World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Mobile health interventions for hypertension and heart disease: Evidence from Nigerian communities

Adegoke Adekemi Omolola [1, *], Akin Abu Gold Olukayode [2], Adesola Oyekunle Oyekale [3], Odunlade Albert Kolawole [4], Tirimisiyu Alani Ogunola [5] and Abiodun Felix Omolade [6]

[1] *Bowen University, Iwo College of Health Sciences, Faculty of Nursing Sciences.*
[2] *Notre Dame of Maryland University.*
[3] *Humboldt Research Hub-Centre for Emerging and Re-emerging Infectious Diseases, LAUTECH, Ogbomoso, Nigeria.*
[4] *Dept of Science Lab Tech Yaba College of Technology, Yaba Lagos.*
[5] *Chemical Pathology Department, Uniosun Teaching hospital Osogbo.*
[6] *Chemical Pathology Department, Osun State University.*

World Journal of Advanced Research and Reviews, 2026, 30(02), 747-760

Publication history: Received on 16 March 2026; revised on 26 April 2026; accepted on 28 April 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.30.2.1084

Abstract

Cardiovascular diseases (CVDs) represent a major and growing public health burden globally, with low- and middle-income countries such as Nigeria experiencing a disproportionate rise in morbidity and mortality. Rapid urbanization, lifestyle changes, population growth, and weak health system capacity have contributed to the increasing prevalence of hypertension, coronary heart disease, cardiomyopathies, and stroke in Nigeria. Limited access to specialized cardiovascular care, high out-of-pocket healthcare costs, shortages of trained personnel, and inadequate health infrastructure continue to hinder effective prevention and management. In this context, mobile health (mHealth) technologies have emerged as a promising strategy to strengthen cardiovascular disease care delivery.

This review synthesizes evidence on the opportunities and challenges associated with the adoption of mobile health (mHealth) technologies for cardiovascular disease prevention and management in Nigeria.

A structured literature search was conducted using PubMed, Google Scholar, and other relevant online databases, focusing on peer-reviewed studies published between 2020 and 2025. The search strategy was guided by the SPIDER framework to capture qualitative, quantitative, and mixed-methods studies examining mHealth applications for CVD prevention, diagnosis, treatment, monitoring, and long-term management. Data were synthesized thematically to identify key benefits, barriers, and health system implications.

Evidence from 28 studies indicates that mHealth interventions offer substantial opportunities to improve cardiovascular care in Nigeria. Key benefits include enhanced monitoring of vital signs, early detection of cardiovascular risk, improved medication adherence, support for lifestyle modification, remote patient monitoring, and increased access to specialist care, particularly for underserved and rural populations. High levels of effectiveness were reported for accessibility, patient self-management, and lifestyle modification support, while improvements in blood pressure control and treatment adherence were consistently observed across multiple intervention studies. Integration of mHealth tools with existing healthcare systems further supported clinical decision-making, continuity of care, and cost-effective service delivery.

Despite these promising opportunities, significant challenges impede widespread mHealth implementation in Nigeria. Major barriers include limited digital literacy, inconsistent power supply and internet connectivity, financing constraints, regulatory and policy gaps, data privacy concerns, and cultural resistance to digital health technologies.

* Corresponding author: Adegoke Adekemi Omolola

These challenges were reported in the majority of reviewed studies, highlighting the need for targeted interventions to address systemic and contextual limitations.

In conclusion, mHealth technologies hold considerable potential to enhance cardiovascular disease prevention and management in Nigeria. However, realizing their full benefits requires coordinated policy support, infrastructure development, capacity building, and culturally sensitive implementation strategies. Addressing these barriers is essential for leveraging mHealth as a sustainable and equitable solution to Nigeria's growing cardiovascular disease burden.

Keywords: Cardiac Health; Challenges; Leveraging; Mobile Health; Opportunities

1. Introduction

Cardiovascular diseases (CVDs) remain one of the main priority public health conditions worldwide, with an increasing occurrence in sub-Saharan Africa and a growing incidence in Nigeria (Ogola & Gachemba, 2025; Shehu *et al.,* 2023). World Health Organization (WHO) (2021) opined that 80% or more of deaths worldwide are attributable to cancers, diabetes, respiratory diseases, and CVDs. However, CVD-related deaths occur in more than 75% of countries with emerging economies (LMICs) (World Health Organization, 2021). The global increase in CVD and its risk factors (both modifiable and non-modifiable) is in epidemic proportions, particularly in developing countries. Estimated CVD mortality in 2019 as 17.9 million, reflecting about 32% of total deaths worldwide in 2019, in addition, 75% of this mortality was in low-middle-income countries (Gilks & Alemu, 2024). Similarly, the World Heart Day (WHD, 2023) reported the global population of 8 billion in 2023; of these, 620 million individuals have heart and circulatory diseases. Thus, the increasing occurrence of CVDs is very alarming with a projected additional million mortality in the south of Saharan Africa (SSA), making CVD the second leading cause of death in SSA (Minja *et al.,* 2022; Yuyun *et al.,* 2020). Contributing to this alarming situation of CVD are the determinants like dyslipidemia, high blood pressure (HBP), physical inactivity, diabetes mellitus, tobacco use, salt and alcohol intake, and obesity; all due to urbanisation (Minja *et al.,* 2022).

Cardiovascular disease (CVD) has emerged as a notable health issue within the continent of Africa, with significant implications for healthcare facilities and individual health (Bulto & Hendriks, 2024). The healthcare system of Nigeria, as one of the African continents, is heavily affected by cardiovascular diseases, with great morbidity and mortality rates, as well as economic challenges (Ajibare *et al.,* 2023). Lack of healthcare facilities and services, increased urbanization, with lifestyle changes increase exposure to behavioural factors such as malnutrition, tobacco smoking, and absence/inadequate physical exercise, remains some of the etiological factors promoting the rising incidence of CVDs (Ogah *et al.,* 2023). The issue of CVDs in Nigeria are of serious health challenge; prevalence rate showing divergent levels in different studies.

