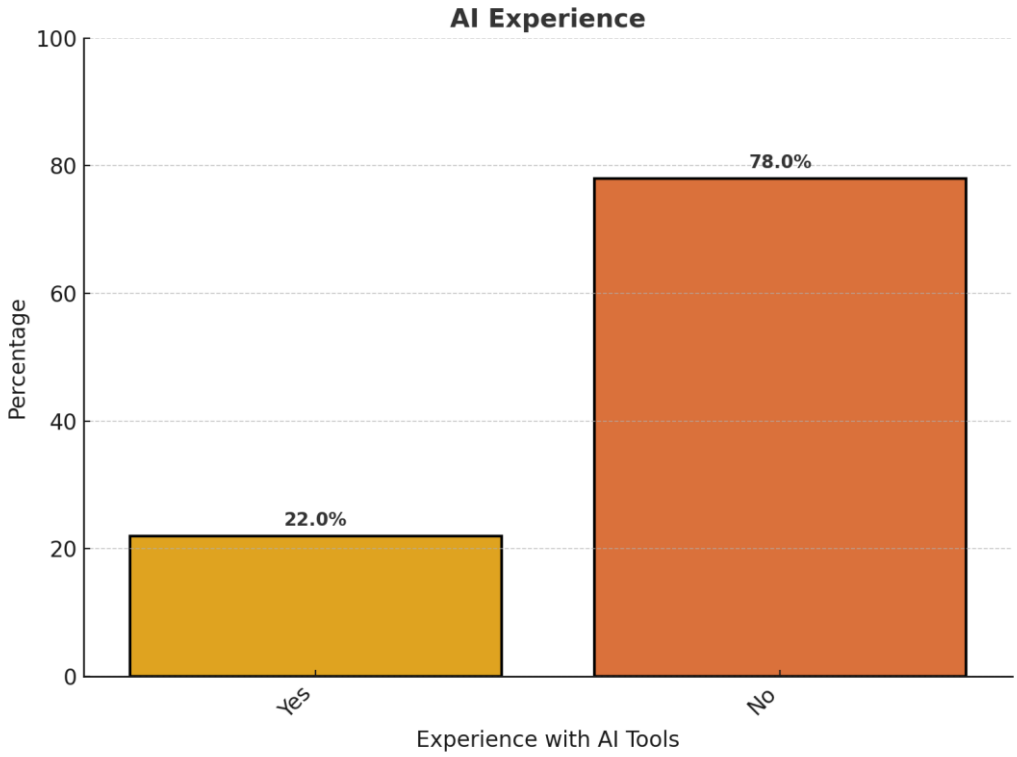
Table 4: Distribution of study participants about awareness of Artificial Intelligence (AI)



Graph 4: Distribution of study participants about awareness of Artificial Intelligence (AI)

Experience with AI Tools	Percentage	Frequency
Yes	22	88
No	78	312

Table 5: Distribution of study participants across the domain- 'Experience with AI Tools'

