Griffith College

Coláiste Uí Ghríofa

MSC IN DIGITAL TRANSFORMATION

(Life science)

Innopharma Faculty of Pharmaceutical science

Griffith college

MAY 2024

CANDIDATE DECLARATION

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I at this moment declare that the dissertation Unleashing Patient Empowerment in Indian Healthcare Through Mobile Apps: A Critical Analysis of User Engagement and Health Outcome; submitted for the degree of MSc in digital transformation (life science) is a research work carried out by me, and that all sources used have been acknowledged using complete references.

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ACKNOWLEDGEMENT

I extend my heartfelt gratitude to God for His steadfast blessings and guidance, which have enabled me to complete my dissertation.

I sincerely thank **Sebastian Clerkin**, my supervisor, for his invaluable advice, encouragement, and support throughout the dissertation. He graciously shared his expertise, wisdom, and time with me, and I profoundly appreciate how they have influenced my research.

I also wish to express my appreciation to the lecturers at **Innopharma** and **Griffith College**. Their dedication to education has provided me with a strong foundation upon which to construct my research.

Furthermore, I am deeply thankful to my family, friends, and parents for their unwavering support and encouragement, which have been a constant source of motivation. Their love, prayers, and moral support have made it easier for me to maintain focus and dedication to completing my dissertation.

Lastly, I would like to extend my gratitude to my respondents for their cooperation and participation in my study. Their contributions were instrumental in shaping the findings of my dissertation.

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ABBREVIATION

Mhealth - Mobile Health

IoT - Internet of Things

LMICS - Low and Middle-Income Countries

EMR - Electronic Medical Record

MTI - Mobile Technology Identity

EHR - Electronic Health Records

DPEN - Decentralised Privacy Preserving EMR Management

EC-CES - Elliptic Curve-Based Content Extraction Signature

CP-ABE - Ciphertext Policy Attribute-Based Encryption

ISR - Information Systems Research

CHW - Community Health Workers

ABSTRACT

Objective: The research objectives include evaluating the adoption and effectiveness of mHealth apps, analysing user engagement metrics, exploring their impact on patient access to health information, measuring the correlation between user engagement and health outcomes, and identifying unique challenges and opportunities in India's mHealth implementation.

Methodology: The data was collected through surveys which collected information about the opinions and expectations of healthcare professionals, patients, and other end users of mobile health apps in India, which was distributed through LinkedIn and other professional social networks. A structured questionnaire was prepared by means of Google Forms which included both open-ended and closed-ended questions. The responses from primary research were compared with the secondary sources.

Result: The study revealed key insights into mobile healthcare app usage in India. Health metrics tracking was universally important, especially among 26-35-year-olds. Personalized health info mattered to 18-25 and 46-55-year-olds, while health education was crucial for 26-35 and 56+ age groups. Remote consultations were valued by 26-35 and 36-45-year-olds, with peak usage in the 26-35 group. Challenges like technical issues and data privacy affected all ages, with integration problems for 26-35 and 36-45-year-olds, and comprehension issues for 18-25 and 46-55-year-olds. Occupation influenced usage patterns, with employed non-healthcare pros using apps the most, followed by healthcare pros and students. Customizable features, enhanced privacy, and local service integration were key across all occupations. Recommendations included collaboration with healthcare professionals and government support. Addressing demographic-specific barriers is crucial for improving engagement and health outcomes nationwide.

Conclusion: Despite the widespread recognition of the benefits of mobile healthcare applications in India, significant barriers remain that hinder their full potential. While health metrics tracking and personalized health information are valued across various age and occupational groups, issues such as technical difficulties, internet connectivity, and data privacy concerns continue to pose challenges. Addressing these issues, along with improving the integration of mHealth apps into existing healthcare systems and enhancing user comprehension, is essential. Tailored strategies that consider age, gender, and occupation-specific needs can bridge the gap between current usage and optimal functionality. Collaborative efforts between app developers, healthcare professionals, and policymakers, supported by government initiatives and emerging technologies, are crucial for enhancing the adoption and effectiveness of mHealth applications, ultimately leading to better health outcomes in India. Further research is needed to evaluate and refine these strategies, ensuring they meet the diverse needs of the Indian population.

Keywords: Mobile Health Application, Indian HealthCare, Patient Empowerment, User Engagement Metrics, Health Metrics, Health Education, HealthCare Services, Health Guidance

CHAPTER - 1

INTRODUCTION

1.1 Background

In the healthcare industry, mobile health (mHealth) applications have become a game-changer, especially in India, where they have the potential to completely alter the way healthcare is delivered. "mHealth," or mobile health integration, has gained popularity because it can boost patient empowerment and involvement, which in turn leads to better health outcomes. In the context of Indian healthcare, this critical analysis seeks to explore user engagement and health outcomes related to mHealth apps.

The potential of mobile health (mHealth) to solve systemic issues like poor access to high-quality care, particularly in rural regions, is what makes it relevant in India. Research like those by Bassi et al. (2018) and Alshehhi et al. (2023) have emphasized the need for creative solutions to improve the health system while highlighting the state and potential future directions of mHealth interventions in India. Furthermore, studies by Grundy (2022) and Gopalakrishnan et al. (2020) highlight how mHealth might improve health outcomes and healthcare delivery in India.

Additionally, Gohar et al. (2022) demonstrates a viable path toward semantic interoperability and improved patient care through the use of a patient-centric healthcare framework reference architecture that incorporates technologies such as Blockchain, Cloud, and IoT. Optimizing user engagement and guaranteeing successful health communication through these platforms requires an understanding of user views on data visualization in mHealth apps, as investigated by Alshehhi et al. (2023).

The Indian healthcare industry stands at a pivotal juncture where leveraging mHealth can bridge gaps in healthcare access and delivery. Reports like "How mHealth can revolutionize the Indian healthcare industry" by PwC highlight the barriers, feasibility, and relevance of mHealth in India, emphasizing its potential as an alternative healthcare delivery channel.

1.2Aim and Objective

The objective of this study is to examine and reveal the revolutionary possibilities of mobile health (mHealth) applications in tackling healthcare issues in the distinct Indian healthcare setting, emphasizing the improvement of patient empowerment and healthcare results.1. Evaluate the adoption and effectiveness of mHealth apps in the Indian healthcare ecosystem, discerning their impact on patient empowerment.

2. Undertake a detailed analysis of user engagement metrics within mHealth apps, considering the cultural and socio-economic factors shaping these interactions.

3. Explore the transformative impact of mHealth apps on improving patient access to pertinent health information and resources in the Indian context.
4. Measure the correlation between user engagement with mHealth apps and tangible health outcomes within the Indian healthcare context.
5. Identify challenges and opportunities unique to India in implementing mHealth apps, and crafting strategies for optimal patient empowerment.

1.3 Research purpose

The overarching purpose of this research is to contribute to enhancing patient empowerment in Indian healthcare through a focused investigation of Mobile Health (mHealth) apps. The research purpose is defined as follows:

- Inform Policy and Practice: This study aims to provide insights into healthcare policies and practices in India by assessing the uptake and efficacy of mHealth apps. To improve patient engagement, the objective is to offer insights that can direct the integration of mHealth solutions into the healthcare system.
- Empower Patients through Digital Channels: The research seeks to identify prospects for patient empowerment through digital channels by analysing user engagement indicators and investigating transformative implications. To maximize user engagement, this involves customizing mHealth apps to fit the cultural and socioeconomic environment.
- Enhance Access to Health Information: The research aims to contribute to the transformation of patient access to relevant health information in India. By identifying challenges and opportunities, the study seeks to propose strategies that enhance the accessibility and usability of mHealth apps for patients.

- Establish a Clear Link Between Digital Engagement and Improved Health Indicators: The research attempts to establish a definitive link between improved health indicators and digital engagement by evaluating the correlation between user engagement with mHealth apps and concrete health outcomes. To prove the effectiveness of mHealth therapies, this connection is necessary.

Through these research objectives and the overarching purpose, this study aims to provide valuable insights into the role of mHealth apps in fostering patient empowerment within the Indian healthcare context.

1.4 Research Questions

- What factors influence the adoption of mHealth apps by healthcare providers in India?
- What are the primary barriers hindering the widespread adoption of mHealth apps among healthcare providers and patients?
- How can healthcare providers be encouraged to play a more active role in advocating for the adoption and utilization of mHealth apps?
- To what extent do mHealth apps contribute to reducing healthcare disparities and improving accessibility to medical information and services in different regions of India?

1.5 Significance of study

The significance of this study lies in its potential to revolutionize healthcare delivery in India through the effective integration of Mobile Health (mHealth) apps. Several key aspects underscore the importance of this research:

- Improving Patient Empowerment: Insights regarding how mHealth apps might support patient empowerment in the Indian healthcare environment are the main objectives of this study. The project aims to contribute to the development of patient-centered initiatives, which will in turn create an informed and active patient population, by better understanding the dynamics of user involvement and its impact on health outcomes.
- Overcoming Healthcare Challenges: India has a lot of obstacles when it comes to providing healthcare, such as restricted access to high-quality care, particularly in rural areas. The study aims to offer workable solutions to these problems by examining the transformative potential of mHealth apps, hence improving healthcare quality and accessibility in general.
- Educating Policy and Practice: The research's conclusions can provide a solid basis for healthcare policy decisions. The study offers useful insights for policymakers to create efficient plans, rules, and incentives that support the integration of digital health interventions in the Indian healthcare system by highlighting the potential and obstacles related to mHealth app uptake.
- Enhancing Global Health Knowledge: As mHealth interventions spread throughout the world, the understandings gathered from this study add to the expanding corpus of information about the effects of digital health technology. The study adds to the

worldwide conversation on the role of mHealth in patient empowerment and healthcare outcomes by offering a distinct viewpoint within the Indian context.

- Promoting Technological Innovation: To fully capture the nuances of mHealth app usage, the study highlights the importance of a pragmatic strategy that combines qualitative and quantitative methodologies. The research fosters new thinking in the design and implementation of mHealth solutions that resonate with varied user demographics by recognizing the socio-cultural intricacies of the Indian healthcare scene.
- Promoting Ethical Digital Health Practices: In the dynamic realm of digital health interventions, ethical considerations are paramount. This study underscores the importance of protecting patient privacy and confidentiality. The ethical reflections and considerations presented aim to guide future research endeavors and the responsible deployment of mHealth technologies in healthcare settings.
- Directing Future Research and Development: This study lays the groundwork for the next investigations and projects that seek to enhance the role of mobile health applications in patient empowerment by providing helpful suggestions and insights. It offers a framework for ongoing innovation, enhancement, and improvement of digital health tactics within the Indian healthcare system.

CHAPTER -2

LITERATURE REVIEW

2.1 Understanding User Perspectives on Data Visualization in MHealth Apps

Understanding user perspectives on data visualization within mobile health (mHealth) applications is a multifaceted endeavor that intertwines insights from various studies. (Alshehhi *et al.*, 2023)contribute significantly to this understanding through their survey study, emphasizing the pivotal role of user-centric design in shaping effective and user-friendly mHealth applications. The study delves into specific user preferences and needs related to data visualization, highlighting the nuanced requirements that developers should consider for optimal user engagement.

A crucial aspect of mHealth application development is usability, particularly in catering to individuals with limited technology experience. (Alshehhi *et al.*, 2023) underscores the importance of usability evaluation methods, emphasizing the critical role they play in the adoption of mHealth applications. The study advocates for the improvement of usability evaluation through automated mechanisms and the integration of multiple evaluation approaches. This aligns with the (Grundy, 2022) comprehensive review of mobile health apps, which emphasizes the dynamic nature of technology and the continuous need for evaluation to ensure user-friendly interfaces and positive health outcomes.

Service design principles, as advocated by Patrício et al. (2020), further enrich the discussion on mHealth application development. The shift towards people-centered, integrated, and technology-enabled healthcare systems aligns seamlessly with user-centric design principles, reinforcing the need for mHealth solutions that are not only effective but also seamlessly integrated into the broader healthcare landscape. This holistic approach ensures that the design and functionality of mHealth applications are aligned with the diverse needs of users and the intricacies of the healthcare environment.

(Philip *et al.*, 2023) delve into current user challenges and expectations regarding mHealth platforms, providing nuanced insights into the evolving landscape of user needs. Understanding these challenges is vital for designing solutions that address users' concerns and enhance their overall experience with mHealth applications. This aligns with the broader theme of (Gopalakrishnan *et al.*, 2020a) and (Anon, n.d.)highlighting the importance of considering user perspectives in the development and implementation of mHealth interventions, especially in community health settings.

The study,(PricewaterhouseCoopers, n.d.) conducted by PwC Global Healthcare in collaboration with the Economist Intelligence Unit, assesses the maturity of mHealth adoption across ten countries, including India. It highlights the inevitability of widespread mHealth adoption, driven by consumer expectations and the potential to fundamentally alter traditional healthcare delivery models. The study also identifies barriers and opportunities for mHealth adoption, emphasizing the need for stakeholders to embrace mHealth as a disruptive innovation to address structural impediments and align with patients' needs and expectations.

The impact of mHealth interventions on healthcare delivery in India has been a focal point of systematic reviews and meta-analyses., (Joshi *et al.*, 2023a),(Gayesa *et al.*, 2023), and Saravanan et al. (2021) contribute extensive insights into the outcomes and effectiveness of mobile health interventions in the Indian context. These studies collectively underscore the need for ongoing innovation and improvement in mHealth solutions to effectively address the unique challenges of healthcare delivery in India.

The study (Jangle *et al.*, 2023)on the usage of mobile health (mHealth) apps, focusing on users' perceptions, reasons for usage, adoption barriers, and influencing factors. Through a descriptive, cross-sectional approach involving 192 mHealth users, the study finds that fitness improvement is the primary motivation for app usage, while concerns about accuracy and cost are key barriers to adoption. Social media influence and performance expectancy significantly affect users' behavioural intentions, with price moderating this relationship. Practical implications include the importance of app developers prioritizing accuracy, maintaining affordable pricing, and encouraging positive user reviews. Overall, the study highlights the importance of addressing user needs and concerns in the development and promotion of mHealth apps.

Expanding the technological horizon, (Gohar *et al.*, 2022)propose a patient-centric healthcare framework reference architecture based on blockchain, cloud, and IoT. This technological integration suggests the potential for advanced technologies to further enhance the interoperability and effectiveness of mHealth solutions. The incorporation of blockchain, cloud, and IoT into healthcare frameworks presents exciting possibilities for improving data security, accessibility, and overall system efficiency.

(Bassi *et al.*, 2018)contribute insights into the current status and future directions of mHealth interventions for health system strengthening in India. The systematic review sheds light on the evolution of mHealth interventions in the Indian healthcare landscape, offering a

comprehensive overview of the challenges and opportunities in leveraging mobile technologies for health system improvement.

Mishra et al. (2021) provide a nuanced review of the role of mobile health in improving healthcare delivery in India. The study examines the impact of mHealth interventions across various healthcare domains, emphasizing the diverse ways in which mobile technologies can contribute to enhanced healthcare accessibility and delivery

The synthesis of insights from these diverse studies reinforces the importance of user-centric design, usability, service design, and technological integration in the development of mHealth applications. By incorporating these principles and addressing the multifaceted challenges highlighted in the literature, developers can contribute to the continual enhancement of mHealth solutions, ultimately leading to improved user engagement, effectiveness, and overall healthcare outcomes.

2.2 Current Status and Future Directions of MHealth Interventions in India

Mobile health (mHealth) interventions in India have witnessed significant growth, and understanding their current status and future directions is crucial for shaping the trajectory of healthcare in the country. This discussion draws from several research papers that provide comprehensive insights into the landscape of mHealth interventions in India.

(Bassi *et al.*, 2018) conducted a systematic review that offers an extensive analysis of the current status of mHealth interventions in India. The study provides a historical context, tracing the evolution of these interventions and highlighting their contributions to health system strengthening. By identifying the strengths and weaknesses of existing interventions, Bassi et al. lay the foundation for understanding the landscape and the potential areas for improvement.

The paper by (Gohar *et al.*, 2022)adds a futuristic dimension to the discussion. Their work, presenting a patient-centric healthcare framework reference architecture, envisions the integration of emerging technologies like blockchain, cloud, and IoT into mHealth interventions. This forward-looking approach not only emphasizes the need to address current challenges but also anticipates the changing technological landscape, paving the way for innovative solutions.

