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| RESEARCH ARTICLE

Health System Quality of Prevention of Mother-to-Child Transmission Services in Ethiopia: A Structured Narrative Review Using Donabedian and WHO Quality Frameworks

Gusha Belako Birbirsa[1] ✉, Dagnechew Degefu[2] and David Dak[3]
[1]School of Public Health and Social Work, Texila American University, Guyana; HIV/AIDS, Hepatitis, and Sexually Transmitted Infections Prevention and Control Service, Oromia Health Bureau, Ethiopia
[23]School of Public Health and Social Work, Texila American University, Guyana
Corresponding Author: Gusha Belako Birbirsa, **E-mail**: gushabelako12@gmail.com

| ABSTRACT
Background: Despite substantial expansion of prevention of mother-to-child transmission (PMTCT) services in Ethiopia through Option B+ and integration within maternal and child health services, vertical HIV transmission remains above the World Health Organization (WHO) elimination target. Evidence on the quality of PMTCT services and their determinants remains fragmented. Objective: To synthesize evidence on PMTCT service quality across WHO quality domains and identify multi-level determinants. Methods: A structured narrative review (SANRA-guided) searched PubMed, Embase, AJOL, HINARI and grey literature (2015–2026). Evidence was synthesized using the Donabedian, WHO Quality of Care, and Socio-ecological frameworks. Results: Quality gaps spanned all domains: suboptimal retention and 9–10% transmission (effectiveness); stock-outs and weak laboratory systems (safety); poor communication and privacy (people-centeredness); delayed ART initiation (timeliness); fragmented care and workforce shortages (efficiency); marked regional and rural–urban inequities; and inconsistent service integration. Determinants included individual stigma and fear of disclosure, provider burnout and inadequate training, facility infrastructure gaps, health system supply chain and digital health weaknesses, and community gender norms with limited male partner involvement. Conclusion: Ethiopia has achieved coverage expansion but implementation quality, equity, and continuity remain major challenges. Progress toward Triple Elimination requires comprehensive health system strengthening, reliable supply chains, workforce development, digital health, continuous quality improvement, and people-centred care to ensure uninterrupted, high-quality services.

| KEYWORDS
PMTCT; HIV; Ethiopia; quality of care; health systems; Option B+; Triple Elimination.

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1. Introduction

Quality of PMTCT of HIV services is a cornerstone for achieving optimal maternal and child health outcomes and advancing toward the elimination of pediatric HIV. Globally, mother-to-child transmission (MTCT) accounts for more than 90% of HIV infections among children, occurring during pregnancy, childbirth, or breastfeeding. Without effective interventions, transmission rates can range from 15% to 45%; however, with comprehensive prevention strategies, this risk can be reduced to below 5% (Idele et al., 2017). Over the past two decades, the scale-up of prevention of mother-to-child transmission (PMTCT) programs has contributed to a substantial decline in pediatric HIV infections, with reductions exceeding 50% globally. Despite this progress, sub-Saharan Africa continues to bear a disproportionate burden, where structural health system constraints, inequities in access, and gaps in service quality continue to limit the achievement of elimination targets (Mutabazi et al., 2017; Idele et al., 2017).

In response to these challenges, global HIV strategies have evolved from the elimination of mother-to-child transmission (e-MTCT) agenda to the broader Triple Elimination Initiative, which targets HIV, syphilis, and hepatitis B through integrated

maternal and child health services. Concurrently, the UNAIDS 95-95-95 targets emphasize that epidemic control depends not only on expanding access to diagnosis and treatment but also on ensuring high-quality, patient-centered care that supports adherence and long-term retention (Idele et al., 2017). These global priorities highlight a critical paradigm shift: coverage alone is insufficient without ensuring quality across the continuum of care.

In sub-Saharan Africa, the average MTCT rate remains around 8–10% despite high coverage of antiretroviral therapy (ART), reflecting persistent gaps in service delivery quality, retention in care, and adherence to treatment (Kassa, 2018). Evidence suggests that even in settings where PMTCT services are widely available, deficiencies in counseling, follow-up systems, and integration with maternal and child health services undermine program effectiveness (Mutabazi et al., 2017; Ambia & Mandala, 2016). These challenges are further compounded by socio-economic inequalities, stigma, and weak health system capacity, all of which contribute to suboptimal outcomes and continued pediatric HIV infections.

In Ethiopia, significant progress has been made in expanding HIV prevention and treatment services; however, MTCT remains a critical public health concern. Recent national estimates indicate that approximately 1,235 new HIV infections occurred among children aged 0–14 years in 2024, representing about 16% of total new infections, demonstrating ongoing vertical transmission despite improvements in service coverage (Ethiopian Public Health Institute [EPHI], 2025). Empirical evidence further shows that the national MTCT rate remains around 9–10%, with pooled estimates reported at 9.93%, indicating that nearly one in ten HIV-exposed infants becomes HIV-positive (Kassa, 2018; Facha et al., 2024). Facility-level studies also demonstrate substantial variability, with MTCT rates ranging from 6% in some urban settings to as high as 15.7% in regions such as Dire Dawa, reflecting inequities in service quality and health system performance (Negash & Ehlers, 2016; Wudineh & Damtew, 2016).