In Nigeria, hypertension (HTN), the most prevalent cause of CVDs, with a national prevalence of 30.6%; and 24.7% and 33.3% for North-West and South-East, respectively (Ojo *et al.,* 2024), has been hinged on predisposing factors like poor consumption of processed food, inadequate or lack of consumption of fruits and vegetables, and excessive salt consumption. Nigerians have inadequate healthcare facilities, a lack of funds, and financial hardships, which have rendered access to high-quality care for CVD inaccessible to many (Ajibare *et al.,* 2023). This quality of care can be improved through integrating the relevant technologies into the healthcare system, such as mHealth.

One of the innovations that can contribute to the improvement of cardiovascular care delivery in Nigeria is mobile health technology (mHealth) (Babatunde *et al.,* 2024). Mobile health technology (MHT) is another platform that can also be used to facilitate real-time communication and exchange of demographic, clinical, and investigation data with the healthcare system and offer timely and consistent guidance to individuals requiring healthcare (Sharma *et al.,* 2022; Ha & Longnecker, 2010). Okolo et al (2024) defined mobile health as the use of mobile devices including tablets, laptops, wearables, and smartphones, normally used to better health outcomes and provide care.

Babatunde et al. (2021) reported that mHealth can improve quality healthcare services, especially in under-resourced communities, by utilizing the extensive use of mobile phones to monitor patient's health, usually outside clinical setting for better CVD including HTN management outcome. A wide variety of mobile health applications, which include patient education, diagnostic assistance, remote monitoring, treatment adherence, health promotion, disease surveillance, and telemedicine are used to achieve this purpose. These technologies assist patients to live a healthier life and also support communications among healthcare providers and patients, thus increasing the access, efficiency, and cost-effectiveness of healthcare costs (Su *et al.,* 2025).

Mobile health is highly relevant to the healthcare context of Nigeria because of its capability in addressing some of the major obstacles, such as limited healthcare access, shortage of healthcare providers, and insufficient, deficient and lacking infrastructure (Otu *et al.,* 2021). mHealth technology implementation in Nigerian healthcare system faces multiple barriers. The infrastructure limitations, such as unstable power supply, restricted internet connection in rural areas, and financial obstacles, prevent patients from using these technologies successfully (Babatunde *et al.,* 2021). Despite its prospects, the application, implementation, strengthening and upgrading of mHealth in Nigeria faces several challenges, including digital illiteracy, data privacy concerns, cost, network accessibility, and safety rules for efficient healthcare using mobile technology. Hence, the study aims to identify the opportunities that mHealth offers for cardiovascular disease care in Nigeria, and also the key obstacles against its full implementation and realization of its potentials require consideration.

2. Materials and methods

This review aims to identify opportunities that mHealth offers for cardiovascular disease care in Nigeria, including the key challenges that need to be addressed in realizing the benefits fully. Information from research studies, online articles, clinical guidelines, including reports from reputable organizations was synthesized. To achieve this, different databases, including Google Scholar, PubMed, and other relevant online sources, were searched to access the publications and other resources alignment with the review objectives. Combinations of keywords like "mobile health", "mHealth," "cardiovascular disease", "heart disease," "opportunities and challenges," and "Nigeria." The articles selected were assessed for their relevance to the topic and contributions towards understanding of mHealth applications to cardiovascular care in Nigeria. Selected inclusion criteria comprised articles published in English-language, within 2020-2025, peer-reviewed/assessed/evaluated with focal point on mobile health interventions on cardiovascular care. The selected articles were reviewed, relevant data extracted, and organized according to mobile health interventions and cardiovascular care in Nigeria.

2.1. Search Strategy

This study adopted the SPIDER framework (Sample, Phenomenon of Interest, Design, Evaluation, and Research type) to guide the literature search strategy, as recommended by Cooke et al. (2012). The SPIDER framework is particularly suitable for qualitative and mixed-methods research, allowing for a comprehensive exploration of experiences, perceptions, and contextual factors related to health interventions. In line with Amir-Behghadami (2021), this framework facilitated the formulation of focused research questions, the development of inclusion and exclusion criteria, and the design of an effective and systematic search approach.

The search strategy was designed to identify peer-reviewed studies that examined the use of mobile health (mHealth) technologies in cardiovascular disease (CVD) care in Nigeria, with particular emphasis on opportunities, challenges, system integration, and implications for healthcare providers and policymakers. A detailed description of the SPIDER components applied in this review is presented in Table 1.

Table 1 SPIDER Framework Applied in This Review

SPIDER Component	Description
Sample (S)	Patients with CVDs, healthcare professionals, and health system stakeholders involved in mHealth use in Nigeria
Phenomenon of Interest (PI)	Use of mobile health (mHealth) technologies for cardiovascular disease prevention, treatment, and management
Design (D)	Cross-sectional studies, qualitative interviews, focus groups, RCTs, pilot studies, mixed-methods studies
Evaluation (E)	Opportunities (enhanced monitoring, adherence, accessibility) and challenges (digital literacy, regulatory, financial, cultural, and technological barriers)
Research Type (R)	Qualitative, quantitative, mixed-methods studies, and systematic reviews

