



A NARRATIVE REVIEW OF APPOINTMENT AND MEDICATION ADHERENCE IN SOCIO-DEMOGRAPHIC CONTEXTS

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Cite this article:

Osuoha, C. B., Njoku-Obi, T. N., David, C. I., Igiri, V. C., Dozie, U. W. (2025), A Narrative Review of Appointment and Medication Adherence in Socio-Demographic Contexts. African Journal of Health, Nursing and Midwifery 8(2), 36-46. DOI: 10.52589/AJBMR-WZPJVB9F

Manuscript History

Received: 29 Mar 2025

Accepted: 7 May 2025

Published: 15 May 2025

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ABSTRACT: *Background:* Mobile health (mHealth) interventions are crucial for enhancing healthcare delivery, particularly in low- and middle-income countries. Despite its potential, socio-demographic differences, particularly in sub-Saharan Africa, continue to influence patterns of adoption, access, and effectiveness of digital health solutions. These discrepancies are particularly prominent in communities co-infected with HIV and tuberculosis (TB), where mHealth has the potential to alter adherence and treatment delivery. **Aim:** This narrative review examines how sociodemographic variables (age, gender, education, income, and geographic location) impact mHealth adherence and uptake among HIV/TB co-infected individuals. **Method:** The review uses a narrative synthesis technique. PubMed, Scopus, Web of Science, AJOL, and Google Scholar were some of the databases searched. The inclusion criteria were based on empirical studies on mHealth, HIV/TB co-infection, and socio-demographic disparities. Thematic analysis was used to organize findings based on major demographic features without the limits of systematic review methodology. **Findings:** The analysis reveals that age and gender have a substantial impact on mHealth literacy and autonomy, whereas education levels correlate with app usability and SMS comprehension. Income and rural residence also hamper device access and network dependability. Policy fragmentation and digital illiteracy remain implementation impediments, whereas participatory design and public-private partnerships emerge as enablers. **Conclusion:** One-size-fits-all mHealth strategies are insufficient. Equity-informed, context-specific frameworks that incorporate sociodemographic profiling into design, implementation, and assessment are critical for long-term effect.

KEYWORDS: mHealth, HIV/TB co-infection, Appointment adherence, Socio-demographics, Digital health in Nigeria, Mobile interventions.

INTRODUCTION

Adherence, broadly defined as the degree to which patients' behaviors correspond to healthcare professional recommendations, is a critical predictor of successful disease management [1-5]. According to the World Health Organization [5], non-adherence in chronic infectious diseases reduces treatment efficacy and contributes to morbidity, mortality, and drug resistance. Maher et al. [1] posited that adherence is particularly difficult in the context of HIV/TB co-infection, a syndemic that is especially prevalent in sub-Saharan Africa, and agreed that managing HIV and tuberculosis at the same time necessitates strict scheduling, a high pill burden, and coordinated care, all of which complicate treatment plans. According to Lawn and Churchyard [2], tuberculosis is the most common opportunistic infection among HIV patients, accounting for one-third of all AIDS-related fatalities worldwide. In Nigeria, the National Agency for the Control of AIDS [4] reported a 30% co-infection rate, emphasizing the importance of novel adherence tactics. Istepanian et al. [6] defined mHealth as medical and public health practices enabled by mobile devices, and it has been widely adopted around the world to improve patient participation and healthcare delivery. Labrique et al. [7], on the other hand, underline its contextual diversity, pointing out that infrastructure, literacy, and socio-cultural norms all influence success. According to Bosworth et al. [8], appointment adherence indicates continuity of care and clinical monitoring, whereas medication adherence involves accurate dosage and timing, and both are interconnected but affected by various factors. As a result, this narrative review investigates the impact of integrated mHealth interventions on appointment adherence as well as how sociodemographic factors influence medicine adherence among HIV/TB co-infected patients.