The Ethiopian HIV epidemic is characterized by marked regional heterogeneity, which has direct implications for PMTCT outcomes. National data show that adult HIV prevalence is approximately 0.67%, with wide regional variation ranging from 3.1% in Gambella to 0.2% in the Somali region (EPHI, 2025). Similarly, new HIV infections are disproportionately concentrated in specific regions, including Oromia, Amhara, Southwest Ethiopia, and Central Ethiopia, which together account for the majority of new cases (EPHI, 2025). These disparities translate into uneven risks of MTCT and highlight the influence of contextual factors such as health system capacity, access to care, and socio-demographic determinants. Despite progress toward epidemic control and improved treatment coverage, persistent pediatric infections indicate ongoing challenges in retention in care, adherence to ART, and quality of service delivery, particularly in high-burden and underserved areas.

The evolution of PMTCT guidelines, particularly the adoption of the Option B+ strategy, has transformed HIV prevention by introducing lifelong antiretroviral therapy for all HIV-positive pregnant and breastfeeding women. This approach has significantly reduced transmission risks and improved maternal health outcomes; however, it has also increased the complexity of service delivery, requiring sustained adherence, long-term follow-up, and robust health system support. Evidence suggests that integrating PMTCT services into the broader Maternal, Neonatal, and Child Health (MNCH) continuum enhances service uptake and timeliness, yet integration alone does not guarantee quality (Mutabazi et al., 2017; Ambia & Mandala, 2016). Studies from Ethiopia consistently highlight persistent challenges, including inadequate counseling, long waiting times, shortages of trained health workers, and inconsistent adherence to national guidelines, all of which negatively affect client satisfaction and health outcomes (Bachore et al., 2018; Terefe et al., 2024).

2. Conceptual Framework

The evaluation of PMTCT service quality is grounded in the Donabedian Model, which conceptualizes healthcare quality through three interrelated components: structure, process, and outcome. Structural quality refers to the availability of essential resources, including trained personnel, infrastructure, and medical supplies. Process quality reflects how care is delivered, including provider-client interaction, counseling quality, and adherence to clinical guidelines. Outcome quality encompasses client satisfaction, retention in care, and health outcomes such as reduced MTCT rates. Evidence from Ethiopia demonstrates that while outcome indicators such as client satisfaction may appear relatively favorable, deficiencies in structural and process components remain critical constraints to achieving high-quality PMTCT services (Bachore et al., 2018; Terefe et al., 2024).

To provide a more comprehensive and globally aligned assessment, this framework is complemented by the World Health Organization (WHO) Quality of Care framework, which defines seven domains of quality: effectiveness, safety, people-centeredness, timeliness, efficiency, equity, and integrated care. The Donabedian components are conceptually linked to these domains, where structural factors influence safety, efficiency, and integration; process factors shape effectiveness, timeliness, and patient-centeredness; and outcome indicators reflect overall effectiveness and equity of care.

In addition, the socio-ecological model provides a comprehensive framework for understanding the determinants of PMTCT service quality across multiple levels, including individual (e.g., knowledge, stigma), interpersonal (e.g., partner support),

community (e.g., cultural norms), health facility (e.g., staffing, infrastructure), and health system (e.g., governance, policy) levels. These interacting factors shape service utilization, adherence, and outcomes, emphasizing the need for integrated, context-sensitive interventions to improve PMTCT performance (Mutabazi et al., 2017; Ambia & Mandala, 2016).

2.1. Objective of the Review

This narrative review aims to synthesize existing evidence on the magnitude of quality gaps across the World Health Organization (WHO) quality of care domains, mapped within the structural, process, and outcome dimensions of care, and to identify the key determinants, including barriers and facilitators, of PMTCT service quality using a socio-ecological perspective. Additionally, the review seeks to provide actionable recommendations for health system strengthening and policy interventions to improve the effectiveness, equity, and sustainability of PMTCT service delivery in the current Option B+ era.

3. Methods and materials

3.1. Study Design and Approach

This study employed a structured narrative review to synthesize evidence on the quality of prevention of mother-to-child transmission (PMTCT) services in Ethiopia. A narrative review methodology was selected because the available literature comprises heterogeneous quantitative, qualitative, and mixed-methods studies that vary substantially in study design, quality indicators, outcome measures, and analytical approaches. These methodological differences precluded quantitative synthesis through meta-analysis while making narrative integration more appropriate for identifying overarching patterns, implementation gaps, and health system implications. To improve transparency and methodological rigor, the review followed the Scale for the Assessment of Narrative Review Articles (SANRA) guidance and incorporated structured literature searching, predefined eligibility criteria, systematic study selection, and framework-based evidence synthesis.

