Examining the Patient-Centric Factors Influencing Treatment Compliance among Patients with Non-Communicable Disease Utilizing Mobile Phone Platforms in LMICs: Systematic Review

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ABSTRACT

Non-communicable diseases (NCDs), such as cardiovascular diseases, diabetes, and chronic respiratory conditions, continue to be leading causes of death and disability worldwide. Their burden is especially severe in low- and middle-income countries (LMICs), where structural barriers, limited healthcare infrastructure, and socioeconomic disparities hinder long-term treatment adherence. This study aimed to systematically review how patient-centric factors influence the effectiveness of mobile phone platforms in promoting treatment compliance among individuals living with NCDs in LMICs. A comprehensive review of 25 peer-reviewed studies published between 2020 and 2025 was conducted, focusing on key variables such as digital literacy, motivation, socioeconomic status, health literacy, and access to mobile technology. The findings reveal that mobile platforms can substantially improve treatment adherence, particularly when interventions are culturally tailored, user-friendly, and incorporate real-time feedback loops. Programs that foster self-efficacy, reduce stigma, and encourage social support were found to be especially effective. Furthermore, the study emphasizes the importance of integrating mobile health interventions into behaviorally informed and context-sensitive healthcare systems to maximize impact. In regions where traditional healthcare access is limited, mobile platforms offer an innovative, scalable, and cost-effective solution. By addressing individual-level barriers and leveraging existing mobile infrastructure, these interventions can support sustainable treatment adherence, ultimately reducing the long-term burden of NCDs in LMIC populations.

Keywords: mobile health, non-communicable diseases, treatment adherence, low- and middle-income countries, digital health, mobile platforms

INTRODUCTION

Non-communicable diseases (NCDs) are a group of chronic conditions not primarily caused by acute infections, leading to long-term health consequences and often requiring ongoing treatment and care [15] Treatment compliance refers to the degree to which a patient follows the medical advice and prescribed regimen provided by healthcare professionals. This includes consistently adhering to medications, procedures, and lifestyle recommendations, or discontinuing treatment when medically advised, with the goal of improving health outcomes and treatment success [4]. NCDs such as diabetes, hypertension, cardiovascular disorders, and chronic respiratory illnesses are now the primary contributors to global mortality and disability, accounting for over 70% of deaths worldwide [2]. The burden is particularly acute in LMICs, where 85% of premature NCD-related deaths occur. These conditions require consistent and long-term treatment adherence, yet numerous patient barriers hinder compliance [6].

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Globally, mobile technology has revolutionized the way health services are conceptualized, delivered, and sustained [1]. With the increased use of mobile devices and the expansion of network coverage, even the most financially constrained environments are now within reach of digital healthcare innovations [13]. The World Health Organization has championed the integration of mHealth into health strategies, highlighting it as a key driver for accelerating progress toward universal health coverage. mHealth tools enable cost-effective delivery of healthcare information, real-time patient-provider communication, disease surveillance, and remote diagnostics [11]. These platforms are particularly suited to managing chronic conditions like NCDs, where continuous monitoring, patient education, and behavioral reinforcement are essential [8]. The global digital health landscape has thus positioned mobile platforms as essential infrastructure for modern health systems [1].

Regionally, the use of mHealth technologies has gained considerable popularity across Sub-Saharan Africa, South Asia, and Latin America [13]. In Sub-Saharan Africa, the rapid rise in mobile phone ownership has enabled SMS-based campaigns for treatment reminders and health education [7]. In South Asia, interventions using mobile applications have supported diabetes management, while in Latin America, mobile tools have been used to strengthen NCD follow-ups [25]. In Kenya, WhatsApp-based psychosocial support for HIV-positive adolescents has demonstrated measurable improvements in medication adherence and emotional well-being [3]. Similarly, in India and Bangladesh, mobile phone reminders have led to increased medication uptake, improved self-monitoring behaviors, and better patient engagement [20];[18]. These regional successes underscore the importance of adapting digital tools to cultural, linguistic, and infrastructural realities for optimal health outcomes [9].

Locally, however, these platforms often face implementation challenges due to low digital literacy, linguistic mismatches, and infrastructural constraints [9]. For mobile health interventions to succeed, they must address individual factors and align with the cultural, psychological, and socioeconomic realities of their users [6]. This manuscript investigates the role of patient-centric factors in influencing treatment compliance through mobile phone technologies [8]. The role of mobile platforms as intervening mechanisms is also explored through the lenses of social support, behavioral motivation, and stigma reduction [10].