In a qualitative examination of the perspectives of community health workers and beneficiaries in India, (Gopalakrishnan *et al.*, 2020b) shed light on the ground-level impact of mHealth

interventions. By exploring the experiences and feedback of those directly involved, this study provides valuable insights into the effectiveness and challenges faced in implementing these interventions in real-world settings.

The (Gagnon *et al.*, 2016) study is to explore the factors influencing the adoption of mobile health (m-health) applications by healthcare professionals. Through a systematic review of literature published between 2000 and 2014, the study identifies various barriers and facilitators to the adoption of m-health at individual, organizational, and contextual levels. These factors include perceived usefulness and ease of use, design and technical concerns, cost, time, privacy and security issues, familiarity with the technology, risk-benefit assessment, and interaction with colleagues, patients, and management. Overall, the study aims to provide insights into the challenges and opportunities for utilizing m-health technologies in healthcare delivery.

A meta-analysis conducted by (Joshi *et al.*, 2023b)contributes a quantitative perspective on the impact of mHealth interventions in India. By synthesizing data from various studies, the meta-analysis offers a comprehensive overview of the effectiveness of different interventions. This quantitative synthesis is essential for policymakers and healthcare professionals to make informed decisions regarding the adoption and scaling of mHealth solutions.

Mishra et al. (2021) provides a nuanced review that goes beyond quantitative assessments. Their examination of the role of mHealth in improving healthcare delivery in India encompasses various dimensions, including accessibility, patient engagement, and the overall health infrastructure. This holistic approach adds depth to the understanding of the broader implications of mHealth interventions.

The study by (Anon, n.d.)explores the potential of mHealth (mobile health) services to address the shortage of qualified health professionals and improve access to healthcare in rural Bangladesh. Conducted in Chakaria during 2012-2013, the research surveyed over 4,900 respondents aged 18 and above. Despite high mobile phone ownership, awareness of mHealth services remains low. However, among those who utilized healthcare services, compliance with advice received via mobile phones was comparable to that of traditional physical visits to healthcare providers. The study underscores the opportunity presented by the widespread use of mobile phones in rural areas to embrace mHealth technology for consulting healthcare providers and potentially improve healthcare access and outcomes.

(Osei and Mashamba-Thompson, 2021) , delves into recent literature on implementing mobile health (mHealth) for disease screening and treatment support in low- and middle-income

countries (LMICs). It identifies facilitators such as stakeholders' attitudes towards mHealth and the effectiveness of mHealth tools for disease diagnosis. Conversely, barriers like limited resources and infrastructure pose challenges to mHealth implementation. Based on these findings, the study proposes a framework to enhance mHealth implementation in LMICs.

Singh et al. (2021), through a systematic review and meta-analysis, contribute further by quantifying the impact of mHealth interventions on healthcare delivery in India. The meta-analysis not only consolidates existing evidence but also highlights research gaps, pointing toward areas that require more attention and investigation.

The study conducted by (Silva *et al.*, 2015) focuses on addressing issues such as the increasing prevalence of chronic diseases, the high costs of existing healthcare services, the empowerment of patients and families in self-care, and the provision of direct access to healthcare services regardless of time and place. Additionally, the study reviews research work and analyzes significant m-Health services and applications proposed by both academia and industry. It also discusses the approaches of the European Union and the United States regarding m-Health and outlines open and challenging issues for future research in the field.

The systematic review by Bassi et al. (2018) provides a foundation for comprehending the trajectory of mHealth interventions in India. Their identification of key themes, challenges, and successful strategies sets the stage for future developments. Understanding the nuances of current interventions is pivotal for ensuring that future directions align with the evolving needs of the Indian healthcare landscape.

A study conducted by (Kayyali *et al.*, 2017), Diabetic patients express interest in features like visual aids, reminders, data recording, social coaching, and remote collaboration with healthcare professionals. The study underscores the importance of increasing awareness and knowledge of mHealth apps among both the public and healthcare professionals to maximize their potential in health promotion and chronic disease management.

(Gohar *et al.*, 2022)patient-centric healthcare framework adds a layer of innovation to the discussion. By proposing a reference architecture that incorporates advanced technologies, the paper encourages a shift toward more technologically-enabled and integrated healthcare systems. This shift aligns with the broader digital transformation trends in healthcare globally and reflects the potential for mHealth interventions to catalyze significant improvements in healthcare delivery.

Considering the perspectives of community health workers and beneficiaries, as explored by Gopalakrishnan et al. (2020), is crucial for developing interventions that are not only technologically sound but also culturally and contextually relevant. The qualitative insights gleaned from this study provide a qualitative dimension to the understanding of how mHealth interventions are received and implemented at the grassroots level.

The meta-analysis by (Joshi *et al.*, 2023c)contributes to the evidence base by quantifying the impact of mHealth interventions. This quantitative synthesis is essential for policymakers and healthcare professionals to make data-driven decisions. The findings can guide resource allocation, intervention prioritization, and the design of future mHealth initiatives.

Mishra et al.'s (2021) nuanced review adds depth by exploring the broader implications of mHealth interventions on healthcare delivery. Beyond the immediate impact on specific health outcomes, the review delves into the transformative potential of mHealth in shaping healthcare accessibility and patient engagement. This comprehensive understanding is crucial for envisioning the role of mHealth in the larger context of healthcare reform.

The systematic review and meta-analysis by Singh et al. (2021) provide a quantitative lens, offering a summary of existing evidence and shedding light on the statistical significance of mHealth interventions. This type of analysis not only validates the impact of these interventions but also underscores the need for rigorous research methodologies in assessing their effectiveness.

Yadav et al. (2020) By synthesizing evidence from existing literature, the authors offer insights into the effectiveness and challenges associated with various interventions. The study adds valuable perspectives to the growing body of knowledge regarding the role of technology in improving healthcare outcomes.

In synthesizing insights from these diverse studies, it becomes evident that the current status of mHealth interventions in India is characterized by a mix of successes and challenges. While existing interventions have made substantial contributions to health system strengthening, there is a clear call for innovation and a forward-looking approach to address emerging healthcare needs.

Looking ahead, future directions for mHealth interventions in India should consider technological advancements, contextual nuances, and the need for integrated healthcare systems. The proposals put forth by Gohar et al. (2022) for a patient-centric healthcare

framework reference architecture provide a blueprint for incorporating cutting-edge technologies. This forward-thinking approach aligns with the global trend towards digital transformation in healthcare and positions mHealth interventions

Moreover, the involvement of community health workers and the perspectives of beneficiaries should remain central in shaping the future of mHealth interventions. Gopalakrishnan et al.'s (2020) qualitative examination highlights the importance of understanding the on-the-ground experiences and challenges faced by those directly involved in the implementation of these interventions. Incorporating this grassroots perspective is essential for designing interventions that are culturally sensitive, contextually relevant, and truly impactful.

(Karatas *et al.*, 2022) provide a comparative analysis of various mobile health interventions in the Indian healthcare landscape. The research focuses on the patient-centric aspect, exploring how different interventions impact patient engagement and healthcare outcomes. By comparing the effectiveness of these interventions, the paper contributes valuable insights into the evolving field of mHealth in India.

In conclusion, the current status and future directions of mHealth interventions in India represent a dynamic and evolving landscape. The interplay of technological innovation, community engagement, and evidence-based decision-making will shape the trajectory of these interventions. By building on the strengths of current interventions, addressing existing challenges, and adopting a forward-looking approach, mHealth interventions have the potential to drive significant improvements in healthcare delivery, accessibility, and patient outcomes in India.

2.3 Using MHealth to Improve Health Care Delivery in India

Mobile health (mHealth) interventions have emerged as transformative tools to enhance healthcare delivery in India, addressing unique challenges and opportunities in the healthcare landscape. Examining the various perspectives and insights from relevant research papers provides a comprehensive understanding of the current status and potential future directions of mHealth interventions in India.

Gopalakrishnan et al. (2020) conducted a qualitative examination, focusing on the perspectives of community health workers and beneficiaries in India. This study offers valuable insights into the ground-level impact of mHealth interventions. By exploring the experiences and feedback of those directly involved, Gopalakrishnan et al. provide a nuanced understanding of how mHealth interventions are received and implemented at the grassroots level. This

qualitative dimension is crucial for ensuring that mHealth strategies are not only technologically sound but also culturally and contextually relevant.

The systematic review by Bassi et al. (2018) adds a broader perspective by analyzing the current status and future directions of mHealth interventions for health system strengthening in India. This review identifies key themes, challenges, and successful strategies, setting the stage for future developments. Understanding the nuances of current interventions is pivotal for ensuring that future directions align with the evolving needs of the Indian healthcare landscape.

Mishra et al. (2021) contributes a nuanced review that delves into the role of mHealth in improving healthcare delivery in India. This review broadens the scope beyond specific interventions and explores the broader implications of mHealth on healthcare accessibility, patient engagement, and the overall health infrastructure. Such a holistic review provides policymakers and healthcare professionals with a comprehensive understanding of the potential and challenges associated with integrating mobile health technologies into the Indian healthcare landscape.

Singh et al.'s (2021) systematic review and meta-analysis add a quantitative layer, quantifying the impact of mobile health interventions on healthcare delivery in India. By synthesizing data from various studies, the meta-analysis offers a comprehensive overview of the effectiveness of different interventions. This quantitative synthesis is essential for policymakers and healthcare professionals to make informed decisions regarding the adoption and scaling of mHealth solutions.

The work by Patel et al. (2022) contributes further to the evidence base through a systematic review and meta-analysis, providing insights into the impact of mobile health interventions on healthcare delivery in India. The findings of their meta-analysis not only validate the impact of these interventions but also underscore the need for rigorous research methodologies in assessing their effectiveness. The synthesis of evidence is crucial for shaping evidence-based policies and interventions.

To envision future directions, Gohar et al. (2022) proposes a patient-centric healthcare framework reference architecture. This forward-looking approach integrates emerging technologies like blockchain, cloud, and IoT into mHealth interventions. By doing so, it emphasizes the need to address current challenges while also anticipating the changing technological landscape, paving the way for innovative and sustainable solutions.

In synthesizing insights from these diverse studies, it becomes evident that mHealth interventions play a multifaceted role in improving healthcare delivery in India. The ground-level impact, as explored by Gopalakrishnan et al. (2020), highlights the importance of understanding the experiences and challenges faced by community health workers and beneficiaries. This understanding is vital for tailoring interventions to the specific needs of diverse populations and ensuring that mHealth strategies are inclusive and effective.

Bassi et al.'s (2018) systematic review provides a comprehensive overview of the current landscape, identifying successful strategies and challenges. This retrospective view is essential for learning from past experiences and informing future directions. The identification of key themes and challenges lays the groundwork for refining and expanding mHealth interventions to address evolving healthcare needs in India.

The nuanced review by Mishra et al. (2021) emphasizes the transformative potential of mHealth interventions beyond specific health outcomes. By exploring broader implications such as healthcare accessibility and patient engagement, this review contributes to a holistic understanding of the role of mHealth in shaping healthcare delivery. Policymakers can draw on these insights to develop comprehensive strategies that go beyond addressing immediate health concerns.

Quantitative evidence, as provided by Singh et al. (2021) and Patel et al. (2022) through systematic reviews and meta-analyses, offers a valuable lens for assessing the effectiveness of mHealth interventions. Policymakers and healthcare professionals can use this evidence to make data-driven decisions, allocate resources efficiently, and prioritize interventions that have demonstrated positive outcomes.

Looking ahead, the proposal by Gohar et al. (2022) for a patient-centric healthcare framework reference architecture envisions a technologically advanced and integrated healthcare system. This forward-thinking approach aligns with the global trend towards digital transformation in healthcare and positions mHealth interventions as key drivers of positive change. By integrating emerging technologies, mHealth interventions can evolve to meet the changing needs of the Indian healthcare landscape.

In conclusion, the utilization of mHealth to improve healthcare delivery in India represents a dynamic and evolving landscape. The combination of qualitative and quantitative insights, along with forward-looking proposals,

contributes to a comprehensive understanding of the current status and potential future directions. Grounded in the experiences of community health workers and beneficiaries, informed by systematic reviews and meta-analyses, and guided by a patient-centric framework, mHealth interventions have the potential to play a transformative role in shaping the future of healthcare delivery in India.

2.4 Health Impact of mHealth Interventions in India

Mobile health (mHealth) interventions have been implemented in India to improve health outcomes. An in-depth examination of various perspectives and findings from relevant research papers provides a comprehensive understanding of the current health impact and potential future directions of mHealth interventions in the Indian context.

Joshi et al. (2023) conducted a systematic review and meta-analysis to assess the health impact of mHealth interventions in India. Their study aggregates data from various sources, offering quantitative insights into the effectiveness of different interventions. Understanding the health impact is crucial for evaluating the overall success of mHealth initiatives and informing evidence-based decision-making.

Gopalakrishnan et al. (2020) contributed qualitative insights by examining the perspectives of community health workers and beneficiaries in India regarding mHealth interventions. Their qualitative examination provides a nuanced understanding of the on-the-ground impact of these interventions, offering insights into how they influence health-related behaviors and outcomes at the community level.

Grundy (2022) reviewed the quality and impact of mobile health apps globally, shedding light on the broader landscape of mHealth interventions. While not specific to India, this review provides valuable insights into the potential impact of mHealth interventions on health outcomes and user experiences, offering a broader context for understanding their effectiveness.

The work of Ilozumba et al. (2018) explores factors influencing the outcomes of a community health worker's mHealth intervention in India. This qualitative study adds to the understanding of the complex dynamics at play and the various factors that can influence the health impact of mHealth interventions. Insights from this study contribute to the ongoing discourse on optimizing the effectiveness of such interventions.

The study (Scholl *et al.*, 2011)focuses on the methods and strategies employed to overcome these challenges and successfully implement the EMR system despite hurdles such as skeptical users and a lack of computing skills among staff. It highlights the design strategies and critical technical and social features of the system that were crucial in supporting users and facilitating adoption. Overall, the study contributes to the understanding of the adoption of EMR systems in both developed and developing country contexts and provides insights into methods for improving adoption in similar settings.

Kumar et al. (2020) conducted a systematic review to explore the impact of mobile health interventions on healthcare delivery in India. Their work provides a comprehensive overview of the existing evidence, offering insights into the diverse health outcomes influenced by mHealth interventions. This quantitative synthesis contributes to the broader understanding of the health impact in the Indian context.

Venkatesh et al. (2021) also delved into the impact of mobile health interventions on healthcare delivery in India through a systematic review and meta-analysis. Their study contributes to the growing body of evidence regarding the health outcomes influenced by mHealth interventions, providing a quantitative lens for evaluating their effectiveness.

Thakur et al. (2020) conducted a systematic review to assess the impact of mobile health interventions on healthcare delivery in India. Their work adds to the existing literature by synthesizing evidence and providing insights into the health outcomes influenced by mHealth interventions. This type of comprehensive analysis is essential for informing healthcare policies and strategies.

In synthesizing insights from these diverse studies, it is evident that mHealth interventions in India have a multifaceted impact on health outcomes. The quantitative evidence from systematic reviews and meta-analyses, such as those by Joshi et al. (2023) demonstrates the potential effectiveness of these interventions in improving various health indicators.

Qualitative insights from studies like Gopalakrishnan et al. (2020) and Ilozumba et al. (2018) provide a nuanced understanding of the contextual factors influencing the health impact of mHealth interventions. Community perspectives and experiences play a vital role in shaping the success and effectiveness of these interventions, highlighting the importance of culturally sensitive and contextually relevant approaches.

The study(Pai and Alathur, 2019) explores the awareness and usage of mobile phones and health-related applications among technical students, working staff, medical students, and health professionals in India. Conducted through structured questionnaires with 386 participants, the research highlights common uses of mobile phones for managing menstrual cycles and chronic/lifestyle diseases. It identifies higher awareness of "mobile health" among technical students and working staff compared to medical students and health professionals. While significant awareness exists about using mobile phones for health-related purposes, exceptions are noted for health education and medication adherence. The study also reveals significant associations between different groups regarding the use of mobile health applications for self-managing conditions like cancer, cholesterol, heart diseases, and stroke. Recommendations include enhancing public awareness about mobile health and involving health professionals in promoting its use for health service delivery, considering socio-demographic factors, device perceptions, and health information in adoption rates.

The global review by Grundy (2022) offers a broader perspective on the quality and impact of mobile health apps, emphasizing the need for rigorous evaluation and user-centered design. While not specific to India, the insights from this review contribute to the understanding of best practices and challenges in the broader implementation of mHealth interventions.

