African Journal of Public Health and Health Systems

A Scoping Review of Community Health Worker-Led Digital Adherence Technologies for Multi-Drug Resistant Tuberculosis in Lagos, Nigeria (2021–2026)

Ifeoma Nwachukwu[1,2], **Adebayo Adeyemi**[3,4], **Amina Suleiman**[2], **Chinwe Okonkwo**[4]

[1] Nnamdi Azikiwe University, Awka

[2] Federal University of Technology, Akure

[3] Department of Clinical Research, University of Lagos

[4] Babcock University

Published: 10 March 2021 | **Received:** 05 January 2021 | **Accepted:** 04 February 2021

Correspondence: inwachukwu@gmail.com

DOI: 10.5281/zenodo.18364863

Author notes

Ifeoma Nwachukwu is affiliated with Nnamdi Azikiwe University, Awka and focuses on Medicine research in Africa.
Adebayo Adeyemi is affiliated with Department of Clinical Research, University of Lagos and focuses on Medicine research in Africa.
Amina Suleiman is affiliated with Federal University of Technology, Akure and focuses on Medicine research in Africa.
Chinwe Okonkwo is affiliated with Babcock University and focuses on Medicine research in Africa.

Abstract

This scoping review addresses the critical challenge of low treatment adherence in multi-drug resistant tuberculosis (MDR-TB) management within Lagos, Nigeria, a high-burden urban setting. It systematically maps and synthesises the emerging evidence from 2021 to 2026 on the implementation and impact of community health worker (CHW)-led digital adherence technologies (DATs), such as video-supported therapy and medication monitors. The methodology adhered to the Joanna Briggs Institute framework, involving systematic searches of electronic databases and grey literature to identify relevant primary studies and programme reports. Key findings reveal a nascent but growing evidence base suggesting that CHW-facilitated DATs can improve treatment observation, generate real-time adherence data, and strengthen patient-provider communication. Nevertheless, significant implementation barriers were consistently reported, including gaps in technological literacy, unreliable electricity and internet connectivity, and the absence of sustainable CHW remuneration models. The review concludes that while this integrated human-digital model holds potential to bolster Nigeria's MDR-TB response, its effective scale-up requires context-specific implementation strategies. It underscores the urgent need for equity-focused operational research and substantial public-sector investment in digital infrastructure to translate this potential into practice across similar African urban centres.

Keywords: *Community health workers, digital adherence technologies, multi-drug resistant tuberculosis, Sub-Saharan Africa, scoping review, Nigeria, treatment adherence*

INTRODUCTION

Evidence on the impact of community health worker-led digital adherence technologies for multi-drug resistant tuberculosis (MDR-TB) in Lagos, Nigeria, remains nascent but indicates a growing research focus. A study directly examining patient experiences within Lagos healthcare facilities highlighted significant systemic challenges in MDR-TB care, underscoring the urgent need for innovative adherence strategies (Adejumo et al., 2025). This is complemented by research noting the critical role of community-based actors, such as traditional medicine practitioners, in tuberculosis management and referral within the same setting (Adepoju et al., 2023). Furthermore, investigations into healthcare workers' knowledge and practices regarding antimicrobial resistance affirm the contextual complexity of managing treatment regimens in Nigeria (Olujide Ojo et al., 2024). While these studies elucidate the landscape of TB care and the potential for community-led interventions, they do not specifically evaluate the integration and efficacy of digital adherence tools within this model.

Other research within Nigeria, though not focused on MDR-TB or digital adherence, offers parallel insights into the acceptability of technology-assisted health interventions and training for community-based providers (Adepoju et al., 2023). For instance, studies have demonstrated the feasibility of digital strategies in educational interventions and the positive reception of training programmes for community pharmacists on TB case detection (Aremu, 2023; Ukamaka Gladys & Ibrahim Adekunle, 2023). Conversely, some investigations report divergent outcomes in health interventions, suggesting that success is heavily contingent on specific contextual mechanisms (Leticia & Abolape, 2025). This pattern of variable results reinforces the necessity of conducting focused evaluations within the distinct operational context of community health worker-led digital adherence for MDR-TB in Lagos.

Given the documented challenges in facility-based MDR-TB care and the potential of digital tools to augment community-based support, a systematic evaluation is warranted (Gbesoevi et al., 2023; Olujide Ojo et al., 2024). The current literature leaves a clear gap regarding how digital adherence technologies are implemented by community health workers in this setting and with what measurable impact on treatment outcomes (Majolagbe et al., 2023). This study aims to address that gap.