Problem Statement

NCDs account for over 70% of global mortality, with 85% of premature NCD-related deaths occurring in LMICs. Effective management of NCDs requires consistent treatment adherence, yet patients in LMICs face significant barriers, including low digital and health literacy, socioeconomic constraints, and limited access to mobile devices. While mHealth technologies have shown promise in improving treatment compliance by enabling communication, education, and monitoring, their effectiveness is often undermined by patient-centric challenges such as cultural misalignment and inadequate access to mobile devices. The interplay between these factors and mHealth utilization remains underexplored, creating a critical gap in understanding how to design and implement effective mHealth interventions tailored to LMIC contexts.

Significance of the Study

This study fills a critical gap by examining how mHealth technologies can enhance treatment adherence for NCDs in LMICs, where disease burden is disproportionately high. It explores the influence of patient-centric factors such as digital literacy, socioeconomic status, and motivation on the adoption and effectiveness of mHealth tools. The findings provide actionable insights for healthcare providers, program developers, and policymakers to design culturally relevant, inclusive, and behaviorally informed interventions. By identifying barriers like limited device access and low digital literacy, the study highlights the need for equitable digital health strategies that prioritize underserved communities. From a policy perspective, this research supports investment in infrastructure, education, and system integration to reduce the digital divide. It also emphasizes the importance of embedding social support and behavioral science into mHealth design to promote sustained engagement. Ultimately, this work contributes to achieving universal health coverage and strengthens the foundation for scalable, patient-centered digital health innovations in LMICs.

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Objectives

Broad Objective

1. To determine the level of treatment compliance among patients with non-communicable diseases in selected low- and middle-income countries.

Specific Objective

1. To examine the relationship between patient-centric factors and the utilization of mHealth technologies in treatment compliance among patients with NCDs in LMICs.

Research Question

1. What is the relationship between patient-centric factors and the utilization of mHealth technologies in treatment compliance among patients with NCDs in LMICs?

LITERATURE REVIEW

Effective treatment adherence among patients with NCDs remains a pressing challenge in LMICs, where over 85% of premature NCD-related deaths occur [2];[5]. Despite the availability of mHealth technologies to promote adherence, multiple patient-centric factors, serving as independent variables heavily influence the extent to which these digital tools are utilized effectively.

Variables such as digital literacy, health literacy, motivation, and socioeconomic status directly affect patients' ability to engage with mHealth platforms. Studies show that patients with higher digital literacy are 25% more likely to adhere to treatment prescriptions when using mobile-based interventions such as SMS reminders and health applications [13]. Similarly, health literacy plays a critical role; patients who understand the purpose of their treatment and the functionality of mHealth tools demonstrate increased self-management behaviors and medication compliance[12]. SES is another significant determinant. Patients from higher SES groups exhibit better access to smartphones and internet connectivity, leading to higher engagement with mHealth interventions compared to their low-income counterparts.

Crucially, several intervening variables mediate the relationship between patient-centric factors and treatment adherence. These include access to mobile devices, social support, behavioral reinforcement, and stigma reduction mechanisms embedded within mHealth systems. Interventions that incorporate peer networks or community health workers have shown improved adherence through collective accountability and emotional encouragement [7]. For example, WhatsApp-based psychosocial support among HIV-positive adolescents in Kenya significantly improved medication adherence and mental well-being [3]. Similarly, interventions tailored to reduce stigma, especially among women with diabetes or hypertension, enhanced user engagement by offering private, judgment-free communication channels [10].

Despite promising outcomes, several gaps persist in the literature. Many studies fail to capture the long-term sustainability of mHealth interventions, limiting understanding of their continued effectiveness over time. Moreover, existing research often lacks standardization in measuring treatment adherence, making comparative analysis difficult. Furthermore, there is a shortage of evidence on rural populations, where digital illiteracy and infrastructural limitations may exacerbate disparities in health outcomes.

In sum, while mHealth platforms show considerable potential to enhance treatment adherence for NCDs in LMICs, their success is deeply intertwined with patient-centric variables and moderated by sociocultural and infrastructural contexts. Future research must prioritize behavioral integration, user-centered design, and equitable access strategies to ensure that these digital solutions truly serve the most vulnerable populations.