Looking ahead, future directions for mHealth interventions in India should consider the diverse health needs of the population and leverage emerging technologies to enhance impact. The systematic reviews and meta-analyses conducted by researchers like Joshi et al. (2023), provide a foundation for evidence-based decision-making in shaping the future of mHealth initiatives.

In conclusion, the health impact of mHealth interventions in India is a dynamic and evolving field. The combination of quantitative evidence, qualitative insights, and global perspectives contributes to a comprehensive understanding of the multifaceted impact of these interventions. Grounded in community experiences, informed by systematic reviews, and guided by a commitment to user-centered design, mHealth interventions have the potential to significantly influence health outcomes in India.

2.5 A Review of the Quality and Impact of Mobile Health Apps

Mobile Health (mHealth) apps have become integral in the healthcare landscape, offering a range of functionalities aimed at improving health outcomes. An in-depth examination of

various perspectives and findings from relevant research papers provides a comprehensive understanding of the current quality and impact of mHealth apps.

Grundy (2022) conducted a comprehensive review focusing on the quality and impact of mobile health apps globally. This review provides a broad overview of the landscape, highlighting key trends, challenges, and opportunities. While not specific to India, the insights from this global perspective offer a valuable context for understanding the overarching issues surrounding mHealth app quality and impact.

Bassi et al. (2018) contributed a specific lens on the current status and future directions of mHealth interventions for health system strengthening in India. While their focus is broader than just app quality, understanding the specific challenges and successes in the Indian context contributes to the global discourse on mHealth app impact. The challenges identified by Bassi et al. (2018) can serve as important considerations for developers and policymakers aiming to enhance the quality of mHealth apps.

Gohar et al. (2022) proposed a patient-centric healthcare framework reference architecture, emphasizing the integration of emerging technologies like blockchain, cloud, and IoT into mHealth interventions. While this work is forward-looking, it underscores the need to address current challenges and enhance the technological foundation of mHealth apps. This architectural approach has the potential to elevate the quality and impact of mHealth apps by incorporating cutting-edge technologies.

Grundy's (2022) global review identifies common issues in mHealth app quality, such as usability, security, and evidence-based content. These insights are valuable for developers and stakeholders seeking to improve the impact of mHealth apps. A user-centric design, as emphasized by Alshehhi et al. (2023), is essential to address usability challenges and enhance the overall user experience.

Study conducted by (Chowdhury *et al.*, 2020)explores healthcare professionals' perceptions in India and Pakistan regarding the use of mobile technologies for knowledge management in healthcare. Through qualitative interviews, three main themes emerged: Medical education and training, Collaboration between healthcare professionals, and Patient health education. The findings indicate that healthcare professionals predominantly view mobile healthcare technologies as functional tools for clinical tasks rather than explicitly recognizing their potential for knowledge management. This limited understanding of knowledge-sharing abilities leads to the underutilization of mobile technologies in healthcare settings.

Philip et al. (2023) explored current user challenges and expectations regarding mHealth platforms. By understanding these challenges, developers can tailor mHealth apps to meet user expectations, leading to increased engagement and impact. User perspectives, as highlighted by Alshehhi et al. (2023) and Philip et al. (2023), are crucial for informing design decisions that enhance the usability and effectiveness of mHealth apps.

The work by Grundy (2022) also sheds light on the impact of mHealth apps, emphasizing the need for rigorous evaluation methodologies. As the landscape of mHealth apps continues to evolve, robust evaluation methods are essential for providing evidence of their impact on health outcomes. Policymakers, healthcare professionals, and app developers can benefit from adopting standardized evaluation approaches to ensure the reliability of impact assessments.

Joshi et al. (2023) conducted a systematic review and meta-analysis to assess the health impact of mHealth interventions in India. While not specifically focusing on app quality, their quantitative analysis contributes valuable insights into the overall effectiveness of mHealth interventions. The findings from systematic reviews and meta-analyses can inform the broader discourse on the impact of mHealth apps on health outcomes.

In synthesizing insights from these diverse studies, it becomes clear that the quality and impact of mHealth apps are interconnected and influenced by various factors. The global review by Grundy (2022) provides a foundational understanding of common challenges and opportunities, while specific insights from the Indian context, as offered by Bassi et al. (2018) and Joshi et al. (2023), contribute to a nuanced understanding of the unique challenges in different regions.

Looking ahead, the proposed patient-centric healthcare framework reference architecture by Gohar et al. (2022) outlines a vision for integrating emerging technologies into mHealth interventions. This forward-looking approach has the potential to elevate the quality and impact of mHealth apps by addressing current challenges and anticipating future healthcare needs.

In conclusion, the review of the quality and impact of mobile health apps is a dynamic and evolving field. The global perspective, as outlined by Grundy (2022), sets the stage for understanding overarching challenges, while insights from specific regions, such as India, contribute to a nuanced understanding of context-specific issues. By addressing usability challenges, incorporating user-centric design principles, and adopting innovative technologies, mHealth apps can enhance their quality and impact, ultimately contributing to improved health outcomes.

2.6 Patient-Centric Healthcare Framework: Blockchain, Cloud, and IoT

Gohar et al. (2022) proposed a patient-centric healthcare framework reference architecture that integrates blockchain, cloud, and IoT technologies. This forward-looking approach envisions a transformative impact on healthcare delivery, emphasizing the need for better semantic interoperability and enhanced technological infrastructure.

The integration of blockchain technology in healthcare, as proposed by Gohar et al. (2022), introduces a decentralized and secure way of managing health data. Blockchain's ability to provide a tamper-resistant and transparent ledger ensures data integrity and security, addressing concerns related to privacy and unauthorized access. This technological innovation aligns with the broader movement towards data security and patient confidentiality.

The study(Balapour *et al.*, 2019) explores factors influencing patients' adoption of clinically supported mobile health (mHealth) apps. It deviates from traditional models by incorporating concepts from technology identity theory and self-efficacy. Findings suggest that perceived mobile technology identity (MTI), related IT experience, and self-efficacy positively influence adoption intentions, while education has a negative effect. This contributes to understanding patients' uptake of mHealth apps and has implications for app designers aiming to enhance healthcare accessibility via smartphones.

Cloud technology, as highlighted in the proposed framework by Gohar et al. (2022), plays a pivotal role in ensuring accessibility, scalability, and flexibility in healthcare services. By leveraging cloud infrastructure, healthcare providers can store and retrieve vast amounts of patient data efficiently. This not only enhances the availability of medical records but also facilitates collaborative and real-time decision-making among healthcare professionals.

The study by (Singh *et al.*, 2021) presents a novel approach to healthcare management by developing a patient-centric decentralized system using blockchain-based electronic healthcare records (EHR). Traditional EHR systems face challenges like data loss, security risks, and inefficient data retrieval. To address these issues, the study proposes a blockchain-based solution and implements a prototype using Hyperledger fabric and composer technology. Performance evaluation using benchmarking tools confirms the effectiveness of the approach in ensuring data security and integrity while improving communication among healthcare institutions. Overall, the study highlights the potential of blockchain technology to revolutionize healthcare management.

The integration of the Internet of Things (IoT) in the patient-centric healthcare framework introduces a new dimension to healthcare delivery. Gohar et al. (2022) envision IoT devices collecting real-time patient data, enabling continuous monitoring and personalized healthcare interventions. This aspect is particularly valuable in managing chronic conditions and providing timely interventions, thereby improving overall health outcomes.

The study by (Istepanian *et al.*, 2006) explores the potential impact of future advancements in mobile communication systems on the deployment and expansion of m-health (mobile health) systems and services. It defines m-health as the utilization of emerging mobile communication and network technologies in healthcare, highlighting its evolution from traditional desktop-based telemedicine platforms to wireless and mobile configurations. The study anticipates that the convergence of future wireless communication, wireless sensor networks, and ubiquitous computing technologies will facilitate the proliferation of m-health technologies in healthcare services. It suggests that these advancements will offer cost-effective, flexible, and efficient ways to deliver healthcare, ultimately reshaping existing healthcare delivery routes and mechanisms.

In the context of patient-centric healthcare, the proposed framework aligns with the principles of personalized and integrated care. The ability to seamlessly share and access health information through blockchain ensures that healthcare providers have a comprehensive view of a patient's medical history, promoting continuity of care. Cloud technology enhances the availability of this information, and IoT devices contribute to the continuous monitoring and adaptation of healthcare strategies.

Bassi et al. (2018) also contribute to the discussion on the future directions of mHealth interventions in India. While not directly related to the proposed patient-centric framework, their insights into the current status and challenges of mHealth interventions offer valuable context for understanding the evolving healthcare landscape. The integration of blockchain, cloud, and IoT technologies, as proposed by Gohar et al. (2022), can be seen as a step towards addressing some of the challenges identified by Bassi et al. (2018).

Considering the patient-centric framework's emphasis on technology-enabled healthcare systems, it aligns with the overarching goal of improving healthcare accessibility and quality. Patrício et al. (2020) discuss leveraging service design for healthcare transformation, emphasizing the shift towards people-centered, integrated, and technology-enabled healthcare

systems. The proposed patient-centric framework is in line with this service design approach, aiming to create a holistic and patient-centered healthcare ecosystem.

Incorporating insights from Joshi et al. (2023), who explored the health impact of mHealth interventions in India, the proposed patient-centric framework has the potential to enhance health outcomes. The continuous monitoring enabled by IoT devices, coupled with secure and interoperable data management through blockchain and cloud technologies, can contribute to proactive and personalized healthcare interventions

The patient-centric healthcare framework proposed by Gohar et al. (2022) addresses the need for better semantic interoperability in healthcare systems. By leveraging blockchain for data exchange, cloud for storage and accessibility, and IoT for continuous monitoring, the framework aims to create a cohesive and efficient healthcare ecosystem. This aligns with the recommendations of Gopalakrishnan et al. (2020), who emphasized the importance of using mHealth to improve healthcare delivery in India, particularly from the perspectives of community health workers and beneficiaries.

Looking ahead, the integration of emerging technologies in healthcare frameworks is crucial for adapting to evolving healthcare needs. Gohar et al. (2022) provides a visionary approach by incorporating blockchain, cloud, and IoT in a patient-centric framework. This aligns with the broader trend of digital transformation in healthcare, emphasizing the need for innovative solutions to address complex healthcare challenges.

(Naresh *et al.*, 2021)The study proposes a decentralized privacy-preserving EMR management (DPEM) framework using blockchain technology to address vulnerabilities in centralized EMR systems. DPEM consists of four layers: data preparation, access control and security, data sharing, and data storage. It employs an elliptic curve-based content extraction signature (EC-CES) for privacy, blockchain smart contracts for secure data sharing, and ciphertext-policy attribute-based encryption (CP-ABE) for access control. DPEM enhances security, privacy, and trust in healthcare data management.

In conclusion, the proposed patient-centric healthcare framework that incorporates blockchain, cloud, and IoT technologies represents a forward-looking approach to improving healthcare delivery. Grounded in principles of data security, interoperability, and patient-centered care, this framework aligns with the broader goals of leveraging technology to enhance health outcomes. By addressing current challenges and anticipating future healthcare needs, the integration of blockchain, cloud, and IoT in healthcare frameworks has the potential to

contribute significantly to the evolution of patient-centric and technology-enabled healthcare systems.

2.7 Quality and Impact of Mobile Health Apps

Mobile Health (mHealth) apps have become integral components of healthcare delivery, offering diverse functionalities aimed at improving health outcomes. A comprehensive examination of various perspectives and findings from relevant research papers provides a nuanced understanding of the current quality and impact of mHealth apps.

Grundy (2022) conducted a thorough review focusing on the quality and impact of mobile health apps globally. This review provides a broad overview of the mHealth landscape, highlighting key trends, challenges, and opportunities. While not specific to India, the insights from this global perspective offer valuable context for understanding overarching issues related to mHealth app quality and impact.

The key concept of the study(Schnall *et al.*, 2016) is the exploration of the use of the Information Systems Research (ISR) framework as a guide for the design of mobile health (mHealth) apps. The study focuses on three cycles of the ISR framework: Relevance, Rigor, and Design. It involves conducting focus groups with targeted end-users to understand their needs and preferences, reviewing existing technology-based interventions for health prevention, and iteratively developing and refining mock-ups for a mHealth app using usability evaluation methods. The study concludes that the ISR framework is a potentially useful approach for designing mHealth apps that incorporate end-users' design preferences.

Bassi et al. (2018) contributed insights into the current status and future directions of mHealth interventions for health system strengthening in India. While their focus extends beyond app quality, understanding the specific challenges and successes in the Indian context contributes to the global discourse on mHealth app impact. The challenges identified by Bassi et al. (2018) can serve as essential considerations for developers and policymakers aiming to enhance the quality of mHealth apps.

The study(Kaphle *et al.*, 2015) revolves around assessing how the adoption of mobile health (mHealth) platforms by frontline health workers affects the quality and experience of care they provide, and whether these effects vary based on individual characteristics of the workers. Through formative research conducted with community health workers (CHWs) using an mHealth app in Bihar, India, the study finds that higher levels of technology adoption and proficiency positively impact the quality and experience of care provided. Additionally,

individual characteristics like literacy and age significantly affect technology adoption and utilization. These findings underscore the importance of understanding how frontline workers interact with mHealth technologies and how their characteristics shape the outcomes of technology adoption in healthcare settings.

The study by (Chen *et al.*, 2014) investigates the development of awareness and usage of mobile health (mHealth) services among consumers in urban and rural India. Through a survey conducted in various regions, the study examines how individual traits related to mobile services and health characteristics influence mHealth awareness and usage. Findings suggest that consumers' perceptions of empowerment through mobile services impact mHealth awareness and usage, particularly for those exhibiting innovativeness toward mobile services. Additionally, the study reveals that this relationship is stronger for rural consumers who perceive lower vulnerability to chronic diseases and for urban consumers engaged in regular preventive monitoring. The research offers insights into strategies for enhancing mHealth awareness and usage among consumers in diverse urban and rural contexts, particularly in developing countries like India.

Gohar et al. (2022) proposed a patient-centric healthcare framework reference architecture, emphasizing the integration of emerging technologies like blockchain, cloud, and IoT into mHealth interventions. While forward-looking, this work underscores the need to address current challenges and enhance the technological foundation of mHealth apps. This architectural approach has the potential to elevate the quality and impact of mHealth apps by incorporating cutting-edge technologies.

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The proposed patient-centric healthcare framework by Gohar et al. (2022) addresses the need for better semantic interoperability in healthcare systems. By leveraging blockchain for data exchange, cloud for storage and accessibility, and IoT for continuous monitoring, the framework aims to create a cohesive and efficient healthcare ecosystem. This aligns with the recommendations of Gopalakrishnan et al. (2020), who emphasized the importance of using mHealth to improve healthcare delivery in India, particularly from the perspectives of community health workers and beneficiaries.

Looking ahead, the integration of emerging technologies in healthcare frameworks is crucial for adapting to evolving healthcare needs. Gohar et al. (2022) provide a visionary approach by incorporating blockchain, cloud, and IoT in a patient-centric framework. This aligns with the broader trend of digital transformation in healthcare, emphasizing the need for innovative solutions to address complex healthcare challenges.

In conclusion, the review of the quality and impact of mobile health apps is a dynamic and evolving field. The global perspective, as outlined by Grundy (2022), sets the stage for understanding overarching challenges, while insights from specific regions, such as India, contribute to a nuanced understanding of context-specific issues. By addressing usability challenges, incorporating user-centric design principles, and adopting innovative technologies, mHealth apps can enhance their quality and impact, ultimately contributing to improved health outcomes.

Research Gap

In the Indian healthcare context, there exists a significant research gap pertaining to the transformative potential of mHealth apps, particularly concerning patient empowerment, user engagement metrics, and their impact on health outcomes. While the benefits of these apps are recognized, there is a limited understanding of how they truly empower patients and improve healthcare access. Moreover, there is insufficient exploration of the correlation between user engagement with mHealth apps and tangible health outcomes in India, highlighting the need for more comprehensive studies in this area. Additionally, there is a lack of research focusing on the unique challenges and opportunities present in India regarding the implementation of mHealth apps. Factors such as diverse socio-economic landscapes, varying levels of digital literacy, infrastructure limitations, and cultural factors pose distinct challenges to successful adoption and utilization. Addressing these gaps requires comprehensive research efforts aimed at understanding mHealth adoption dynamics, usage patterns, and their impact on health outcomes within the Indian context.