CONCEPTUAL AND THEORETICAL FRAMEWORK

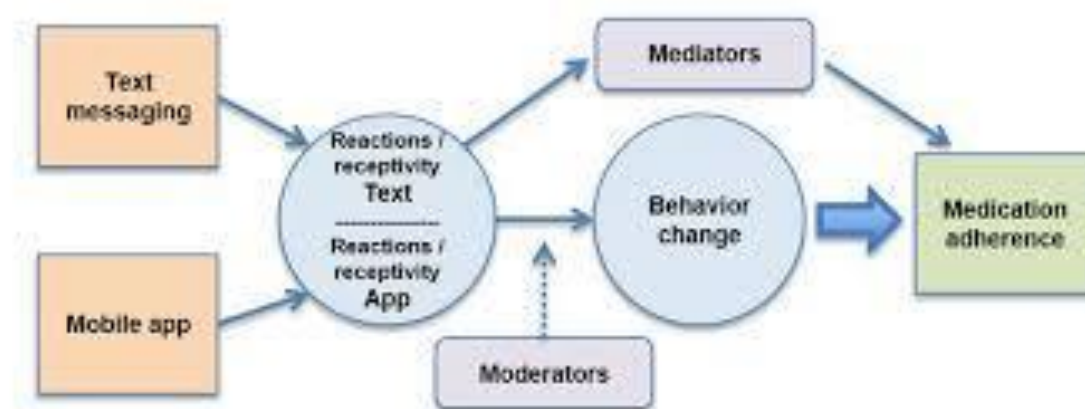


Figure 1: Conceptual model of behaviour change for medication adherence (Source: Davis [11])

The implementation of mobile health (mHealth) solutions is supported by behavioral and technology acceptance theories, which explain patient engagement and adherence behaviors (Figure 1). According to Rosenstock et al. [9], the Health Belief Model (HBM) suggests that perceived vulnerability, severity, advantages, and barriers influence health-related behavior. When applied to mHealth, HBM reveals that SMS reminders or digital alerts increase perceived



benefits while decreasing forgetfulness, a major adherence barrier [10]. Davis [11] proposes the Technology Acceptance Model (TAM), which contends that perceived simplicity of use and perceived usefulness is the major motivator for consumers to adopt digital interventions. This viewpoint is consistent with Venkatesh and Davis [12], who broaden TAM by including social impact as a determinant especially pertinent in collectivist societies like Nigeria, where communal ideas shape technological adoption. Thaler and Sunstein [13], drawing on Behavioural Economics, believe that low-cost, well-timed "nudges" like SMS reminders can impact decision-making in predictable ways while preserving autonomy. This viewpoint implies that appointment and prescription adherence can be enhanced using subtle cues integrated in digital systems, and as described by Bosworth et al. [8], appointment adherence is the patient's consistent attendance at scheduled clinical visits, which is critical for monitoring and continuity of care. Vrijens et al. [14], on the other hand, describe medication adherence as the degree to which patients take their prescriptions exactly as recommended, including commencement, implementation, and persistence, and while both behaviors are linked, they are influenced by different factors and necessitate separate remedies.

METHODOLOGY

A narrative review is a qualitative, interpretive method of literature synthesis that seeks to provide a thorough, critical, and contextual overview of existing information on a certain topic [15]. Unlike systematic reviews, which follow precise rules and criteria to avoid bias and maintain consistency, narrative reviews are more relaxed, allowing for the exploration of concepts and themes across various domains and approaches. According to Grant and Booth [16], narrative reviews are best suited for complicated themes with fragmented information that require the integration of both quantitative and qualitative outcomes to capture nuanced patterns. To fit this approach, a narrative review method was used in this review. Also, due to heterogeneity in study design, outcome measures, and populations, the topic necessitates the incorporation of diverse data sources, including epidemiological studies, behavioral research, and digital health implementation literature, which may not meet the strict criteria of a systematic review or permit statistical meta-analysis. A multi-database search method was employed to establish a solid foundation for the narrative synthesis; databases such as PubMed, Scopus, Web of Science, African Journals Online (AJOL), and the World Health Organization's (WHO) Global Health Library, all of which are known for providing thorough coverage of global and African-focused health literature, were used. The search method was intended to include peer-reviewed research and gray literature on mobile health and adherence habits in HIV/TB co-infected patients. Keywords were developed by combining specific terms and phrases, such as "mobile health" or "mHealth," with "HIV/TB co-infection," "appointment adherence," "visit adherence," "clinical attendance," "medication adherence," and various socio-demographic factors such as "age," "gender," "education," "income," "rural," or "urban." Articles were omitted if they did not directly discuss HIV/TB co-infection, mHealth interventions, or adherence results. Studies that focused primarily on the clinical efficacy of antiretroviral or tuberculosis treatment without behavioral components were also omitted. Instead of doing a stringent quality check or integrating papers in a meta-analysis, theme analysis was utilized to extract and arrange findings based on their central ideas. According to Thomas and Harden [17], thematic synthesis enables the analysis of textual material from diverse research by recognizing repeating patterns and conflicts. The analysis was arranged around specific themes, such as keeping appointments, adhering to medication programs, social

and demographic characteristics, and mobile health strategies, while remaining adaptable enough to add new discoveries such as technical skills, stigma, or infrastructural concerns.