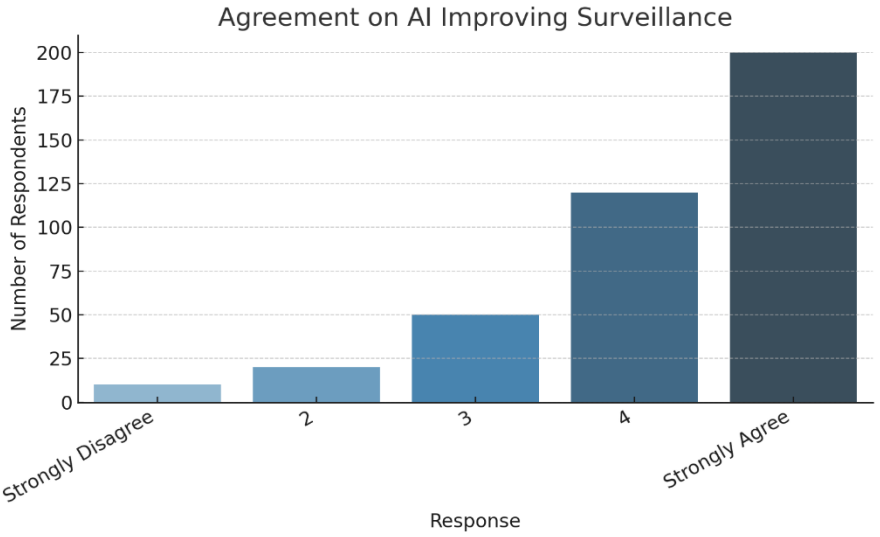


Graph 5: Distribution of study participants across the domain- 'Experience with AI Tools''

Agreement Level	Frequency	Percentage
Strongly Disagree	10	2.5%
2	20	5.0%
3	50	12.5%
4	120	30.0%
Strongly Agree	200	50.0%

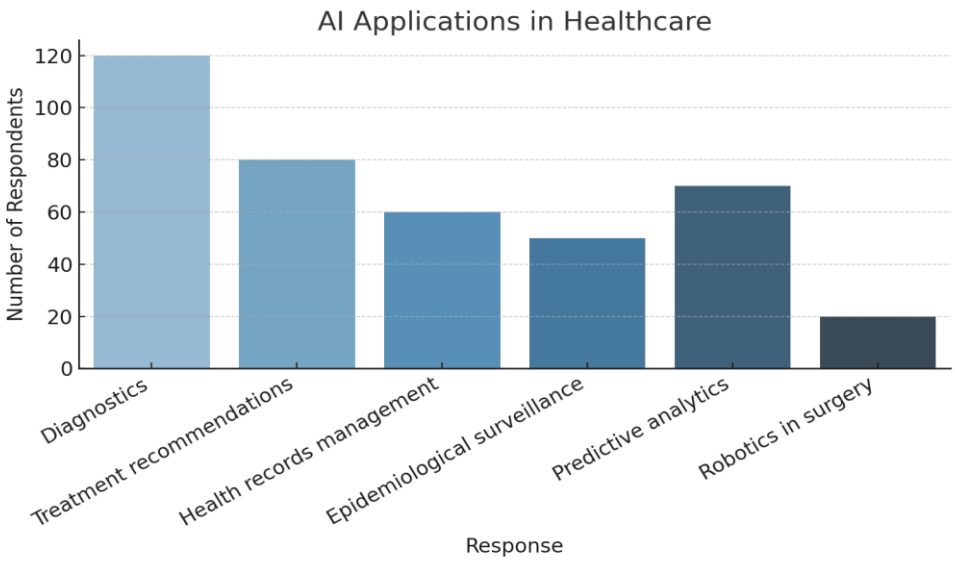
Table 6: Distribution of study participants across the domain- "Artificial Intelligence has the potential to improve public health surveillance"--the level of agreement

Graph 6: Distribution of study participants across the domain- “Artificial Intelligence has the potential to improve public health surveillance"--the level of agreement



Application Area	Frequency	Percentage
Diagnostics	120	30
Treatment recommendations	80	20
Health records management	60	15
Epidemiological surveillance	50	12.5
Predictive analytics	70	17.5
Robotics in surgery	20	5

Table 7: Distribution of study participants across the domain- ‘Knowledge of AI applications in healthcare’



Graph 7: Distribution of study participants across the domain- 'Knowledge of AI applications in healthcare'

Participants in the study shared a strongly positive view about the role artificial intelligence (AI) could play in improving public health. Many believed that AI has the potential to bring major improvements, especially in areas like early detection of disease outbreaks. For instance, with AI's ability to quickly analyse large amounts of health data, it could help health authorities identify emerging health threats much sooner than traditional methods, allowing for faster response and containment. (Table-8, Graph-8)

Most respondents have a positive view of AI-generated public health insights. A majority trust them, followed by many who completely trust them. Fewer respondents were unsure or somewhat trust them, while few do not trust them at all. Overall, trust levels are generally high, with limited skepticism. (Table-9, Graph-9)

Another area where participants saw value was in managing resources more effectively during public health emergencies. They felt that AI could help determine where supplies like vaccines, medicines, and medical personnel should be sent, based on real-time data, to ensure they reach the areas that need them most. This could prevent delays and reduce waste, especially when resources are limited.

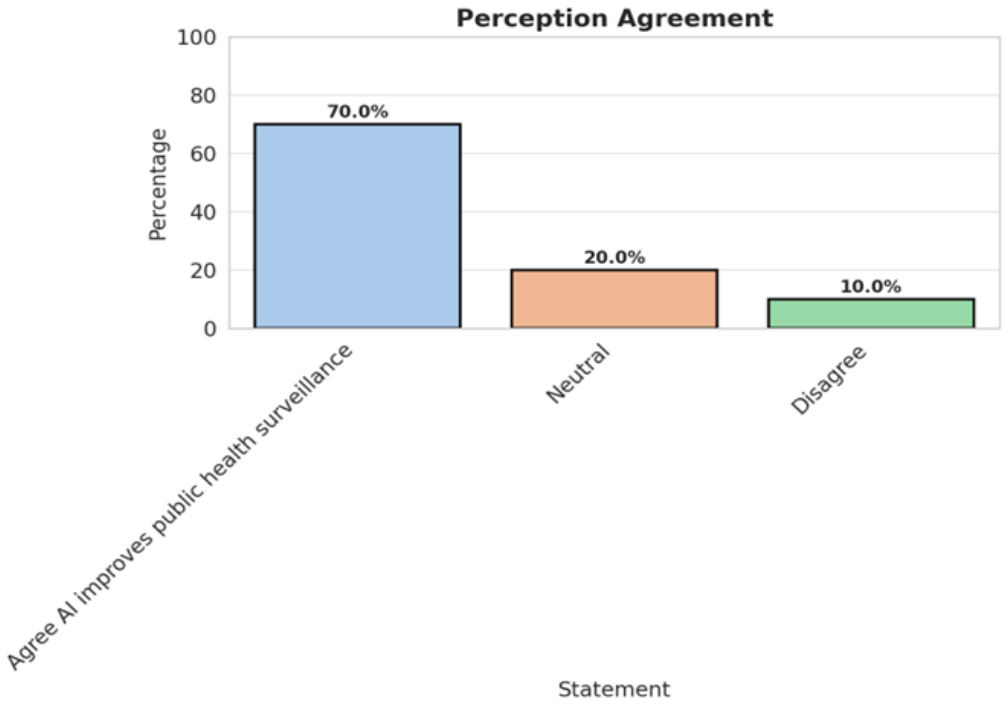
Participants also appreciated how AI could support smarter decision-making by analysing trends, predicting outcomes, and helping officials create strategies based on evidence rather than assumptions. They

mentioned that AI could support localized health monitoring—tracking disease patterns in specific communities—which would allow for more targeted and efficient health interventions. (Table-10, Graph-10)

Overall, the responses showed that healthcare professionals are not only aware of AI's benefits but are also open to using these tools in their work. However, they emphasized that for this to happen successfully, proper training and access to the right tools and technologies are essential. Without these, even the most advanced AI systems won't be useful in day-to-day public health practice.

Statement	**Percentage**	**Frequency**
Agree AI improves public health surveillance	70	280
Neutral	20	80
Disagree	10	40

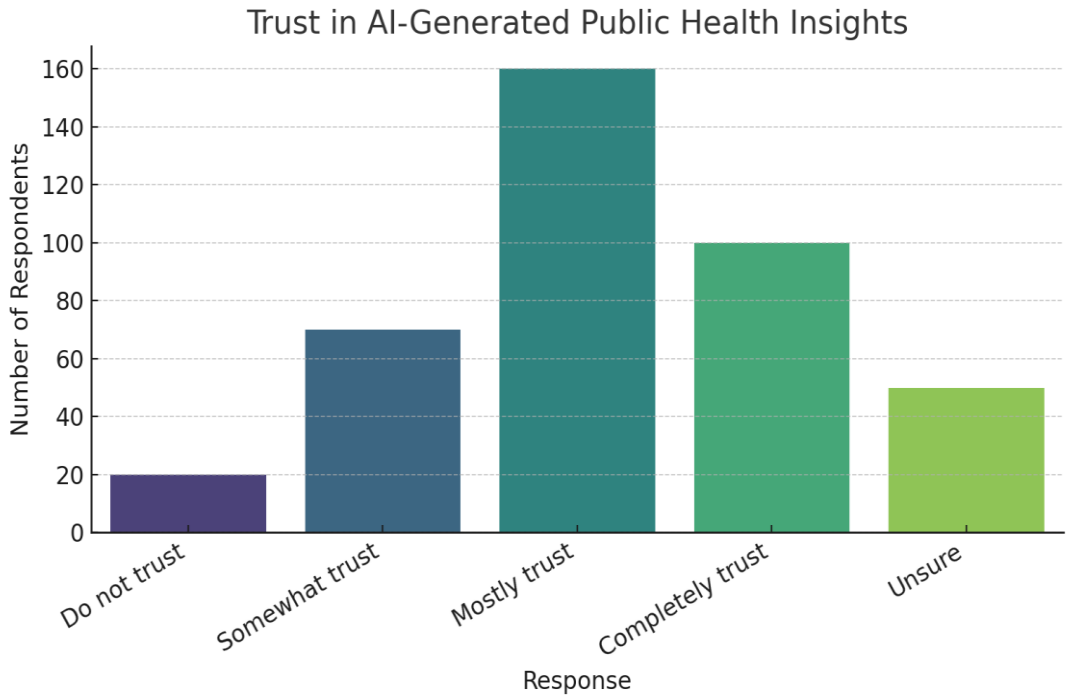
Table 8: Distribution of study participants across the domain- Agreement with the statement: "Artificial Intelligence has the potential to improve public health surveillance".



Graph 8: Distribution of study participants across the domain- Agreement with the statement: "Artificial Intelligence has the potential to improve public health surveillance".

Response	Frequency	Percentage
Do not trust	20	5.0%
Response	Frequency	Percentage
Do not trust	20	5.0%
Somewhat trust	70	17.5%
Mostly trust	160	40.0%
Completely trust	100	25.0%
Unsure	50	12.5%

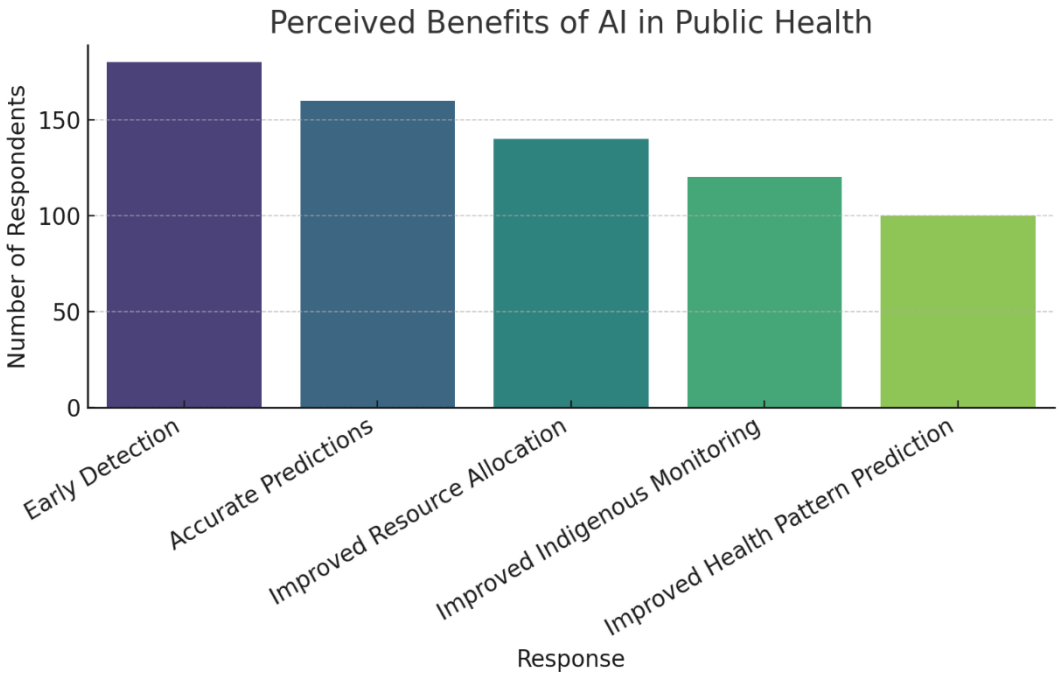
Table 9: Distribution of study participants across the domain- '*Trust in AI-generated insights'*



Graph 9: Distribution of study participants across the domain- 'Trust in AI-generated insights'

Benefit	Frequency	Percentage
Early Detection	180	25.71
Accurate Predictions	160	22.86
Improved Resource Allocation	140	20
Improved Indigenous Monitoring	120	17.14
Improved Health Pattern Prediction	100	14.29

Table 10: Distribution of study participants across the domain- 'Perceived Benefits of AI'



Graph 10: Distribution of study participants across the domain- 'Perceived Benefits of AI'

While many people were excited about using Artificial Intelligence (AI) in public health, they also pointed out some major problems that could make it hard to put AI into action. The biggest concern was the lack of proper training. Around 30% of participants said that most healthcare workers don't have the technical knowledge or hands-on experience needed to use AI tools effectively. This means that even if they want to use AI, they don't yet have the skills to do so.

Another major issue was data privacy. About 25% of the participants were worried that personal health information might not be handled safely by AI systems. They felt that stronger rules and better safeguards are needed to protect sensitive data.

A third challenge was funding. Nearly 20% of respondents said there wasn't enough financial support to buy the necessary technology or to train staff in using AI. Without proper investment, it would be hard for many healthcare facilities to adopt AI-based solutions.

In addition to these, poor infrastructure was also seen as a major barrier. Participants mentioned that many healthcare centres still lack fast internet, reliable electricity, or powerful computers needed to run AI software. In such places, using advanced technology becomes very difficult.

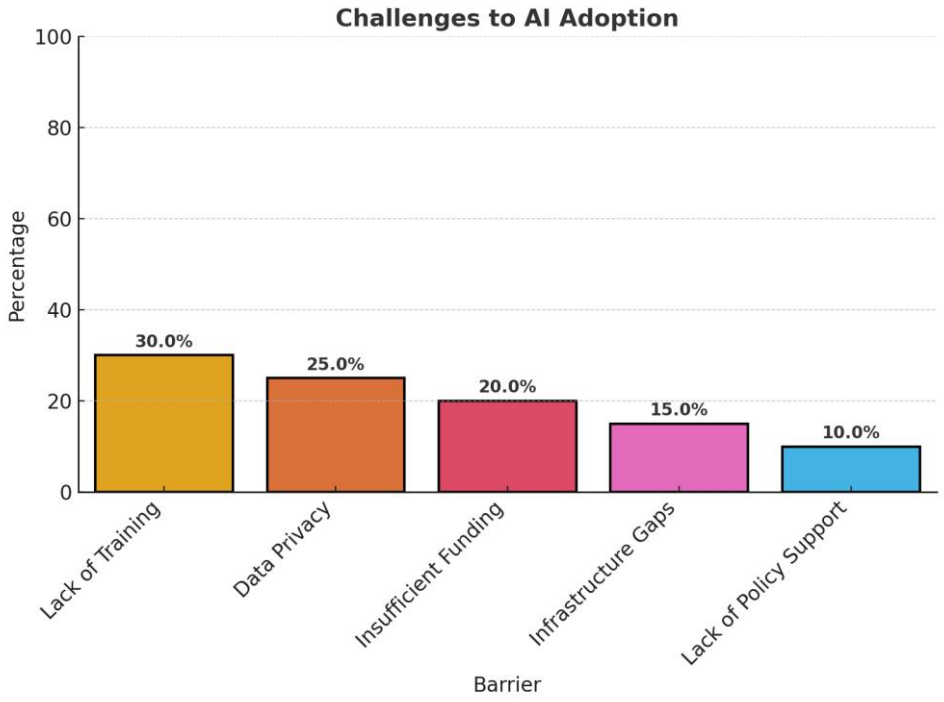
Lastly, the absence of clear government policies and guidelines was another concern. Many people felt that there is

confusion around how AI should be used in healthcare, what is legally allowed, and who is responsible if something goes wrong. (Table-11, Graph-11)

These challenges are similar to what international organizations like the WHO have noticed, especially in developing countries, where limited access to technology and resources makes it harder to use AI in public health.

Barrier	**Percentage**	**Frequency**
Lack of Training	30	120
Data Privacy	25	100
Insufficient Funding	20	80
Infrastructure Gaps	15	60
Lack of Policy Support	10	40

Table 11: Distribution of study participants across the domain- 'Major barriers to AI implementation'



Graph 11: Distribution of study participants across the domain- 'Major barriers to AI implementation'

The study found that many participants—around 80%—are interested in learning more about Artificial Intelligence (AI) and how to use it in their healthcare roles. This is a very encouraging sign, as it shows that people are not only aware of AI but also motivated to gain the skills needed to use it effectively in public health settings. (Table-12, Graph-12)

When asked about how they would prefer to learn, participants shared several ideas. Many said they would like to take online courses, which allow them to study at their own pace and from any location. Others preferred live webinars and interactive workshops where they can ask questions and practice what they learn in real time. Some were also interested in joining more formal academic programs that provide structured lessons and recognized certificates.

This feedback highlights how important it is to offer different types of training that are easy to access, especially for people who may not have a lot of time or live far away from training centres. It also shows that training should be flexible, practical, and designed to fit the real needs of healthcare workers. For professionals working in under-resourced or rural areas, these kinds of programs could make a big difference by helping them build confidence and skills to work with AI in their daily jobs. (Table-13, Graph-13)

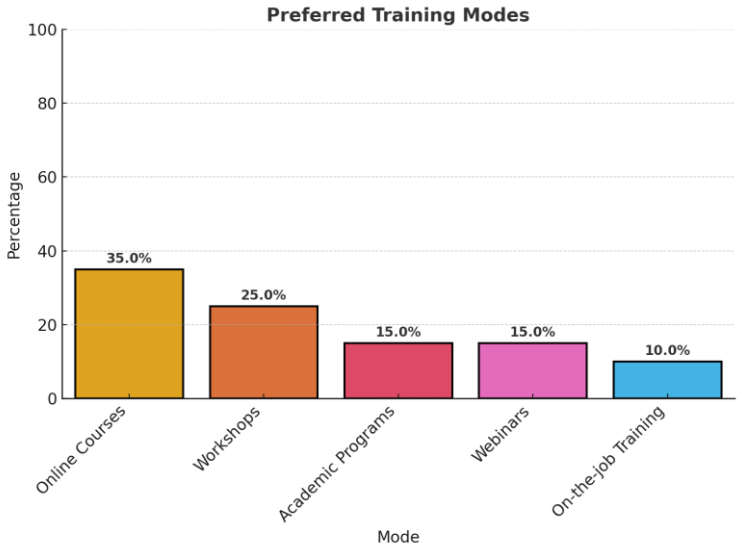
Interest in AI Training	**Percentage**	**Frequency**
Interested	80	320
Not Interested	20	80

Table 12: Distribution of study participants across the domain- 'Interest in AI Training'

Graph 12: Distribution of study participants across the domain- 'Interest in AI Training'

Mode	**Percentage**	**Frequency**
Online Courses	35	140
Workshops	25	100
Academic Programs	15	60
Webinars	15	60
On-the-job Training	10	40

Table 13: Distribution of study participants across the domain- 'Preferred modes of training'



Graph 13: Distribution of study participants across the domain- 'Preferred modes of training'

Discussion

The results of this research, which measured the awareness and self-perceived feasibility of applying Artificial Intelligence (AI) in public health monitoring among students and healthcare workers, provide important insights and are in accordance with trends found in available literature.

85% of the participants reported having knowledge of AI use in healthcare, and 70% thought AI would improve public health monitoring. These findings align with those in earlier studies. For example, Jiang et al. (2017) [1] indicated growing awareness among healthcare professionals about the role of AI in diagnosis and tracking health trends. Likewise, Topol (2019) [2] stressed that numerous professionals are already aware of the capabilities of AI in detecting outbreaks of diseases and predicting public health events, supporting the results of our research.

Nonetheless, despite such high awareness, merely 22% of the respondents had prior experience working with AI tools. This reflects a large disparity between education and everyday application. A similar trend was noted by Zhang et al. (2021) [3], who noted widespread support for the integration of AI into healthcare but usage rates below 30%. This reflects an overall, international issue—numerous healthcare workers receive little practical training or resources to utilize AI efficiently, especially in areas with low infrastructure and educational resources.

The research also indicated major hindrances to AI adoption: insufficient technical training (30%), issues related to

data privacy (25%), and poor funding (20%). These issues closely reflect the issues discussed in the World Health Organization's (2021) [4] report on AI in healthcare, which noted that low- and middle-income nations tend to grapple with the same limitations. The report also noted the necessity of standardized policies and ethical standards, a reflection supported by participants in our research.

Respondents also attributed poor digital infrastructure and a lack of defined national policies as major challenges to the adoption of AI. Such issues are corroborated by Mesko et al. (2020) [5], who observed that although AI is developing fast on a worldwide basis, most developing countries are behind due to fragmented health systems and regulatory ambiguity.

A noteworthy outcome of this research is the considerable interest in continuing education: 80% of respondents wanted to gain more knowledge on AI, with a preference for flexible learning like online courses and workshops. This is an indication of being prepared to acquire AI-related skills, given accessible and customized training. This concurs with research by Lee and Park (2022) [6] that championed a hybrid learning method—online and face-to-face combined—as the most suitable for upskilling health practitioners.

Cases from around the world show how seamless AI integration is achievable even in resource-scarce environments. Rwanda [8,9] is a case where effective integration of AI in healthcare was supported by local targeted training and resilient infrastructure development. Likewise, an American study conducted by the Centers for Disease Control and Prevention (CDC) [10] illustrated that AI greatly enhanced outbreak monitoring, especially when paired with a properly trained labor force and planned systems. These case studies align with our results, implying that if AI is to be successfully implemented in India, it will need to be incorporated into a health system that is both properly funded and planned.

Conclusion

Most healthcare providers were aware of Artificial Intelligence (AI) and think it has the potential to enhance public health by enabling early disease detection and a more efficient use of resources. Fewer than half, however, have applied AI tools, highlighting a significant gap between awareness and application.

The primary obstacles to applying AI are the absence of technical orientation, fear of data privacy, insufficient funds, and inadequate infrastructure. Several participants also talked of the lack of specific rules and regulations for how AI is applied in healthcare.

Positive to note is that 80% of the participants indicated an interest in learning more about AI and would prefer self-help tools like online courses and workshops. This indicates a high degree of willingness to change and develop if provided proper support.

To effectively implement AI in public health, we should invest in education,

enhance digital infrastructure, establish clear policies, and foster intersectoral collaboration between the health, education, and technology sectors.

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