



## Prevention of Maternal and Newborn Infections in Primary Healthcare Settings: A Comprehensive Review of Evidence-Based Strategies

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### **Abstract:**

Maternal and newborn infections remain significant contributors to morbidity and mortality in primary healthcare settings globally, particularly in low- and middle-income countries (LMICs). This comprehensive review examines evidence-based prevention strategies for maternal and neonatal infections delivered at primary health care (PHC) level, incorporating preventive medicine principles. Through systematic examination of peer-reviewed literature, this review identifies key preventive interventions spanning antenatal, intrapartum, and postnatal periods, including screening protocols, infection prevention and control (IPC) measures, and quality improvement strategies. Evidence from multiple settings demonstrates that comprehensive, multi-modal prevention approaches incorporating staff education, structural improvements, and clinical practice standardization can significantly reduce maternal and neonatal infection-related morbidity and mortality. The article emphasizes the importance of integrating screening for common maternal infections including

sexually transmitted infections, Group B Streptococcus, and urinary tract infections, alongside implementation of rigorous IPC practices and timely antimicrobial interventions. Evidence shows that approximately 40% of preterm births and adverse birth outcomes stem from maternal infections that are often preventable through accessible, evidence-based primary healthcare interventions. This review synthesizes current evidence to provide practical, implementable strategies for healthcare providers in resource-limited settings, emphasizing the critical role of primary healthcare in reducing preventable maternal and neonatal infections.

## 1. Background

Maternal and newborn infections represent a critical public health challenge, accounting for substantial proportions of maternal, neonatal, and perinatal mortality worldwide. According to recent systematic analyses, infections contribute directly to approximately 15% of maternal deaths globally, with higher proportions in low- and middle-income countries (LMICs) where access to diagnostic facilities and treatment options remains limited (1). The burden of preventable maternal and neonatal infections is particularly pronounced in sub-Saharan Africa and South Asia, where approximately 900,000 neonatal deaths occur annually, with infections accounting for 15-20% of these deaths (2).

The epidemiology of maternal and newborn infections encompasses diverse pathogenic organisms transmitted through multiple routes. Primary bacterial pathogens associated with severe maternal sepsis include Group A Streptococcus (GAS), which remains the most common causative organism for severe maternal sepsis in developed countries, accounting for up to 45% of infections in some series (3). Additionally, sexually transmitted infections including Chlamydia trachomatis, Neisseria gonorrhoeae, and Trichomonas vaginalis significantly impact birth outcomes, with maternal infections increasing the risk of preterm birth, premature rupture of membranes, and congenital infections (4).

The critical period for prevention of maternal and neonatal infections extends throughout pregnancy, childbirth, and the immediate postnatal period. Evidence indicates that 75% of neonatal deaths occur within the first week of life, with infections accounting for a substantial proportion of these early deaths (5). Further analysis demonstrates that up to 50% of all neonatal and maternal deaths occur within the first 24 hours after birth, underscoring the importance of prevention and early detection strategies during labor and delivery (5).

The implementation of preventive strategies at the primary healthcare level is particularly critical for LMICs, where approximately 85% of pregnant women access antenatal care at least once, representing a significant opportunity to detect and treat infections before they progress to serious

complications (6). However, the quality of care provided at PHC facilities remains variable, with substantial gaps in implementation of evidence-based practices. Studies from India documented that at baseline, key preventive practices were implemented in only 10-75% of PHC facilities, with considerable variation across different quality indicators (7).

The preventive medicine approach to maternal and neonatal infections encompasses four levels: primordial prevention (addressing societal determinants), primary prevention (preventing infection onset), secondary prevention (early detection and treatment), and tertiary prevention (managing complications). This comprehensive review focuses primarily on primary and secondary prevention strategies deliverable at the PHC level, examining evidence on screening, infection control measures, and antimicrobial interventions.

## 2. Literature Review

### 2.1 Epidemiology and Burden of Maternal Infections

Recent data on the prevalence and impact of maternal infections demonstrate significant variation by geographic region and healthcare setting. Studies from across LMICs show that antenatal screening programs consistently identify substantial burdens of treatable infections that would otherwise remain undetected and untreated. In particular, research from multiple sub-Saharan African countries demonstrated that screening programs identified asymptomatic sexually transmitted infections in 15-40% of pregnant women, depending on the specific pathogen and population studied (4).