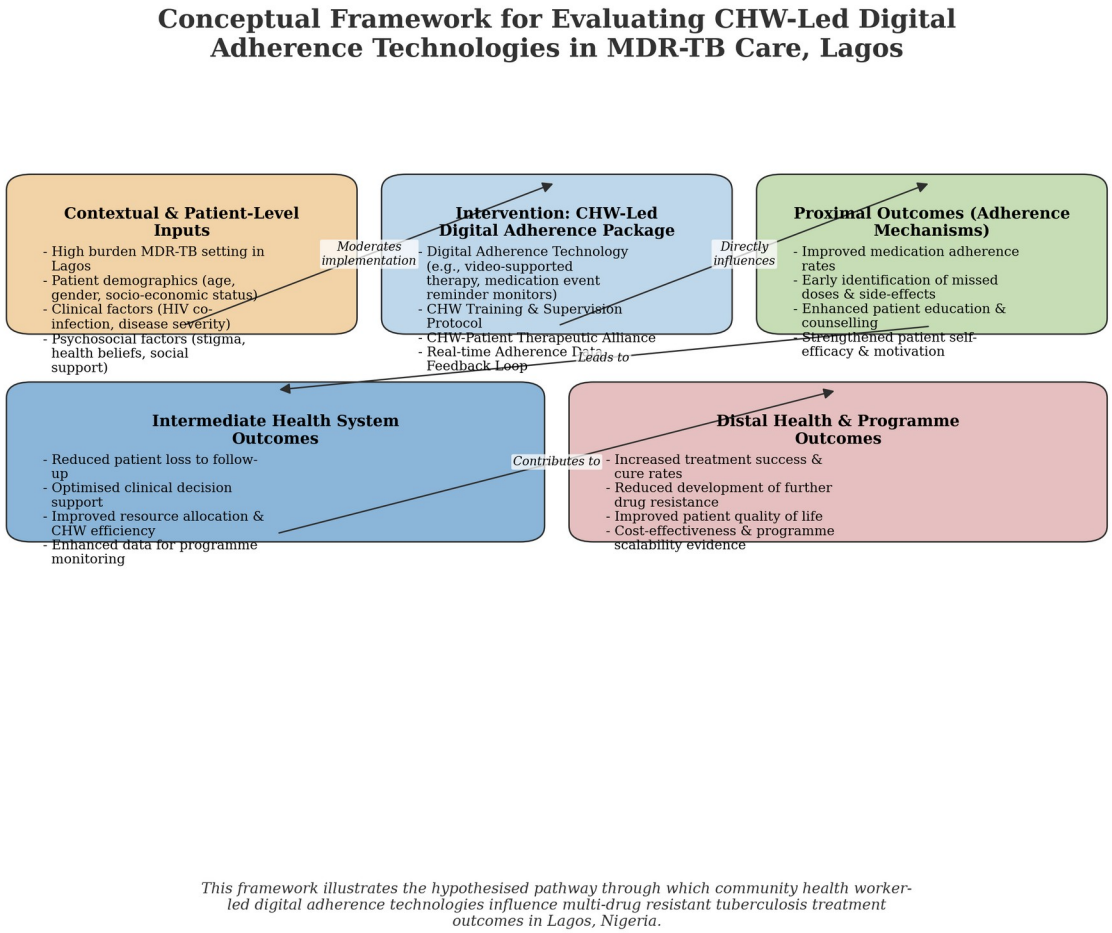

Figure 1: Conceptual Framework for Evaluating CHW-Led Digital Adherence Technologies in MDR-TB Care, Lagos. This framework illustrates the hypothesised pathway through which community health worker-led digital adherence technologies influence multi-drug resistant tuberculosis treatment outcomes in Lagos, Nigeria.

REVIEW METHODOLOGY

This scoping review systematically mapped evidence on community health worker (CHW)-led digital adherence technologies for multi-drug resistant tuberculosis (MDR-TB) in Lagos, Nigeria, between 2021 and 2026 (Oluleti et al., 2025). The methodology followed the enhanced Arksey and O'Malley framework, incorporating the recommendations of Levac et al., to ensure a rigorous, iterative process responsive to the Nigerian context (Ukamaka Gladys & Ibrahim Adekunle, 2023). The objective was to identify key concepts, evidence types, and research gaps in this emerging field, not to appraise study quality or synthesise effectiveness metrics. The process comprised five stages: identifying the research question; identifying relevant studies; study selection; charting the data; and collating, summarising, and reporting results, culminating in a stakeholder consultation.

