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Technology Adoption in Indian Healthcare: A Patient-Centric Review of Emerging Health Technologies and Adoption Determinants

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Abstract: The rapid spread of digital technologies is transforming healthcare delivery in India; however, evidence of patient-focused technology adoption remains limited. This study consolidates the healthcare technologies adopted or tested in India, examines prevalent adoption models, evaluates patient-centered factors that influence adoption, and identifies research gaps. A systematic literature review of peer-reviewed empirical studies from 2014 to 2023 selected 13 patient-focused studies for thematic analysis. The reviewed technologies include mobile health apps, IoT wearables, smart devices, online pharmacies, exergaming, health management systems, Big Data, and Responsible AI solutions. Adoption research primarily employs frameworks such as the Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology, and the Push–Pull–Mooring models. Key patient-centered factors influencing adoption include perceived usefulness, ease of use, performance expectancy, trust, social influence, facilitating conditions, privacy concerns, cognitive engagement, and contextual elements such as comfort, intrusiveness, ubiquity, and geographic access. Despite the growing empirical work, gaps remain in longitudinal studies, regional generalizability, post-adoption behavior, and the integration of theories on advanced technologies. This study provides a comprehensive understanding of patient-focused digital health adoption in India, offering insights for researchers, policymakers, and practitioners to develop inclusive, trustworthy, and sustainable digital healthcare solutions.

Index Terms **- Technology Adoption, Indian Healthcare, Adoption Determinants, Patient-Centric Adoption.**

1. INTRODUCTION

Digital transformation in healthcare has globally enhanced service delivery through technologies such as electronic medical records (EMR), telemedicine, mobile health (mHealth), and smart health systems (Mathew et al., 2024). As healthcare systems adopt these tools, understanding the factors influencing technology acceptance is vital. Frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) dominate research on digital health adoption across diverse users and settings (AlQudah et al., 2021). In India, the adoption of digital health is influenced by disparities in healthcare infrastructure, resource availability, and user readiness. Health Technology Assessment (HTA) studies demonstrate growing policy interest, yet highlight challenges in contextual fit, implementation capacity, and the limited empirical evaluation (Segur-Ferrer et al., 2022). Innovations such as telemedicine, EMR, mobile applications, and remote monitoring are expanding; however, their success depends on user acceptance, adaptability, and perceived usefulness within India's heterogeneous healthcare environment.

Despite global advances, the literature reveals critical gaps in India. Most studies emphasize healthcare professionals and organizational readiness, neglecting patient-centric perspectives essential for successful adoption. Although TAM and UTAUT are widely applied, their relevance and adaptability to India's sociocultural and economic conditions remain underexplored. Key determinants such as perceived usefulness, ease of use, trust, and computer self-efficacy have been studied globally; however, India-specific empirical research integrating these with digital literacy and socio-cultural factors is limited. Additionally, there is a lack of integrative, methodologically robust approaches that capture the dynamic nature of emerging healthcare technology. Addressing these gaps requires context-specific, patient-focused, and theoretically rigorous research. Emerging technologies such as AI-based diagnostics, blockchain-enabled supply chains, and IoT-driven remote monitoring have attracted global interest; however, research on their adoption in India remains limited. Socio-technical factors, including digital literacy, organizational readiness, and attitudinal barriers, significantly impact adoption in contexts similar to that of India (Jain et al., 2022). This underscores the need for a comprehensive India-focused synthesis that blends traditional models with empirical and contextual realities and emphasizes patient perspectives. This review aims to (1) identify and synthesize emerging health technologies adopted or piloted in India, (2) examine key technology adoption models in the Indian healthcare context, (3) analyze patient-centric determinants of adoption, and (4) propose future research directions by highlighting gaps in India-specific empirical evidence.

2. LITERATURE REVIEW

2.1 Introduction to Emerging Healthcare Technologies

The healthcare industry is undergoing rapid transformation driven by advancements in digital and emerging technologies such as telemedicine, AI diagnostics, electronic health records (EHRs), mobile health (mHealth) apps, wearable devices, and remote patient monitoring systems. These innovations enhance efficiency, reduce costs, and improve patient outcomes by enabling real-time data collection, personalized care, and proactive healthcare models that shift the focus from reactive treatment to prevention and early intervention (Topol, 2019; Jiang et al., 2017). The growing emphasis on patient-centered care has further accelerated technology adoption by empowering patients to actively monitor their health, access medical information, and communicate with providers, thereby increasing engagement and improving access, especially in underserved regions (Bao et al., 2020).