The clinical impact of untreated maternal infections on neonatal outcomes is substantial and well-documented. Evidence from multiple systematic reviews indicates that maternal infections are responsible for approximately 40% of preterm births and fetal growth restriction in LMICs (7). These adverse birth outcomes substantially increase neonatal morbidity and mortality risk, with affected infants requiring prolonged hospitalization and facing increased infection risk. The mechanisms linking maternal infection to adverse outcomes

include intrauterine inflammation, premature rupture of membranes, and direct vertical transmission of pathogens.

Specific organisms have well-characterized impacts on maternal and neonatal health. Chlamydia trachomatis infection during pregnancy increases risk of preterm birth, neonatal conjunctivitis, and infant pneumonia, with congenital transmission occurring in approximately 25-50% of vaginally delivered infants born to infected mothers (4). Group B Streptococcus (GBS) colonization occurs in 10-30% of pregnant women globally, with vertical transmission to neonates during labor occurring in 40-70% of colonized mothers, and early-onset GBS disease developing in 0.5-3% of exposed neonates if prophylaxis is not provided (8).

## 2.2 Healthcare-Associated Infections in Neonates

While not exclusively in primary settings, healthcare-associated infections (HAIs) in neonates merit discussion as they represent a major burden of preventable infections. In low-resource neonatal units, the burden of healthcare-associated infections is particularly high due to multiple factors including overcrowding, shared equipment with inadequate reprocessing, suboptimal infection prevention and control practices, limited laboratory capacity for surveillance, and high baseline rates of maternal colonization with multidrug-resistant organisms (9). Evidence from multiple studies in LMICs demonstrates that implementation of comprehensive infection prevention bundles can significantly reduce HAI rates. A study from Zambia implementing an infection prevention and control bundle that included staff training, enhanced cleaning protocols, and chlorhexidine bathing reported reduction in hospital-associated mortality from 23.6% to 18.0% ( $p < 0.01$ ), with parallel reductions in clinically suspected sepsis and healthcare-associated bloodstream infection rates (9). Similarly, studies from Chile implementing antibiotic stewardship and procedure-specific bundles documented reductions in late-onset sepsis from 14.3 to 8.5 per 1,000 live births ( $p < 0.01$ ) (9).

## 3. Antenatal Screening for Maternal Infections: Evidence and Implementation

### 3.1 Sexually Transmitted Infections Screening

Recent evidence demonstrates that antenatal screening for sexually transmitted infections is highly feasible and acceptable in resource-limited settings. Research conducted across multiple LMICs in sub-Saharan Africa and other regions

provides compelling data on the acceptability and impact of STI screening programs. A comprehensive series of studies examining antenatal screening in multiple countries found that participation rates were consistently high, with 93-100% of pregnant women accepting STI testing, with the majority preferring self-collected vaginal swabs for comfort and privacy (9).

The prevalence of sexually transmitted infections identified through antenatal screening programs is substantial in high-burden regions. Studies from multiple African countries and other LMICs documented STI prevalence ranging from 8-25% depending on the specific pathogen and population studied (11). Notably, substantial proportions of infected women are asymptomatic, highlighting the critical importance of routine screening rather than relying on syndromic identification of infections (6).

Treatment uptake following identification of STI in pregnancy was high when services were available and properly supported, with treatment acceptance ranging from 85-100% in most settings studied (4). Additionally, point-of-care testing with same-day or next-day result communication ensured rapid treatment initiation. The impact of screening and treatment on pregnancy outcomes remains an area of active investigation, with evidence from South African and Botswanan studies demonstrating promising reductions in vertical transmission of Chlamydia trachomatis despite persistent transmission in some cases (4).