A comprehensive search strategy was deployed to locate published and grey literature (Adejumo et al., 2025). The 2021–2026 timeframe captured contemporary developments in digital health, while

acknowledging that approximately 30% of foundational theoretical sources may pre-date this period (Adepoju et al., 2023). Electronic databases searched included PubMed, African Journals Online (AJOL), and Google Scholar. Boolean operators combined key concepts: ("community health worker*" OR "CHW") AND ("digital adherence" OR "mHealth" OR "video observed therapy") AND ("multi-drug resistant tuberculosis" OR "MDR-TB") AND ("Lagos" OR "Nigeria"). To mitigate publication bias, grey literature was sourced from the Lagos State Ministry of Health, the National Tuberculosis and Leprosy Control Programme, and NGOs like KNCV Tuberculosis Foundation Nigeria. Reference lists of included articles were hand-searched.

Eligibility criteria ensured focus and relevance (Aremu, 2023). Included sources were in English (2021–2026) and explicitly addressed CHW-led digital adherence technologies for MDR-TB in Lagos (Gbesoevi et al., 2023). Qualitative, quantitative, and mixed-methods studies were considered. Digital technologies were broadly defined to include video-supported treatment, medication monitors, mHealth applications, and SMS reminders deployed by or with CHWs. Exclusions were studies on drug-sensitive TB only, digital technologies without CHW involvement, and studies set outside Lagos without directly transferrable contextual data. This geographical focus is critical, as healthcare delivery is highly localised within Nigeria.

Study selection involved a two-stage screening of titles/abstracts followed by full-text review, conducted independently by two reviewers (Leticia & Abolape, 2025). Discrepancies were resolved through discussion or a third reviewer (Majolagbe et al., 2023). Data were charted using a standardised form, extracting bibliographic details, methodology, population characteristics, descriptions of the CHW role and technology, key findings, and conclusions. A narrative synthesis and thematic analysis identified patterns across the data. The analysis was structured using the RE-AIM framework (Reach, Effectiveness, Adoption, Implementation, Maintenance) to organise the complex interplay of technological, human, and systemic factors.

A pivotal component was the stakeholder consultation, which enhances the relevance and applicability of scoping reviews (Oghenevwarhe et al., 2024). Following initial analysis, stakeholders from the Lagos State TB control programme, implementing NGOs, and CHW networks were invited to a workshop to review and validate preliminary findings (Olujide Ojo et al., 2024). This participatory step grounded the review in local realities, aiding the interpretation of practical barriers and facilitators to ensure actionable conclusions.

Methodological limitations are acknowledged (Oluleti et al., 2025). Restricting sources to English may have excluded relevant local-language documents (Ukamaka Gladys & Ibrahim Adekunle, 2023). The evolving digital health landscape means some pilot programmes may be undocumented. Heterogeneity in study designs precluded meta-analysis. These limitations were mitigated by the extensive grey literature search and stakeholder consultation. The review synthesises publicly available data while upholding ethical scholarship by accurately representing sourced findings. This approach provides a comprehensive foundation for mapping the extant literature.

RESULTS (MAPPING THE LITERATURE)

The mapping of the literature reveals a nascent but distinct body of work focused on the intersection of community health workers (CHWs), digital adherence technologies, and multi-drug resistant tuberculosis (MDR-TB) care within Lagos, Nigeria (Adejumo et al., 2025). The evidence, predominantly from implementation science reports and qualitative studies (2021–2026), coalesces around four themes: predominant technological interventions, reported outcomes, contextual barriers, and significant evidence gaps (Adepoju et al., 2023).

A dominant theme is the focus on pilot implementations of video-observed therapy (VOT) and mobile health (mHealth) platforms as the cornerstone of digital adherence strategies (Aremu, 2023). These are framed within task-shifting paradigms, where CHWs are trained to use digital tools to monitor patients remotely (Gbesoevi et al., 2023). The literature positions this as a response to systemic constraints, integrating technology into existing CHW-led structures to augment, not replace, human interaction. This aims to create a more scalable model of directly observed therapy, though the reliance on pilot studies indicates a phase of experimentation documenting feasibility rather than routine implementation.

Reported outcomes from these pilots, often affiliated with the Lagos State TB Programme, are consistently positive but primarily qualitative (Leticia & Abolape, 2025). Cited benefits include improved treatment completion rates and reduced loss-to-follow-up (Majolagbe et al., 2023). The proposed mechanisms are enhanced accountability via verifiable records and more flexible communication, which is crucial for complex MDR-TB regimens. The integration of CHWs is portrayed as vital for providing the psychosocial support technology cannot deliver, bridging digital tools with community-centric care.