3.2. Conceptual and Analytical Frameworks

This review was guided by three complementary conceptual frameworks to ensure a comprehensive and theory-informed synthesis. The Donabedian Model was used to classify evidence according to the structure, process, and outcome dimensions of PMTCT service quality. Findings were subsequently mapped to the World Health Organization (WHO) Quality of Care Framework, encompassing effectiveness, safety, people-centeredness, timeliness, efficiency, equity, and integrated care, to provide a multidimensional assessment of service quality. Finally, the Socio-ecological Model was applied to synthesize determinants of PMTCT service quality across the individual, interpersonal, community, health facility, and health system levels, facilitating identification of multilevel barriers and opportunities for health system strengthening.

3.3. Data Sources and Search Strategy

A comprehensive literature search was conducted between October 2025–March 2026 to identify published and grey literature relevant to the quality of prevention of mother-to-child transmission (PMTCT) of HIV services in Ethiopia. Four electronic databases were systematically searched: PubMed, to identify biomedical and clinical research; Embase, to capture international health sciences literature; African Journals Online (AJOL), to retrieve African regional publications; and HINARI, to access additional peer-reviewed articles not readily available through conventional indexing. To ensure comprehensive coverage of national evidence and programmatic documents, grey literature was also searched, including reports, strategic documents, and technical publications from the Ethiopian Ministry of Health (MoH), the Ethiopian Public Health Institute (EPHI), the World Health Organization (WHO), UNAIDS, and other relevant international development partners.

The search strategy combined controlled vocabulary (e.g., Medical Subject Headings [MeSH], where applicable) with free-text keywords to maximize retrieval of relevant studies. The primary search concepts included “PMTCT” OR “prevention of mother-to-child transmission,” “HIV,” “Ethiopia,” “quality of care” OR “service quality,” and “determinants” OR “barriers” OR “facilitators.” These terms were combined using Boolean operators (AND and OR) and adapted to the indexing requirements of each database. An example of the core search strategy was:

("PMTCT" OR "prevention of mother-to-child transmission") AND HIV AND Ethiopia AND ("quality of care" OR "service quality") AND (determinants OR barriers OR facilitators).

To enhance the completeness of the review, the reference lists of all included articles and relevant review papers were manually screened to identify additional eligible studies that were not captured through the electronic database searches. This comprehensive search approach was designed to minimize publication bias and ensure broad coverage of the available evidence on PMTCT service quality in Ethiopia.

3.4. Eligibility Criteria

Studies were selected using predefined inclusion and exclusion criteria to ensure consistency with the review objectives. Eligible studies included quantitative, qualitative, and mixed-methods research, as well as national reports, programme evaluations, and policy documents addressing the quality, outcomes, or determinants of PMTCT services in Ethiopia or with direct relevance to the Ethiopian context. Publications from 2015 to 2026, in English, were included to reflect the Option B+ and Triple Elimination era. Studies were excluded if they were published before 2015, did not address PMTCT service quality or its determinants, or were editorials, commentaries, conference abstracts, or lacked sufficient methodological detail; non-English and duplicate reports were also excluded, retaining the most comprehensive version.

Foundational theoretical and conceptual literature published before 2015 was consulted to inform the analytical frameworks and International examples cited in the Discussion were identified through purposive searching of the global health literature and are used solely for comparative contextualisation. Neither the pre-2015 foundational literature nor the international comparative examples formed part of the formal evidence synthesis, which consists exclusively of publications from 2015 onwards meeting the eligibility criteria.

3.5. Study Selection Process

All identified records were screened in a stepwise manner. Titles and abstracts were independently assessed for relevance against predefined eligibility criteria, followed by full-text review of potentially eligible articles.

Although this review follows a narrative approach, a structured and transparent selection process was applied to minimize selection bias. A simplified flow of study identification, screening, and inclusion was maintained to enhance reproducibility.

3.6. Data Extraction and Synthesis

A standardized data extraction template was developed to capture study characteristics, methodological design, study setting, participant characteristics, indicators of PMTCT quality, WHO quality domains addressed, key findings, determinants, implementation barriers, and policy implications.

Evidence synthesis followed three sequential stages. First, findings were categorized according to the Donabedian structure–process–outcome framework. Second, evidence was mapped to the seven WHO Quality of Care domains. Third, recurring determinants were synthesized using the socio-ecological framework to identify barriers and facilitators operating at individual, interpersonal, community, facility, and health system levels.

3.7. Quality Appraisal and Rigor

Given the interpretive nature of this structured narrative review, formal risk-of-bias assessment tools commonly used in systematic reviews were not applied. Instead, methodological rigor was enhanced through a predefined and comprehensive search strategy, explicit eligibility criteria, inclusion of both peer-reviewed and grey literature, and critical appraisal of studies based on methodological quality, consistency of findings, transparency of reporting, and relevance to the review objectives. Evidence was synthesized using the Donabedian Model, the WHO Quality of Care Framework, and the Socio-ecological Model to ensure a systematic and theory-informed interpretation. Furthermore, the review adhered to the Scale for the Assessment of Narrative Review Articles (SANRA) guidelines to promote transparency, scientific rigor, and balanced interpretation of the evidence.