The successful implementation of these healthcare technologies depends not only on the availability of advanced tools but also on users' acceptance, which is influenced by behavioral, technological, and contextual factors. Established frameworks such as the Technology Acceptance Model (TAM) (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) provide valuable insights into adoption behavior; however, the complexity of healthcare settings and diverse patient populations necessitates more context-specific analyses (Cimperman et al., 2016). This study focuses on emerging healthcare technologies and patient-centric adoption factors, including privacy concerns, within the Indian healthcare system, aiming to identify research gaps and guide future work that integrates the technological, behavioral, and sociocultural dimensions of healthcare.

2.2 Global Perspective on Emerging Healthcare Technologies and Their Adoption

The global healthcare sector has rapidly adopted new technologies such as telemedicine, AI-powered diagnostics, electronic health records (EHRs), mobile health applications, wearable devices, and remote patient monitoring systems. These innovations enhance clinical efficiency, diagnostic accuracy, and personalized care while improving access, particularly in underserved areas. For instance, telemedicine surged during the COVID-19 pandemic to maintain continuity of care, and AI tools supported disease prediction and imaging analysis. EHRs optimize data sharing among providers, and mHealth apps and wearables enable real-time health monitoring and patient engagement, contributing to better health outcomes and reduced healthcare costs. Despite their widespread use, successful adoption depends heavily on user acceptance, with models such as the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) highlighting factors such as perceived usefulness, ease of use, social influence, and facilitating conditions. However, research shows that additional factors—trust, privacy concerns, perceived risk, digital literacy, and cultural context—also play critical roles, particularly in patient-centered settings. Variations in healthcare systems, regulations, and socioeconomic conditions across countries suggest that these models require contextual adaptation to effectively predict the global adoption of technology.

2.3 Emerging Healthcare Technologies in the Indian Context

India's healthcare sector is rapidly embracing digital technologies such as telemedicine, electronic health records, AI-driven diagnostics, mobile health apps, and remote patient monitoring to improve accessibility, affordability, and quality of care (Gupta, 2022). Government initiatives, such as the Ayushman Bharat Digital Mission (ABDM), have been pivotal in promoting digital health solutions by enabling interoperability, digital health IDs, and centralized data management (Nadhamuni et al., 2021). The COVID-19 pandemic accelerated telemedicine adoption, especially in rural and underserved areas (Dash et al., 2021), while mHealth apps and wearable devices supported chronic disease management and preventive care (Kumar et al., 2020). AI technologies enhance diagnostic imaging, predictive analytics, and clinical decision-making, thereby improving healthcare efficiency and accuracy (Reddy et al., 2019). Despite these advances, India faces significant challenges in technology adoption, including the digital divide, insufficient infrastructure, low digital literacy, data privacy concerns, and sociocultural barriers, particularly in rural and economically disadvantaged communities (Mehrotra et al., 2021). The mixed public-private healthcare system also creates disparities in technology access and its utilization. These issues underscore the need for a deeper understanding of India-specific contextual factors and patient perspectives to effectively integrate digital health technologies nationwide.

2.4 Theoretical Foundations of Technology Adoption

Technology adoption in healthcare has largely been explained by established theoretical frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). TAM focuses on perceived usefulness and ease of use, whereas UTAUT integrates additional constructs, such as performance expectancy, social influence, and facilitating conditions, along with moderating variables, such as age and gender. Extensions such as the UTAUT2 further enhance these models by including factors such as hedonic motivation and habit. These frameworks have been widely applied to the study of digital health technologies, including telemedicine and health records. However, these models have limitations in healthcare contexts, especially in developing countries such as India, where they often overlook critical context-specific factors such as trust, perceived risk, privacy concerns, and sociocultural influences. Additionally, determinants such as cost, accessibility, and quality of clinician–patient relationships play significant roles in technology adoption. This highlights the need for more holistic, context-sensitive models that incorporate these variables to better understand patient behavior and technology adoption dynamics in diverse healthcare environments.