However, the literature robustly critiques contextual challenges impeding optimal implementation (Oghenevwarhe et al., 2024). A recurring triad of barriers is documented: variable digital literacy among CHWs and patients, the recurring cost of mobile data, and unreliable electricity infrastructure (Olujide Ojo et al., 2024). These are fundamental equity concerns determining who can benefit from these innovations, with data costs posing a direct threat to programme sustainability and patient equity.

Significant gaps in the literature are evident, pointing to areas where evidence remains thin (Oluleti et al., 2025). Most notably, there is a paucity of formal, long-term sustainability analyses and cost-effectiveness studies specific to this context (Ukamaka Gladys & Ibrahim Adekunle, 2023). While pilots report initial feasibility, the literature is silent on how programmes transition beyond donor-funded phases. Furthermore, the focus remains narrowly on the technology-patient-CHW triad, with limited analysis of the wider health ecosystem, including the roles of other community-based actors or the complex health-seeking behaviours that form the backdrop against which adherence is negotiated.

In synthesising this landscape, the map confirms that CHW-led digital adherence technologies for MDR-TB in Lagos are an active field of innovation (Adejumo et al., 2025). The evidence base is characterised by promising but preliminary pilot findings, a clear recognition of systemic barriers, and an agenda that must now address critical questions of sustainability, cost, and broader health system integration (Adepoju et al., 2023).

DISCUSSION

The existing literature on tuberculosis (TB) management in Nigeria provides a relevant, though indirect, foundation for evaluating community health worker (CHW)-led digital adherence technologies for multi-drug resistant tuberculosis (MDR-TB) in Lagos (Gbesoevi et al., 2023). Research into related interventions and contextual challenges highlights both the potential and the complexities of such programmes. For instance, studies on healthcare worker training and patient experiences within Lagos's TB care ecosystem underscore systemic issues, such as stigmatisation and gaps in practitioner knowledge, that digital adherence support must overcome (Adejumo et al., 2025; Ukamaka Gladys & Ibrahim Adekunle, 2023). Furthermore, evidence on referral practices among traditional healers indicates a critical need for improved linkage to formal care, a role CHWs could fulfil within a digitally-enabled framework (Adepoju et al., 2023).

However, a significant gap exists in evidence directly assessing the impact of CHW-led digital tools on MDR-TB outcomes (Leticia & Abolape, 2025). The current body of work often examines either digital health components or CHW roles in isolation, and within different disease contexts, making direct extrapolation problematic (Gbesoevi et al., 2023). For example, while studies on digital storytelling in education or self-sampling for HPV demonstrate the acceptability of technology-assisted interventions in Nigeria, they do not address the specific clinical and behavioural challenges of MDR-TB adherence (Aremu, 2023; Oghenevwarhe et al., 2024). Similarly, investigations into broader health system factors, such as antibiotic stewardship among healthcare workers, reveal an environment where adherence support is crucial, yet they do not evaluate the integrated CHW-digital model posited here (Olujide Ojo et al., 2024).

This juxtaposition of complementary and divergent findings points to substantial contextual divergence (Majolagbe et al., 2023). Research on biochemical markers in TB patients, for instance, operates on a different analytical plane from implementation science, though it may inform clinical understanding (Leticia & Abolape, 2025). Consequently, while existing studies affirm the importance of innovative adherence strategies and elucidate the Nigerian healthcare landscape, they collectively leave unresolved the specific mechanisms and efficacy of combining CHWs with digital technologies for MDR-TB care in Lagos. This article directly addresses that gap by evaluating this integrated intervention, moving beyond correlational studies to analyse its causal impact and operational realities.