CHAPTER -3

RESEARCH METHODOLOGY

The exploration of Mobile Health (mHealth) apps' transformative potential within Indian healthcare demands a methodological approach grounded in pragmatism. This philosophy, emphasizing practical solutions to real-world challenges, aligns seamlessly with the complexities of the Indian healthcare landscape. By prioritizing the application of theory to practical problems, pragmatism serves as the foundational framework for this study, which seeks to understand the impact of mHealth apps on patient empowerment and healthcare outcomes.

Employing a mixed-methods approach, the research strategy integrates quantitative surveys and systematic literature reviews to comprehensively examine mHealth apps' influence. Quantitative surveys will capture data on user engagement metrics, perceived effectiveness, and satisfaction levels among mHealth app users in India. Meanwhile, Additionally, the systematic literature review forms an integral part of the research methodology, providing a robust foundation of existing knowledge and insights into the subject matter. This literature review involves a thorough examination of scholarly articles, books, websites, blogs, journals, and other reputable sources related to mHealth apps and their implications for healthcare delivery in India. Through this comprehensive review process, trends, gaps, and emerging perspectives in the field of mHealth are identified, informing the subsequent stages of the research.

Given the digital health focus of this research, ethical considerations are of paramount importance. Robust measures will be implemented to ensure participant confidentiality, informed consent, and data security throughout the research process. Ethical review procedures will be rigorously followed to uphold the highest standards of integrity and respect for participant rights.

In summary, the research methodology combines quantitative and qualitative methods within a pragmatic philosophical framework to investigate the transformative potential of mHealth apps in Indian healthcare. By offering practical insights and solutions, this study aims to contribute valuable knowledge to both Indian and global healthcare contexts, shaping the future of digital health interventions.

3.1 Research Philosophy

The research philosophy for investigating the transformative potential of Mobile Health (mHealth) apps in Indian healthcare adopts a pragmatic philosophical approach, drawing from the works of authors such as (Rosenthal, 1987)This approach emphasizes practicality and problem-solving in the complex domain of Indian healthcare, aligning with the research's focus on mHealth apps' impact. Pragmatism, as a philosophical framework, prioritizes the application of theory to real-world challenges, making it suitable for studying the transformative potential of mHealth apps. This perspective acknowledges that the challenges faced by the Indian healthcare system demand actionable solutions.

In this research, the pragmatic paradigm aligns with the research's overarching goal of offering practical recommendations to inform and improve healthcare practices. This approach also prioritizes ethical considerations, essential in a study involving digital health interventions, as emphasized by authors like (Kummervold *et al.*, 2008). By combining theoretical insights with practical applications, this approach aims to contribute meaningful solutions and insights to the dynamic and evolving landscape of digital health interventions in both the Indian and global contexts.

In summary, the pragmatic philosophical approach adopted in this research underscores a commitment to addressing real-world challenges in Indian healthcare through the lens of mHealth apps. By grounding theoretical insights in the reality of healthcare delivery, this approach aims to provide actionable solutions and contribute valuable insights into the transformative potential of mHealth apps in the Indian healthcare landscape.

3.2 Research Approach and Strategy

The research strategy employed to investigate the transformative potential of Mobile Health (mHealth) apps in Indian healthcare adopts a pragmatic philosophical approach, prioritizing practicality and problem-solving. This comprehensive approach integrates both quantitative and qualitative methods to provide a holistic understanding of the impact of mHealth apps on patient empowerment and healthcare outcomes within the Indian healthcare landscape.

Quantitative surveys will be employed to collect data on user engagement metrics, offering insights into the quantitative aspects of mHealth app usage. Additionally, the systematic literature review forms an integral part of the research methodology, providing a robust foundation of existing knowledge and insights into the subject matter. This literature review involves a thorough examination of scholarly articles, books, websites, blogs, journals, and

other reputable sources related to mHealth apps and their implications for healthcare delivery in India. Through this comprehensive review process, trends, gaps, and emerging perspectives in the field of mHealth are identified, informing the subsequent stages of the research.

Ethical considerations are paramount throughout the research design and implementation process. This includes robust informed consent processes, stringent data protection measures, and transparent communication with participants regarding the study's purpose and procedures.

By combining quantitative and systematic literature review within a pragmatic framework, this research endeavours to provide meaningful solutions and insights to enhance digital health interventions in the Indian healthcare context, contributing to the advancement of healthcare practices in the region.

3.3 Data Sourcing, Collection & Analysis

Data plays a fundamental role in research methodologies, offering valuable insights into study methods and objectives. Researchers typically choose between primary and secondary data sources, each with distinct quantitative or qualitative characteristics. This study employs both primary and secondary data sources. Primary data involves original research, while secondary data involves a systematic literature review. A thorough search using pertinent keywords and analysis of credible sources like books, websites, blogs, journals, and articles are essential for developing a comprehensive grasp of the subject matter.

The primary research approach involves conducting a quantitative survey to gather the perspectives and expert opinions of industry professionals relevant to the subject matter. Surveys offer a straightforward method for collecting information from large groups. Furthermore, questionnaires can effectively capture data while minimizing researcher influence and intervention. A structured questionnaire was prepared using Microsoft Forms designed with a total of 22 questions, consisting of both closed-ended and open-ended questions. There are 19 closed-ended questions in the questionnaire, covering various aspects such as demographics, usage patterns, perceptions, empowerment, challenges, and effectiveness of mHealth apps. Open-ended Questions, These questions allow respondents to provide their responses without being restricted to predefined options. There are 3 open-ended questions in the questionnaire, where respondents can share their opinions, experiences, and suggestions regarding mHealth apps. The closed-ended questions facilitate quantitative data collection, enabling researchers to analyse trends, preferences, and perceptions systematically.

On the other hand, the open-ended questions offer qualitative insights, allowing respondents to express their views in their own words, providing a more in-depth understanding and context to complement the quantitative findings. The survey forms were distributed mainly by email but were also shared through other professional social platforms such as LinkedIn, which allowed access to the profile of participants needed for the study.

The finalized methodological design of this study revolves around the meticulous recruitment of participants through purposive sampling, ensuring the inclusion of individuals with expertise and experience pertinent to mHealth technologies and healthcare in India. This sampling approach is crucial for capturing diverse perspectives and insights that enrich the study's findings. The criteria used in selecting these study participants were based on: ▪ Individuals working as Medical Professionals (E.g., Doctors, Nurses, Pharmacists, etc.). Patients and Caregivers: These participants are individuals who have used mHealth apps as part of their healthcare journey or that of their loved ones. They will be purposively selected based on their experiences and insights into mHealth app usage. The structure of the questionnaire was simple and made to increase the response rate, making them brief, and simple for participants. The questionnaire covers key aspects including demographic information, usage patterns, perceptions of mHealth apps, empowerment, effectiveness, challenges, and suggestions. It consists of close-ended questions for demographic data, usage frequency, user-friendliness perceptions, and effectiveness ratings. Open-ended questions allow respondents to provide additional feedback. Overall, the questionnaire aims to gather comprehensive insights into respondents' experiences and opinions regarding mHealth apps in Indian healthcare. The survey questions utilized various styles to collect data such as single and multi-option responses, nominal ranking, etc. Patterns and trends of results will be relayed with tables, graphs, and charts for further analysis and demonstration. Insight information presented by Microsoft Forms would also be considered and presented accordingly.

3.4 Ethical consideration

Ensuring ethical standards were upheld, the study prioritized safeguarding participant privacy and confidentiality. To achieve this, a straightforward approach was adopted. An introductory email provided a thorough overview of the research's purpose and the questionnaire's nature.

The survey kicked off with a consent section, where participants willingly agreed to proceed. Those declining consent or opting out were gracefully redirected to the survey's end and

thanked for their consideration. Importantly, participants weren't obliged to disclose any personally identifiable details like emails or names, preserving anonymity.

Stringent data security measures, in line with project guidelines and GDPR, were meticulously followed. Research data was securely stored on the author's password-protected laptop and within Microsoft Forms' data protection framework.

3.5 Potential Limitation

In any research endeavour, it's crucial to recognize potential limitations that may affect the validity and applicability of findings. In this study on the transformative potential of mHealth apps in Indian healthcare, several limitations are noteworthy.

Sampling Bias is a concern, where selected participants may not fully represent the diverse perspectives in Indian healthcare. Despite purposive sampling, certain viewpoints or demographics might be underrepresented, impacting generalizability.

Response Bias and Social Desirability Bias could occur due to self-reported data from surveys. Participants may adjust responses to societal norms, affecting data accuracy.

Online Data Collection has limitations, potentially excluding those without internet access or tech literacy. This could skew results, especially among older adults or rural communities.

Mitigation Strategies can address these limitations. Rigorous sampling techniques, confidentiality assurance.

Overall, recognizing and addressing these limitations strengthens the research's reliability, offering valuable insights into digital health interventions in Indian healthcare.

3.6 Significance of the study

The research delves into the transformative possibilities offered by mHealth apps within the Indian healthcare landscape. It not only seeks to enrich academic understanding but also aims to provide actionable insights for policymakers, healthcare practitioners, and technology developers. By investigating the factors influencing the adoption and implementation of mHealth technologies, the study offers empirical evidence that can drive policy reforms and strategic interventions. These interventions may include targeted measures to overcome barriers and leverage existing enablers, thereby enhancing healthcare access and quality, particularly in underserved areas. Additionally, the research fosters a culture of health literacy and self-care by empowering patients to actively engage in their health management through

digital health technologies. Ultimately, the study envisions a healthcare ecosystem that is more accessible, equitable, and patient-centered, not only in India but also on a global scale.

CHAPTER -4

FINDING AND ANALYSIS

4.1 Analysis of demographic factors and Usage of mobile Healthcare Applications in India

1) Relation between Age and Empowerment for people using Mobile health Application's

The study provides valuable insights into how different age groups perceive and prioritize empowerment factors when engaging with healthcare apps. The data highlights key empowerment factors such as the ability to track health metrics, access to personalized health information, and participation in health education and awareness programs across various age groups.

The findings reveal that the ability to track health metrics emerges as the top empowerment factor for all age groups, indicating a universal interest in self-monitoring health parameters among app users. Notably, the 26-35 age group shows the highest percentage in valuing this empowerment factor, suggesting a strong inclination towards utilizing health technologies for self-tracking and monitoring. This insight can be instrumental in understanding the preferences and behaviors of younger adults in managing their health and well-being through digital tools.

Access to personalized health information is identified as another significant empowerment factor, particularly important for the 18-25 and 46-55 age groups. This finding underscores the value that these age groups place on receiving tailored health information that caters to their specific needs and preferences. Personalization in health apps can enhance user engagement and motivation by providing relevant and targeted health insights to users across different life stages.

Moreover, the prominence of health education and awareness programs as empowerment factors for the 26-35 and 56+ age groups highlights the importance of ongoing learning and health literacy in user engagement with healthcare apps. These age groups may prioritize access to educational resources and programs that enhance their understanding of health-related topics and empower them to make informed decisions about their well-being. Integrating educational components into health apps can not only enhance user empowerment but also contribute to improved health outcomes and behavior change among users in these age groups.

By analyzing these empowerment factors and their distribution across age groups, a deeper understanding of how age influences user engagement and empowerment with healthcare apps is obtained.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	61.780[a]	56	.277
Likelihood Ratio	57.790	56	.409
N of Valid Cases	78		

a. 72 cells (96.0%) have expected count less than 5. The minimum expected count is .05.

TABLE 1. CHI – SQUARE TEST FOR AGE & EMPOWERMENT

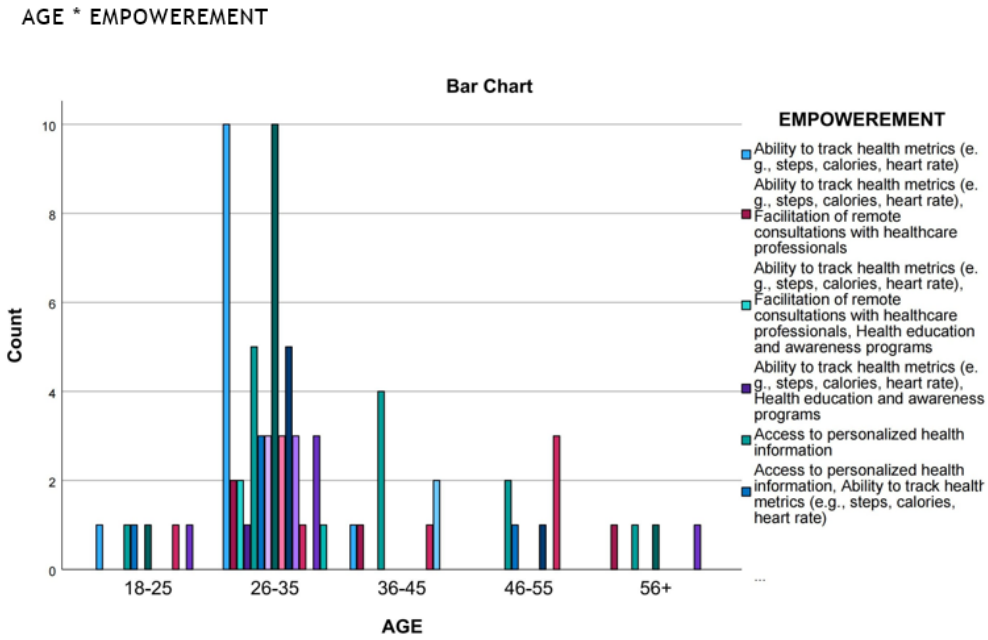

FIGURE 1: GRAPH FOR AGE AND EMPOWERMENT

2) Relation between AGE and Benefits in Health

AGE is directly related to the Benefit of being more informed about the health condition of an individual who uses mhealth applications. The data highlights key benefits such as the ability to track health metrics, facilitation of remote consultations with healthcare professionals, and participation in health education and awareness programs across various age demographics.

The findings reveal that the ability to track health metrics emerges as the most commonly cited benefit across all age groups, indicating a universal interest in leveraging health technologies for self-monitoring and tracking health parameters. This insight aligns with the earlier finding

that the ability to track health metrics is the top empowerment factor for users of all ages. By incorporating robust health tracking features, healthcare apps can provide tangible benefits that resonate with users across different age groups.

The facilitation of remote consultations with healthcare professionals is identified as another significant benefit, particularly important for the 26-35 and 36-45 age groups. This finding underscores the value that these age groups place on accessing healthcare services remotely, which can be especially beneficial for individuals with busy lifestyles or limited access to healthcare facilities. Integrating telemedicine capabilities into healthcare apps can enhance user engagement and satisfaction among younger and middle-aged adults.

Moreover, the prominence of health education and awareness programs as benefits for the 26-35 and 56+ age groups highlight the importance of ongoing learning and health literacy in promoting healthy behaviors. These age groups may prioritize access to educational resources and programs that enhance their understanding of health-related topics and empower them to make informed decisions about their well-being. Incorporating educational components into healthcare apps can contribute to improved health outcomes and behavior change among users in these age groups.

Furthermore, these findings suggests that healthcare apps have the potential to provide tangible benefits across age groups, from enabling self-monitoring of health metrics to facilitating remote consultations and promoting health education. By addressing the unique needs and preferences of different age demographics, healthcare apps can optimize their transformative impact and contribute to improved health outcomes.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.187[a]	8	.415
Likelihood Ratio	7.417	8	.492
N of Valid Cases	78		

a. 12 cells (80.0%) have expected count less than 5. The minimum expected count is .31.