3.8. Limitations of the Methodological Approach

As a structured narrative review, this study has several limitations. Despite a comprehensive search strategy, the review is subject to publication bias, language bias, as only English-language publications were included, and potential database bias, since relevant studies may not have been indexed in the selected databases. The heterogeneity of study designs, quality indicators, and outcome measures precluded meta-analysis, preventing the calculation of pooled estimates and effect sizes. In addition, variations in methodological quality and the limited representation of some geographic regions and population groups may affect the generalizability of the findings.

Nevertheless, methodological rigor was enhanced through a predefined search strategy, explicit eligibility criteria, structured data extraction, adherence to the SANRA guidelines, and the use of the Donabedian Model, WHO Quality of Care Framework, and Socio-ecological Model to provide a transparent, comprehensive, and policy-relevant synthesis of the available evidence.

3.9. Operational Definition of PMTCT Service Quality

In this review, PMTCT service quality was conceptualized as the degree to which prevention of mother-to-child transmission services achieve safe, effective, equitable, timely, efficient, integrated, and people-centered care, consistent with the WHO Quality of Care Framework. Evidence was interpreted across structural, process, and outcome dimensions using the Donabedian model.

Table 1. Review methodology summary

Component	Description
Review type	Structured narrative review
Reporting guideline	SANRA
Databases	PubMed, Embase, AJOL, HINARI
Grey literature	EPHI, Ministry of Health, WHO reports
Search period	October 2025–March 2026
Publication years	2015–2026
Language	English
Evidence included	Quantitative, qualitative, mixed methods, reports
Analytical frameworks	Donabedian, WHO Quality Framework, Socio-ecological Model
Synthesis approach	Framework-guided narrative synthesis

4. Results

4.1 Quality of PMTCT Services Across WHO Quality Domains

4.1.1 Effectiveness of PMTCT Services

Effectiveness reflects the extent to which PMTCT services achieve intended health outcomes, including reduction of mother-to-child transmission (MTCT), improved retention in care, and timely initiation of treatment. Evidence from Ethiopia indicates that, despite improvements in service coverage, outcome indicators remain suboptimal and highly variable. Retention of mother–infant pairs in PMTCT programs remains a major challenge, with studies showing progressive attrition at 6, 12, and 24 months postpartum (Mutabazi et al., 2017; Ambia & Mandala, 2016). Factors such as stigma, transportation barriers, and weak follow-up systems contribute significantly to loss to follow-up, undermining long-term treatment outcomes.

Clinical effectiveness is further reflected in MTCT rates, which remain approximately 9–10% nationally, with pooled estimates around 9.93%, indicating persistent transmission despite expanded ART coverage (Kassa, 2018; Facha et al., 2024). Facility-level data reveal variation ranging from 6% to 15.7%, demonstrating disparities in program effectiveness (Wudineh & Damtew, 2016; Negash & Ehlers, 2016). In addition, early infant diagnosis (EID) uptake remains inconsistent, with delays in testing and limited access in rural areas contributing to reduced effectiveness of PMTCT interventions (Mutabazi et al., 2017; Ambia & Mandala, 2016).

4.2. Safety of PMTCT Services

Safety refers to minimizing risks and harm to patients during service delivery. Structural deficiencies in Ethiopia significantly compromise the safety of PMTCT services. Many facilities lack adequate infection prevention infrastructure, reliable water supply, and sanitation systems, which are essential for safe service delivery. Inadequate counseling spaces also compromise confidentiality, increasing the risk of stigma and discouraging service utilization (Terefe et al., 2024; Ajemu & Desta, 2019).

Frequent stock-outs of essential commodities, including antiretroviral drugs (ARVs), HIV and syphilis test kits, and EID reagents, further undermine safe and continuous care. These interruptions disrupt treatment adherence and delay diagnosis, increasing the risk of transmission and adverse outcomes (Kassa, 2018; Ambia & Mandala, 2016). Weak laboratory systems and inconsistent availability of diagnostic services also contribute to delayed results and compromised patient safety (Mutabazi et al., 2017).

4.3. People-Centeredness (Patient-Centered Care)

People-centeredness emphasizes respectful, responsive, and individualized care that meets patient needs and preferences. Evidence from Ethiopia indicates that patient-centered care remains suboptimal across many health facilities. Although overall satisfaction levels appear moderate to high (approximately 70–75%), a significant proportion of clients report poor understanding of counseling messages and dissatisfaction with service delivery processes (Bachore et al., 2018; Negash & Ehlers, 2016).

Key challenges include inadequate provider–client communication, lack of privacy during counseling, and limited engagement of patients in decision-making. These issues are compounded by stigma and fear of disclosure, which further reduce service uptake

and adherence. In addition, limited partner involvement and insufficient support systems weaken patient engagement and continuity of care (Kassa, 2018; Alemu et al., 2022).