mHEALTH AND APPOINTMENT ADHERENCE

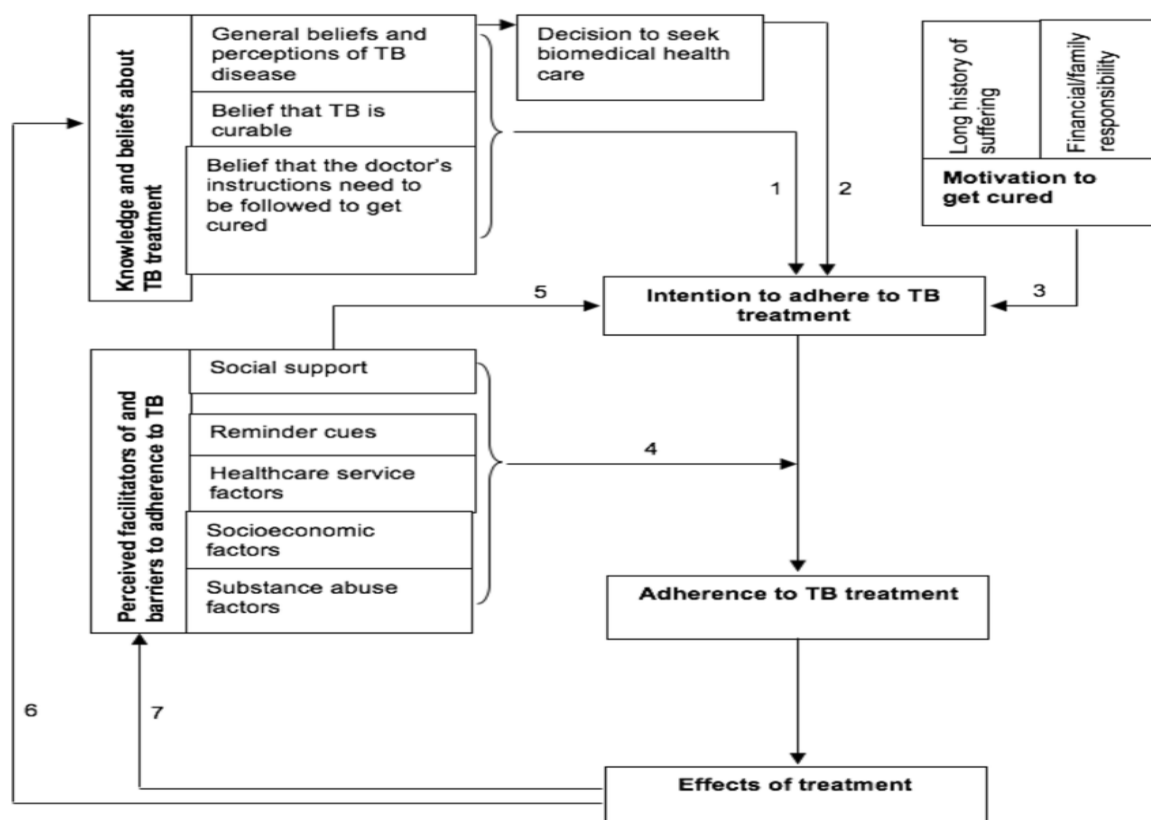


Figure 2: Implementation and effectiveness of evriMED with short message service (SMS) [18].

The World Health Organization [19] defines mobile health (mHealth) as the use of mobile and wireless technology to help people accomplish their health goals. mHealth refers to a wide range of interventions such as short message service (SMS) reminders, mobile health applications, automated voice calls, and telehealth platforms that aim to improve patient engagement, continuity of care, and adherence to treatment schedules [14]. According to Kay et al. [20], SMS reminders continue to be the most popular mHealth tool in low- and middle-income countries due to their low cost and compatibility with basic mobile phones. In contrast, Labrique et al. [7] report an increase in the use of smartphone-based applications that provide interactive features such as appointment scheduling, health education, and bidirectional communication, despite the fact that these tools are frequently inaccessible to populations with low digital literacy or poor internet connectivity (Figure 2). Regarding the global impact, Aranda-Jan et al. [21] conducted a review of mHealth interventions in low-resource settings and discovered that appointment adherence improved in more than 60% of studies using SMS reminders. Similarly, Hall et al. [22] found a significant increase in clinical attendance among HIV-positive patients who received regular text message prompts. In contrast, Kunutsor et al. [23] believe that some mHealth interventions had neutral or limited effects, particularly when not tailored to the patient context or when technical issues disrupted service continuity. These findings suggest that mHealth success is not universal and is heavily reliant on design relevance