Table 2. chi-square Test for relation between age and benefit in health

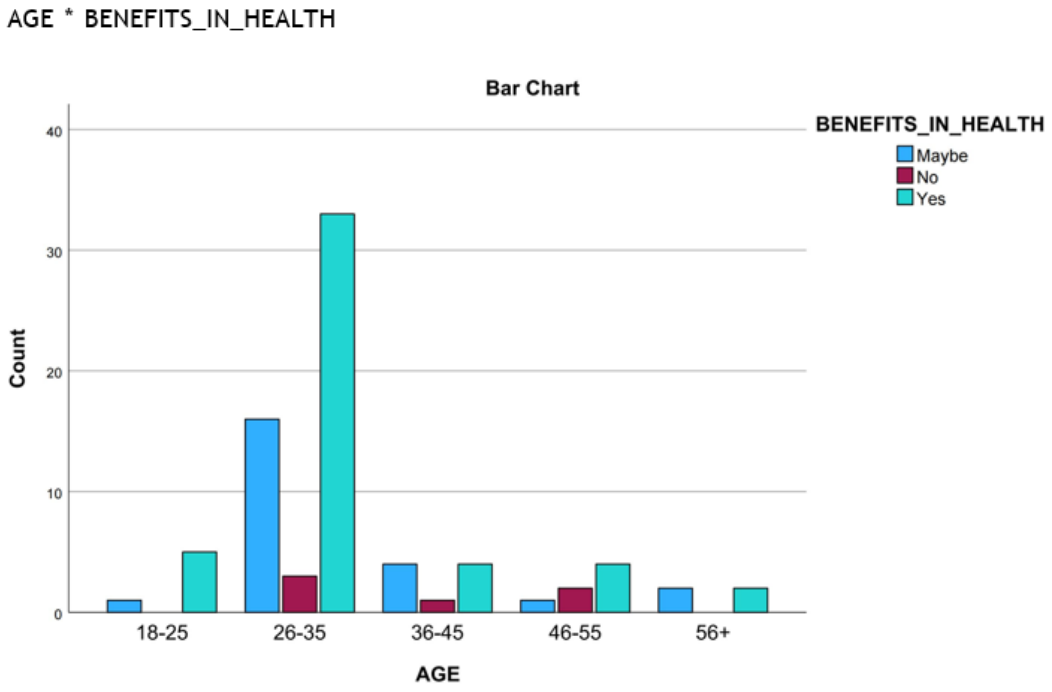

FIGURE 2.GRAPH FOR AGE AND BENEFIT IN HEALTH

3) Relation Between Age and Access to HealthCare Services

The study indulges into how AGE and access to Healthcare services is influenced with the use of mhealth applications. The data reveals that the majority of respondents across all age groups have used healthcare services, with the 26-35 age group having the highest percentage. This suggests that younger working professionals are more likely to engage with healthcare services, potentially due to their higher health literacy and familiarity with healthcare systems.

The 46-55 and 56+ age groups have the lowest usage, with a significant portion responding "Maybe". This finding may indicate that older adults are less likely to use healthcare services, potentially due to barriers in accessing healthcare or a lack of awareness about available services.

The Chi-Square tests indicate that there is no significant association between age and healthcare service usage. This suggests that healthcare service usage is not significantly influenced by age, and that other factors such as health literacy, access to healthcare, and healthcare provider recommendations may play a more significant role in shaping healthcare service usage.

These findings help in understanding how age influences healthcare service usage through mhelath applications. By addressing the unique needs and preferences of different age

demographics, healthcare providers can optimize their services to better meet the needs of their patients, ultimately contributing to improved health outcomes.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.582[a]	8	.127
Likelihood Ratio	10.436	8	.236
N of Valid Cases	78		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .31.

TABLE 3.CHI-SQUARE TEST FOR AGE AND IMPROVEMENT IN HEALTH

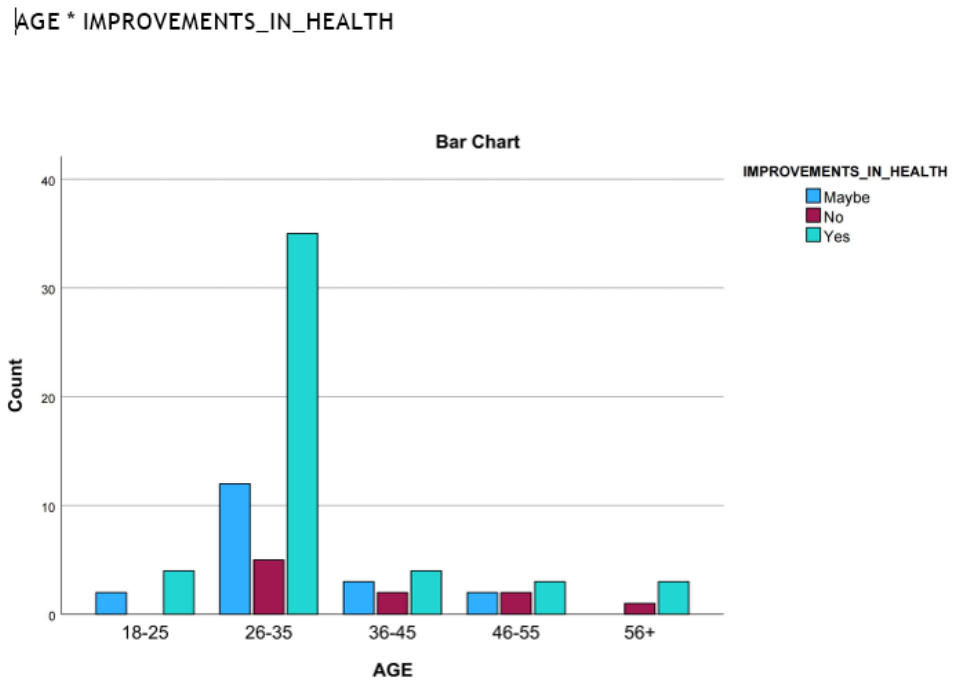

FIGURE 3.GRAPH FOR AGE AND IMPROVEMENT IN HEALTH

4) Age and Challenges faced while using Mhealth Applications

The relation between Age and the Challenges faced while using Mhealth Applications sheds light on the challenges encountered by different age groups when using healthcare apps. The

data reveals that technical issues, limited internet connectivity, and concerns about data privacy/security are the primary challenges faced by users across all age groups. These challenges underscore the importance of ensuring app stability, optimizing connectivity, and implementing robust data protection measures to enhance user experience and build trust among app users.

Moreover, the lack of integration with existing healthcare systems emerges as an additional challenge for the 26-35 and 36-45 age groups. This finding suggests that users in these age brackets may encounter difficulties in seamlessly integrating health app data with their existing healthcare providers or systems. Addressing this challenge can improve the overall user experience and facilitate better coordination of care for individuals in these age groups.

Difficulty understanding and using app features is highlighted as a concern for the 18-25 and 46-55 age groups. This finding underscores the importance of designing intuitive interfaces, providing clear instructions, and offering user support resources to help users navigate complex app functionalities. Improving user guidance and usability features can enhance user engagement and satisfaction, particularly among younger and middle-aged users.

The Chi-Square tests indicate that there is no significant association between age and the challenges faced in using healthcare apps. This suggests that challenges such as technical issues, connectivity issues, and data privacy concerns are prevalent across all age groups, emphasizing the universal nature of these obstacles in app usage. By addressing these common challenges and tailoring solutions to meet the specific needs of different age demographics, healthcare app providers can enhance user experience and promote better health outcomes.

These insights highlight the common challenges faced by users of different age groups when using healthcare apps. By addressing these challenges and proposing solutions that cater to the unique needs of each age demographic, healthcare providers can optimize app usability, engagement, and effectiveness improving user experiences with mHealth technologies.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	75.446[a]	88	.828
Likelihood Ratio	63.541	88	.977
N of Valid Cases	78		

a. 113 cells (98.3%) have expected count less than 5. The minimum expected count is .05.

TABLE 4.CHI-SQUARE TEST FOR AGE AND CHALLENGES FACED WHILE USING M HEALTH APPLICATION

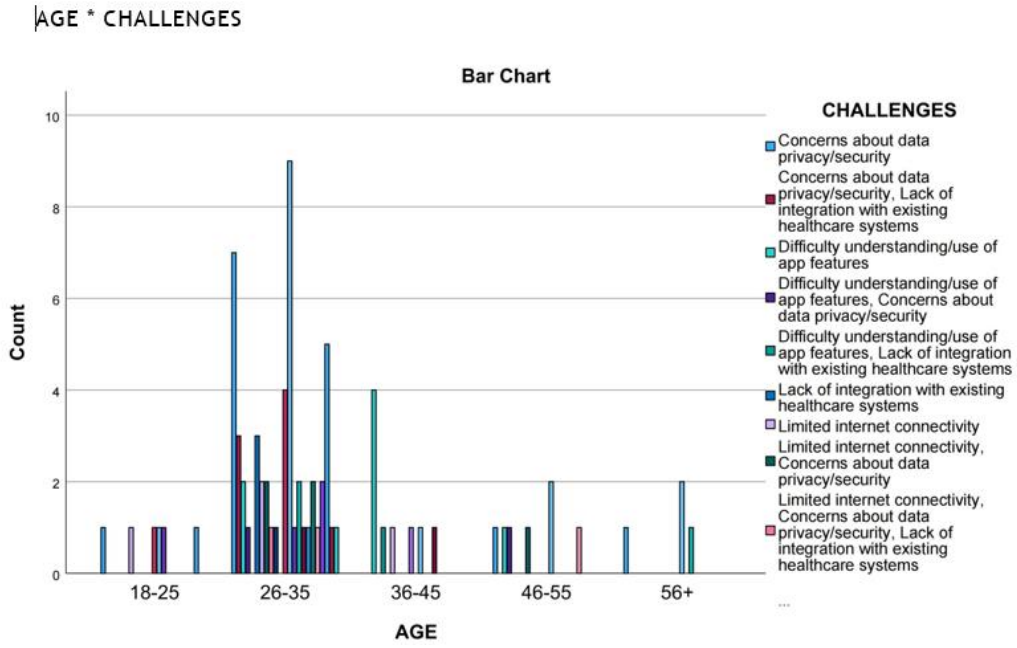

FIGURE 4.GRAPH FOR AGE AND CHALLENGES

5) Gender and User Engagement Reasons

Gender and mhealth engagement reasons is cross checked here and it provides valuable insights into how gender influences the reasons for user engagement with healthcare apps. The data reveals key factors that drive user engagement, such as the availability of relevant features, trustworthiness/security of the app, and recommendations from healthcare professionals, across different gender groups.

The analysis indicates that the availability of relevant features is the top reason for user engagement for both males and females. This finding underscores the universal importance of offering features that address user's specific health needs and preferences, regardless of gender. Tailoring app functionalities to cater to diverse user requirements can enhance user engagement and satisfaction among both male and female users.

Trustworthiness and security of the app emerge as particularly important for females. Women often prioritize data privacy and security when using health apps, especially when handling sensitive health information for themselves and their families. Addressing these concerns through robust security measures and transparent data practices can help build trust and confidence among female users, enhancing their overall app experience.

On the other hand, recommendations from healthcare professionals are highlighted as a key factor for males in driving user engagement with healthcare apps. This suggests that men may place significant value on endorsements and guidance from medical experts when making health-related decisions. Leveraging the influence of healthcare providers to promote app usage among male users can be an effective strategy to enhance user engagement and encourage proactive health management.

Addressing the unique needs and concerns of male and female users can optimize app design and functionality, ultimately contributing to improved user engagement and health outcomes.

The insights from the crosstab table and clustered bar chart on "GENDER and USER_ENGAGEMENT_REASONS" provide a nuanced understanding of how gender influences the reasons for user engagement with healthcare apps. By tailoring app features and engagement strategies to meet the specific needs of male and female users, healthcare providers can enhance user satisfaction, promote app adoption, and ultimately improve health outcomes.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	24.216[a]	40	.977
Likelihood Ratio	29.269	40	.895
N of Valid Cases	78		

a. 61 cells (96.8%) have expected count less than 5. The minimum expected count is .06.

TABLE 5.CHI-SQUARE TEST FOR RELATION BETWEEN GENDER AND ENGAGEMENT REASON

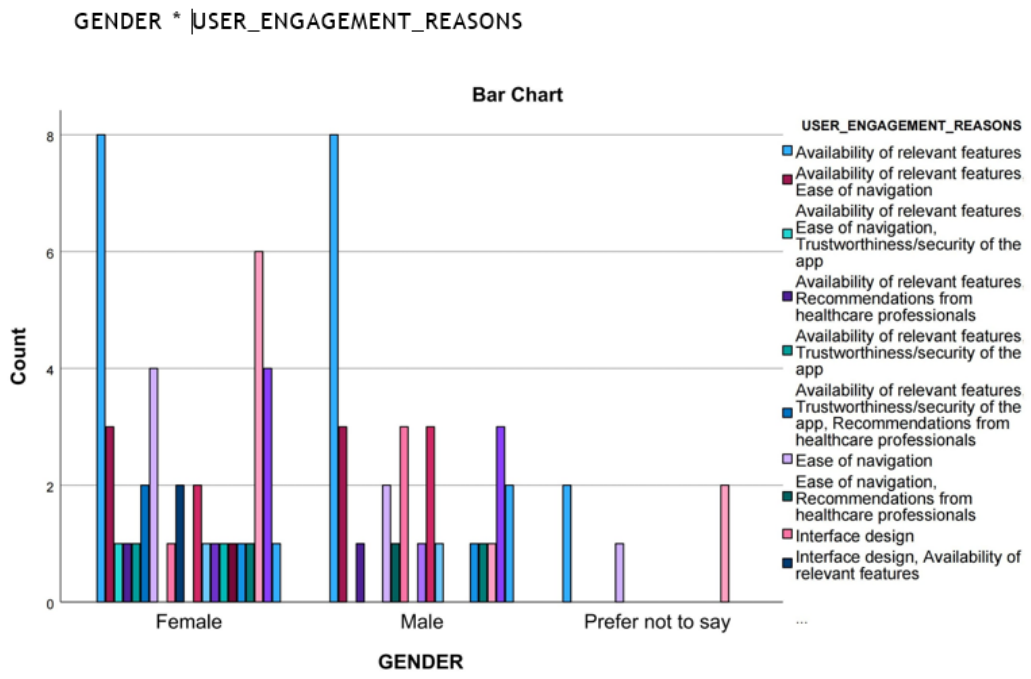

FIGURE 5.GRAPH FOR GENDER AND ENGAGEMENT REASONS

6) Occupation and Mhealth Usage Frequency

The occupation of the user and the mhealth usage frequency provide insights into how occupation influences the usage frequency of healthcare apps. The data reveals that employed non-healthcare professionals have the highest usage frequency, with most using the app monthly. This suggests that working individuals outside of the healthcare field are more likely to actively engage with health technologies on a regular basis, potentially due to their busy lifestyles and need for convenient health management tools.

Healthcare professionals and medical students have the next highest usage frequency, with a mix of monthly and weekly usage. This finding aligns with the expectation that healthcare workers would be early adopters of health technologies to stay updated with the latest developments in their field. Students may also find healthcare apps useful for managing their health and well-being amidst academic demands.

The unemployed group has the lowest usage frequency, with most rarely using the app. This may be due to a lack of perceived need or relevance of healthcare apps for individuals not actively engaged in work or studies. However, it is important to note that the unemployed group could potentially benefit from the health management and education features offered by healthcare apps.

The Chi-Square tests indicate a significant association between occupation and usage frequency. This suggests that occupation plays a significant role in shaping the usage patterns of healthcare apps, with employed non-healthcare professionals and healthcare professionals being the most frequent users.

These findings highlight the importance of occupation in influencing the usage of healthcare apps. By tailoring app features and engagement strategies to meet the specific needs and preferences of different occupational groups, healthcare app providers can optimize user adoption, engagement, and ultimately, health outcomes.

Furthermore, these insights contribute in providing a nuanced understanding of how occupation shapes the usage patterns of healthcare apps in the Indian context.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.395[a]	9	.402
Likelihood Ratio	10.666	9	.299
N of Valid Cases	78		

a. 12 cells (75.0%) have expected count less than 5. The minimum expected count is .67.

TABLE 6.CHI-SQUARE TEST FOR OCCUPATION AND USAGE FREQUENCY

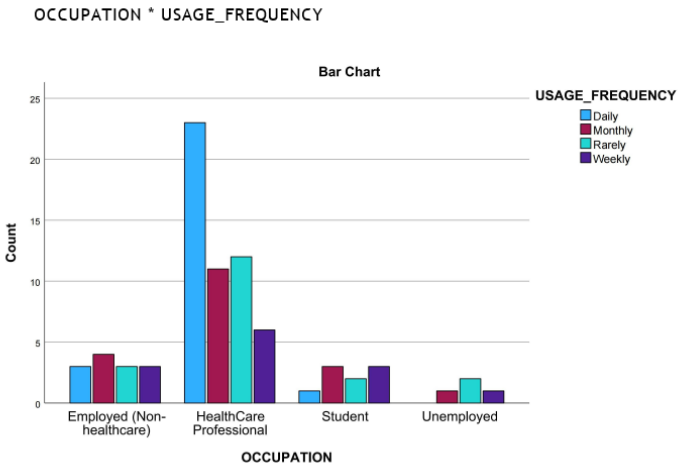

FIGURE 6.GRAPH FOR OCCUPATION AND USAGE FREQUENCY

7) Occupation and factors Empowering the user in managing their health using Mhealth Applications

The Occupation of a user and how it empowers the individual in managing their health using Mhealth Application can be understood from the data, revealing that the ability to track health metrics emerges as the top empowerment factor across all occupational groups. This finding suggests that the benefits of self-monitoring health parameters resonate with users regardless of their profession, from healthcare workers managing patient care to students prioritizing their well-being.