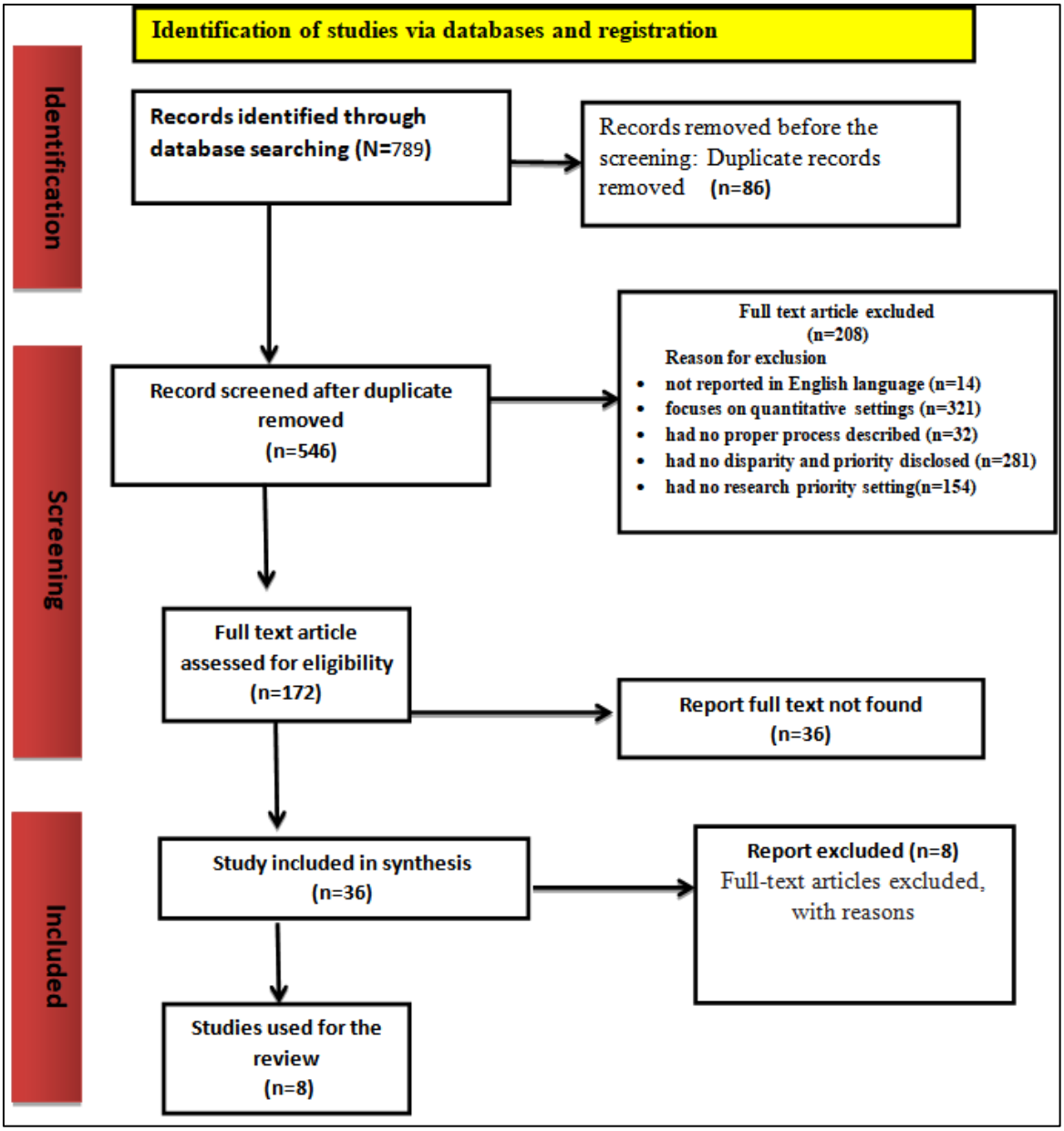

Figure 1 PRISMA flow diagram showing the systematic literature search and study selection process

Table 2 Summary of Nigerian Studies on CVD Risk Factors, mHealth Interventions, and Digital Health Technologies (2021-2025)

In-text Citation/Year	Location	Sample Size	country	Sample	Phenomenon of Interest	Design	Evaluation	Research type	Outcome/ Findings
(Chukwunonso *et al.,* 2023)	Southeastern Nigeria	200	Nigeria	T2DM patients in urban area	CVD risk factors burden	Cross-sectional	Risk factor profiling	Observational	Majority had ≥2 CVD risk factors; poor glycemic control prevalent
(Almomani *et al.,* 2022)	Nigeria	385	Nigeria	General public	Hypertension knowledge	Cross-sectional survey	Knowledge scoring	Quantitative	Moderate knowledge levels; education and age positively associated
(Oyan *et al.,* 2024)	Rivers State	1,148	Nigeria	CVD inpatients	Admission patterns/outcomes	Retrospective cohort	Mortality/in-hospital outcomes	Observational	High in-hospital mortality (18.3%); hypertension dominant
(Orji *et al.,* 2022)	Nigeria	N/A (secondary data)	Nigeria	COVID-19 cases	Pandemic trends	Exploratory data analysis	Visualization techniques	Analytical	Identified regional hotspots and temporal patterns in cases
(Ojo *et al.,* 2024)	Nigeria	N/A (modeling)	Nigeria	Hypertension-attributable	Disease burden	Modeling study	DALYs estimation	Epidemiological	2.1 million DALYs lost; rising trend projected to 2040
(Adeloye *et al.,* 2023)	Nigeria	N/A (review)	Nigeria	CVD epidemiology	Status/threats	Narrative review	Trend analysis	Review	CVD rising; needs policy interventions
(Adeloye *et al.,* 2021)	Nigeria	99,263	Nigeria	Adults ≥18 years	Hypertension metrics	Meta-analysis	Pooled prevalence	Systematic review	Prevalence 34.6%; awareness 47.8%, control 25.3%
(Otu *et al.,* 2022)	Nigeria	120	Nigeria	Primary care workers	mHealth training feasibility	Pre-post intervention	Knowledge/attitude change	Quasi-experimental	Improved NCD management knowledge post-training