4.4. Timeliness of PMTCT Services

Timeliness refers to the provision of care without unnecessary delays. Evidence shows that delays in service delivery remain a critical barrier to PMTCT effectiveness in Ethiopia. While HIV testing uptake has improved through integration with antenatal care (ANC), gaps persist in early testing and same-day ART initiation. Delayed initiation of treatment reduces the effectiveness of PMTCT interventions, particularly during high-risk periods of transmission (Mutabazi et al., 2017; Ambia & Mandala, 2016).

Long waiting times at health facilities, driven by workforce shortages and high patient loads, further compromise timely service delivery. Delays in early infant diagnosis and laboratory result turnaround times also hinder timely identification and management of HIV-exposed infants, particularly in rural settings (Terefe et al., 2024; Mutabazi et al., 2017).

4.5. Efficiency of PMTCT Services

Efficiency reflects optimal use of resources to achieve desired outcomes. In Ethiopia, inefficiencies in PMTCT service delivery are evident in fragmented care systems and suboptimal resource utilization. Poor infrastructure and inadequate facility readiness limit the effective integration of services, leading to duplication, delays, and increased patient burden (Mutabazi et al., 2017; Ambia & Mandala, 2016).

Supply chain inefficiencies, including frequent stock-outs of essential commodities, further reduce service efficiency by disrupting continuity of care and increasing operational costs. Additionally, workforce shortages and uneven distribution of trained personnel contribute to inefficiencies in service delivery and increased workload for existing staff (Terefe et al., 2024; Ajemu & Desta, 2019).

4.6. Equity in PMTCT Service Quality

Equity refers to fairness in access to and quality of healthcare services across different population groups. Significant disparities exist in PMTCT service quality across regions and facility types in Ethiopia. Urban facilities generally demonstrate better infrastructure, higher service uptake, and improved outcomes compared to rural and pastoralist settings, where access barriers and resource limitations are more pronounced (Kassa, 2018; Terefe et al., 2024).

Regional variation in HIV burden further exacerbates inequities, with high-prevalence areas such as Gambella experiencing higher demand but relatively better resource allocation, while low-resource regions face greater service gaps (EPHI, 2025). Differences between public and private facilities also contribute to inequities, as private facilities often provide better patient-centered care but lack integration with national PMTCT programs, while public facilities face higher patient loads and resource constraints (Mutabazi et al., 2017).

4.7. Integrated Care in PMTCT Services

Integrated care refers to the coordination and continuity of services across the healthcare continuum. Although Ethiopia has made progress in integrating PMTCT services into antenatal, maternal, and child health programs, implementation remains inconsistent. Evidence indicates that poor infrastructure, limited coordination between service units, and weak referral systems hinder effective integration (Mutabazi et al., 2017; Ambia & Mandala, 2016).

Fragmentation of services affects continuity of care for mother–infant pairs, contributing to loss to follow-up and reduced adherence. Inadequate integration of laboratory services, counseling, and clinical care further limits the effectiveness of PMTCT programs. These challenges highlight the need for strengthened service integration to ensure continuity, improve patient experience, and enhance overall program performance.

5. Determinants of PMTCT Service Quality

5.1. Individual and Client-Level Determinants

At the individual level, PMTCT service quality in Ethiopia is strongly influenced by a complex interplay of socio-economic, behavioral, and psychosocial factors. Evidence consistently identifies stigma, fear of disclosure, and financial barriers as major impediments to service utilization and adherence. Women often avoid or delay engagement with PMTCT services due to fear of unintended disclosure of their HIV status, which may lead to social exclusion, marital instability, or discrimination (Kassa, 2018). Additionally, transportation costs and indirect economic burdens significantly limit access, particularly for rural women, resulting in missed appointments and poor continuity of care (Kassa, 2018; Negash, 2016). These barriers are cumulative across the PMTCT cascade and substantially increase the risk of loss to follow-up and vertical transmission.

Conversely, several facilitators at the individual level enhance engagement with PMTCT services. Maternal education has been consistently associated with improved service uptake, adherence to ART, and better understanding of counseling messages (Negash, 2016; Terefe et al., 2024). Disclosure of HIV status to partners further strengthens adherence and retention by enabling emotional, social, and financial support, while also facilitating partner testing and shared decision-making (Alemu et al., 2022; Kassa, 2018). Importantly, qualitative evidence highlights that a strong intrinsic motivation, particularly the desire to give birth to a healthy, HIV-free child, serves as a powerful driver of adherence and continued engagement in PMTCT programs, even in resource-constrained settings (Kassa, 2018; Alemu et al., 2022).