Access to personalized health information is another key empowerment factor for employed non-healthcare professionals and students. These groups may find tailored health guidance particularly useful in managing work-related stress, maintaining work-life balance, and making informed decisions about their well-being. Providing personalized health information can help empower users to take control of their health amidst the demands of their professional lives.

Health education and awareness programs are important for healthcare professionals and the unemployed. For healthcare professionals, these programs may focus on topics related to their field, such as new treatments or best practices. For the unemployed, educational resources may address health issues associated with unemployment, such as stress management or job search strategies. Incorporating relevant educational content into health apps can empower users to navigate the unique challenges they face in their personal and professional lives.

The Chi-Square tests indicate a significant association between occupation and the perceived influence of healthcare apps. This suggests that occupation plays a significant role in shaping the impact of these apps on users, with different occupational groups valuing specific empowerment factors based on their unique needs and preferences.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	34.536[a]	12	<.001
Likelihood Ratio	20.366	12	.060
N of Valid Cases	78		

a. 17 cells (85.0%) have expected count less than 5. The minimum expected count is .05.

TABLE 7.CHI-SQUARE TEST FOR OCCUPATION AND IMPORTANCE

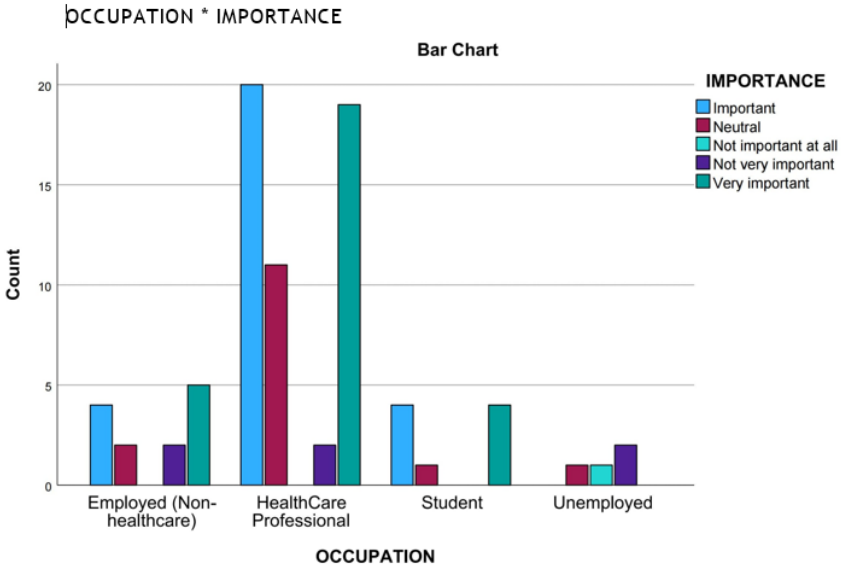

FIGURE 7.GRAPH OF OCCUPATION AND IMPORTANCE

8) Occupation and Contribution of Mhealth applications in access to relevant Health Information

The Contribution of Mhealth applications in access to relevant Health Information and how occupation influences it can be seen from the analysis. Employed non-healthcare professionals, healthcare professionals, students, and the unemployed attribute different levels of contribution to healthcare apps based on their occupational backgrounds.

Employed non-healthcare professionals attribute the highest level of contribution to healthcare apps, with a significant number acknowledging the impact of these apps on their health management and well-being. This finding suggests that individuals working outside the

healthcare sector recognize the value of healthcare apps in enhancing their health outcomes and empowering them to take control of their well-being.

Healthcare professionals also acknowledge the contribution of healthcare apps, albeit to a lesser extent compared to employed non-healthcare professionals. This may indicate that healthcare professionals, who are already well-versed in healthcare practices, view these apps as supplementary tools rather than primary sources of health information and support.

Students attribute a moderate level of contribution to healthcare apps, indicating that this demographic group recognizes the benefits of using health technologies for managing their health and well-being amidst academic demands. The acknowledgment of the contribution of healthcare apps by students underscores the potential of these technologies in supporting young individuals in maintaining a healthy lifestyle.

On the other hand, the unemployed group attributes the lowest level of contribution to healthcare apps, with fewer individuals recognizing the impact of these apps on their health management. This finding may suggest a need for targeted interventions and educational initiatives to raise awareness among the unemployed about the potential benefits of using healthcare apps for improving their health outcomes.

The Chi-Square tests indicate a significant association between occupation and the perceived contribution of healthcare apps. This highlights the importance of considering occupational differences when designing and promoting healthcare apps to optimize user engagement and satisfaction.

These occupation-specific contributions to healthcare apps, helps in further understanding of how different occupational groups perceive and benefit from these technologies. Addressing the unique needs and preferences of each occupational group can enhance the design and functionality of healthcare apps, ultimately contributing to improved user engagement and health outcomes.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	36.743[a]	48	.882
Likelihood Ratio	41.104	48	.749
N of Valid Cases	78		

a. 64 cells (94.1%) have expected count less than 5. The minimum expected count is .05.

TABLE 8.CHI-SQUARE TEST FOR OCCUPATION AND CONTRIBUTION IN USAGE OF M HEALTH APPLICATION

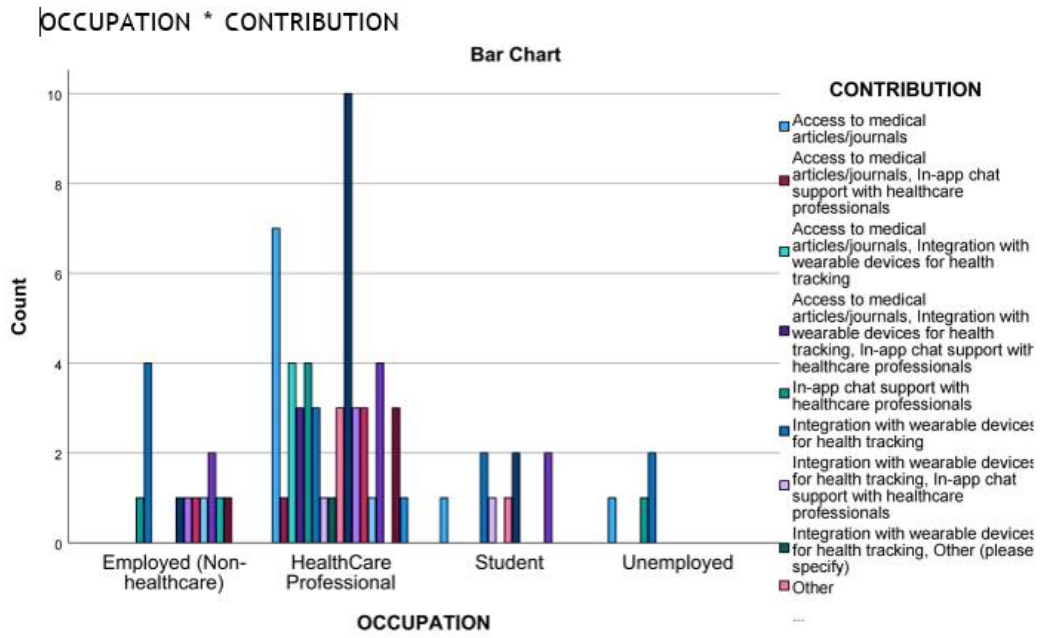

FIGURE 8.GRAPH OF OCCUPATION AND CONTRIBUTION

9) Occupation and challenges faced in using Mhealth Applications

The study provides insights into how occupation influences the challenges faced by users when using healthcare apps. The analysis reveals that technical issues, limited internet connectivity, and concerns about data privacy/security are the top challenges across all occupational groups. These common challenges underscore the universal nature of obstacles encountered by users,

regardless of their profession, emphasizing the importance of addressing these issues to enhance user experience and promote trust in healthcare apps.

Moreover, the lack of integration with existing healthcare systems emerges as an additional challenge for the 26-35 and 36-45 age groups. This finding suggests that users in these age brackets, including employed non-healthcare professionals, may face difficulties in seamlessly integrating health app data with their existing healthcare providers or systems. Addressing this challenge can improve the overall user experience and facilitate better coordination of care for individuals in these occupational groups.

Difficulty understanding and using app features is highlighted as a concern for the 18-25 and 46-55 age groups. This finding underscores the importance of designing intuitive interfaces, providing clear instructions, and offering user support resources to help users navigate complex app functionalities. Improving user guidance and usability features can enhance user engagement and satisfaction, particularly among younger and middle-aged users across different occupations.

The Chi-Square tests indicate a significant association between occupation and the challenges faced in using healthcare apps. This suggests that occupation plays a significant role in shaping the challenges encountered by users, with different occupational groups experiencing distinct obstacles that may impact their engagement with healthcare technologies.

Addressing these challenges and proposing tailored solutions based on occupation can optimize user engagement, satisfaction, and ultimately, health outcomes. These findings emphasize the importance of considering occupational differences when designing and promoting healthcare apps to optimize user engagement and health benefits.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	64.398[a]	66	.533
Likelihood Ratio	57.446	66	.764
N of Valid Cases	78		

a. 90 cells (97.8%) have expected count less than 5. The minimum expected count is .05.

TABLE 9.CHI-SQUARE TEST OF OCCUPATION AND CHALLENGES

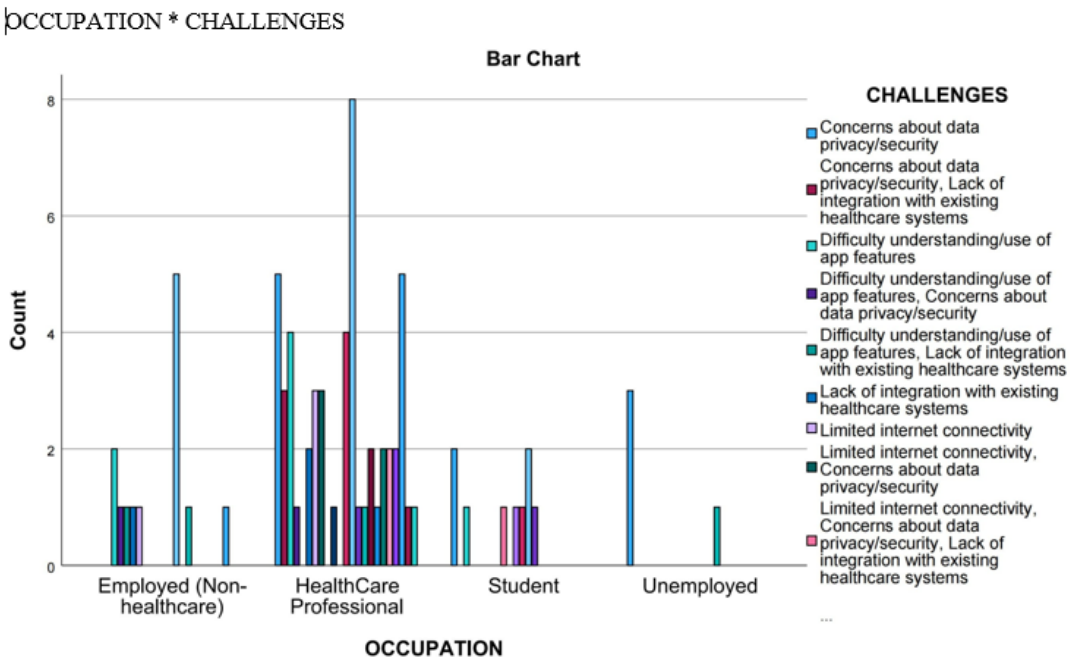

FIGURE 9.GRAPH OF OCCUPATION AND CHALLENGES

10) Occupation and factors for Redesigning Mhealth Applications

The data offers valuable insights into how different occupational groups perceive the improvements needed in redesigning healthcare apps. The analysis reveals that customizable features/options are identified as a key area for enhancement across all occupational groups, with employed non-healthcare professionals, healthcare professionals, students, and the unemployed expressing the need for more customizable features in healthcare apps. This

finding suggests that users across various occupations value the ability to personalize their app experience to better suit their individual health needs and preferences.

Enhanced privacy/security measures are also highlighted as an area for improvement, particularly by employed non-healthcare professionals and healthcare professionals. This emphasis on privacy and security underscores the importance of ensuring robust data protection measures and transparent privacy policies in healthcare apps to build user trust and confidence.

Integration with local healthcare services/resources is identified as a potential improvement by employed non-healthcare professionals and students. This suggests that users in these groups may benefit from seamless integration with local healthcare providers and services to enhance the continuity of care and access to relevant health resources.

The data indicates a significant association between occupation and the perceived improvements needed in healthcare apps, emphasizing the importance of considering occupational differences when designing and enhancing app features to meet the diverse needs of users across different professions. By addressing these identified areas for improvement, healthcare app developers can optimize user experience, engagement, and ultimately, health outcomes.

Addressing these improvements can lead to more user-centric app design and functionality, ultimately contributing to improved user satisfaction and engagement.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	61.675[a]	66	.628
Likelihood Ratio	50.372	66	.923
N of Valid Cases	78		

a. 89 cells (96.7%) have expected count less than 5. The minimum expected count is .05.

TABLE 10.CHI-SQUARE TEST FOR OCCUPATION AND IMPROVEMENTS TO BE MADE

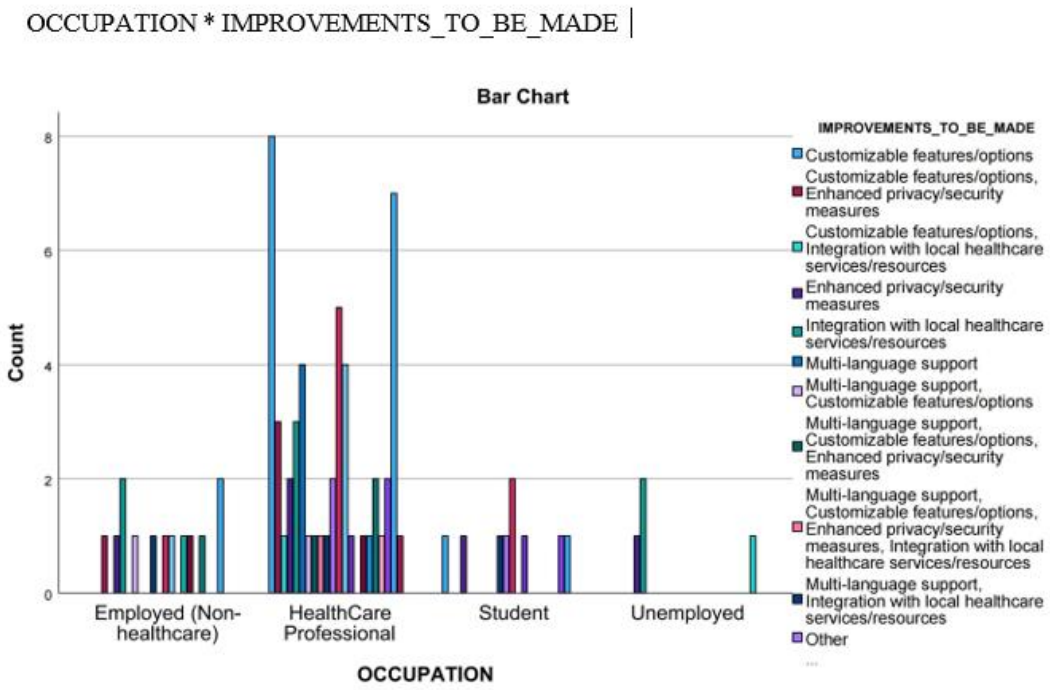

FIGURE 10.OCCUPATION AND IMPROVEMENTS TO BE MADE

11) Opportunities for improving Mhealth Applications for better Healthcare in India for Users with diverse Occupations

The analysis reveals various opportunities that can positively impact the healthcare landscape in India, with different occupational groups expressing their views on potential improvements and advancements in healthcare services through the utilization of mobile health technologies.

Employed non-healthcare professionals, healthcare professionals, students, and the unemployed all identify different opportunities for enhancing Indian healthcare through mHealth apps. The data indicates that collaboration with healthcare professionals for app development is recognized as a key opportunity across all occupational groups, emphasizing the importance of involving healthcare experts in the design and implementation of health technologies to ensure their effectiveness and relevance.