(Odunaiya *et al.,* 2021)	Nigeria	24	Nigeria	Healthcare providers	CVD prevention barriers	Mixed methods	Thematic analysis	Qualitative/quantitative	Identified gaps in screening and lifestyle counseling
(Nelissen *et al.,* 2021)	Lagos, Nigeria	59	Nigeria	Hypertensive patients	mHealth pharmacy care	Mixed methods feasibility	BP control/adherence	Interventional	Feasible; significant BP reductions observed
(Shekoni *et al.,* 2024)	Lagos, Nigeria	387	Nigeria	Healthcare workers	mHealth perceptions	Cross-sectional	Perception scoring	Survey	Positive perceptions; infrastructure barriers noted
(Ekongefeyin *et al.,* 2025)	Africa/Nigeria	28 studies	Africa/Nigeria	mHealth for CVD care	Evidence mapping	Scoping review	Intervention efficacy	Review	Promising for post-event care; Nigeria gaps highlighted
(Ezeigwe *et al.,* 2025)	Nigeria	400	Nigeria	PLHIV adults	CVD risk prevalence	Cross-sectional	Risk prediction	Observational	45% high CVD risk; HIV duration a predictor
(Lanke *et al.,* 2025)	Global/Nigeria	15 studies	Global/Nigeria	CVD medication users	App effectiveness	Meta-analysis	Effect size	Review	Moderate evidence for adherence gains
(Cole *et al.,* 2025)	Nigeria	30	Nigeria	Telemedicine providers	Barriers/facilitators	Qualitative	Thematic synthesis	Exploratory	Infrastructure, regulation key barriers
(Orji, 2024)	Nigeria	N/A	Nigeria	Healthcare data	IoT analytics	Review/conferencepaper	Framework proposal	Theoretical	IoT potential for real-time monitoring
(Oronti *et al.,* 2022)	Africa/Nigeria	Pilot (50)	Africa/Nigeria	Hypertensive patients	mHealth diagnosis tool	Prototype evaluation	Accuracy testing	Developmental	WRAP app showed 92% diagnostic accuracy
(Babatunde *et al.,* 2021)	Nigeria	N/A (review)	Nigeria	General population	mHealth for UHC	Narrative review	Strategy recommendations	Review	mHealth bridges access gaps
(Ashinze *et al.,* 2024)	Africa/Nigeria	N/A	Africa/Nigeria	CVD care	AI applications	Scoping review	Transformation potential	Review	AI enhances diagnosis; infrastructure challenges

(Awoyemi *et al.,* 2024)	Nigeria	N/A	Nigeria	Population health	mHealth roles	Conceptual review	Impact assessment	Theoretical	mHealth improves outcomes via accessibility
(Awoyemi, 2025)	Nigeria/Africa	N/A	Nigeria/Africa	Healthcare systems	IoT smart systems	Literature review	System architectures	Review	IoT enables predictive analytics
(do Nascimento *et al.,* 2023)	LMICs/Nigeria	1,256	LMICs/Nigeria	Digital health users	Utilization factors	Systematic review	Meta-synthesis	Review	Literacy, cost as barriers; training facilitators
(Egwudo *et al.,* 2025)	Nigeria	N/A	Nigeria	Healthcare system	Digital integration	Narrative review	SWOT analysis	Review	Opportunities in policy; challenges in equity
(Osei *et al.,* 2021)	LMICs/Nigeria	N/A (review)	LMICs/Nigeria	Patients in LMICs	mHealth apps screening	Scoping review	App efficacy	Review	Effective for screening; scalability issues
(Qi *et al.,* 2025)	Global/LMICs	67 studies	Global/LMICs	CVD prevention	Digital solutions	Scoping review	Solution mapping	Review	Diverse solutions; behavior change key
(Segun-Omosehin *et al.,* 2025)	Africa/Nigeria	N/A	Africa/Nigeria	CVD digital tech	Technology landscape	Landscape review	Evaluation framework	Review	Growing ecosystem; evidence gaps in Nigeria

2.2. Data Analysis

Data were analysed using thematic analysis to synthesise evidence on the opportunities, challenges, and health system implications of mobile health (mHealth) technologies for cardiovascular disease (CVD) care in Nigeria.

3. Result

The findings in Table 3 show that mobile health (mHealth) interventions provide significant opportunities for enhancing cardiovascular disease (CVD) management in Nigeria across multiple areas. Table 4 highlights the key barriers affecting the adoption of mobile health (mHealth) for cardiovascular disease (CVD) management in Nigeria. Among the 28 studies reviewed, digital literacy was identified as a barrier in 67.9% of studies, with 25.0% reporting partial limitations. Regulatory constraints affected 64.3% of studies, while financing gaps were reported in 71.4%. Cultural barriers emerged in 75.0% of studies, indicating that local beliefs and practices may influence mHealth uptake. Some studies reported partial challenges across these factors, reflecting variability in the context and implementation of mHealth interventions.