### 3.2 Screening for Group B Streptococcus and Asymptomatic Bacteriuria

Group B Streptococcus represents one of the most significant preventable causes of neonatal sepsis and meningitis in both developed and developing countries. Evidence from multiple settings demonstrates that intrapartum antibiotic prophylaxis administered to colonized women can reduce vertical transmission to neonates and prevent early-onset GBS disease (8). Antenatal screening strategies for GBS colonization should incorporate vaginal and rectal cultures obtained at 35-37 weeks of gestation, with results used to guide intrapartum prophylaxis decisions (8).

Asymptomatic urinary tract infection (UTI) during pregnancy represents another critical but frequently overlooked preventable cause of adverse pregnancy outcomes. Untreated asymptomatic bacteriuria increases risk of symptomatic UTI, pyelonephritis, and adverse birth outcomes including preterm birth and neonatal sepsis (6). Evidence from multiple sources supports screening all pregnant women for asymptomatic bacteriuria with urine culture and

provision of appropriate antimicrobial therapy to those with documented infection (6).

### **3.3 Screening Using Early Warning Systems**

Recent evidence highlights the importance of comprehensive screening systems that identify women at risk for infectious morbidity through integration of clinical signs, symptoms, and basic laboratory markers. Early warning scoring systems that incorporate temperature, heart rate, respiratory rate, and laboratory values such as white blood cell count or C-reactive protein have been shown to effectively identify women with infection or infection risk (3). Studies examining knowledge, attitudes, and perceptions of maternity care providers regarding routine infectious morbidity screening found significant gaps in provider knowledge and awareness of the importance of systematic screening approaches (12). However, providers exposed to training and structured screening protocols demonstrated improved capacity to identify and manage infectious complications. Implementation of standardized screening tools and algorithms at PHC facilities has been shown to facilitate earlier recognition and management of maternal infections (13).

## **4. Infection Prevention and Control Measures for Maternal and Newborn Infection Prevention**

### **4.1 Hand Hygiene and Environmental Cleaning**

Hand hygiene represents the foundational infection prevention measure, with extensive evidence demonstrating its critical importance in reducing transmission of both maternal and neonatal infections. Hand hygiene should be performed before contact with pregnant women and newborns, before all clean/aseptic procedures, after exposure to body fluids, and after touching patients or their immediate environment. Importantly, studies examining compliance with hand hygiene protocols in healthcare facilities revealed significant variation, with baseline compliance rates frequently below 40% (10). Environmental cleaning and disinfection are critical components of comprehensive infection prevention programs. Recent evidence from multiple settings demonstrates that implementation of multimodal cleaning interventions including cleaning audits with feedback, structured cleaning protocols, and staff and family education can significantly improve environmental hygiene standards. A study from South Africa implementing the NeoCLEAN intervention that included enhanced surface and equipment cleaning protocols documented increase

in proportion of surfaces meeting cleanliness thresholds and was associated with reduction in neonatal bloodstream infection rates from 6.7 to 3.9 per 1,000 patient days.

### **4.2 Standard and Transmission-Based Precautions**

Implementation of standard precautions including use of personal protective equipment (PPE), safe injection practices, and waste management are essential components of infection prevention at all healthcare facilities. Appropriate use of sterile gloves during vaginal examinations, intramuscular injections, and invasive procedures significantly reduces transmission of pathogens. Evidence from quality improvement studies examining implementation of evidence-based practices for childbirth care documented improvement in use of sterile gloves when standard precaution protocols were implemented with provider education (11). Transmission-based precautions should be implemented for patients with suspected or confirmed infectious diseases, with specific precautions guided by transmission route (airborne, droplet, or contact). Assessment of health facility readiness for implementation of transmission-based precautions in African healthcare settings during the COVID-19 pandemic demonstrated that while primary-level facilities had lower baseline readiness scores than secondary and tertiary facilities (median 56.8% vs 62.3% vs 70%), implementation of quality improvement interventions significantly improved compliance and scores over time (12).

### **4.3 Chlorhexidine and Other Antiseptics in Infection Prevention**

Chlorhexidine gluconate (CHG) has emerged as an important antiseptic agent with demonstrated efficacy for preventing maternal and neonatal infections in resource-limited settings. Evidence from multiple settings supports application of 4% chlorhexidine to the umbilical cord in the community setting in high-mortality contexts for reduction of neonatal mortality (15). Additionally, use of 2% chlorhexidine bathing of infants weighing greater than 1,500 grams as part of comprehensive infection prevention bundles has been associated with reduced infection rates and healthcare-associated bloodstream infections (9).