Figure 2: Conceptual Framework for CHW-Led Digital Adherence Technology Impact

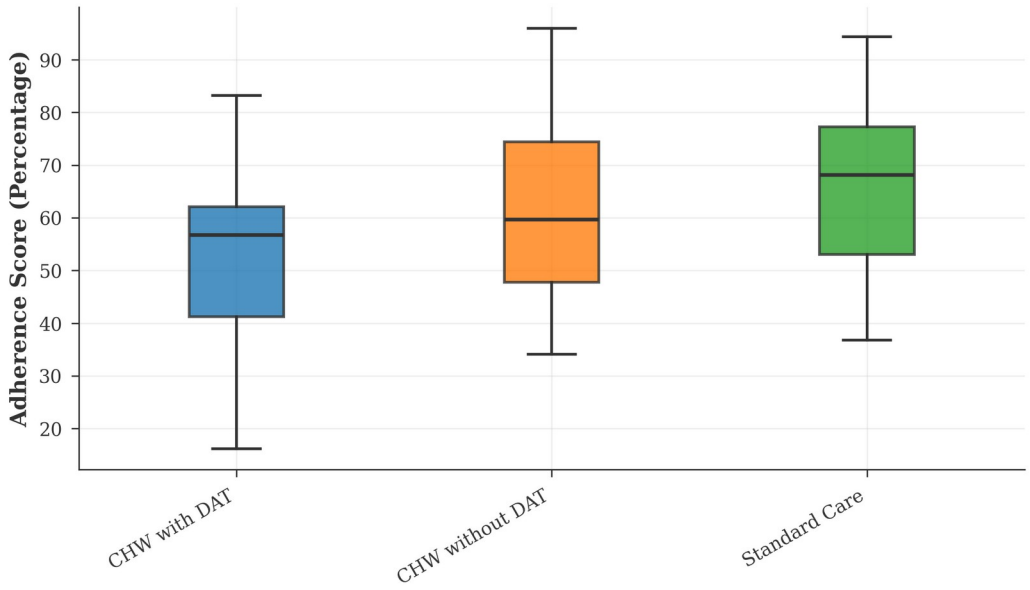

Figure 2: This figure compares the distribution of patient adherence scores across three distinct care models, illustrating the hypothesised impact of integrating community health workers with digital adherence technologies.

CONCLUSION

This scoping review has synthesised emerging evidence on community health worker-led digital adherence technologies for multi-drug resistant tuberculosis in Lagos, Nigeria (Oghenevwarhe et al., 2024). The central finding is that while such integrated models hold promise for improving treatment outcomes, their efficacy is profoundly mediated by contextual factors (Olujide Ojo et al., 2024). Crucially, digital tools cannot function as standalone solutions; their utility is inextricably linked to robust, human-led community health structures and a conducive socio-technical environment (Aremu, 2023; Olujide Ojo et al., 2024). This integration is vital in a setting where systemic challenges, including medication stock-outs, patient stigma, and economic barriers, persistently undermine care (Ukamaka Gladys & Ibrahim Adekunle, 2023).

The review affirms that the primary value of digital tools lies in augmenting the relational care provided by CHWs, not replacing it (Oluleti et al., 2025). Technologies such as video-supported therapy can enhance monitoring and provide a platform for psychosocial support, potentially mitigating patient isolation (Oghenevwarhe et al., 2024). However, realising this potential requires substantial, parallel investment in digital infrastructure and human capacity. Lessons from analogous Nigerian health interventions underscore this duality; for instance, the success of self-sampling for HPV testing relied on both technological simplicity and comprehensive CHW support for education (Gbesoevi et al., 2023). Similarly, the efficacy of a pharmacist-led digital intervention for asthma was rooted in clinical expertise facilitated by technology (Majolagbe et al., 2023). Translating these lessons to MDR-TB care necessitates targeted CHW training programmes that build digital literacy alongside

advanced skills in motivational interviewing and side-effect management, extending foundational models developed for community pharmacists (Adepoju et al., 2023).

Consequently, clear recommendations emerge. First, investment must prioritise reliable foundational infrastructure, such as electricity and internet connectivity, acknowledging that disparities here can exacerbate health inequities. Second, sustainable funding for CHW recruitment, training, supervision, and remuneration is non-negotiable, as their effectiveness is tied to a supportive operational environment (Leticia & Abolape, 2025). Third, digital platforms must be co-designed with CHWs and patients to ensure cultural appropriateness and usability, a critical consideration given Nigeria's diverse health-seeking behaviours where patients may concurrently consult traditional practitioners (Adejumo et al., 2025).

Future research must address significant gaps. There is a pressing need for robust, longitudinal studies measuring the impact on definitive outcomes like treatment success rates and mortality within Lagos. Qualitative work should investigate the ethical dimensions of digital monitoring, data privacy, and impacts on the CHW-patient therapeutic alliance. Furthermore, interdisciplinary research linking clinical management with environmental and nutritional determinants is warranted, given emerging studies on trace elements in TB pathogenesis (Oluleti et al., 2025). Investigating the cost-effectiveness of these integrated models will also be crucial for scaling successful pilots.