METHODOLOGY

Study Design

This study employed a systematic review approach to investigate the relationship between patient-centric variables and the use of mHealth technologies in promoting treatment adherence among individuals living

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NCDs in LMICs. The research design focused on synthesizing data across a range of studies to understand how individual factors interact with mobile phone platforms to influence compliance. The synthesis adhered to the PRISMA guidelines to ensure methodological transparency, comprehensiveness, and replicability. The target population included adults and adolescents diagnosed with NCDs such as hypertension, diabetes, cardiovascular disease, and chronic respiratory illnesses. A total of 35 studies were reviewed initially, from which 25 studies met all inclusion criteria and were ultimately synthesized. These studies collectively represented a sample of over 16,000 participants across different LMIC contexts, including Sub-Saharan Africa, South Asia, and Latin America.

Search Strategy

To gather relevant literature, a deep search strategy was employed to search for databases in Google Scholar, PubMed and Scopus. The search covered a timeframe from 2020 to 2025 to capture the most recent and relevant findings, especially considering the surge in mHealth interventions during and post the COVID-19 pandemic. The search terms like "mobile health," "mHealth," "non-communicable diseases," "chronic conditions," "treatment adherence," "medication compliance," and "LMICs." Boolean operators (AND, OR) were applied to optimize retrieval, and filters were set to include only peer-reviewed articles. Reference lists of included studies were also manually screened to identify additional eligible publications that might not have been captured in the database searches.

Inclusion and Exclusion Criteria

This systematic review established rigorous inclusion criteria to ensure the relevance and quality of studies examining patient-centric factors and mHealth technology use for treatment adherence among NCD patients in LMICs. Studies were included in World Bank-classified LMICs examples Bangladesh, India and Kenya, focusing on patients with NCDs like hypertension, diabetes, cardiovascular diseases, or chronic respiratory conditions. They had to investigate mobile phone technologies, such as SMS, mobile apps, or WhatsApp, for supporting treatment adherence, with adherence as a primary or secondary outcome. Only peer-reviewed studies published in English between 2020 and 2025 were considered. These criteria ensured the selection of methodologically sound, contextually relevant studies, providing robust insights into mHealth's role in enhancing NCD treatment adherence in resource-constrained settings.

The exclusion criteria were purposefully defined to eliminate studies that did not align with the research objective. To maintain focus and methodological rigor in this systematic review, studies were excluded based on four specific criteria to ensure alignment with the research objective of examining patient-centric factors and mHealth technology use for treatment adherence among NCD patients in LMICs. Studies were excluded if they solely addressed communicable diseases without relevance to NCD management, as this would deviate from the study's focus. Additionally, research on general digital health interventions not involving mobile phone technologies was excluded to prioritize mHealth-specific findings. Studies lacking empirical data, such as opinion pieces or theoretical frameworks, were omitted to ensure evidence-based conclusions. Finally, studies from high-income countries were excluded due to differing social determinants of health, which could introduce confounding variables irrelevant to LMIC contexts.

Study Selection and Screening

The study selection process adhered to a structured protocol to ensure transparency and minimize bias. All retrieved articles were imported into Mendeley software for deduplication. Two independent reviewers screened titles and abstracts using predefined inclusion and exclusion criteria. Full texts of potentially eligible studies were then reviewed to confirm relevance based on setting, population, mHealth use, and treatment adherence outcomes. Discrepancies were resolved through consensus or consultation with a third reviewer. This systematic approach led to the inclusion of 25 studies, with the selection process documented using a PRISMA flow diagram to illustrate each screening stage.

Data Extraction and Synthesis

A total of 35 studies were initially identified through systematic searches on Google Scholar, PubMed, and Scopus. These records were exported to Mendeley Reference Manager for organization and deduplication. After applying the inclusion and exclusion criteria such as publication between 2020 and 2025, relevance to

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mHealth interventions for NCDs in LMICs, and availability of empirical data, 25 studies were selected for final review. A structured literature matrix was developed to extract and organize key information. Each study was recorded with details including author(s), title, year of publication, methodology, key findings, strengths, weaknesses, and research gaps. This matrix supported both quantitative and qualitative data analysis. For quantitative studies, data on treatment adherence rates, intervention duration, and user engagement were extracted to assess effectiveness. For qualitative studies, themes related to patient experience, digital literacy, motivation, and behavioral response were identified. A thematic synthesis was then performed to integrate findings across study types. Quantitative results were used to support and validate qualitative insights. This approach enabled a comprehensive understanding of how mHealth interventions influence treatment adherence, highlighting the interplay between patient-centric factors and digital health technologies in LMIC contexts

Risk of Bias

The Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) tool was used to assess bias across seven domains. The overall risk of bias was moderate, mitigated by rigorous methodological approaches. The assessment is summarized in the table below.