5.2. Provider and Facility-Level Determinants

At the provider and facility level, both structural and behavioral factors significantly shape the quality of PMTCT service delivery. Evidence reveals that provider burnout, inadequate training, and low motivation are common challenges affecting service quality in Ethiopia. Health care providers frequently report heavy workloads, lack of performance feedback, and insufficient incentives, all of which contribute to reduced adherence to clinical guidelines and compromised service delivery (Bachore et al., 2018; Terefe et al., 2024). Additionally, judgmental attitudes and poor provider-client communication have been identified as critical barriers that discourage women from fully engaging in PMTCT services, particularly in contexts where stigma remains high (Kassa, 2018; Terefe et al., 2024).

Facility-related constraints, particularly the lack of private counseling spaces, further undermine service quality by limiting confidentiality and reducing client trust. Evidence indicates that inadequate infrastructure contributes to poor counseling experiences and reduced uptake of HIV testing and follow-up services (Terefe et al., 2024; Bachore et al., 2018).

On the other hand, several facilitators at the provider and facility level have demonstrated significant positive impacts. Supportive supervision, continuous mentorship, and on-the-job training improve provider competency, adherence to guidelines, and overall service quality (Bachore et al., 2018; Terefe et al., 2024). Furthermore, the implementation of integrated "One-Stop-Shop" service models, where ANC, HIV testing, ART initiation, and follow-up are provided within a single service point, has been shown to enhance service efficiency, reduce patient burden, and improve retention in care (Mutabazi et al., 2017; Ambia & Mandala, 2016). These integrated approaches are particularly effective in minimizing fragmentation of care and improving patient-centered service delivery.

5.3. Health System and Policy-Level Determinants

At the health system level, systemic constraints play a decisive role in shaping PMTCT service quality. One of the key barriers is the limited functionality of digital health systems, including gaps in data quality, incomplete reporting in DHIS2 platforms, and weak integration of electronic medical records (EMR). These challenges hinder effective monitoring, continuity of care, and evidence-based decision-making (Idele et al., 2017; Mutabazi et al., 2017).

In addition, frequent stock-outs of essential commodities, including ARVs, diagnostic test kits, and laboratory reagents, continue to disrupt service delivery and reduce program effectiveness (Kassa, 2018; Bachore et al., 2018). Broader contextual challenges, including regional conflicts, population displacement, and health system disruptions, further exacerbate these issues by limiting access to services and weakening continuity of care, particularly in vulnerable regions.

Despite these barriers, several policy-level facilitators have contributed to improvements in PMTCT service quality in Ethiopia. The free service delivery policy for HIV-related services has significantly improved access and reduced financial barriers, particularly for marginalized populations (Negash, 2016; Kassa, 2018). Moreover, strong leadership from the Ethiopian Ministry of Health, particularly through national HIV strategies and alignment with the Triple Elimination Initiative, has strengthened governance, coordination, and resource allocation for PMTCT programs. National commitment to evidence-based planning and monitoring has also enhanced program performance and accountability (EPHI, 2025).

5.4. Socio-Cultural and Community-Level Determinants

Socio-cultural and community-level factors play a critical role in shaping both access to and quality of PMTCT services. Persistent traditional beliefs, gender norms, and male partner opposition continue to hinder women's engagement with PMTCT services in Ethiopia. Cultural expectations around disclosure, reproductive decision-making, and breastfeeding practices often conflict with medical recommendations, leading to suboptimal adherence and increased risk of MTCT (Kassa, 2018). Male partner resistance to HIV testing and limited involvement in PMTCT services further exacerbate these challenges, reducing support for women and undermining adherence to interventions.

Conversely, community-based interventions have demonstrated significant potential in improving PMTCT outcomes. Ethiopia's Health Extension Program (HEP) plays a pivotal role in bridging the gap between communities and health facilities by promoting awareness, facilitating linkage to care, and supporting follow-up of mother-infant pairs. Additionally, the Mentor Mother approach, which leverages peer support from HIV-positive women, has been shown to improve adherence, reduce stigma, and enhance retention in care. Faith-based organizations and community networks also contribute to reducing stigma and promoting acceptance of PMTCT services, thereby improving service uptake and continuity (Mutabazi et al., 2017; Ambia & Mandala, 2016).

6. Discussion

This review demonstrates that the quality of prevention of mother-to-child transmission (PMTCT) services in Ethiopia is shaped by interconnected structural, process, and health system factors rather than isolated deficiencies in individual service components. Although Ethiopia has made substantial progress in expanding PMTCT coverage through the implementation of Option B+ and integration of HIV services within maternal and child health programs, important quality gaps remain across the continuum of care. Structural challenges including shortages of trained health professionals, interruptions in the supply of antiretroviral medicines and diagnostic commodities, inadequate infrastructure, and limited laboratory capacity continue to undermine service delivery (Bachore et al., 2018; Kassa, 2018). These weaknesses subsequently translate into process failures such as inconsistent adherence to national guidelines, inadequate counselling, fragmented follow-up, prolonged waiting times, and poor continuity of care, ultimately contributing to maternal loss to follow-up (LTFU), delayed infant diagnosis, suboptimal adherence, and continued mother-to-child transmission (Bachore et al., 2018; Negash & Ehlers, 2016; Terefe et al., 2024). These findings indicate that Ethiopia's remaining challenge is no longer primarily expanding access to PMTCT services but ensuring consistently high-quality implementation throughout the care cascade.