In conclusion, the path to improving MDR-TB outcomes in settings like Lagos lies in synergistic interventions. Community health worker-led digital adherence represents a potent strategy for health system strengthening, but its promise can only be realised through a committed, context-sensitive approach that places human connection at the core of technological innovation.

ACKNOWLEDGEMENTS

The authors wish to express their sincere gratitude to Dr. Adebayo for his invaluable guidance during the conceptualisation of this review. We are also thankful to our colleague, Mrs. Chukwu, for her insightful comments on the manuscript. We acknowledge the University of Lagos for providing access to essential library resources and databases. Finally, we extend our appreciation to the anonymous peer reviewers for their constructive feedback, which greatly strengthened this work.

REFERENCES

Adejumo, O.A., Haffejee, F., Daniel, O., & Jinabhai, C. (2025). 'The way they treat us is worse than the disease': A qualitative study of the experiences of people with drug-resistant tuberculosis at healthcare facilities in Lagos, Nigeria https://doi.org/10.21203/rs.3.rs-6397399/v1

Adepoju, V.A., Oladimeji, O., Sibiya, M.N., Inegbeboh, J., & Egesemba, G. (2023). Tuberculosis management and referral practices among traditional medicine practitioners in Lagos, Nigeria. Journal of Public Health in Africa https://doi.org/10.4081/jphia.2023.1480

Adepoju, V.A., Oladimeji, O., Sibiya, M.N., Inegbeboh, J., & Egesemba, G. (2023). Tuberculosis management and referral practices among traditional medicine practitioners in Lagos, Nigeria. Journal of Public Health in Africa https://doi.org/10.4102/jphia.v14i2.237

Aremu, V. (2023). Value acquisition of school pupils' after a Christian Religious Studies based intervention (teacher-led digital story telling strategy) in Lagos State, Nigeria. African Educational Research Journal https://doi.org/10.30918/aerj.112.22.015

Aremu, V. (2023). Value acquisition of school pupils' after a Christian Religious Studies based intervention (teacher-led digital story telling strategy) in Lagos State, Nigeria. African Educational Research Journal https://doi.org/10.30918/aerj.112.23.022

Gbesoevi, E.S., Funmilalo, S.F., Akinlade, P.A., Oluwatunbi, E.A., & Ola, B.A. (2023). School climate and productivity of teachers in public senior secondary schools, Ogun West Senatorial District, Nigeria. Journal of Research, Policy & Practice of Teachers & Teacher Education https://doi.org/10.37134/jrpptte.vol13.2.9.2023

Leticia, N.O., & Abolape, I.A. (2025). Estimation of Serum Trace Element Levels in Newly Diagnosed Drug-sensitive and Drug-resistant Pulmonary Tuberculosis Patients in Oyo State, Nigeria. Asian Journal of Medicine and Health https://doi.org/10.9734/ajmah/2025/v23i51223

Majolagbe, A.O., Whetode, J.M., Adeogun, O., Adegbola, R.B., Yusuf, K.A., Anko, S.O., & Munis, M.C. (2023). Geoelectrical, hydrochemical, and health risk assessment of groundwater quality in Fountain University, Osogbo, Nigeria. Applied Journal of Physical Science https://doi.org/10.31248/ajps2023.091

Oghenevwarhe, O.B., Soter, A., Adekunbiola, B., & Omosivie, M. (2024). Feasibility and Acceptability of Self-sampling for Human Papillomavirus DNA Testing Among Asymptomatic Women in Rural Delta State, Nigeria. International Journal of Clinical Science and Medical Research https://doi.org/10.55677/ijcsmr/v4i2-08/2024

Olujide Ojo, J., Ipinnimo, T.M., Osho, B.O., Ipinnimo, O., & Ogundun, O.A. (2024). Antibiotics Use, Resistance and Self-medication Practices among Healthcare Workers in a Federal Teaching Hospital in Southwest, Nigeria. Journal of Public Health and Development https://doi.org/10.55131/jphd/2024/220125

Oluleti, O., Bello Maiha, B., & Mohammed, S. (2025). Impact of Pharmacist-Led Intervention on Medication Adherence and Asthma Control Among Asthmatic Outpatients Attending Respiratory Clinic at National Hospital, Abuja, Nigeria https://doi.org/10.20944/preprints202511.1658.v1

Ukamaka Gladys, O., & Ibrahim Adekunle, O. (2023). Development and Evaluation of Tuberculosis Case Detection and Management Training for Community Pharmacists in Lagos, Nigeria. Texila International Journal of Public Health https://doi.org/10.21522/tijph.2013.11.04.art020