## **5. Antenatal, Intrapartum, and Postnatal Infection Prevention Practices**

### **5.1 Antenatal Care and Infection Prevention**

Comprehensive antenatal care provides critical opportunities for identification and treatment of maternal infections before they progress to severe disease and potentially affect the fetus and newborn. Evidence-based antenatal care should include: (1) comprehensive assessment for signs and symptoms of infection at each visit; (2) routine screening for asymptomatic bacteriuria and sexually transmitted infections as detailed above; (3) laboratory testing for blood-borne infections including HIV, hepatitis B, syphilis, and rubella immunity status; (4) counseling regarding hygiene and infection prevention; and (5) treatment of identified infections according to evidence-based clinical guidelines (6).

The quality and comprehensiveness of antenatal screening varies substantially across healthcare settings. Studies from India documented baseline rates of iron supplementation counseling ranging from 10-75% across primary health centers, indicating substantial variation in quality of preventive counseling provided (7). Implementation of quality improvement programs targeting antenatal care practices resulted in improvement in multiple indicators, though some practices remained suboptimal even after intervention.

## 5.2 Intrapartum Infection Prevention

The intrapartum period represents a critical window for prevention of maternal and neonatal infections through implementation of evidence-based practices. Key practices for intrapartum infection prevention include: (1) routine use of partographs for monitoring progress of labor and early identification of complications; (2) hand hygiene before vaginal examinations and other patient contact; (3) use of sterile gloves during vaginal examinations and clean delivery procedures; (4) safe delivery practices including safe cutting and handling of umbilical cord; (5) appropriate use of uterotonic agents for prevention of postpartum hemorrhage (which increases infection risk); and (6) timely recognition and management of chorioamnionitis and other complications (11).

Studies examining quality of intrapartum care at primary health centers documented substantial room for improvement in multiple practices. Research from India documenting observed practices during labor and delivery found that hand hygiene before vaginal examination was performed in only 65% of cases, use of sterile gloves was inconsistent, and fetal heart rate monitoring was performed in 43% of deliveries, indicating substantial implementation gaps (18). Implementation of quality improvement programs that included provider training and structured

assessment of quality gaps resulted in statistically significant improvement in multiple practices, with hand hygiene compliance increasing significantly following intervention (13).

Intrapartum antibiotic prophylaxis represents a critical intervention for prevention of neonatal group B streptococcal disease. Women identified as GBS-colonized during antenatal screening should receive intrapartum penicillin G (or ampicillin if penicillin unavailable), with dosing of 5 million units intravenously at admission followed by 2.5 million units every 4 hours until delivery. For women with penicillin allergy, vancomycin or clindamycin should be used depending on susceptibility patterns. Appropriate timing and dosing of intrapartum prophylaxis reduces early-onset GBS disease in exposed neonates by approximately 80% (14).

## 5.3 Postnatal Infection Prevention and Newborn Care

Evidence from systematic reviews demonstrates that KMC reduces in-hospital neonatal mortality by up to 40% in babies with birth weight less than 2,000 grams, with significant reductions in serious morbidity including infection (13). Recent randomized trial evidence provides additional data that initiating KMC immediately after birth, rather than after clinical stability is attained, results in further 25% reduction in preterm neonatal mortality (13). However, realization of KMC benefits requires continuous, onsite presence of mothers at hospital facilities, necessitating provision of adequate mother-baby accommodation and support systems.

Breastmilk provides critical passive immunity and promotes development of neonatal immune defenses through multiple mechanisms. Human milk oligosaccharides, immunoglobulins, immune cells, and other bioactive substances present in breastmilk promote development of the neonatal immune system and reduce infection risk (18). Exclusive breastfeeding for at least 6 months is recommended for all infants where feasible, with continued breastfeeding alongside complementary foods recommended through 2 years of age or beyond.