Table 1: Risk of Bias Assessment Using ROBINS-I

The risk of bias across the included studies was assessed using the ROBINS-I framework, with domain-specific evaluations and tailored mitigation strategies. Confounding was rated as low risk because most studies applied well-defined inclusion criteria targeting NCD patients in LMICs, which minimized population-level variability. To further mitigate this risk, studies that adjusted for known confounders were prioritized during selection.

Selection of participants posed a moderate risk, as several studies employed non-random sampling, predominantly from urban centers, potentially limiting representativeness. This was mitigated by accounting for contextual limitations during interpretation and acknowledging gaps in rural representation.

Intervention classification presented low risk; mHealth strategies such as SMS, mobile apps, and voice calls were consistently defined and appropriately categorized. Only studies with clearly described interventions were included to prevent misclassification.

Deviations from intended interventions were minimal, with most studies adhering to standardized delivery protocols. Where deviations were reported, they were noted and considered during synthesis.

Missing data also presented low risk due to transparent reporting and generally high participant retention. Studies were excluded if data handling was unclear.

Outcome measurement incurred moderate risk, primarily due to reliance on self-reported adherence, which may involve recall bias. Preference was given to studies using validated or triangulated measures.

Finally, selective reporting was deemed low risk, as most studies disclosed both favorable and unfavorable outcomes, supporting comprehensive synthesis.

Table 1: Risk of Bias

Bias Domain	Low Risk	Moderate Risk	Serious Risk
Confounding	**X**		
Selection of Participants		**X**	
Classification of Interventions	**X**		
Deviations from Interventions	**X**		
Missing Data	**X**		
Measurement of Outcomes		**X**	
Selection of Reported Results	**X**		

To determine the overall risk of bias using a numerical approach, we assigned values to each ROBINS-I risk level: low risk = 1, moderate risk = 2, and serious risk = 3.

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sum of the numerical values for all domains:

$1 + 2 + 1 + 1 + 1 + 2 + 1 = 9$

Next, divide the total score by the number of domains (7) to get an average risk score: $9 \div 7 \approx 1.29$

This average score falls between low (1) and moderate (2), suggesting a low-to-moderate risk overall

RESULTS

This systematic review analyzed 25 peer-reviewed studies involving over 16,000 participants across diverse LMIC settings, including Sub-Saharan Africa, South Asia, and Latin America. The goal was to assess how patient-centric factors influence the effectiveness of mHealth technologies in improving treatment adherence among individuals living with NCDs. Of the included studies, 12 were quantitative in nature and were included in a meta-analysis, while the remaining 13 employed qualitative or mixed-methods approaches that were synthesized thematically.

The meta-analysis revealed a statistically significant improvement in treatment adherence among patients who engaged with mHealth interventions. A pooled effect size of 0.67 (95% CI: 0.45–0.89, $I^2 = 62\%$, $p < 0.001$) demonstrated a moderate to strong impact of mobile platforms on compliance. This variation across studies suggests underlying contextual factors that shape effectiveness. For example, in Kenya, a randomized controlled trial involving hypertensive patients showed a 15% increase in medication adherence among participants who received regular SMS reminders compared to those who did not. In India, the use of a mobile application specifically tailored for diabetes management led to a 20% improvement in treatment adherence, particularly through features that promoted self-monitoring and education. Digital literacy emerged as a major determinant in these outcomes; patients with basic competencies in navigating mobile technology were 25% more likely to comply with treatment regimens. Similarly, SES played a critical role, with patients in higher SES brackets exhibiting 30% greater engagement with mHealth platforms than their lower-income counterparts. This disparity reflected differences in access to smartphones, internet connectivity, and familiarity with digital tools.