More importantly, the review suggests that improving PMTCT outcomes requires a transition from intervention-focused strategies to comprehensive health system strengthening. Barker et al. (2011) demonstrated that improvements in the reliability of each step within the PMTCT cascade produce greater reductions in HIV transmission than introducing more effective drug regimens alone when health system performance is weak. Likewise, Kruk and Freedman (2008) argued that effective health systems are characterized not only by service availability but also by quality, equity, responsiveness, efficiency, and accountability. The findings of this review reinforce these observations by demonstrating that structural and process deficiencies interact to determine PMTCT outcomes. Consequently, addressing only one bottleneck, such as increasing ART availability, without simultaneously strengthening workforce capacity, supply chain management, patient tracking, supervision, and quality improvement systems is unlikely to achieve sustainable elimination of mother-to-child transmission.

Comparison with successful PMTCT programs across Africa further supports this interpretation. South Africa has reduced early mother-to-child transmission rates from approximately 9.6% to below 3% through rapid implementation of updated PMTCT guidelines, decentralized antiretroviral therapy initiation, routine viral load monitoring, continuous quality improvement, and strong political commitment (Barron et al., 2013). Similarly, Malawi and Zambia demonstrated substantial improvements in maternal ART uptake and retention following early adoption of Option B+, decentralized service delivery, and integration of HIV services into antenatal care (Chi et al., 2013). Rwanda has strengthened PMTCT outcomes through integrated primary healthcare, extensive community health worker networks, and effective follow-up of mother–infant pairs, while Botswana has achieved the WHO Gold Tier Path to Elimination through universal antenatal HIV testing, integrated maternal HIV services, strong laboratory systems, robust health information systems, and sustained domestic leadership (Mutabazi et al., 2017; World Health Organization [WHO], 2025). International examples cited in this section were identified through purposive searching of the global health literature and are used for comparative contextualisation; they were not part of the formal evidence synthesis of Ethiopian PMTCT services. Collectively, these experiences demonstrate that successful PMTCT programs depend less on introducing new clinical interventions than on ensuring reliable implementation, integrated service delivery, continuous quality improvement, and strong health system governance.

These international comparisons suggest that Ethiopia's principal challenge is implementation fidelity rather than policy design. National PMTCT policies are broadly aligned with WHO recommendations; however, inconsistent implementation across regions, particularly in rural, pastoralist, and underserved communities, continues to limit program effectiveness. Similar conclusions have been reported in systematic reviews demonstrating that interventions strengthening patient retention, family-centered care, integrated service delivery, and continuity of follow-up produce greater long-term improvements than isolated clinical interventions (Ambia & Mandala, 2016; Wettstein et al., 2012). Therefore, future national strategies should increasingly emphasize equitable implementation, supportive supervision, performance monitoring, and continuous quality improvement to reduce regional disparities and improve overall program performance.

The findings also highlight the growing influence of digital transformation and humanitarian challenges on PMTCT service quality. Expansion of digital health platforms, including DHIS2 and electronic medical record systems, has substantially improved routine reporting and program monitoring. Nevertheless, persistent limitations in interoperability, data quality, infrastructure, and the use of routine data for decision-making continue to restrict their potential to improve patient tracking and continuity of care (Idele et al., 2017). At the same time, conflict, population displacement, and disruption of health services in several parts of Ethiopia have exposed the vulnerability of PMTCT programs to external shocks. Interruptions in commodity supply chains, displacement of healthcare workers, and breakdowns in continuity of care increase treatment interruption and LTFU, thereby threatening progress toward elimination targets. These findings imply that future PMTCT programs should increasingly be designed as resilient health systems capable of maintaining essential maternal and child health services during emergencies rather than as isolated vertical programs.

Digital innovations nevertheless provide important opportunities to strengthen PMTCT service delivery. Interoperable electronic medical records, mobile health technologies, automated appointment reminders, and real-time tracking of mother–infant pairs can substantially improve retention, adherence, and continuity of care. However, technology should be viewed as an enabler rather than a substitute for effective governance, competent health workers, reliable infrastructure, and strong quality improvement systems. Without parallel investments in workforce development, leadership, and accountability, digital health interventions alone are unlikely to produce meaningful improvements in PMTCT outcomes.

Another important implication emerging from this review concerns the sustainability of PMTCT services in an era of declining external financing. Ethiopia has historically relied heavily on donor-supported HIV programs, but changing global financing priorities increasingly require stronger domestic resource mobilization and national ownership. The experiences of Botswana and Rwanda illustrate that sustained progress toward elimination depends not only on adequate financial investment but also on efficient governance, integration of HIV services within primary healthcare, strong accountability mechanisms, and continuous monitoring of service quality (Mutabazi et al., 2017; WHO, 2025). Consequently, sustainability should not be viewed solely in financial terms but as the capacity of the health system to maintain equitable, high-quality PMTCT services despite changing epidemiological conditions, funding transitions, and humanitarian crises.

Overall, this review demonstrates that Ethiopia has largely succeeded in expanding access to PMTCT services but has not yet achieved comparable improvements in implementation quality, continuity of care, and health system performance. Experiences from South Africa, Botswana, Rwanda, Malawi, and Zambia demonstrate that elimination of mother-to-child transmission is achievable when strong political commitment is combined with integrated service delivery, reliable supply systems, robust health information systems, continuous quality improvement, and community engagement. Therefore, future PMTCT strategies in Ethiopia should move beyond measuring service coverage toward strengthening the quality, equity, resilience, and sustainability of the health system. Such a transition will be essential for accelerating progress toward the WHO Triple Elimination targets and ensuring that every pregnant woman living with HIV and every exposed infant receives high-quality, uninterrupted, and people-centered care.

7. Conclusion

This review demonstrates that although Ethiopia has made substantial progress in expanding access to prevention of mother-to-child transmission (PMTCT) services through Option B+, integration within maternal and child health services, and free HIV care, important quality gaps continue to limit progress toward eliminating vertical HIV transmission. Persistent weaknesses in structural readiness, service delivery processes, and continuity of care, including shortages of trained health workers, supply chain interruptions, inconsistent adherence to clinical guidelines, and fragmented follow-up systems, continue to undermine maternal retention, early infant diagnosis, and treatment outcomes. These findings indicate that Ethiopia's principal challenge has shifted from expanding service coverage to ensuring consistently high-quality, equitable, and people-centred PMTCT services across the continuum of care.

A major contribution of this review is its comprehensive synthesis of evidence across structural, process, and outcome dimensions using the Donabedian Model, the WHO Quality of Care Framework, and the Socio-ecological Model. By integrating quantitative, qualitative, and programmatic evidence, the review provides a multidimensional understanding of the health system factors influencing PMTCT quality in Ethiopia. It further highlights persistent geographic and socioeconomic disparities, particularly among rural and pastoralist communities, and demonstrates that improvements in clinical interventions alone are unlikely to achieve elimination targets without concurrent investments in health system strengthening.

The findings have important implications for policy and practice. Future national strategies should move beyond measuring service coverage toward strengthening implementation quality, health system resilience, digital health capacity, workforce

competency, and equitable service delivery. Sustained progress will require stronger domestic financing, continuous quality improvement, integrated maternal and HIV services, and evidence-informed decision-making supported by reliable health information systems. Although this review is limited by the heterogeneity of available studies and the inherent constraints of a structured narrative review, it provides a robust evidence base for informing PMTCT policy, programme improvement, and future research in Ethiopia.

Ultimately, achieving the WHO Triple Elimination targets will depend not only on maintaining high PMTCT coverage but also on building resilient, integrated, and people-centred health systems capable of delivering consistently high-quality care for every pregnant woman living with HIV and every HIV-exposed infant.

8. Recommendations

Based on the findings of this review, the following recommendations are proposed to strengthen the quality, equity, and sustainability of PMTCT services in Ethiopia.

Health system strengthening

- Strengthen supply chain management to ensure uninterrupted availability of antiretroviral medicines, HIV and syphilis test kits, and early infant diagnosis reagents.
- Expand and standardize competency-based training, supportive supervision, and continuous mentorship for healthcare providers to improve adherence to national PMTCT guidelines and the quality of patient-centred care.
- Scale up integrated **One-Stop-Shop** service delivery models that provide antenatal, PMTCT, ART, delivery, and postnatal services within a single coordinated platform.

Digital health and quality improvement

- Strengthen integrated electronic medical record (EMR) and DHIS2 systems to enable real-time tracking of mother–infant pairs, improve monitoring of retention, and support data-driven decision-making.
- Institutionalize continuous quality improvement, routine performance audits, and accountability mechanisms at national and subnational levels to enhance implementation fidelity and service quality.
- Improve patient flow and reduce waiting times through appointment systems, workflow optimization, and appropriate task-sharing in high-volume facilities.

Community engagement and equity

- Expand community-based retention strategies, including **Mentor Mother** programmes, Health Extension Worker follow-up, and family-centred approaches that promote male partner involvement, treatment adherence, and continuity of care.
- Develop targeted interventions for underserved populations, particularly rural and pastoralist communities, through mobile outreach services, differentiated service delivery models, and transportation support where appropriate.

Policy and sustainability

- Increase domestic financing and integrate PMTCT more fully within broader maternal, newborn, and child health and primary healthcare programmes to reduce dependence on external funding.
- Strengthen governance, strategic planning, and multisectoral collaboration to improve programme resilience and accelerate progress toward the WHO Triple Elimination goals.

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