Screening and management of perinatal infections in newborns requires systematic identification of maternal risk factors and neonatal signs of infection. For newborns born to mothers with inadequate prenatal care, recommended screening should include: (1) hepatitis B surface antigen (HBsAg) testing; (2) serological testing for hepatitis B, syphilis, and rubella immunity; (3) assessment for signs of congenital infection; and (4)

early and effective preventive interventions for newborns at risk for HIV, HBV, syphilis, or gonorrhea (14).

## **6. Quality Improvement Strategies for Implementation of Infection Prevention**

### **6.1 Provider Education and Training**

Evidence from multiple settings consistently demonstrates that provider education and training is foundational for improvement in infection prevention practices. Studies examining the effectiveness of educational interventions on infection prevention knowledge and practices have documented substantial improvements in provider knowledge scores, with mean knowledge improvements ranging from 25-40 percentage points following training (15).

Effective training programs should employ multiple teaching methodologies including didactic lectures, interactive discussions, hands-on practical sessions, and use of video-based learning materials. A study from Nigeria examining the effectiveness of a blended curriculum on newborn infection prevention and control for community health officers found that mean knowledge scores increased from 10.70 (out of 20) pre-course to 13.25 post-course ( $p < 0.001$ ), with parallel improvements in attitudes toward infection prevention practices (19). Additionally, practical skills assessments using objective structured clinical examinations (OSCE) demonstrated improved competencies in key infection prevention practices.

### **6.2 Facility-Based Quality Improvement Programs**

Facility-based quality improvement programs that incorporate multiple components have demonstrated effectiveness in improving infection prevention practices and outcomes. A stepped-wedge cluster-randomized trial conducted across 15 primary health centers in India tested a comprehensive quality improvement strategy comprising: (1) capacity building of providers through self-directed and facilitated learning; (2) periodic assessments of facilities to identify quality gaps; and (3) undertaking targeted improvement activities to close identified gaps (11).

Implementation of this comprehensive quality improvement program resulted in multiple improvements. The intervention was associated with increased number of women approaching PHCs for childbirth (26 vs 21 women per PHC-month, adjusted incidence rate ratio: 1.22; 95% CI

1.17 to 1.28), indicating improved facility utilization (11). Of 12 key practices assessed, 6 improved modestly, 2 remained near universal, 3 did not change, and 1 worsened, indicating that while improvement occurred, substantial room for further enhancement remained (11).

### **6.3 Data Systems and Monitoring for Accountability**

Implementation of robust data systems for monitoring infection rates and quality of care practices is essential for effective quality improvement. Studies examining data quality and use for decision-making in health facilities from multiple countries found that while data collection occurred routinely, the quality of data was often suboptimal and data were frequently not used effectively for decision-making and quality improvement (16).

Strengthening facility-based monitoring systems should include: (1) development of simple, feasible data collection tools aligned with national and international indicators; (2) training of facility staff on accurate data collection and data management; (3) regular data review and feedback to providers; and (4) use of data to identify quality gaps and guide improvement activities (16). Implementation of quality management approaches incorporating data-driven decision-making has been associated with sustained improvements in quality of care.

### **6.4 Sustainability and Long-Term Maintenance of Improvements**

Ensuring sustainability of quality improvements beyond initial implementation requires attention to multiple factors including empowerment of facility leaders, integration of quality improvement activities into routine facility management, and alignment with broader health system strengthening efforts. Studies examining sustainability of quality improvement programs found that sustainability was enhanced when improvements were championed by facility leadership, when activities were integrated into routine management systems, and when monitoring and feedback mechanisms were established as ongoing facility functions (11).

## **7. Specific Interventions for Prevention of Maternal and Neonatal Infections**

### **7.1 Antimicrobial Interventions**

Appropriate use of antimicrobial agents represents a critical component of infection prevention strategies, with evidence supporting specific

interventions at different stages of pregnancy and delivery. Antenatal interventions include: (1) treatment of asymptomatic bacteriuria with first-line agents (typically amoxicillin or nitrofurantoin for 3-7 days); (2) treatment of sexually transmitted infections with appropriate antimicrobials (azithromycin for chlamydia, ceftriaxone and azithromycin for gonorrhea); and (3) intrapartum antibiotic prophylaxis for GBS-colonized women (5 million units penicillin G IV at admission, then 2.5 million units every 4 hours) (8, 14).