and infrastructure considerations, and because of its high mobile phone coverage and health-care system limitations, sub-Saharan Africa has emerged as a hotbed of mHealth experimentation [14]. Pop-Eleches et al. [24] conducted a randomized controlled trial in Uganda and found that weekly SMS reminders significantly improved appointment adherence among HIV patients, which is consistent with theories of behavioral reinforcement and cue-to-action proposed in the Health Belief Model [9]. Lester et al. [25] found that interactive SMS messages improved not only adherence but also patient-provider trust in Kenya, implying that mHealth can serve both as an information delivery tool and as a relationship support tool. Knop et al. [26] found that telephonic follow-ups helped reduce missed prenatal consultations among HIV-positive women in South Africa but cautioned that inadequate network coverage and changing phone numbers remained significant barriers. According to Karigi [27], SMS reminders increased attendance at ART clinics in Lagos, although the impact was tempered by socioeconomic level and phone ownership. Similarly, Akinfaderin-Agarau et al. [28] highlight how mobile platforms facilitated youth-friendly HIV care, despite the fact that the intervention required culturally appropriate communication methods to be effective. Tomlinson et al. [29] contend that simplicity and low-cost scalability are critical to mHealth sustainability in resource-constrained environments. McHenry et al. [30] add that user literacy and digital skills are still important predictors of uptake, with interventions failing when they surpass users' technical capacity. Furthermore, Leon et al. [31] underline the importance of integrating into current health systems, such as synchronizing reminders with clinic scheduling systems and involving frontline health workers, in order to ensure sustainability and confidence.

Role of mHealth



Figure 4: Role of Mobile Health in Healthcare



Socio-demographic factors, defined as the social and demographic features that influence health behaviors and outcomes, play a critical role in determining the effectiveness of mobile health (mHealth) interventions, particularly in terms of medication adherence [27]. Vrijens et al. [14] define medication adherence as the extent to which patients take drugs as prescribed, including timing, dosage, and frequency; thus, mHealth serves as a mediation tool, encouraging adherence through reminders, education, and behavioral nudges. However, Kruse et al. [32] posited that socio-demographic characteristics have a significant impact on how patients interact with such technology, as well as stating that younger groups are more likely to accept mobile-based therapies since they are more technologically savvy and utilize smartphones. In contrast, older persons frequently confront challenges such as inadequate computer literacy, visual impairments, and reluctance to technological change [33]. Nonetheless, Heart et al. [34] argue that with adequate support and simple interfaces, senior people can still benefit from mHealth, particularly in chronic disease management. This is consistent with the Technology Acceptance Model [11], which states that perceived usefulness and ease of use drive technology uptake regardless of age. According to Jennings and Gagliardi [35], gender also has an important role, arguing that in many patriarchal settings, women may be denied phone access or must obtain male consent to use digital health services. In contrast, some research suggests that women are more proactive in their health-seeking activities and thus more responsive to mHealth programs [36]. According to Aker and Mbiti [37], urban residents benefit from more network coverage, better healthcare infrastructure, and higher exposure to technology, all of which improve mHealth usability. However, in rural regions, inadequate infrastructure and sporadic electricity significantly limit the reach and reliability of digital interventions [30]. However, Tomlinson et al. [29] contend that rural populations, which are frequently underserved by traditional health systems, will benefit the most from mHealth if it is carefully tailored to local conditions. Dijk van [38] defines digital literacy as the ability to identify, assess, and use digital tools successfully. Users with higher education levels are more likely to interact meaningfully with mobile health messaging and apps [7]. In contrast, inadequate literacy might skew understanding, impair confidence in digital communication, and increase reliance on intermediaries such as family members or health workers [30]. However, while mobile phone ownership has increased tremendously, affordability continues to limit usage in low-income groups, thereby identifying income as another important factor [39]. Free mHealth services frequently exclude the expenses of data, phone charging, or handset replacement, resulting in hidden challenges to access [40]. Furthermore, financial hardship is frequently associated with lower drug adherence, emphasizing the necessity for comprehensive socioeconomic support methods. Additionally, Akinfaderin-Agarau et al. [28] argued that socio-demographic identities have a substantial impact on privacy concerns, stigma, and trust in healthcare providers and that young persons living with HIV in Nigeria prefer anonymous digital communication to avoid stigma, whereas elderly adults are concerned about confidentiality breaches. Similarly, Jennings et al. [35] believe that health workers' endorsement of mHealth tools can reduce skepticism, particularly among conservative or low-literacy groups.



DISCUSSION

WHO 2011 [19] defines mHealth as the use of mobile and wireless technology to facilitate the achievement of health goals, and it has received accolades for its capacity to close healthcare access gaps. Adherence, whether to medication or clinic appointments, refers to how well patients follow prescribed health regimens [14]. However, as Aranda-Jan, Mohutsiwa-Dibe, and Loukanova [21] note, the effectiveness of mHealth interventions is heavily context dependent. While SMS reminders improved ART adherence among Kenyan youth, similar measures failed in rural Uganda because of language barriers and phone-sharing behaviours [24, 41]. Structural inequality, defined as disparities in access to resources such as healthcare, education, and technology, has a significant impact on the efficacy of mobile health [14]. Tomlinson et al. [29] argue that, while mHealth is touted as a low-cost option, it implicitly assumes basic access to phones, computer literacy, and electricity resources that are typically scarce in impoverished areas, and this creates a tension: whereas mHealth promotes inclusivity, it can worsen exclusion if basic socioeconomic circumstances are ignored. Jennings and Gagliardi [35] gendered phone ownership norms in sub-Saharan Africa impede women's participation in mHealth projects, despite the fact that women are typically primary caregivers. Similarly, Mechael et al. [42] discover that improved access and literacy benefit youth and urban residents disproportionately, while leaving the elderly, rural, and disabled populations behind, and these trends indicate that if mHealth is not deployed effectively, it has the potential to exacerbate rather than resolve existing health disparities. According to Labrique et al. [7], a common constraint is a lack of interaction between mHealth tools and national health systems. Furthermore, few studies look into long-term behavioral change or address privacy, permission, and monitoring concerns, which are critical for stigmatized conditions like HIV. Lessons from underperformance are [24]. Chib et al. [43] posited that a popular mHealth app in India failed due to a lack of community participation and an over-reliance on automated procedures. This is congruent with Behavioral Economics theory, which states that nudges must be contextually tailored and reinforced in order to effectively influence health behaviors [13].

IMPLICATIONS FOR POLICY, PRACTICE, AND RESEARCH

Before scaling up mHealth treatments, policymakers must be cautious and evidence-based, especially in situations with socioeconomic gaps and limited infrastructure. Policy decisions that ignore digital exclusion may, in fact, exacerbate rather than resolve health disparities [29]. According to Labrique et al. [7], the success of mHealth depends not just on technical deployment but also on strategic integration into current health systems, which is supported by legal frameworks that safeguard privacy and provide sustainability. According to Jennings and Gagliardi [35], top-down, one-size-fits-all digital health initiatives frequently fail because they are not aligned with local realities. It is vital to tailor interventions to sociodemographic heterogeneity, including age, gender, education, language, and the rural-urban split. For example, Chib et al. [43] find that treatments that ignore gendered patterns of phone access and literacy frequently omit women, who play an important role in family health decision-making in many African communities. From a practical standpoint, healthcare professionals must be equipped and taught to connect technology and human engagement, reinforcing digital cues with compassionate care. According to WHO [19], digital tools should supplement rather than replace human interaction, and integrating mHealth into primary care procedures guarantees



that it enhances rather than competes with existing modalities. According to Mehra et al. [41], longitudinal studies are critical for assessing long-term health outcomes and sustained adherence behaviors. Mixed-methods research, which combines quantitative trends with qualitative observations, can reveal the socio-cultural intricacies that drive consumer involvement or resistance [29]. Furthermore, locally built tools that incorporate feedback from end users may outperform externally imposed platforms by better aligning with language, cultural, and behavioral contexts [21].

CONCLUSION

This narrative review critically examined the impact of integrated mobile health (mHealth) interventions on appointment adherence and the moderating effects of socio-demographic factors among people living with HIV and tuberculosis (TB) in resource-constrained settings, particularly in Imo State, Nigeria. Drawing on global, African, and local evidence, it argues that, while mHealth via tools such as SMS reminders, mobile apps, and automated calls has shown promising results in improving appointment and prescription adherence, its success is neither universal nor assured. Studies repeatedly show that such interventions are more likely to succeed when they are straightforward, culturally relevant, cost-effective, and linked with local health-care system capabilities. However, the review emphasizes that the combined framing of appointment adherence and sociodemographic modifiers provides a strong lens for comprehending mHealth's real-world implications. Appointment adherence, while often underestimated, is an important predictor of long-term health outcomes for HIV/TB patients, influencing treatment timing, monitoring, and viral suppression.

Authors' Contribution

All authors contributed to the review process.

Final Approval of Manuscript

All authors

Ethics Approval and consent to Participate

Not Applicable

Consent to Publish

Not applicable

Availability of Data and Materials

N/A

Competing Interests

Authors have declared that they have no competing interests.

Funding

No funds were received for this study.



Acknowledgements

Not Applicable

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