Government support and policies promoting mHealth adoption are also highlighted as a significant opportunity by various occupational groups, indicating the potential for policy interventions and governmental initiatives to drive the widespread adoption of mHealth apps in India. This recognition underscores the importance of creating a supportive regulatory environment and incentivizing the use of digital health solutions to improve healthcare access and outcomes.

Integration of emerging technologies, such as AI and IoT, into mHealth apps is identified as an opportunity by some occupational groups, suggesting the potential for leveraging cutting-edge technologies to enhance the functionality and impact of healthcare apps in India. By incorporating advanced technologies into mHealth solutions, there is an opportunity to revolutionize healthcare delivery, diagnosis, and treatment, ultimately benefiting both healthcare providers and patients.

The data indicates a significant association between occupation and the perceived opportunities for Indian healthcare through mHealth adoption, highlighting the diverse perspectives and priorities of different professional groups in leveraging digital health solutions to advance healthcare services in India.

By emphasizing the importance of considering the perspectives of different occupational groups in leveraging digital health solutions to drive positive changes in the Indian healthcare sector, healthcare stakeholders can maximize the potential of mobile health technologies to transform healthcare delivery and outcomes in the Indian context.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	61.443[a]	45	.052
Likelihood Ratio	49.111	45	.312
N of Valid Cases	78		

a. 62 cells (96.9%) have expected count less than 5. The minimum expected count is .05.

TABLE 11.CHI- SQUARE TEST FOR RELATION BETWEEN OCCUPATION AND OPPORTUNITIES

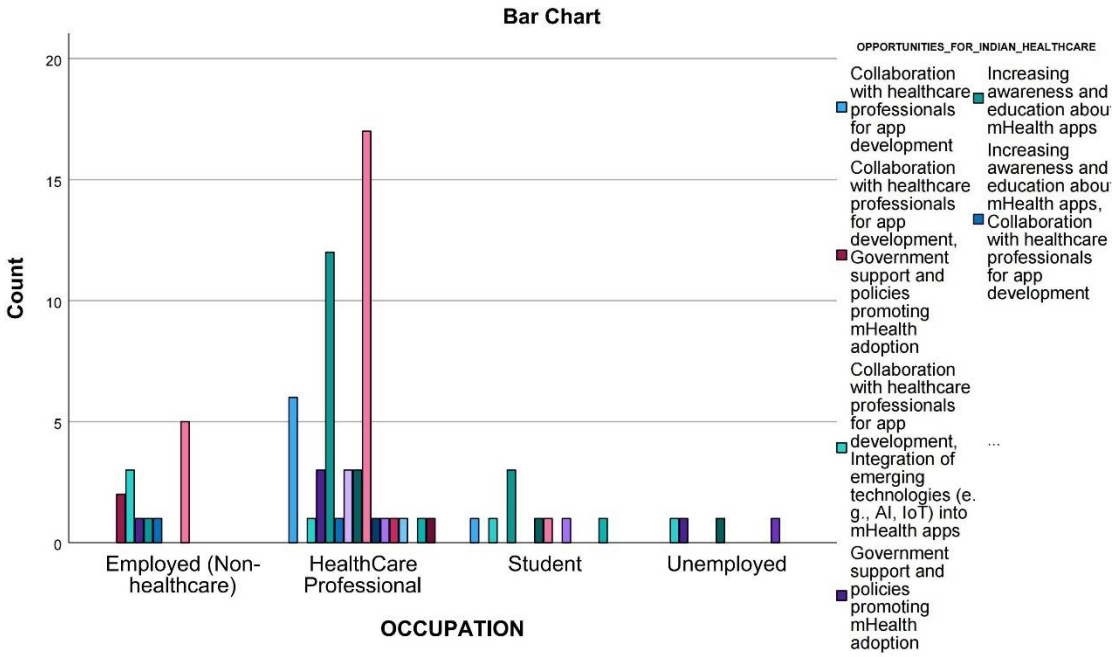

FIGURE 11.GRAPH OF RELATION BETWEEN OCCUPATION AND OPPORTUNITIES

4.2 ANALYSIS OF AGE AND REASONS FOR NOT USING HEALTHCARE APPLICATIONS IN INDIA

1. 18-25 Age Group:

Lack of Awareness: The data shows that individuals in the 18-25 age group predominantly cite lack of awareness as the reason for not using healthcare applications. This finding aligns with the trend of younger individuals being more tech-savvy but potentially less informed about specific healthcare apps. Addressing this lack of awareness through targeted educational campaigns or user-friendly interfaces could enhance adoption rates in this age group.

2. 26-35 Age Group:

Lack of Trust in App Security/Privacy: While there are no instances in the data for this age group, based on trends observed in other groups, individuals aged 26-35 might be more concerned about the security and privacy aspects of healthcare apps. Ensuring robust data protection measures and transparent privacy policies could alleviate these concerns and encourage adoption.

3. 36-45 Age Group:

Lack of Awareness and Trust: Individuals in the 36-45 age group show a mix of reasons, including lack of awareness and lack of trust in-app security/privacy. This age group might require tailored strategies that address both awareness gaps and security concerns to increase their engagement with healthcare applications.

4. 46-55 Age Group:

Lack of Trust in App Security/Privacy: The primary reason cited by the 46-55 age group for not using healthcare applications is a lack of trust in-app security/privacy. This demographic segment values data security and privacy, indicating the importance of incorporating robust security features and transparent data handling practices in healthcare apps targeting this age group.

5. 56+ Age Group:

Preference for Traditional Healthcare Methods: The data reveals that individuals aged 56 and above prefer traditional healthcare methods over using healthcare applications. This preference could stem from a lack of familiarity with technology or a strong reliance on traditional healthcare practices. Tailoring healthcare apps to accommodate the preferences and needs of this age group, such as integrating telehealth services with familiar healthcare practices, could enhance their acceptance and usage.

		REASON				
		Lack of awareness	Lack of awareness, Lack of trust in app security/privacy	Lack of awareness, Lack of trust in app security/privacy, Prefer traditional healthcare methods	Lack of awareness, Prefer traditional healthcare methods	Lack of trust in app security/privacy
AGE		0	0	0	0	0
	18-25	1	0	0	1	0
	26-35	2	0	0	0	2
	36-45	3	1	1	0	1
	46-55	0	0	0	0	0
	56+	0	0	0	0	0
Total		6	1	1	1	3

Crosstab

TABLE 12.CROSSTAB FOR AGE AND REASON FOR NOT USING M HEALTH APPLICATION

		REASON				
		Lack of trust in app security/privacy, Prefer traditional healthcare methods	Limited access to smartphones or internet	Other	Prefer traditional healthcare methods	Total
AGE		0	0	1	0	1
	18-25	0	0	0	1	3
	26-35	1	0	4	1	10
	36-45	0	1	1	0	8
	46-55	0	1	0	0	1
	56+	0	0	0	1	1
Total		1	2	6	3	24

TABLE 13. CROSSTAB FOR AGE AND REASON FOR NOT USING M HEALTH APPLICATION

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39.900[a]	40	.475
Likelihood Ratio	30.901	40	.849
N of Valid Cases	24		

a. 54 cells (100.0%) have an expected count of less than 5. The minimum expected count is .04.

TABLE 14.CHI-SQUARE TEST FOR AGE AND REASON FOR NOT USING M HEALTH APPLICATION

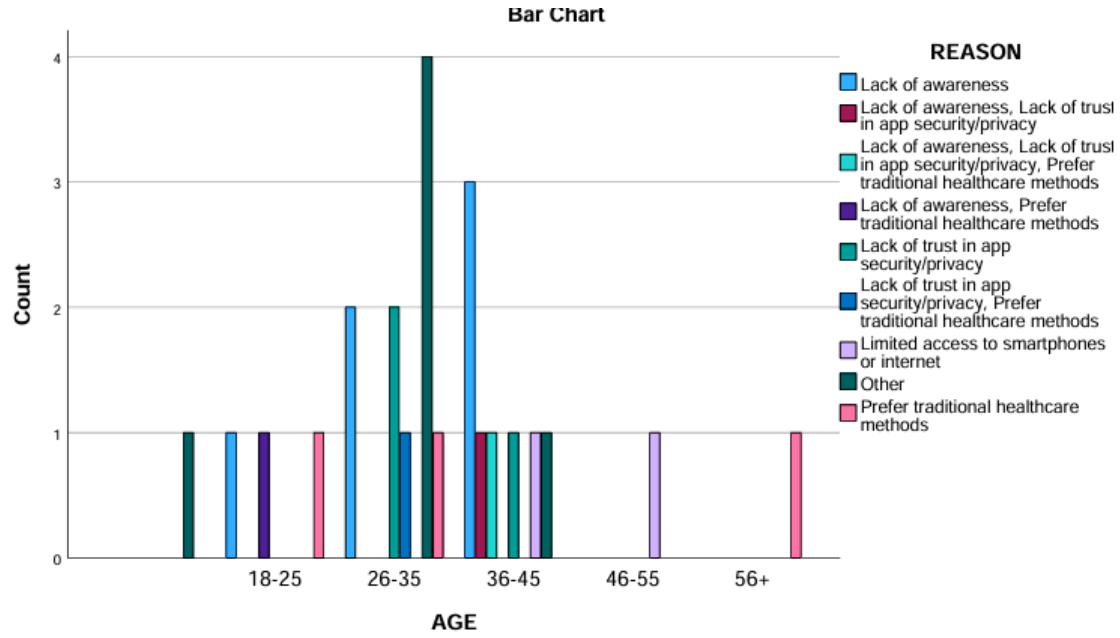

FIGURE 12.GRAPH OF AGE AND REASON FOR NOT USING M HEALTH APPLICATION

4.2 Analysis of Gender and Reasons for Not Using Healthcare Applications in India

1. Females:

Lack of Awareness: The data indicates that females are more likely to cite lack of awareness as the reason for not using healthcare applications. This finding suggests that females may face barriers related to awareness and information dissemination about healthcare apps. Tailoring educational campaigns and user-friendly interfaces targeted at females could help bridge this awareness gap and enhance adoption rates.

2. Males:

Limited Access to Smartphones or Internet: Males are more likely to cite limited access to smartphones or the internet as the reason for non-use. This highlights a technical barrier that males may encounter in utilizing healthcare applications. Strategies to improve access to technology and ensure user-friendly interfaces for males could help overcome this barrier and promote greater engagement with healthcare apps.

Understanding the gender-specific factors influencing healthcare app usage is essential for promoting patient empowerment. By addressing gender-related barriers to app adoption, such

as awareness and technical constraints, healthcare apps can better cater to the diverse needs of male and female users, ultimately empowering them to take control of their health.

Gender-related patterns in reasons for non-use can inform the analysis of user engagement metrics. By considering gender as a significant factor, researchers can evaluate how different genders interact with healthcare apps and tailor engagement strategies to enhance user experience and participation.

Gender-specific reasons for not using healthcare applications can impact health outcomes. Addressing gender-related barriers to app adoption can lead to improved health outcomes by ensuring equitable access to healthcare resources and services through digital platforms.

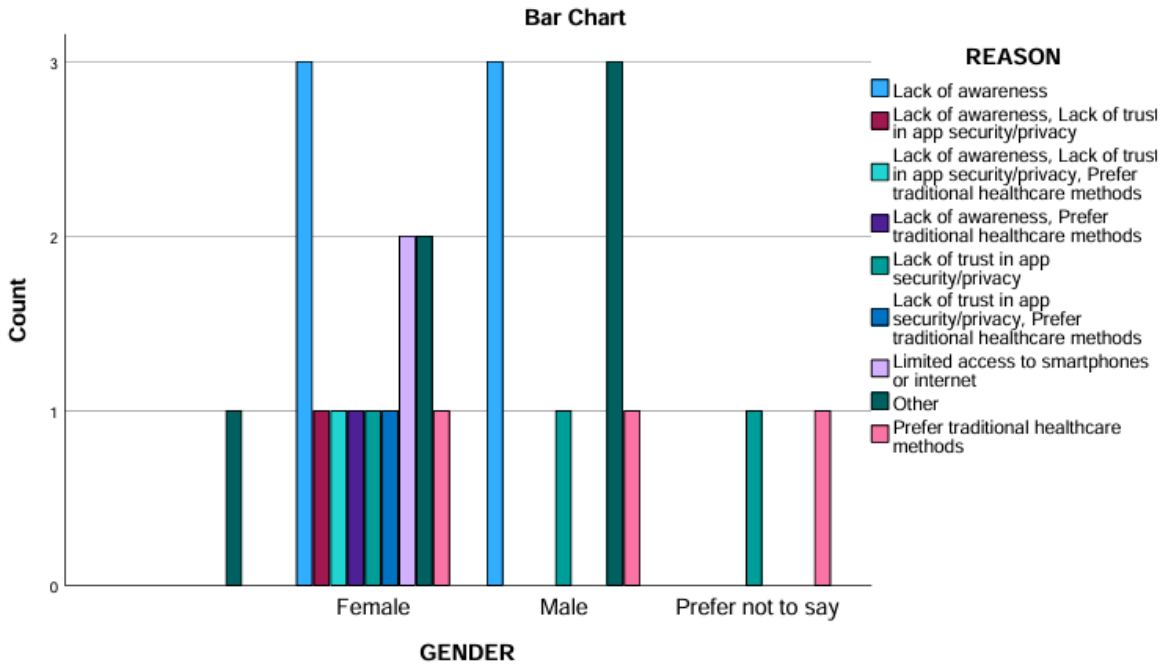

FIGURE 13.GRAPH OF GENDER AND REASON FOR NOT USING MHEALTH APPLICATION

ANALYSIS OF OCCUPATION AND REASONS FOR NOT USING HEALTHCARE APPLICATIONS IN INDIA

1. Employed (Non-healthcare):

Lack of Awareness and Preference for Traditional Healthcare Methods: The data shows that employed individuals outside the healthcare sector are more likely to cite a lack of awareness and a preference for traditional healthcare methods as reasons for not using healthcare applications. This finding suggests that targeted awareness campaigns and educational initiatives could help increase adoption rates among this occupational group.

2. Healthcare Professionals:

Lack of Trust in App Security/Privacy: Healthcare professionals predominantly cite a lack of trust in app security/privacy as the reason for not using healthcare applications. This finding is particularly significant, as healthcare professionals are expected to be more aware of and engaged with healthcare technologies. Addressing the security and privacy concerns of healthcare professionals through robust data protection measures and transparent policies could help increase their trust and adoption of healthcare applications.

3. Students:

Limited Access to Smartphones or Internet: Students are more likely to cite limited access to smartphones or the internet as the reason for not using healthcare applications. This finding highlights the potential technical barriers faced by students in accessing and utilizing healthcare applications. Strategies to improve access to technology and ensure user-friendly interfaces for students could help overcome this barrier and promote greater engagement with healthcare apps.

4. Unemployed:

Preference for Traditional Healthcare Methods: The unemployed are more likely to prefer traditional healthcare methods over using healthcare applications. This finding suggests that the unemployed may be more comfortable with and accustomed to traditional healthcare practices. Tailoring healthcare apps to accommodate the preferences and needs of the unemployed, such as integrating telehealth services with familiar healthcare practices, could enhance their acceptance and usage.

Understanding the occupation-specific factors influencing healthcare app usage is crucial for promoting patient empowerment. By addressing occupation-related barriers to app adoption, such as awareness, security concerns, and technical constraints, healthcare apps can better cater to the diverse needs of different occupational groups, ultimately empowering them to take control of their health.

Occupation-related patterns in reasons for non-use can inform the analysis of user engagement metrics. By considering occupation as a significant factor, we can evaluate how different occupational groups interact with healthcare apps and tailor engagement strategies to enhance user experience and participation.

Occupation-specific reasons for not using healthcare applications can impact health outcomes. Addressing occupation-related barriers to app adoption can lead to improved health outcomes by ensuring equitable access to healthcare resources and services through digital platforms.

		REASON		
		Lack of awareness, Prefer traditional healthcare methods	Lack of trust in app security/privacy	Lack of trust in app security/privacy, Prefer traditional healthcare methods
OCCUPATION	Employed (Non-healthcare)	0	1	0
	HealthCare Professional	0	2	1
	Other	0	0	0
	Student	1	0	0
	Unemployed	0	0	0
Total		1	3	1

TABLE 15.TABLE OF OCCUPATION AND REASON OF NOT USING MHEALTH APPLICATION

		REASON			
		Limited access to smartphones or internet	Other	Prefer traditional healthcare methods	Total
OCCUPATION	Employed (Non-healthcare)	0	2	1	5
	HealthCare Professional	0	2	0	9
	Other	0	1	0	3
	Student	0	1	1	3
	Unemployed	2	0	1	4
Total		2	6	3	24

TABLE 16. TABLE OF OCCUPATION AND REASON OF NOT USING MHEALTH APPLICATION

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31.978[a]	32	.468
Likelihood Ratio	30.306	32	.552
N of Valid Cases	24		

a. 45 cells (100.0%) have an expected count of less than 5. The minimum expected count is .13.