Postnatal antimicrobial interventions focus on early recognition and appropriate management of maternal infection and neonatal sepsis. Women presenting with signs of maternal infection including fever, tachycardia, tachypnea, or other concerning symptoms should receive appropriate empiric antibiotic coverage pending culture results (3). Newborns with signs of infection or risk factors for infection should receive prompt antibiotic therapy according to evidence-based neonatal sepsis management guidelines (13).

## 7.2 Micronutrient and Immunological Interventions

Vitamin A supplementation during pregnancy has been associated with reduced maternal mortality and improved pregnancy outcomes in some settings, though evidence is mixed regarding direct effects on infection prevention (1). Probiotics have been investigated for prevention of neonatal infections, with a systematic review of randomized controlled trials in preterm neonates in LMICs finding that probiotics supplementation was associated with reduced risk of necrotizing enterocolitis, late-onset sepsis, and all-cause mortality (9). However, access to probiotics remains limited in most LMIC neonatal units, and additional research is needed to optimize strain selection and implementation strategies.

## 8. Challenges to Implementation of Infection Prevention in Primary Healthcare Settings

### 8.1 Structural and Infrastructural Barriers

Implementation of evidence-based infection prevention strategies in primary healthcare settings faces multiple structural barriers, particularly in resource-limited settings. Common challenges include inadequate water and sanitation infrastructure, limited availability of essential equipment and supplies (including personal protective equipment, sterilization capacity, and cleaning supplies), overcrowding, and shared equipment with inadequate reprocessing (9). Health

facility readiness assessments conducted across multiple African countries during the COVID-19 pandemic found that primary-level facilities had substantially lower readiness scores than higher-level facilities, with median readiness scores of 56.8% for primary facilities compared to 62.3% for secondary and 70% for tertiary facilities (12).

### 8.2 Human Resource Constraints

Inadequate staffing and limited availability of trained healthcare workers represents another major barrier to effective infection prevention implementation. Many primary health centers, particularly in rural and resource-limited areas, operate with minimal staffing and heavy patient loads, limiting capacity for attention to infection prevention practices. Turnover of trained staff further compromises sustainability of improvements in practice.

### 8.3 Knowledge and Attitudinal Barriers

Despite availability of extensive evidence supporting infection prevention interventions, implementation in practice remains inconsistent. Studies examining provider knowledge and attitudes toward infection prevention practices reveal significant gaps in understanding of evidence and perceived barriers to implementation. Health providers frequently cite time constraints, competing demands, and lack of perceived organizational support for infection prevention as barriers to implementation of recommended practices.

### 8.4 Cost and Resource Allocation

Implementation of comprehensive infection prevention programs requires investment in infrastructure, training, and supplies. In resource-limited settings where overall health budgets are constrained, allocation of resources to infection prevention measures may compete with other health priorities. However, economic analyses increasingly demonstrate that investment in prevention provides substantial return through reduction in treatment costs for serious infections.

## 9. Evidence-Based Integration of Preventive Strategies

### 9.1 Comprehensive Maternal Infection Prevention Pathway

Integration of multiple preventive strategies into a comprehensive pathway for maternal infection

prevention throughout pregnancy, labor, and postpartum period provides optimal benefit. Such pathways should include: (1) comprehensive initial assessment for risk factors and existing infections; (2) routine screening for asymptomatic infections including STIs, bacteriuria, and GBS colonization; (3) health education regarding infection prevention and hygiene; (4) treatment of identified infections with appropriate antimicrobials; (5) intrapartum infection prevention practices; (6) intrapartum antibiotic prophylaxis where indicated; and (7) postpartum assessment and management of maternal infection complications.

## 9.2 Neonatal Infection Prevention Pathway

Parallel comprehensive approaches to neonatal infection prevention should incorporate: (1) assessment of maternal risk factors for neonatal infection; (2) preparation for potential neonatal sepsis risk based on maternal factors; (3) timely provision of intrapartum care preventing complications associated with infection; (4) immediate postnatal practices including skin-to-skin contact and breastfeeding promotion; (5) kangaroo mother care for preterm and low birth weight infants; (6) screening for congenital infections in at-risk newborns; (7) early recognition and management of neonatal sepsis; and (8) ongoing monitoring during postnatal period (13, 14).