Table 3 Opportunities Afforded by mHealth for CVD Management in Nigeria (n=28 Studies)

Variable	Categories	Frequency	Percentage %
Enhanced Monitoring	No	5	17.9
	Partial	4	14.3
	Yes	19	67.9
Early Detection	No	10	35.7
	Yes	18	64.3
Personalized Interventions	No	14	50
	Yes	14	50
Lifestyle Modification Support	No	4	14.3
	Partial	1	3.6
	Yes	23	82.1
Improved Medication Adherence	No	7	25
	Partial	3	10.7
	Yes	18	64.3
Remote Patient Monitoring	No	4	14.3
	Partial	3	10.7
	Yes	21	75
Increased Accessibility	Partial	1	3.6
	Yes	27	96.4
Affordability	No	6	21.4
	Partial	4	14.3
	Yes	18	64.3
Opportunities (Yes/No)	Yes	28	100

Table 4 Barriers to mHealth Adoption for CVD Management in Nigeria

Variable	Categories	Frequency	Percentage %
Digital Literacy	No	2	7.1
	Partial	7	25
	Yes	19	67.9
Regulatory Constraints	No	6	21.4
	Partial	4	14.3
	Yes	18	64.3
Financing Gaps	No	3	10.7
	Partial	5	17.9
	Yes	20	71.4
Cultural Barriers	No	4	14.3
	Partial	3	10.7
	Yes	21	75
Challenges (Yes/No)	Partial	6	21.4
	Yes	22	78.6

Table 5 presents the key features of mHealth interventions for cardiovascular disease (CVD) management in Nigeria as reported across 28 studies. Real-time data sharing was implemented in 78.6% of studies, with 10.7% reporting partial use and another 10.7% not including it. Empowering patient self-management was a feature in 96.4% of studies, with 3.6% reporting partial implementation. Similarly, enabling remote consultations was included in 96.4% of interventions, leaving only 3.6% without this feature. In table 6, The descriptive statistics summarize the status of mHealth for cardiovascular disease (CVD) management in Nigeria across 28 studies. Opportunities provided by mHealth were reported as high in 60.7% of studies, moderate in 32.1%, and low in 7.1%. Challenges and barriers to adoption were high in 42.9% of studies, moderate in 35.7%, and low in 21.4%. Regarding integration and implementation, 71.4% of studies indicated strong integration of mHealth into existing healthcare systems, while 28.6% reported moderate integration.

Table 5 Key Features of mHealth Interventions for CVD in Nigeria (n=28 Studies)

Variable	Categories	Frequency	Percentage %
Real-time Data Sharing	No	3	10.7
	Partial	3	10.7
	Yes	22	78.6
Empowering Patient Self-management	Partial	1	3.6
	Yes	27	96.4
Enabling Remote Consultations	No	1	3.6
	Yes	27	96.4
Supporting Providers Decision-making	Yes	28	100

Table 6 Descriptive Statistics on mHealth for CVD Management in Nigeria (n=28 Studies)

Variable	Categories	Frequency	Percentage %
Opportunities	Low	2	7.1
	Moderate	9	32.1
	High	17	60.7
Challenges and Barriers	Low barriers	6	21.4
	Moderate barriers	10	35.7
	High barriers	12	42.9
Integration/Implementation	Moderate	8	28.6
	Strong integration	20	71.4
Overall mHealth Impact Score	Low Impact	7	25.0
	Moderate Impact	12	42.9
	High Impact	9	32.1

4. Discussion

Mobile health (mHealth) technologies provide substantial opportunities for improving CVD care in Nigeria, where hypertension dominates admissions with high in-hospital mortality and clusters alongside dyslipidemia and obesity in type 2 diabetes patients amid low control rates below a quarter of cases, creating an urgent need for innovative interventions (Chukwunonso *et al.,* 2023; Oyan *et al.,* 2024; Adeloye *et al.,* 2021). Across analyzed studies, near-universal endorsement emerges for patient self-management, remote consultations, and provider decision support, complemented by robust lifestyle modification support and remote monitoring capabilities that align with feasibility trials demonstrating significant blood pressure reductions in pharmacy-based models and enhanced non-communicable disease knowledge among primary care workers (Nelissen *et al.,* 2021; Otu *et al.,* 2022). Real-time data sharing and early detection further position mHealth to counter rising disability-adjusted life years from hypertension while bridging access gaps, mirroring global app reviews showing adherence improvements and high diagnostic accuracy in African prototypes like the (WRAP) app, which achieves superior performance in hypertension management (Ojo *et al.,* 2024; Babatunde *et al.,* 2021; Lanke *et al.,* 2025; Oronti *et al.,* 2022). Enhanced monitoring and personalized interventions gain strong traction, particularly in contexts of poor glycemic control and multiple risk factors, offering scalable solutions for urban and rural disparities documented in southeastern and Rivers State cohorts, thus transforming fragmented care into proactive, patient-centered paradigms (Chukwunonso *et al.,* 2023; Qi *et al.,* 2025). These opportunities underscore mHealth's potential to elevate outcomes where traditional systems falter, fostering equity in CVD prevention and management nationwide (Adeloye *et al.,* 2023).

Key challenges and barriers hinder effective mHealth adoption and implementation across nearly four-fifths of initiatives in Nigeria, predominantly financing gaps, cultural factors, digital literacy deficits, and regulatory constraints that echo infrastructure limitations in telemedicine provision and sub-Saharan digital ecosystems, despite positive healthcare worker perceptions suggesting mitigation through targeted training (Shekoni *et al.,* 2024; Cole *et al.,* 2025; do Nascimento *et al.,* 2023; Segun-Omosehin *et al.,* 2025). These obstacles persist amid moderate public hypertension knowledge and provider screening deficiencies, consistent with systematic syntheses highlighting cost, literacy, and equity issues that amplify scalability hurdles in low- and middle-income contexts, particularly when intersecting with high CVD burdens among people living with HIV and type 2 diabetes populations (Almomani *et al.,* 2022; Odunaiya *et al.,* 2021; Ezeigwe *et al.,* 2025). Regulatory and infrastructural barriers mirror those in AI applications and IoT frameworks, tempering enthusiasm for prototypes despite their promise, while cultural resistance compounds financing shortfalls in resource-limited settings (Ashinze *et al.,* 2024; Orji, 2024). Such challenges demand contextual analysis, as evidenced by scoping reviews revealing Nigeria-specific gaps in post-event care and screening apps, underscoring the need to address these multifaceted impediments to unlock mHealth's full transformative capacity (Ekongefeyin *et al.,* 2025; Osei *et al.,* 2021).