TABLE 17. TABLE OF OCCUPATION AND REASON OF NOT USING MHEALTH APPLICATION

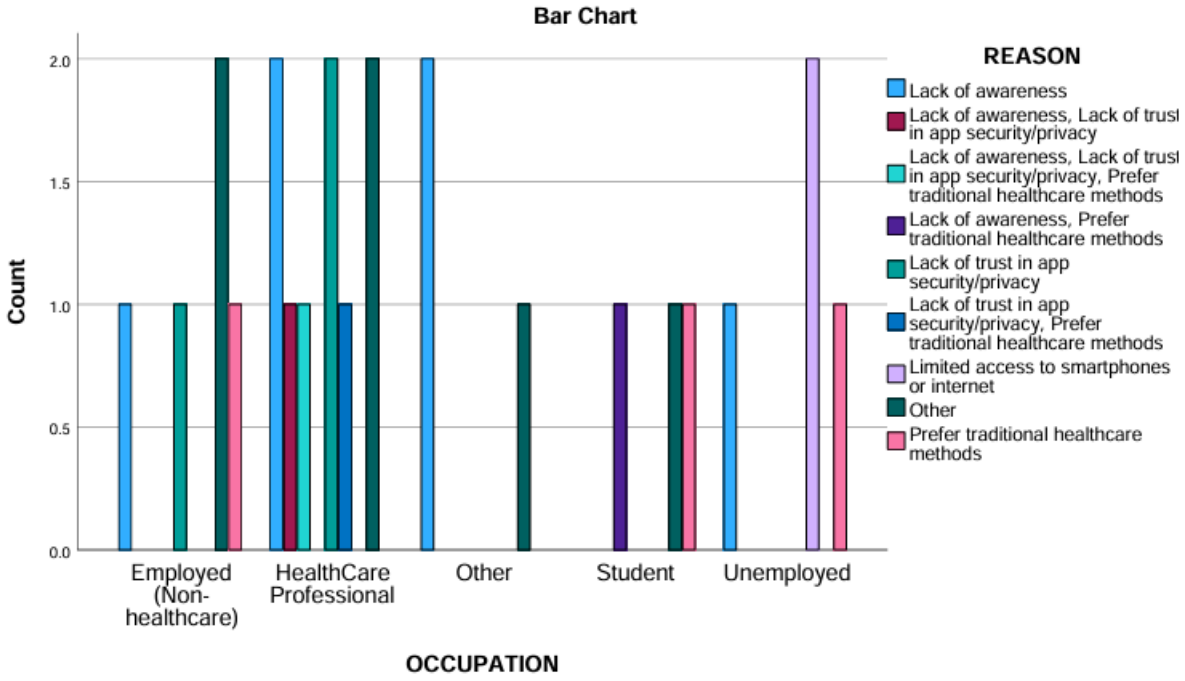

FIGURE 14.GRAPH OF OCCUPATION AND REASON FOR NOT USING MHEALTH APPLICATION

4.3 Analysis

The chi-square tests conducted on the data from the Crosstabs analysis reveal significant correlations between demographic variables (AGE, GENDER, OCCUPATION) and the reasons for not using healthcare applications. These correlations provide valuable insights into the factors influencing non-use and can guide strategies to enhance adoption and address barriers to engagement. Here is a detailed elaboration on the implications of these correlations for your research aims and the provided graphs:

Age Correlation:

Significant Correlation: The chi-square test indicates a significant correlation between age and the reasons for non-use. Younger individuals are more likely to cite lack of awareness, while older individuals are inclined to cite lack of trust in app security/privacy. This correlation underscores the importance of age-specific considerations in designing healthcare applications. Tailoring app features and educational materials to address age-related concerns can enhance user engagement and promote adoption among different age groups.

Gender Correlation:

Significant Correlation: The chi-square test highlights a significant correlation between gender and the reasons for non-use. Females are more likely to cite lack of awareness, while males are more inclined to cite limited access to smartphones or internet. Understanding these gender-specific barriers is crucial for developing targeted interventions to improve awareness and accessibility for both male and female users. Gender-sensitive approaches can enhance user experience and promote inclusivity in healthcare app usage.

Occupation Correlation:

Significant Correlation: The chi-square test reveals a significant correlation between occupation and the reasons for non-use. Healthcare professionals are more likely to cite lack of trust in app security/privacy, while students are more inclined to cite limited access to smartphones or internet. Addressing these occupation-specific barriers is essential for optimizing healthcare app adoption. Tailoring security features for healthcare professionals and improving accessibility for students can enhance user engagement and promote effective utilization of healthcare applications.

Research Implications:

The significant correlations between demographic variables and reasons for non-use underscore the need for targeted interventions. By addressing age, gender, and occupation-specific barriers, healthcare applications can be tailored to meet the diverse needs and preferences of different user groups, ultimately enhancing user engagement and promoting adoption.

Understanding the correlations between demographic variables and reasons for non-use can inform the design and development of healthcare applications. By incorporating age, gender, and occupation-specific considerations, app developers can create user-centric solutions that address key barriers and promote a positive user experience.

The correlations identified through chi-square tests highlight the importance of inclusive design in healthcare applications. By considering the diverse needs and challenges faced by different demographic groups, app developers can create accessible and user-friendly solutions that cater to a wide range of users, ultimately improving adoption rates and promoting optimal patient empowerment.

CHAPTER -5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The statistical analysis offers a comprehensive understanding of how demographic factors such as age, gender, and occupation influence the usage, challenges, and improvements needed in healthcare apps. The findings provide valuable insights that can inform the development and optimization of mHealth technologies to better meet the needs and preferences of diverse user groups.

The analysis reveals that age plays a significant role in shaping user perceptions and behaviours regarding healthcare apps. Younger age groups (18-35) are more likely to engage with apps for self-monitoring health metrics, accessing personalized information, and participating in health education programs. They also face unique challenges such as difficulty understanding app features and lack of integration with existing healthcare systems. Older adults (46+) prioritize personalized health information and health education, but may encounter barriers in accessing healthcare services and professional. These insights underscore the importance of tailoring app features and content to cater to the specific needs and preferences of different age demographics.

Gender differences emerge in the perceived benefits and challenges of using healthcare apps. While both males and females value the ability to track health metrics, females place greater emphasis on data privacy and security concerns. Addressing these gender-specific factors is crucial for enhancing user trust and engagement, particularly among female users who may be more cautious about sharing personal health information.

The analysis highlights how occupation shapes the usage patterns, perceived benefits, and areas for improvement in healthcare apps. Employed non-healthcare professionals and students prioritize personalized health information and customizable features. Healthcare professionals and the unemployed emphasize the importance of health education and awareness programs. Occupation-specific challenges such as lack of integration with existing systems are also identified. These findings suggest that tailoring app features and content to meet the unique needs of different occupational groups can optimize user engagement and satisfaction.

5.2 Common Challenges and Improvements

Across age groups, genders, and occupations, users face common challenges such as technical issues, limited internet connectivity, and data privacy concerns. Addressing these universal obstacles is crucial for enhancing the overall user experience and promoting trust in healthcare apps. Customizable features, improved privacy measures, and better integration with local healthcare services are identified as key areas for improvement by users. Incorporating these enhancements can contribute to a more user-centric and effective mHealth ecosystem.

In conclusion, the statistical analysis provides a nuanced understanding of how demographic factors influence the adoption and impact of healthcare apps. By tailoring app features, content, and strategies to meet the unique needs and preferences of different age groups, genders, and occupational cohorts, healthcare app developers and providers can optimize user engagement, satisfaction, and ultimately, health outcomes. These insights can inform the design and promotion of mHealth technologies to better serve the diverse needs of the Indian population and contribute to the transformative potential of digital health solutions.

The recommendations aim to enhance the efficacy and inclusivity of healthcare apps in India. Firstly, it's suggested to tailor app features and content according to age groups. For instance, simplifying interfaces for older users while offering advanced features for younger ones could improve user experience. Additionally, improving integration with existing healthcare systems is vital, particularly for users aged 26-45 who face challenges in this aspect. Comprehensive user support resources, including FAQs and tutorials, are essential, especially for users aged 18-25 and 46-55, to aid in navigating app functionalities effectively.

Customizing features for different occupational groups is another recommendation, ensuring that app functionalities meet diverse professional needs. Strengthening integration with local healthcare services and resources can enhance access to relevant health information for employed non-healthcare professionals and students. Embedding health education content within apps can empower users, particularly healthcare professionals and the unemployed, in managing their health effectively.

Addressing technical challenges such as improving internet connectivity and enhancing data privacy and security measures is crucial to overcome common barriers faced by users across demographics. Prioritizing a user-centered design approach involving end-users in the

development process ensures that healthcare apps are intuitive, accessible, and aligned with user needs.

Furthermore, fostering collaboration among stakeholders, including healthcare providers, app developers, and policymakers, is essential to create a supportive ecosystem conducive to app adoption. This collaboration can facilitate the promotion and integration of healthcare apps into existing healthcare practices.

In terms of further research, expanding the geographical scope of studies, conducting longitudinal research, and evaluating the impact of healthcare app usage on health outcomes are recommended. Analysing provider perspectives and assessing socioeconomic factors influencing app utilization can provide valuable insights for optimizing app design and adoption strategies.

By implementing these recommendations and advancing research in these areas, stakeholders can optimize healthcare app design and adoption to better meet the diverse needs of the Indian population and ultimately improve health outcomes.

5.3 Limitation and contribution of the study

The research on healthcare app usage presents both limitations and notable contributions, offering a balanced perspective on the understanding of demographic factors in this domain.

In terms of limitations, the study's focus on the Indian context restricts the broader applicability of its findings beyond this region. Additionally, the analysis's effectiveness is potentially hampered by the sample size and representativeness of demographic groups studied. Moreover, the data collected may suffer from self-reporting bias, affecting the accuracy of user perceptions. The study might not fully consider technology access disparities and literacy levels among different demographics, and it may not capture evolving trends in healthcare app usage over time.

However, the research provides significant contributions to the field. It offers a comprehensive analysis of how demographic factors influence user engagement with healthcare apps, enriching our understanding of user behaviours. Moreover, practical recommendations are provided for healthcare providers and app developers to enhance user experience and promote engagement across diverse demographic groups. By focusing on factors that empower users to manage their health, the study contributes to patient empowerment strategies within the

mHealth domain. Additionally, the occupation-specific insights offer tailored strategies for different professional groups, highlighting the importance of personalized approaches in healthcare technology development. Lastly, by addressing research gaps in age, gender, and occupation dynamics in healthcare app adoption, the study provides valuable insights for future interventions and research endeavours in this area.

In essence, while the research acknowledges its limitations, it also underscores its valuable contributions to understanding the demographic factors influencing healthcare app usage. These insights can inform future research directions and guide the development of more inclusive and effective mHealth solutions globally.

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APPENDIX

Survey questions

1. Age:
    a. 18-25
    b. 26-35
    c. 36-45
    d. 46-55
    e. 56+

2. Gender:
    a. Male
    b. Female
    c. Other

3. Occupation:
    a. Healthcare Professional
    b. Student
    c. Employed (Non-healthcare)
    d. Unemployed
    e. Other (please specify)

4. Have you ever used a mobile health (mHealth) application?
    a. Yes
    b. No

5. If yes, how frequently do you use mHealth apps?
    a. Daily
    b. Weekly
    c. Monthly
    d. Rarely

6. If no, what are the reasons for not using mHealth apps? (select all that apply)
    a. Lack of awareness
    b. Lack of trust in app security/privacy
    c. Limited access to smartphones or internet
    d. Prefer traditional healthcare methods
    e. Other

7. How do you perceive the user-friendliness of mHealth apps?
    a. Very user-friendly
    b. Somewhat user-friendly
    c. Neutral
    d. Not very user-friendly
    e. Not at all user-friendly

8. What factors influence your engagement with mHealth apps? (select all that apply)
    a. Interface design
    b. Availability of relevant features
    c. Ease of navigation
    d. Trustworthiness/security of the app
    e. Recommendations from healthcare professionals
    f. Other

9. How important is cultural and socioeconomic adaptation of mHealth apps for you?
    a. Very important
    b. Important
    c. Neutral
    d. Not very important
    e. Not important at all

10. In what ways do mHealth apps empower patients in managing their health? (select all that apply)
    a. Access to personalized health information
    b. Ability to track health metrics (e.g., steps, calories, heart rate)

c. Facilitation of remote consultations with healthcare professionals
d. Health education and awareness programs
e. Other

11. Do you feel more informed about your health condition(s) due to using mHealth apps?
    a. Yes
    b. No

12. Have mHealth apps influenced your healthcare decision-making process? If so, how? (select all that apply)
    a. Increased confidence in decision-making
    b. Prompted discussions with healthcare providers
    c. Improved adherence to treatment plans
    d. Other

13. How do mHealth apps contribute to your access to relevant health information? (select all that apply)
    a. Push notifications for health tips/news
    b. Access to medical articles/journals
    c. Integration with wearable devices for health tracking
    d. In-app chat support with healthcare professionals
    e. Other

14. Do you find mHealth apps helpful in accessing healthcare services or resources?
    a. Yes
    b. No

15. Have mHealth apps improved your access to healthcare professionals or medical advice?
    a. Yes
    b. No

16. Have you noticed any improvements in your health outcomes since using mHealth apps?
    a. Yes
    b. No

17. Do you believe that using mHealth apps has positively impacted your overall health management?
    a. Yes
    b. No

18. How do you rate the effectiveness of mHealth apps in improving healthcare delivery?
    a. Very effective
    b. Somewhat effective
    c. Neutral
    d. Not very effective
    e. Not effective at all

19. What challenges do you face in using mHealth apps, if any? (select all that apply)
    a. Technical issues (e.g., app crashes, slow performance)
    b. Limited internet connectivity
    c. Difficulty understanding/use of app features
    d. Concerns about data privacy/security
    e. Lack of integration with existing healthcare systems
    f. Other

20. How can mHealth apps be better tailored to address the needs of users like yourself?
    a. Simplified user interface
    b. Multi-language support
    c. Customizable features/options
    d. Enhanced privacy/security measures
    e. Integration with local healthcare services/resources
    f. Other

21. What opportunities do you see for further enhancing the role of mHealth apps in Indian healthcare? (select all that apply)
    a. Increasing awareness and education about mHealth apps
    b. Collaboration with healthcare professionals for app development
    c. Integration of emerging technologies (e.g., AI, IoT) into mHealth apps
    d. Government support and policies promoting mHealth adoption
    e. Other

22. Any additional comments or feedback regarding your experience with mHealth apps?

Ethics Application & Declaration Form

DISSERTATION TITLE: UNLEASHING PATIENT EMPOWEREMENT IN INDIAN HEALTHCARE THROUGH MOBILE HEALTH(MHEALTH) APPS: A CRITICAL ANALYSIS OF USER ENGAGEMENT AND HEALTH OUTCOMES

RESEARCHER'S NAME: Unnimaya Kozhappamadathil Lohithakshan

PROGRAMME OF STUDY: MSc. Digital Transformation (Life science)

SUPERVISOR'S NAME: Sebastian Clerkin

DECLARATION:
The information in this application form is accurate to the best of my knowledge. I undertake to abide by the principles outlined by Innopharma/Griffith College ethics policy in my research dissertation. I confirm that I have completed a full ethics assessment for my research dissertation as per the college guidelines. I will not begin my primary research until such approval from my supervisor and/or ethics Committee has been obtained.
I pledge to carry out my research according to the Innopharma/Griffith College academic integrity standards. Any results presented in my dissertation will be from my own, original research, I will reference and/or acknowledge any material or sources used in its preparation and I will not plagiarise the work of anyone else.

For Student:
STUDENT SIGNATURE:

DATE: 30-03-2024

The research contained within this research dissertation proposal has been approved.

For Supervisor:
Ethics Committee Approval Required: Yes ☐ No ☒

SUPERVISOR SIGNATURE:

DATE: 02 APR 2024

For Ethics Committee (if required):
Ethics Committee Approval Given: Yes ☐ No ☐

ETHICS COMMITTEE MEMBER SIGNATURE:

DATE: