



## Internet of Medical Things in Indian Healthcare: Clinical, Patient-Centric, and Administrative Insights

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### Abstract

The Internet of Medical Things (IoMT) is a revolutionary technology advancement in contemporary healthcare that facilitates real-time data sharing, remote monitoring, and data driven decision-making. Empirical findings in this research present evidence on how adoption of IoMT has influenced India's healthcare system from the perspectives of three critical stakeholders—clinicians, patients, and healthcare administrators. Employing quantitative techniques such as paired sample t-tests, ANOVA, and Chi-square tests, the study measured pre- and post-intervention attitudes towards IoMT applications in tuberculosis treatment, remote monitoring of patients during COVID-19, malaria diagnosis, cardiovascular risk prediction, diabetes treatment, COPD monitoring, and psychiatric treatment. Findings indicate improved levels of confidence and acceptance among all groups ( $p < 0.001$ ). Physicians indicated an 85.8% increase in IoT-based pill dispenser support, while 60% increase was observed in patient confidence in IoT-based chronic disease management. saw more than a 60% increase. Healthcare administrators showed high levels of support for IoT-based mood monitoring systems, showing increased institutional preparedness for digitalization. The results affirm that IoMT technologies do not only improve patient outcomes and adherence to treatment but also improve system effectiveness and clinical coordination. This research emphasizes the capacity of IoMT to catalyse inclusive, data-driven, and patient-centred healthcare reformation in India and other low- and middle-income countries.

**Keywords:** IoT, Healthcare, India, Patient Care, Digital Health, ABDM, AIoT, Policy, Health Systems

### Introduction

The Internet of Medical Things (IoMT) is where medicine and digital technology converge to facilitate connectivity among a variety of medical devices, apps, sensors, and healthcare information systems. In India, the rapid digitization of healthcare is spurred forward by government initiatives such as the Ayushman Bharat Digital Mission (ABDM) and rise of telemedicine platforms, which has contributed to an enabling environment of IoMT (Kaur, & Gupta, 2023). This connectivity enables real-time monitoring, data sharing, and remote diagnosis, which alleviates geographical constraints and optimally utilizes resources sharing in the context of a complex healthcare system.

From a clinical perspective, IoMT technology strives to increase the accuracy of diagnostic tests, improve the effectiveness of clinical decision making, and enhance evidence-based medicine. Smart medical devices such as wireless ECG monitors, insulin pumps, and remote patient monitoring, can be utilized almost routinely in both hospital and primary care settings which ultimately enhances clinicians' access to real time information and allows for more proactive, personalized medical treatment for patients. Such advancements are particularly meaningful for India's tiered healthcare system, which highlights issues such as access to care by specialists, late detection of cancer and other conditions and uneven access to care.

At the patient and administrative levels, IoMT can improve engagement between patients and health providers as well as increase transparency and efficiency. Wearable health trackers and mobile health applications provide patients a way to improve chronic health conditions and live healthier lives, whereas administrative platforms, like electronic medical records (EMRs) can increase efficiency for health providers. (Singh & Verma, 2022).

Methodology

**Research Design**

The research takes up a quantitative, pre–post experimental design to assess the effect of Internet of Medical Things (IoMT) technologies on healthcare provision in India. The study was undertaken among three groups of stakeholders—doctors, patients, and healthcare administrators—to understand multi-dimensional perspectives. Statistical tests such as paired sample t-tests, ANOVA, and Chi-square tests were used to investigate differences in attitudes and perceptions before and after IoMT interventions. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval for the study was obtained from the JSPH- Institutional Review Board (Approval Number: [100032-IRB/20-21]). Prior to participation, all respondents were informed about the objectives, voluntary nature, and confidentiality of the study. Informed consent was obtained from all participants electronically before they proceeded with the survey. No personally identifiable information was collected, and all data were anonymized to maintain participant privacy.

**Population and Sampling**

A total of 535 participants were surveyed, including 175 doctors, 175 patients, and 185 healthcare administrators from telemedicine platforms, diagnostic centres, and hospitals in India. A purposive sampling approach was utilized to ensure participants had previous experience with digital or IoT-based health systems. Informed consent was secured from all the participants prior to data collection.

**Intervention and Tools**

The research assessed six IoMT technologies that cater to varied healthcare functions:

- IoT-based pill boxes for tuberculosis treatment
  - Remote patient monitoring (RPM) of COVID-19
  - Portable PCR machines for the diagnosis of malaria
  - IoT and machine learning-based models for cardiovascular risk assessment
  - IoT-based blood glucose monitors for diabetes management
  - IoT-enabled inhalers for COPD monitoring
  - IoT-based mood monitoring devices for psychiatric treatment
- Each technology was presented to participants in demonstrations, prototypes, and training modules, after which participants had hands-on experience. Perceptions were captured before and after the exposure period.

**Data Collection and Instruments**

Data collection was done using a structured Likert-scale questionnaire measuring parameters like technology usefulness, ease of use, reliability, and effect on healthcare outcomes. Pre- and post-intervention surveys were done at an interval of four weeks. Data integrity and anonymity were maintained during the process.

**Data Analysis**

Quantitative data were analyzed by using IBM SPSS Statistics (Version 26.0). Paired sample t-tests were used to assess within-group change in perception. One-way ANOVA was used to identify significant improvements across multiple variables. Chi-square tests evaluated changes in categorical agreement levels. A significance threshold of  $p < 0.05$  was adopted for all statistical tests, with results interpreted to assess both statistical and practical significance.

**Summary Table 1: Doctors’ Perspective**

Technology	Statistical Test	Before Mean	After Mean	Test Statistic	p-value	Key Outcome
IoT-based Pill Dispensers for Tuberculosis	Paired Sample t-test	2.61	4.85	$t = -29.99$	$< .001$	85.8% rise in doctor support for IoT pill dispensers
IoT Remote Patient Monitoring (COVID-19)	Chi-Square	2.82	4.75	$\chi^2 = 279.10$	$< .001$	Doctor agreement rose from 27.4% to 98.8%
Portable PCR for Malaria	ANOVA	2.74	4.77	$F = 484.07$	$< .001$	Strong endorsement for portable malaria

Diagnosis						diagnosis tools
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Summary Table 2: Patients’ Perspective

Technology	Statistical Test	Before Mean	After Mean	Test Statistic	p-value	Key Outcome
IoT & ML for Cardiovascular Risk Prediction	ANOVA	3.09	4.72	F = 261.48	< .001	52.7% improvement in patient trust
IoT-based Diabetes Monitoring	Paired Sample t-test	3.58	4.73	t = -8.75	< .001	Agreement rose from 4.5% to 97.3%
IoT-connected Inhalers for COPD	Chi-Square	2.87	4.75	$\chi^2 = 272.98$	< .001	Significant rise in patient confidence for IoT inhalers

Summary Table 3: Healthcare Administrators’ Perspective

Technology	Statistical Test	Before Mean	After Mean	Test Statistic	p-value	Key Outcome
IoT-based Mood Monitoring	Paired Sample t-test	2.46	4.42	t = -18.80	< .001	79.7% increase in administrative support for psychiatric IoT tools

**Results: Multi-stakeholder Views on IoMT Integration**

From the physicians' point of view, the deployment of IoT-based pill dispensers for TB control dramatically shifted clinical mind-sets toward digital adherence technologies. A paired samples t-test demonstrated a very significant rise in physicians' agreement scores (t = -29.99, p < .001), attesting to a robust positive change after intervention. The mean support increased from 2.61 pre-deployment to 4.85 post-deployment, an 85.8% increase in support. Levels of agreement jumped from a mere 9.7% to almost universal acceptance at 99.4%, a measure of broad-based confidence in the potential of IoT-enabled dispensers to enhance medication adherence and treatment continuity for TB patients.

In view of the above, the use of IoT-driven Remote Patient Monitoring (RPM) solutions during the COVID-19 pandemic elicited a very high level of clinician enthusiasm. The Chi-square test outcomes ( $\chi^2 = 279.10$ , p < .001) verified doctors' perceptions as significantly different before and after being exposed to RPM tools. Mean agreement scores jumped dramatically from 2.82 to 4.75, reflecting a rise of 68.4%. This almost universal support (98.8% post-intervention) indicates that RPM systems can be considered unavoidable for ensuring continuity of remote consultations, patient safety, and care optimization amid public health crises.

For effective management of infectious diseases in rural areas, portable PCR systems for diagnosing malaria were yet is another important innovation. The ANOVA test scores (F = 484.07, p < .001) established significant within-subject

improvement in perceptions of doctors after they were exposed to the low-cost, disposable-chip-based diagnostic

technology. Mean scores increased from 2.74 to 4.77, reflecting high clinical approval of portable PCR as a field-friendly tool for prompt malaria diagnosis. The uniformly high F-values across several statistical adjustments affirm the stability of these results, proving the viability of IoT-based diagnostic breakthroughs to enhance the surveillance and response capacity in resource-constrained regions.

From the patient's perspective, IoMT technologies also gained universal acceptance. The use of IoT sensors and machine learning (Bi-LSTM models) for cardiovascular risk prediction markedly increased patient trust in preventive digital health applications. ANOVA findings (F = 261.48, p < .001) revealed that attitudes were bettered (Improved) from a mean of 3.09 to 4.72, demonstrating higher confidence in IoT-enabled early detection and tailored care. Similarly, the implementation of IoT-based diabetes monitoring systems also yielded statistically significant changes in patient attitudes (t = -8.75, p < .001), as mean scores increased to 4.73 from 3.58. Consensus rates improved from 4.5% to 97.3%, reflecting increased acceptance of CGM and AI-supported disease management. For respiratory wellness, IoT-enabled inhalers for COPD care reported comparable success, with Chi-square findings ( $\chi^2 = 272.98$ , p < .001) validating significant improvements in confidence by patients. The average agreement jumped (increased) from 2.87 to 4.75, highlighting the importance of intelligent inhalers in early indication, compliance, and emergency readiness.

From the administrative point of view, the use of IoT-based mood monitoring devices for psychiatric treatment garnered strong institutional support. The paired samples t-test ( $t = -18.80$ ,  $p < .001$ ) reaffirmed a significant improvement in healthcare administrators' views on the usability of the technology in monitoring psychological parameters. The mean score increased from 2.46 prior to implementation to 4.42 after implementation, which indicates an increase of 79.7% in favourability. After the intervention, almost all administrators (96.2%) supported IoT-enabled mood monitoring as a worthwhile innovation for improving psychiatric care, maximizing resource utilization, and facilitating evidence-based interventions in mental health services.

### Discussion:

This research offers strong empirical evidence showing how the Internet of Medical Things (IoMT) has the potential to transform India's healthcare system. (Sharma & Kumar, 2023) In clinical, patient, and administrative frames of reference, the incorporation of IoT-facilitated technologies yielded statistically significant gains in perception, confidence, and intent for adoption [World Health Organization. (2021)]. Physicians displayed intense backing for intelligent pill dispensers, point-of-care PCR diagnostics, and distant patient monitoring systems, whereas patients displayed increased faith in IoT-based chronic illness control [Gupta & Rao, 2023]. Clinical managers supported IoT mood monitoring solutions, recognizing their applicability in mental health management and institutional digitalization [Sharma, N., & Mehta, V. (2022)].

The results confirm IoMT as a major facilitator of preventive, data-driven, and patient-centric healthcare [Raghavan, P., & Thomas, M. (2021)]. These results closely resonate with India's National Digital Health Mission (NDHM) in favor of interoperability, data convergence, and equal digital health access [United Nations Development Programme (UNDP). (2022)]. In Future policy action could be focused on IoMT infrastructure investment, digital literacy initiatives, and common data governance models. Further this study can promote Pilot initiatives in rural areas and may be connecting IoMT platforms to electronic health records which could advance predictive public health management and optimal resource utilization. IoMT technologies have tremendous potential in driving India's shift in healthcare from reactive to predictive and personalized treatment. There is a present need to develop an ecosystem of collaboration among policymakers, hospitals and healthcare institutions, technology creators, and patients to achieve this potential target. Strategically implementation of IoMT can redefine healthcare access, enhance systemic resilience, and make a considerable contribution towards the fulfilment of universal health coverage (UHC) in India and other low- and middle-income countries.

### Conclusion and Policy Implications

**Conclusion:** The integration of Internet of Medical Things (IoMT) technologies in various layers of the healthcare ecosystem displays extremely encouraging results from the perspectives of clinical effectiveness, patient involvement, and administrative control. Research evidently suggests significant positive changes in attitude among physicians, patients, and healthcare administrators after being exposed to several IoT-based innovations, such as smart pill dispensers for tuberculosis treatment adherence (Charles et al. (2024).], remote patient monitoring systems during public-health emergencies (Al Khatib et al. 2024), AI-augmented cardiovascular risk-prediction systems (Cuevas-Chávez, et.al 2023), continuous glucose monitoring systems (Janapati et Al., 2024), intelligent inhalers (Duan et al. 2025), and mood-monitoring devices for psychiatric illness (Kokol, 2024). In all implemented interventions, statistical calculations always returned substantial improvements in terms of favourability scores, acceptance rates, and usability perceptions (Alshehri et al., 2025) Results like these further support the hypothesis that technology-facilitated care pathways enhance compliance, improve diagnostic turn-around, and facilitate early detection even in physically limited environments. (Abdulmalek et al., 2022) The widespread post-intervention deployment indicates increasing trust in IoMT as an agent facilitating preventive over reactive, data-enabled healthcare. Together, these results confirm that IoMT integration is not only value-additive but ever more necessary to enhance clinical decision-making, streamline resource allocation, and provide continuity of care in routine and crisis situations.

### Policy Recommendations

1. Institutionalize IoMT Adoption Through National Digital Health Frameworks  
Policymakers must integrate IoMT adoption into such national health programs as the Ayushman Bharat Digital Mission (ABDM), placing interoperability, security, and standardized data exchange at the forefront. This would ensure harmonious integration into current telehealth services, such as eSanjeevani platforms.
2. Create Reimbursement Models and Incentives Insurance programs and government funding schemes need to consider IoT-enabled monitoring devices as reimbursable health assets. Incentives based on performance can further motivate providers to utilize digital adherence and monitoring measures, lowering the cost of long-term treatment.
3. Enhance Data Privacy and Cybersecurity Laws Strong legal mechanisms have to be implemented for handling consent, anonymization, safe storage, and sharing of data. Regular audits and compliance checks will be crucial to maintain trust among patients in AI-based diagnosis devices and remote health monitoring devices (Al-Sarawi *et.al.*, 2020)

4. Enlarge IoMT Infrastructure to Rural and Resource-Limited Regions Government and private collaborations must give top priority to portable diagnostic equipment and remote monitoring systems for the underserved areas. Subsidized models of deployment can fill gaps in treatment and diagnosis, especially for infectious and chronic conditions. (Patel & Nair, (2023)

5. Enable Workforce Capacity-Building and Digital Competency Specialized training programs for clinicians, nurses, community health workers, and administrative personnel are essential. Upskilling will enhance handling of devices, remote data interpretation, and workflow integration into care, combating digital resistance. (Sinha & Bandyopadhyay, S., 2022).

6. Facilitate Ethical AI Integration in IoMT Ecosystems Standards for dealing with bias, transparency, and algorithmic accountability need to be standardized. Ethical watchdog committees may oversee the use of ML-based prediction models in the clinical domain. [Ministry of Health and Family Welfare (MoHFW),2021]

7. Foster Public-Private Innovation Collaboratives Technology sandboxes and innovation incubators need to be made available to startups and device companies. Joint research with hospitals and academic institutions will facilitate scalable pilots and generation of evidence.

8. Standardize Evaluation and Accreditation Protocols National authorities should establish performance indicators, safety standards, and certification streams for IoMT devices. Periodic validation will ensure technological dependability and clinical trust.

9. Design Patient-Centric Engagement Platforms Intuitive mobile dashboards, multilingual interfaces, and patient-tailored feedback loops will enhance adherence and health literacy. Patient empowerment is the cornerstone of long-term digital health acceptance.

10. Invest in Predictive Analytics and Remote Emergency Management Policy structures should facilitate AI-based early warning systems for high-risk patients, especially in cardiovascular, respiratory, and psychiatric conditions. Predictive monitoring will help to decrease hospitalization and emergency escalation.

Overall Policy Implication IoMT scaling across the healthcare verticals presents a strategic chance for shifts toward preventive, precision medicine, and continuous care models. With appropriate regulatory encouragement, digital infrastructure investment, and workforce upskilling, IoMT has the potential to revolutionize national disease surveillance, advance patient outcomes, and optimize cost-effectiveness of public health systems.

## Author Contributions

The author has significantly contributed to the study's conception, design, data collection, analysis, and interpretation. All authors were involved in writing the manuscript or critically reviewing it for its intellectual value. They have reviewed and approved the final version for submission and publication and accept full responsibility for the content and integrity of the work.

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## Conflicts of Interest

The authors state that there are no financial, personal, or professional conflicts of interest associated with this research.

## Ethical Approvals

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval for the study was obtained from the JSPH-Institutional Review Board (Approval Number: [100032-IRB/20-21]). Prior to participation, all respondents were informed about the objectives, voluntary nature, and confidentiality of the study. Informed consent was obtained from all participants electronically before they proceeded with the survey. No personally identifiable information was collected, and all data were anonymized to maintain participant privacy.

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