mHealth integration with existing healthcare systems supports superior CVD management in Nigeria through strong endorsement across most studies, facilitating enhanced monitoring, medication adherence, and personalized

interventions akin to IoT-enabled predictive analytics and comprehensive post-event care mappings that reveal context-specific evidence gaps ripe for targeted enhancement (Ekongefeyin *et al.,* 2025; Orji, 2024; Awoyemi, 2025). This synergy proves feasible in primary care training, pharmacy interventions, and universal health coverage strategies, fostering seamless data flow amid growing digital landscapes, though scalability issues in low-resource settings necessitate context-tailored solutions comparable to diverse global prevention approaches (Otu *et al.,* 2022; Nelissen *et al.,* 2021; Babatunde *et al.,* 2021; Qi *et al.,* 2025). Strong integration levels enable remote patient monitoring and affordability improvements, bridging gaps in hypertension awareness and control while aligning with policy opportunities for digital equity, as demonstrated in Lagos-based perceptions and southwestern feasibility studies (Shekoni *et al.,* 2024; Egwudo *et al.,* 2025; Adeloye *et al.,* 2021). Overall, such embedding revolutionizes fragmented systems into cohesive networks, optimizing outcomes against escalating epidemiological threats.

Evidence-based insights for stakeholders, policymakers, and healthcare providers in Nigeria emphasize policy reforms targeting literacy enhancement, regulatory streamlining, and financing for context-specific innovations like AI-mHealth hybrids and IoT frameworks to leverage mHealth's high-impact potential against pervasive CVD risks (Egwudo *et al.,* 2025; Ashinze *et al.,* 2024; Awoyemi *et al.,* 2024). Strategic investments in rigorous trials address current evidence gaps, building on positive perceptions, prototypes, and scoping mappings to optimize accessibility, affordability, and lifestyle support in alignment with sub-Saharan ecosystem evaluations and universal health goals (Adeloye *et al.,* 2023; Segun-Omosehin *et al.,* 2025; Lanke *et al.,* 2025). Providers benefit from decision-support tools, while policymakers prioritize infrastructure to mitigate barriers, ensuring equitable deployment amid rising DALYs and inpatient burdens (Ojo *et al.,* 2024; Oyan *et al.,* 2024). These recommendations guide scalable implementation for sustained CVD care transformation.

5. Conclusion

Mobile health (mHealth) technologies represent a pivotal frontier for transforming cardiovascular disease (CVD) care in Nigeria, where escalating burdens of hypertension, dyslipidemia, obesity, and poor control rates demand innovative, scalable solutions amid high in-hospital mortality and rising disability-adjusted life years. This synthesis of 28 studies reveals overwhelming opportunities, with near-universal support for patient self-management, remote consultations, provider decision-making, and accessibility enhancements, complemented by robust endorsements for lifestyle modification, remote monitoring, and early detection that align with feasibility demonstrations of blood pressure reductions and knowledge gains in primary care settings. Despite prevalent barriers financing gaps, digital literacy deficits, cultural factors, and regulatory constraints affecting nearly four-fifths of initiatives strong integration potentials and high-impact scores position mHealth to bridge equity gaps, foster personalized interventions, and support universal health coverage, as evidenced by prototypes achieving high diagnostic accuracy and predictive analytics capabilities.

Strategic policy reforms, literacy enhancement, and context-specific investments emerge as imperatives for stakeholders to overcome infrastructural hurdles and evidence gaps, enabling mHealth to mitigate Nigeria's CVD epidemiological threats through cohesive system integration. Ultimately, targeted implementation unlocks mHealth's revolutionary capacity, optimizing outcomes and equity in CVD management nationwide.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Adeloye, D., Basquill, C., Aderemi, A. V., Thompson, J. Y., & Obi, F. A. (2021). Prevalence, awareness, treatment, and control of hypertension in Nigeria in 1995 and 2008: A systematic review and meta-analysis. BMC Public Health, 21(1), Article 2205. https://doi.org/10.1186/s12889-021-12205-3

[2] Adeloye, D., Owolabi, E. O., Ojji, D. B., Auta, A., Dewan, M. T., Olanrewaju, T. O., Ezeigwe, N., & Ale, O. O. (2023). Cardiovascular diseases in Nigeria: Current status, threats, and opportunities. Circulation, 148(23), e320–e331. https://doi.org/10.1161/CIRCULATIONAHA.123.063671

[3] Ajibare, A.O., Adekoya, A. O., Dada, A. O., Fagbemiro, E. Y., Odeyemi, A. S., & Okogun, E. (2021). Cardiovascular risk factors: A silent epidemic among urban adult male socialites. J Epidemiol Soc Niger. 4: 61–70

[4] Ajibare, M.A., Ajibare, A.O., Ojo, O.T., Dada, A.O., Odeyemi, A.S., Aderibigbe, A.A., & Adekoya, A.O. (2023). Cardiovascular health implications of worsening economic indices in Nigeria: A narrative review. Nig. J. Med. 32(4): 345-350.

[5] Almomani, M. H., Alomari, M. S., & Al-Sheyab, N. A. (2022). Public's knowledge of hypertension and its associated factors. The Open Nursing Journal, 16, 60–70. https://doi.org/10.2174/18744346-v16-e221060

[6] Ashinze, P., Oluwafemi, O., & Adebayo, A. (2024). Artificial intelligence: Transforming cardiovascular healthcare in Africa. Discovery Medicine, 36(193), 1777–1788. https://doi.org/10.1007/s44337-024-00051-3

[7] Awoyemi, B. O. (2025). Advancing healthcare through IoT: Smart systems review. 2025 International Conference on Machine Learning and Autonomous Systems. https://doi.org/10.1109/ICMLAS64557.2025.10967632

[8] Awoyemi, B. O., Awoyemi, A. O., & Oluwatobi, S. (2024). The roles of digital health technologies-mobile health in improving health status in Nigeria. In Lecture Notes in Networks and Systems (pp. 1–15). Springer. https://doi.org/10.1007/978-3-031-75221-6_15

[9] Babatunde, A.O. Abdulkareem, A.A., Akinwande, F.O., Adebayo, A.O., Omenogor, E.T., Adebisi, Y.A., & Ilesanmi, E.B. (2021). Leveraging mobile health technology towards achieving universal health coverage in Nigeria. Public Health Pract (Oxf). 2:100120. https://doi.org/10.1016/j.puhip.2021.100120.

[10] Babatunde, A.O., Ogundijo, D.A., Afolayan, A.G.O., Awosiku, O.V., Aderohunmu, Z.O., Oguntade, M.S., ... & Amusat, O.A. (2024). Mobile health technologies in the prevention and management of hypertension: A scoping review. Digital Health, 10, 20552076241277172.

[11] Babatunde, O.A., Olarewaju, S.O., Adeomi, A.A., Akande, J.O., Bashorun, A., Umeokonkwo, C.D., & Bamidele, J.O. (2020). 10-year risk for cardiovascular diseases using WHO prediction chart: findings from the civil servants in South-western Nigeria. BMC Cardiovascular Dis. 20:1-10.

[12] Bulto, L.N., & Hendriks, J.M. (2024). The burden of cardiovascular disease in Africa: prevention challenges and opportunities for mitigation. Eur. J. Cardiovascular Nursing. 23(6): e88-e90.

[13] Chukwunonso, O. U., Ezeala-Adikaibe, B. A., & Chime, C. O. (2023a). CVD risk factors burden in type 2 diabetes subjects in Southeastern Nigeria. BMC Endocrine Disorders, 23(1), Article 243. https://doi.org/10.1186/s12902-023-014243

[14] Chukwunonso, O. U., Ezeala-Adikaibe, B. A., & Chime, C. O. (2023b). Burden of cardiovascular disease risk factors among subjects with type 2 diabetes mellitus in an urban area of Southeastern Nigeria. Annals of Clinical Cardiology and Basic Research, 7(1), 1–7. https://doi.org/10.4081/acbr.2023.243

[15] Cole, O. K., Adejumo, O. A., & Ogunmodede, J. A. (2025). Barriers and facilitators of telemedicine provision in Nigeria. BMC Health Services Research, 25(1), Article 3124. https://doi.org/10.1186/s12913-025-0323124

[16] do Nascimento, I. J. B., Amaral, W. C. D., & Toledo, A. (2023). Barriers and facilitators to utilizing digital health technologies. Global Health Action, 16(1), Article 2259847. https://doi.org/10.1080/16549716.2023.2259847

[17] Egwudo, A. E., Nwankwo, C. H., & Eze, C. N. (2025). Integrating digital health technologies into the healthcare system: Challenges and opportunities in Nigeria. PLOS Digital Health, 4(7), Article e0000928. https://doi.org/10.1371/journal.pdig.0000928

[18] Ekongefeyin, S. N. N., Ogunleye, O. O., & Adebayo, P. B. (2025). Mapping the evidence on mHealth interventions for cardiovascular event care in Africa. Heart, 112(2), 65–74. https://doi.org/10.1136/heartjnl-2025-325992

[19] Ezeigwe, N., Ojji, D. B., & Ale, O. O. (2025). Prevalence and predictors of cardiovascular disease risk among PLHIV in Nigeria. BMC Cardiovascular Disorders. Advance online publication. https://doi.org/10.1186/s12872-025-00786-w

[20] Gilks, C.F., & Alemu, Y.A. (2024). A WHO Public Health Approach to Ending AIDS in the Global South: Lessons for NCD Control and Universal Health Coverage. Taylor & Francis.

[21] Kozik, M., Isakadze, N., & Martin, S.S. (2021). Mobile health in preventive cardiology: current status and future perspective. Curr. Opin. Cardiol. 36(5):580-588. https://doi.org/10.1097/HCO.0000000000000891.

[22] Lanke, V., Patel, R., & Sharma, S. (2025). Mobile apps for medication adherence in CVD. JMIR, 29, Article e60822. https://doi.org/10.2196/60822

[23] Liaqat, M., Mushtaq, M., Jamil, A., Mushtaq, M.M., Ali, H., Anwar, R., Raza, A., Aslam, A., Tariq, T., Hussain, M., Bakht, D., & Bokhari, S.F.H. (2024). Mobile health interventions: A frontier for mitigating the global burden of cardiovascular disease. Cureus. 16(6):e62157. https://doi.org/10.7759/cureus.62157.

[24] Minja, N.W., Nakagaayi, D., Aliku, T., Zhang, W., Ssinabulya, I., Nabaale, J., ... & Kayima, J. (2022). Cardiovascular diseases in Africa in the twenty-first century: gaps and priorities going forward. Front. Cardiovasc. Med. 9:1008335.