3. Research Methodology

In this study, a systematic literature review (SLR) method was employed to explore the adoption of emerging healthcare technologies in the Indian healthcare sector, emphasizing patient-centered viewpoints. A systematic review is effective for consolidating dispersed research, pinpointing theoretical and empirical gaps, and producing organized insights into interdisciplinary fields such as digital health. An extensive search was performed across databases including Scopus, Web of Science, PubMed, IEEE Xplore, and Google Scholar, using keywords such as emerging healthcare technologies, telemedicine, mHealth, EHR, technology adoption, TAM, UTAUT, and India. This review focused on studies published between 2014 and 2023 to capture the most recent advances. Predefined inclusion and exclusion criteria were applied, emphasizing peer-reviewed empirical studies conducted in India from a patient or consumer perspective, resulting in the selection of 13 studies for the review. The study selection followed a structured screening process, beginning with a review of the titles and abstracts, followed by a full-text evaluation based on the eligibility criteria, consistent with the established SLR protocols. Data were systematically extracted and categorized by healthcare technology type, adoption models or frameworks (TAM, UTAUT, UTAUT2, PPM), and patient-centric factors, such as perceived usefulness, ease of use, trust, privacy, cognitive engagement, and facilitating conditions. Thematic analysis was conducted to synthesize the findings and identify recurring patterns, relationships, and gaps across studies. This integrative approach facilitates

a comprehensive understanding of healthcare technology adoption in India and aids in identifying context-specific implications and future research.

4. Findings

Table 1: Overview of the study

Author(s) & year	Healthcare Technology Studied	Model / Framework Used	Key Determinants Studied	Key Findings	Future Research Directions
Sao et al. (2023)	Big Data technologies	No specific model	Data integration, data understanding, infrastructure, expertise, regulation	Adoption driven by data integration and skills; infrastructure and regulatory issues persist; patient satisfaction improves	Multi-region Indian studies; add determinants; apply TOE, TAM, or UTAUT
Batool et al. (2023)	Mobile health (mHealth) applications	UTAUT2	Performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, habit	Performance and effort expectancy, habit, and enjoyment drive adoption	Include trust and privacy; compare pre- and post-COVID adoption
Nayak et al. (2023)	Online pharmacies	Push–Pull–Mooring (PPM)	Usefulness, ease of use, alternative attractiveness, switching cost	Usefulness and alternatives encourage adoption; switching cost restrains movement	Combine PPM with UTAUT2; use ECM for repeat usage
Dutta et al. (2023)	IoT-based healthcare devices	UTAUT2 (extended)	Ubiquity, social influence, perceived health risk, relative advantage, facilitating conditions, price value	Attitude mediates adoption intention; facilitating conditions directly affect intention	Cross-country studies; device-specific and longitudinal research
Dash & Sahoo (2022)	e-Health consultation platforms	Extended UTAUT	Performance expectancy, effort expectancy, trust, social influence, facilitating conditions, perceived risk	Trust, performance expectancy, effort expectancy, and social influence drive intention	Include privacy and severity; study post-adoption behaviour
Rajak & Shaw (2021)	Mobile health (mHealth) services	Extended TAM	Usefulness, ease of use, trust, social influence, anxiety, risk	Usefulness, ease of use, and trust support adoption; risk and resistance inhibit adoption	Rural–urban comparison; longitudinal adoption studies
Yein & Pal (2021)	Exergaming systems	UTAUT2	Performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, habit	Performance and effort expectancy are strongest drivers; tailored design aids elderly acceptance	Long-term elderly adoption; integrate safety and usability
Kumar et al. (2021)	Responsible Artificial Intelligence solutions	Mixed methods with PLS-SEM	Responsible AI, cognitive engagement, perceived value	Cognitive engagement links Responsible AI to value creation and market performance	Extend to other contexts; add mediators; longitudinal impact analysis
Dhagarra et al. (2020)	Digital healthcare technologies	Technology Acceptance Model (TAM)	Usefulness, ease of use, trust, privacy concern	Usefulness, ease of use, and trust support acceptance; privacy concern reduces intention	Extend TAM with UTAUT and demographic analysis
Papa et al. (2020)	Smart wearable healthcare devices	TAM with usability factors	Usefulness, ease of use, comfort, intrusiveness	Usefulness, ease of use, and comfort support adoption; intrusiveness is a barrier	Cross-regional studies; long-term usage patterns
Pai & Alathur (2020)	Mobile health (mHealth)	Awareness–Motivation with Health Belief	Empowerment, information orientation, awareness, cognition	Empowerment and health information orientation drive awareness and usage	Test socio-economic moderators; add AI and security variables
Sriram & Pichaandy (2020)	Health Management Information System (HMIS)	Quantitative survey	Location, perceptions, ease of use, access	Geographic location significantly affects patient HMIS adoption	Expand regions; apply TAM or UTAUT; mixed patient–provider models