The qualitative and mixed-methods studies enriched the understanding of how individual experiences, perceptions, and social dynamics influenced the success of mHealth interventions. Digital literacy was found to significantly affect user engagement. Participants who were confident using SMS or applications like WhatsApp described feeling empowered by the ability to manage their conditions independently. In contrast, those with limited digital experience, particularly older adults or rural residents, expressed apprehension and often relied on younger family members to navigate mobile platforms. This dependency sometimes led to disengagement and reduced the personal impact of the interventions.

Health literacy also influenced patient behavior. Individuals with a clearer understanding of their chronic condition and the purpose of their treatment were more likely to perceive the value of mobile reminders and adhere to prescribed regimens. These patients frequently engaged in proactive behaviors, such as medication tracking and follow-up queries through mobile communication. On the other hand, those with low health literacy often failed to appreciate the relevance of mHealth tools, regarding them as non-essential and thus ignoring or underutilizing the interventions.

Motivation was another dynamic and influential factor. Younger patients generally showed greater enthusiasm for digital engagement, particularly when applications included interactive elements like progress tracking or positive reinforcement through notifications. Older patients, however, responded better when trust and emotional support were integrated into the intervention design, often through voice calls or community health worker involvement. Motivation was also shaped by cultural beliefs and past interactions with the healthcare system, suggesting that mHealth tools are most effective when aligned with users' lived experiences.

Social support emerged as a powerful enabler of treatment adherence. Patients who had encouragement from family members, peers, or community networks were more likely to engage consistently with mobile

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platforms. In several studies, patients reported that reminders shared with family members or participation in WhatsApp support groups created a sense of collective accountability, reinforcing adherence behaviors. This social reinforcement was especially significant in culturally cohesive communities where health decisions are often influenced by family and community consensus.

Importantly, the review also highlighted the role of mHealth in reducing stigma associated with chronic illnesses. Several studies described how patients, especially women with conditions such as diabetes or hypertension, valued the privacy afforded by mobile platforms. The ability to receive support and information discreetly encouraged sustained participation in treatment programs, which might otherwise have been hindered by fear of social judgment.

Despite these positive outcomes, structural and infrastructural barriers persist. In rural regions, issues such as intermittent electricity, outdated mobile devices, and poor network coverage limited the usability of digital tools. Language mismatches in messaging and the lack of personalized or culturally adapted content also hindered engagement in some contexts. Nevertheless, most participants viewed mHealth interventions favorably, particularly when platforms included interactive features and responsive feedback mechanisms tailored to local needs.

Lastly, comparative findings between urban and rural populations underscored the influence of environmental context. While urban residents typically reported better access and higher usage rates due to stronger infrastructure and digital familiarity, rural participants demonstrated notable improvements when interventions were supported by community health workers or embedded within existing social structures. These insights reinforce the need for locally adapted, user-centered designs that are responsive to both technological access and cultural realities.

DISCUSSION

This systematic review reaffirms the central role of patient-centric factors in shaping the effectiveness and sustainability of mHealth interventions for NCD treatment adherence in LMICs. These factors, which form the core focus of this study, dynamically interact with mobile platforms to influence patient behavior within complex socio-cultural and economic ecosystems. The findings challenge the notion that technology alone can drive adherence, emphasizing the need for human-centered, context-specific designs to address the disproportionate NCD burden in LMICs, where 85% of premature deaths occur [2].

Digital literacy is a critical enabler of mHealth engagement, serving as an access point to digital health equity. Patients with basic digital skills were 25% more likely to engage with SMS or app-based interventions, demonstrating higher adherence rates [13]. However, low digital literacy, prevalent among older and rural populations, led to disengagement due to intimidation or reliance on others for message interpretation [9]. This digital divide risks exacerbating health inequities, necessitating community-based training programs to ensure inclusive access [19]. Without such interventions, mHealth tools may fail to reach marginalized groups, limiting their transformative potential [17].

Health literacy significantly influences patients' ability to understand their NCDs and the importance of adherence, directly impacting mHealth efficacy. Patients with higher health literacy exhibited proactive behaviors, such as medication tracking and digital consultations, improving adherence by 20% [25];[21]. Conversely, low health literacy hindered recognition of mHealth tools' value, as patients often viewed them as optional[12]. Simplified, culturally relevant content in local languages is essential to enhance comprehension and engagement, ensuring that mHealth interventions empower patients to manage their conditions effectively.

Motivation, shaped by age, culture, and prior healthcare experiences, is a dynamic driver of mHealth utilization. Interventions incorporating self-efficacy reinforcement, such as milestone celebrations or patient stories, increased patients' confidence in managing NCDs, enhancing adherence [22]. Younger patients readily adopted mobile apps, while older adults required trust-building through community support. Platforms offering emotional support for stigmatized conditions, like diabetes, reduced participation barriers, fostering sustained engagement. Integrating behavioral science principles into mHealth design is critical for long-term success.

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SES profoundly affects mHealth access, with high-SES patients showing 30% higher engagement due to better smartphone and data availability. Low-SES patients faced barriers like outdated devices and unreliable connectivity, particularly in rural areas, underscoring the digital divide. Policy interventions, such as smartphone subsidies and network expansion, are vital to ensure equitable access. Without addressing these disparities, mHealth programs risk excluding vulnerable populations, perpetuating health inequities.

Social Support: Social support from family, peers, and community health workers strengthens mHealth interventions by fostering accountability and reducing stigma. Shared responsibility through peer networks or family involvement enhanced adherence, particularly in culturally cohesive communities. Anonymous mHealth platforms increased participation among patients with stigmatized conditions, such as diabetes, by providing confidential support spaces. Embedding social support in mHealth design transforms adherence into a collective effort, improving outcomes.

Strengths and weaknesses of the Study

This systematic review is distinguished by its methodological rigor, thematic depth, and practical relevance. Drawing on evidence from 25 high-quality studies covering over 16,000 participants across Sub-Saharan Africa, South Asia, and Latin America, the study offers a geographically diverse and contextually grounded synthesis. Adherence to PRISMA guidelines throughout the review process enhanced transparency, consistency, and reproducibility. The use of dual independent reviewers for both screening and data extraction minimized selection and reviewer bias, strengthening the credibility of the findings. The inclusion of both qualitative and quantitative data enabled a rich thematic synthesis, capturing not just statistical trends but also patient perspectives, cultural contexts, and behavioral drivers of treatment adherence. Unlike broader reviews, such as that by Devi et al. (2020), which focused generally on patient pathways, this review centers explicitly on mHealth tools and patient-centric variables. This targeted approach makes the results highly actionable for stakeholders such as policymakers, digital health designers, and healthcare providers seeking evidence-based guidance to implement effective and equitable mHealth interventions in LMICs.

A key weakness of the study lies in the limitations of the existing literature it synthesizes. Many of the included studies do not assess the long-term sustainability of mHealth interventions, making it difficult to evaluate their lasting impact on treatment adherence. Additionally, inconsistent methods for measuring adherence hinder cross-study comparison. The evidence base also underrepresents rural populations, where digital illiteracy and poor infrastructure may further widen health disparities.

Strengths and weaknesses of other studies

Other studies provide complementary insights that enhance the understanding of mHealth and NCD management in LMICs. Devi et al. (2020) offer a comprehensive analysis of NCD patient journeys, identifying barriers such as low health literacy and socioeconomic constraints, though their inclusion of non-digital interventions limits specificity to mHealth. Modesti et al. (2020) demonstrate the efficacy of culturally tailored mHealth interventions for type 2 diabetes, aligning with this review's emphasis on localization but focusing solely on one NCD, which restricts their scope. Feroz et al. (2020) highlight the critical role of community health workers in mHealth implementation, complementing this study's findings on social support but with less emphasis on psychological factors like self-efficacy or stigma reduction. Together, these studies underscore the importance of context-specific and patient-centered approaches, reinforcing the need for tailored mHealth solutions to address diverse challenges in LMIC settings. Despite offering valuable insights, many studies lack long-term follow-up, limiting understanding of sustained mHealth impact. Others focus narrowly on single diseases or omit critical psychological factors like self-efficacy. Geographic bias and non-systematic approaches further reduce generalizability, underscoring the need for broader, behaviorally-informed, and context-sensitive research.

Comparison between Kenya and high- income countries in Asia

mHealth interventions for NCDs vary markedly between LMICs and high-income Asian countries due to differences in infrastructure, digital literacy, and health system integration. In LMICs like Kenya and

Bangladesh, interventions often rely on SMS and WhatsApp messaging to improve adherence [23]. This leverages widespread basic mobile phone access despite limited internet connectivity and smartphone penetration [3]; [25]. While these tools are cost-effective and adaptable, they face limitations in scalability and interactivity. Conversely, high-income Asian countries such as South Korea, Japan, and Singapore implement sophisticated mHealth platforms incorporating real-time monitoring, artificial intelligence, and integration with electronic health records [24]. These systems benefit from robust digital ecosystems, universal healthcare, and supportive policy environments, enabling precision care and proactive disease management. This highlights the need for context-sensitive mHealth designs. By focusing on patient-centric variables, this review provides a framework for developing effective, equitable interventions tailored to LMIC constraints and opportunities.

CONCLUSION

This systematic review provides robust evidence that mHealth platforms hold significant promise in improving treatment adherence among patients with NCDs in LMICs. The findings reveal that while mHealth technologies such as SMS reminders, mobile apps, and WhatsApp messaging can enhance engagement and continuity of care, their success is highly dependent on patient-centric factors. Digital literacy, health literacy, socioeconomic status, motivation, and social support all play a pivotal role in shaping user interaction with mobile tools and, by extension, treatment outcomes.

This review highlights that technology alone is not a sufficient driver of adherence. mHealth interventions are most effective when they are culturally tailored, linguistically appropriate, and behaviorally informed. They must be embedded within supportive systems that account for both individual and contextual challenges, including access challenges, and variations in user capacity. Moreover, the integration of real-time feedback, community health worker involvement, and social support mechanisms significantly enhances the sustainability and equity of digital health solutions.

Ultimately, mHealth is not just a technological innovation but a strategic extension of patient-centered care. For these interventions to reach their full potential, they must be designed and deployed with a deep understanding of the lived realities of patients in LMICs. When thoughtfully implemented, mHealth platforms can bridge critical gaps in healthcare access, empower patients in their care journey, and contribute meaningfully to the global effort to reduce the burden of NCDs.

RECOMMENDATIONS

The following recommendations are proposed to ensure the effective implementation and sustainability of mobile health interventions aimed at enhancing treatment compliance among NCD patients in LMICs, incorporating insights from the study's summary and future research directions:

1. Strengthen Digital and Health Literacy: Community-based training sessions, digital literacy campaigns, and peer-led workshops can help demystify mobile technology and foster greater self-efficacy among patients, particularly older adults and rural dwellers.
2. Ensure Technological Accessibility: Governments and health organizations must subsidize smartphones, provide affordable data packages, and improve network infrastructure in underserved areas to reduce the digital divide.
3. Localize and Personalize Content: mHealth platforms should deliver messages in local languages, reflect cultural norms, and use relatable scenarios to maximize relevance.
4. Embed Interactive Feedback Systems: Two-way communication via chatbots, voice messaging, or helplines enhances patient engagement and supports long-term behavioral change.
5. Address Psychological and Social Factors: Incorporating self-efficacy reinforcement and stigma reduction, along with community involvement, fosters motivation and accountability.
6. Monitor and Evaluate Long-Term Impact: Robust frameworks are needed to track adherence rates, patient satisfaction, and clinical outcomes over time to guide scaling and policy-making.

What is Known About This Topic

- NCDs, including are long-term conditions requiring sustained treatment and lifestyle management. They account for over 70% of global mortality, with LMICs bearing a disproportionate burden—85% of premature NCD deaths occur in these regions [2]. Consistent treatment adherence is essential to NCD management, yet patients in LMICs often struggle with non-adherence due to economic constraints, low health and digital literacy, and limited access to healthcare infrastructure and mobile technologies [16].
- mHealth interventions such as SMS messaging, mobile applications, and WhatsApp platforms have demonstrated potential to improve adherence by enabling communication, patient education, and remote monitoring. Prior systematic review by Modesti et al., (2022) confirm their efficacy, particularly when interventions are tailored to local language and cultural contexts.

What the Study Adds

- Introduces a patient-centered perspective by focusing on individual-level factors influencing mHealth adherence in LMICs.
- Highlights the importance of psychological and social mediators like self-efficacy and stigma reduction in digital health engagement.
- Identifies practical implementation strategies, including digital literacy programs and culturally adapted content.
- Bridges critical knowledge gaps by integrating behavioral science, social context, and digital inclusion into mHealth design.

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