[25] Nelissen, H. E., Hendriks, M. E. L., & Wit, F. W. N. M. (2021). Pharmacy-based hypertension care employing mHealth in Lagos, Nigeria: A mixed methods feasibility study. BMC Health Services Research, 21(1), Article 112. https://doi.org/10.1186/s12913-021-06105-3

[26] Odunaiya, N.A., Adesanya, T.B., Okoye, E.C., & Oguntibeju, O.O. (2021). Towards cardiovascular disease prevention in Nigeria: A mixed method study of how adolescents and young adults in a university setting perceive cardiovascular disease and risk factors. Afr. J. Prm. Health Care Fam. Med. 13(1):a2200. https://doi.org/10.4102/phcfm.v13i1.2200

[27] Ogah, O.S., Orimolade, O.A., & Jinadu, T.O. (2023). Cardiovascular diseases in Nigeria: Current status, threats, and opportunities. Circulation. 148:1441-1444. DOI: 10.1161/CIRCULATIONAHA.123.063671

[28] Ogola, E.N., & Gachemba, Y.M. (2025). Tackling the challenge of the epidemic of cardiovascular diseases: A case of sub-Saharan Africa. In: Global Challenges in Cardiovascular Prevention in Populations with Low Socioeconomic Status. pp. 179-193. Springer Nature. https://doi.org/10.1007/978-3-031-79051-5_9.

[29] Ojo, A.E., Ojji, D.B., Grobbee, D.E., Huffman, M.D., & Peters, S.A.E. (2024). The burden of cardiovascular disease attributable to hypertension in Nigeria: A modelling study using summary-level data. Global Heart. 19(1):50. httpd://doi.org/10.5334/gh.1332.

[30] Okolo, C.A., Babawarun, O., & Olorunsogo, T.O. (2024). Mobile health (mhealth) innovations for public health feedback: a global perspective. Int. Med. Sci. Res. J. 4(3):235-246. https://doi.org/10.1016/j.puhip.2021.100120.

[31] Orji, U. E. (2024). IoT and data analytics in healthcare. 2024 IEEE International Conference on Machine Learning and Autonomous Systems. https://doi.org/10.1109/ICMLAS.2024.11026330

[32] Orji, U. E., Nwankwo, C. H., & Eze, C. N. (2022). Visual exploratory data analysis of the Covid-19 pandemic data in Nigeria. 2022 IEEE International Conference on Computing. https://doi.org/10.1109/ICECOCON55189.2022.10051529

[33] Oronti, I. B., Adejumo, O. A., & Ogunmodede, J. A. (2022). WRAP: Hypertension diagnosis & management in Africa using mobile health technology. 2022 IEEE Africa Health Expo. https://doi.org/10.1109/AfriHealth53979.2022.9809807

[34] Osei, E., & Mashamba-Thompson, T. P. (2021). Mobile health applications for disease screening and treatment support in low-and middle-income countries: A narrative review. Heliyon, 7(3), e06639. https://doi.org/10.1016/j.heliyon.2021.e06639

[35] Oso, A. (2023). Non-communicable diseases: An emerging epidemic in Nigeria. Tropical J. Nephrol. 18(1–2): 31-37.

[36] Otu, A. A., Osungbade, K. O., & Owoaje, E. T. (2022). mHealth guideline training for non-communicable diseases in primary care delivery in Nigeria. Frontiers in Digital Health, 4, Article 942282. https://doi.org/10.3389/fdgth.2022.942282

[37] Otu, A., Ukpeh, I., & Ozu, O. (2021). Leveraging mobile health applications to improve sexual and reproductive health services in Nigeria: Implications for practice and policy. Reproductive Health 18:21. https://doi.org/10.1186/s12978-021-01069-z.

[38] Oyan, B., Abere, S., Ajala, A., Orupabo, F., Nyeche, O., Nwosu, J., & Fana-Granville, L. (2024). Patterns and outcomes of cardiovascular disease admissions in the medical wards of the Rivers State University Teaching Hospital, Port Harcourt, Nigeria: A two-year review. Nigerian Medical Journal, 65(4), 479–489. https://doi.org/10.60787/nmj.v65i4.467

[39] Qi, Y., Mohamad, E., Azlan, A. A., Zhang, C., Ma, Y., & Wu, A. (2025). Digital health solutions for cardiovascular disease prevention: Systematic review. Journal of Medical Internet Research, 27, e64981. https://doi.org/10.2196/64981

[40] Segun-Omosehin, O. A., Ojji, D. B., & Sliwa, K. (2025). Evaluating the digital health technology landscape in sub-Saharan Africa for cardiovascular medicine. Cardiovascular Digital Health Journal. Advance online publication. https://doi.org/10.1007/s44325-025-00055-9

[41] Sharma, S., Kumari, B., Ali, A., Yadav, R.K., Sharma, A.K., Sharma, K.K., Hajela, K., & Singh, G.K. (2022). Mobile technology: A tool for healthcare and a boon in pandemic. J. Fam. Med. Primary Care. 11(1):37-43. https://doi.org/10.4103/jfmpc.jfmpc_1114_21.

[42] Shehu, M.N., Adamu, U.G., Ojji, D.B., Ogah, O.S., & Sani, M.U. (2023). The pandemic of coronary artery disease in the sub-Saharan Africa: what clinicians need to know. Curr. Athero. Reports. 25(9):571-578.

[43] Shekoni, O., Osibogun, A., & Okunlola, M. A. (2024). Healthcare workers' perceptions about the use of mobile health technologies in public health facilities in Lagos, Nigeria. Digital Health, 10, Article 20503121231224568. https://doi.org/10.1177/20503121231224568

[44] World Health Organisation (WHO). Cardiovascular diseases (CVDs). 2021 [cited 2025 June3] Accessed 3rd June, 2025. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds).

[45] Yuyun, M.F., Sliwa, K., Kengne, A.P., Mocumbi, A.O., & Bukhman, G. (2020). Cardiovascular diseases in sub-Saharan Africa compared to high-income countries: an epidemiological perspective. Global Heart. 15(1).