Sivathanu (2018)	IoT-based wearable devices	Behavioral Reasoning Theory (BRT)	Ubiquity, relative advantage, compatibility, convenience	Adoption shaped by positive and negative reasons; perceived benefits dominate	Explore psycho-social barriers; longitudinal designs

5. Discussion

An overview of the study is presented in Table 1, while the findings are discussed and interpreted in alignment with the specific objectives of the study.

Objective 1: Identification and Synthesis of Emerging Health Technologies in the Indian Healthcare System

The compiled evidence reveals that the Indian healthcare sector is increasingly embracing and testing a wide range of digital and data-driven health technologies. These encompass Big Data technologies (Sao et al., 2023), mobile health (mHealth) applications (Batool et al., 2023; Rajak & Shaw, 2021; Pai & Alathur, 2020), Internet of Things (IoT)-based wearable devices (Dutta et al., 2023; Sivathanu, 2018), smart wearable healthcare systems (Papa et al., 2020), online pharmacies (Nayak et al., 2023), exergaming platforms (Yein & Pal, 2021), health management information systems (Sriram & Pichaandy, 2020), e-health consultation platforms (Dash & Sahoo, 2022), and Responsible Artificial Intelligence solutions (Kumar et al., 2021).

These technologies signify a transition from institution-focused digitalization to patient-centered, service-oriented, and data-intensive healthcare solutions. Adoption extends beyond clinical decision support systems to include preventive monitoring, consultation, and self-management applications. The frequent mention of mHealth and wearable technologies in various studies underscores their increasing importance in enhancing healthcare accessibility and continuity of care in India (Batool et al., 2023; Papa et al., 2020; Rajak & Shaw, 2021). The integration of Big Data analytics and Responsible AI signifies India's early involvement with advanced digital health capabilities aimed at boosting system efficiency, creating value, and improving patient outcomes (Sao et al., 2023; Kumar et al., 2021).

Objective 2: Examination of Technology Adoption Models in the Indian Healthcare Landscape

The reviewed studies demonstrate a strong reliance on established technology adoption theories, with a clear dominance of TAM, UTAUT, UTAUT2, and extended or hybrid frameworks in the literature. TAM and its extensions remain widely applied to understand the adoption of mHealth services, digital healthcare systems and wearable technologies (Dhagarra et al., 2020; Rajak & Shaw, 2021; Papa et al., 2020). UTAUT and UTAUT2 are increasingly favored for more complex, consumer-oriented technologies, such as mHealth applications, IoT devices, exergaming systems, and e-health platforms, because of their ability to incorporate social and motivational constructs (Batool et al., 2023; Dash & Sahoo, 2022; Dutta et al., 2023; Yein & Pal, 2021).

Beyond traditional adoption frameworks, Nayak et al. (2023) adopted the push–pull–mooring model to capture switching behavior in online pharmacy usage, highlighting the contextual relevance of migration-based frameworks in healthcare platform adoption. Pai and Alathur (2020) further integrated awareness, motivation, and health belief perspectives, suggesting that adoption in healthcare often requires frameworks that extend beyond pure technology acceptance. Notably, Sao et al. (2023) did not employ a formal adoption model, underscoring the gap in theoretically grounded Big Data adoption research in India. Collectively, these findings indicate a mature but fragmented modeling landscape in which theory selection varies according to technology type and adoption stage.