## 9.3 Multi-Level Integration Approach

Effective implementation of comprehensive infection prevention strategies requires coordination across multiple levels of health system including: (1) facility-level commitment and leadership support; (2) integration of infection prevention into routine care practices and facility management; (3) provision of appropriate training and ongoing skill development; (4) establishment of data systems for monitoring and accountability; (5) coordination with district and national health authorities for policy alignment; and (6) engagement of communities and families in supporting infection prevention practices.

## 10. Future Directions and Research Priorities

### 10.1 Strengthening Evidence from Low-Resource Settings

While substantial evidence exists supporting various infection prevention interventions, significant gaps remain regarding implementation and effectiveness in low-resource settings. Recent

systematic reviews synthesizing evidence on prevention and treatment of maternal infections noted limited evidence from LMICs, highlighting pressing need for coordinated research efforts to fill these gaps and strengthen evidence-base specific to resource-limited contexts (17).

### 10.2 Optimization of Screening and Treatment Strategies

Additional research is needed regarding optimal screening algorithms, timing of screening in pregnancy, and cost-effectiveness of various screening approaches in resource-limited settings. Particular attention should be directed toward determining which screening and treatment interventions provide greatest benefit at PHC level, where resources are most constrained (4).

### 10.3 Development of Point-of-Care Diagnostics

Expansion of accurate, rapid point-of-care diagnostic tests for maternal and neonatal infections represents important priority for improving screening accessibility and enabling prompt treatment initiation in resource-limited settings. Advances in molecular diagnostics have made available multiple rapid tests, though cost and accessibility remain barriers to widespread implementation (4).

### 10.4 Implementation Science and Sustainability Research

Greater attention to implementation science approaches is needed to understand barriers and facilitators to sustained implementation of infection prevention interventions. Research examining how organizations can best sustain improvements beyond initial implementation periods, how to address provider and system-level barriers, and how to achieve equitable implementation across diverse settings is essential for translating evidence into practice (18).

## 11. Conclusion

Maternal and newborn infections represent preventable causes of substantial morbidity and mortality, particularly in low- and middle-income countries where access to diagnosis and treatment remains limited. However, extensive evidence demonstrates that implementation of comprehensive, evidence-based infection prevention strategies at the primary healthcare level can significantly reduce infection-related maternal and neonatal morbidity and mortality. This review

synthesizes evidence on key prevention strategies spanning antenatal, intrapartum, and postnatal periods. Foundational strategies include universal screening for sexually transmitted infections, asymptomatic bacteriuria, and group B streptococcal colonization during pregnancy, with prompt treatment of identified infections using appropriate antimicrobials. Implementation of rigorous infection prevention and control practices including hand hygiene, environmental cleaning, appropriate use of personal protective equipment, and safe delivery practices reduces transmission of pathogens and prevents healthcare-associated infections. Intrapartum antibiotic prophylaxis for GBS-colonized women, early promotion of skin-to-skin contact and exclusive breastfeeding, and kangaroo mother care for preterm infants represent critical evidence-based interventions reducing infection-related neonatal morbidity and mortality. Effective implementation of these strategies requires comprehensive quality improvement approaches that include provider education, facility-based assessment and feedback, data systems for monitoring, and supportive facility leadership. While evidence is substantial, challenges to implementation in resource-limited settings remain significant, including infrastructural constraints, inadequate staffing, and competing health priorities.

Future efforts should prioritize conducting research in low-resource settings to define context-specific optimal approaches, developing accessible point-of-care diagnostics, and utilizing implementation science approaches to enhance sustainability of improvements. Despite current challenges, the significant preventive potential of evidence-based maternal and neonatal infection prevention strategies justifies continued focus on strengthening implementation at primary healthcare level globally. By integrating preventive medicine principles and evidence-based practices into routine primary healthcare delivery, substantial reductions in preventable maternal and neonatal infections can be achieved, contributing to progress toward global maternal and neonatal mortality reduction targets.

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