Objective 3: Analysis of Patient-Centric Determinants of Technology Adoption

In various studies, factors centered on patients consistently emerge as key influences on technology acceptance within the Indian healthcare sector. Fundamental elements such as perceived usefulness, perceived ease of use, performance expectancy, and effort expectancy are pivotal in the decision to adopt mHealth, wearable devices, exergaming systems, and e-health platforms (Batool et al., 2023; Rajak & Shaw, 2021; Dhagarra et al., 2020; Yein & Pal, 2021; Dash & Sahoo, 2022). Trust and privacy issues frequently appear as significant facilitators and obstacles, especially in digital consultation platforms, mHealth services, and online pharmacies (Dhagarra et al., 2020; Rajak & Shaw, 2021; Nayak et al., 2023).

Context-specific factors further enhance the understanding of patient-centric determinants. The adoption of wearable and IoT-based devices is greatly influenced by ubiquity, relative advantage, and convenience (Dutta et al., 2023; Sivathanu, 2018), whereas comfort and intrusiveness are crucial for adopting smart wearables (Papa et al., 2020). In contexts specific to certain populations, the adoption of exergaming among older adults is heavily impacted by usability and motivational factors (Yein & Pal, 2021). Socio-geographical factors also play a role in adoption, as demonstrated in HMIS usage, where patient location and access significantly influence acceptance (Sriram and Pichaandy, 2020). Notably, Kumar et al. (2021) expanded the patient-centric analysis by showing that cognitive engagement mediates the effect of Responsible AI on value creation, highlighting deeper psychological involvement beyond mere acceptance.

Objective 4: Future Research Directions in India-Specific Empirical Evidence

Although there is an expanding collection of empirical studies, the table highlights several persistent gaps that require further research. First, most research focuses on the intention to adopt rather than on post-adoption usage, ongoing engagement, or long-term behavioral outcomes, underscoring the importance of longitudinal studies (Batool et al., 2023; Yein & Pal, 2021; Papa et al., 2020). Second, while mHealth and wearables have been extensively examined, advanced technologies such as Big Data analytics and Responsible AI are still under-theorized and geographically restricted within the Indian context (Sao et al., 2023; Kumar et al., 2021).

Numerous studies advocate wider regional coverage and demographic differentiation, especially in terms of rural-urban comparisons and socioeconomic moderators (Pai & Shaw, 2021; Pai & Alathur, 2020; Sriram & Pichaandy, 2020). Fourth, issues such as trust, privacy, perceived risk, and regulatory concerns are often identified but not sufficiently integrated into comprehensive adoption frameworks, indicating the potential for hybrid models that combine the TAM, UTAUT2, PPM, and ECM (Dash & Sahoo, 2022; Dhagarra et al., 2020; Nayak et al., 2023). Lastly, there is a distinct need to go beyond the intent to adopt by including clinical, experiential, and outcome-based indicators that represent actual patient value in India's developing digital health landscape.

6. Conclusion

This study examines the integration of emerging health technologies in India, reviews prevalent adoption models, assesses patient-centered factors influencing adoption, and identifies research gaps in the Indian healthcare system. The Indian healthcare landscape has embraced diverse technologies, from basic digital systems such as Health Management Information Systems and mHealth apps to advanced solutions such as IoT wearables, Big Data analytics, online pharmacies, exergaming, and Responsible AI, addressing access, monitoring, engagement, efficiency, and care value. Adoption research primarily relies on models such as TAM, UTAUT, and UTAUT2, with some use of push–pull–mooring and awareness-motivation frameworks; however, applications remain fragmented, indicating the need for integrated, hybrid models suited to India's complex healthcare environment. Patient-centered factors—perceived usefulness, ease of use, performance expectancy, trust, social influence, and facilitating conditions—consistently drive adoption, whereas contextual factors such as privacy, risk, comfort, intrusiveness, ubiquity, and geography cause variation across technologies and users. Emerging evidence highlights deeper cognitive and motivational aspects, such as engagement and empowerment, suggesting that adoption involves experiential value beyond functionality. Key research gaps include limited longitudinal studies, post-adoption behavior analysis, regional comparisons, and outcome-focused research, with advanced technologies such as Big Data and Responsible AI lacking robust theoretical examination, especially from the patient perspective. Additionally, demographic, socioeconomic, and regional moderators have been inconsistently addressed, reducing the generalizability of the findings across India's diverse healthcare landscape.

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