



Neonatal Emergencies: Causes and Management of Preterm Birth, Neonatal Sepsis, Birth Asphyxia, and Congenital Anomalies – A Narrative Review

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Abstract

Neonatal emergencies remain a significant global health challenge and are among the leading causes of neonatal morbidity and mortality, particularly in resource-limited settings. This narrative review examines the causes, clinical implications, management approaches, and preventive strategies associated with four major neonatal emergencies: Preterm birth, neonatal sepsis, birth asphyxia, and congenital anomalies. The reviewed literature indicates that preterm birth is a major contributor to neonatal complications due to physiological immaturity, while neonatal sepsis continues to cause substantial mortality owing to difficulties in early diagnosis and timely treatment. Birth asphyxia is strongly associated with neonatal death and long-term neurological impairment, highlighting the importance of prompt recognition and effective resuscitation. Congenital anomalies also represent a considerable burden, contributing to neonatal mortality and lifelong disability and often require early detection and multidisciplinary management. Overall, the findings emphasize that improved antenatal care, early diagnosis, evidence-based clinical interventions, timely emergency management, and strengthened neonatal healthcare systems are essential for reducing adverse outcomes. In conclusion, comprehensive preventive measures and coordinated neonatal care play a crucial role in improving survival, reducing complications, and enhancing long-term health outcomes among newborns affected by these critical conditions.

Keywords: Birth asphyxia, congenital anomalies, neonatal emergencies, neonatal management, neonatal sepsis, preterm birth

BACKGROUND

Neonatal emergencies are a major cause of newborn morbidity and mortality worldwide, particularly in low- and middle-income countries. Preterm birth, neonatal sepsis, birth asphyxia, and congenital anomalies contribute substantially to neonatal deaths and long-term disabilities. Early diagnosis and timely management are essential for improving survival and health outcomes. This narrative review examines the

causes, clinical challenges, and current management strategies for these common neonatal emergencies to support evidence-based neonatal care and reduce the global burden of neonatal mortality.^[1]

Globally, an estimated 2.3 million neonates died within the first 28 days of life in 2022, accounting for approximately 6500 deaths/day and 47% of all under-five mortality. Although neonatal deaths declined from 5.0 million in 1990 to 2.3 million in 2022, the reduction in neonatal mortality has been slower than that observed for post-neonatal under-five mortality. Furthermore, progress has slowed since 2010, and many countries are projected to miss the Sustainable Development Goal target for neonatal mortality by 2030 without accelerated interventions. To ensure timely, life-saving care, healthcare professionals must remain knowledgeable about the identification and management of critical neonatal conditions.^[1,2]

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Neonatal emergencies, including preterm birth, neonatal sepsis, birth asphyxia, and congenital anomalies, constitute a major global health concern and account for a substantial proportion of neonatal morbidity and mortality, particularly in low- and middle-income countries.^[3] The neonatal period extends from birth to 28 completed days of life. A neonatal emergency is defined as any potentially life-threatening condition occurring during this period that requires prompt recognition and immediate medical intervention to prevent mortality and long-term complications.^[3,4]

Each year, an estimated 2.3–2.4 million neonates die within the first 28 days of life, with the highest burden occurring in sub-Saharan Africa and South Asia.^[5] Preterm birth, birth asphyxia, and neonatal sepsis are major contributors to neonatal mortality; however, early identification, appropriate treatment, and evidence-based care can significantly reduce mortality rates.^[6] Congenital anomalies also contribute substantially to neonatal morbidity and mortality and frequently require comprehensive diagnostic evaluation, surgical intervention, and long-term management.^[7] These high mortality rates reflect persistent gaps in maternal and newborn healthcare services. Improved access to skilled birth attendants, neonatal intensive care units (NICUs), essential newborn care, kangaroo mother care, and life-saving medications can substantially improve neonatal outcomes and survival.^[8]

METHOD OF LITERATURE SEARCH

A narrative review of the literature was undertaken to collect and integrate evidence related to neonatal emergencies, with particular emphasis on preterm birth, neonatal sepsis, birth asphyxia, and congenital anomalies, focusing on their underlying causes and approaches to management.

A narrative literature review was conducted to synthesize evidence regarding preterm birth, neonatal sepsis, birth asphyxia and congenital anomalies. Electronic databases including PubMed/MEDLINE, Scopus, Web of Science, Google Scholar and the Cochrane Library were searched, together with reports and guidelines from international organizations such as the World Health Organization (WHO) and United Nations Children's Fund (UNICEF). The literature search strategy, databases consulted, keywords used, and eligibility criteria are summarized in Table 1.

A comprehensive search was conducted across major databases, including PubMed, Scopus, Web of Science, Google Scholar, and the Cochrane Library, along with guidelines from the World Health Organization and UNICEF. Relevant studies were identified using Medical Subject Headings terms and keywords related to neonatal emergencies, combined with Boolean operators. English-language, full-text articles published between 2000 and 2025 were included, with emphasis on recent studies. Selection was based on relevance and quality, including peer-reviewed research and clinical guidelines, while non-relevant and low-quality studies were excluded. Articles were screened by titles, abstracts, and full

texts, with additional sources identified from reference lists. Studies were screened based on predefined inclusion and exclusion criteria. Following duplicate removal and title and abstract screening, eligible full-text articles were reviewed for inclusion in the narrative synthesis. The study selection process is presented in Table 2.

THEMATIC REVIEW

This review examines four key dimensions of neonatal emergencies: Risk factors and etiology, clinical features and early identification, management strategies, and prevention with health system support. These themes encompass preterm birth, neonatal sepsis, birth asphyxia and congenital anomalies, highlighting both shared determinants and condition-specific challenges.

Risk factors and etiology

Neonatal emergencies arise from a combination of maternal, fetal, and healthcare-related factors. Prematurity, maternal

Table 1: Method of literature search

Component	Description
Study design	Narrative literature review conducted to collect and synthesize evidence on neonatal emergencies.
Focus areas	Preterm birth, neonatal sepsis, birth asphyxia and congenital anomalies, including causes and management approaches.
Data sources	Electronic databases: PubMed/MEDLINE, Scopus, Web of Science, Google Scholar, and Cochrane Library.
Additional sources	International organizations such as the World Health Organization and United Nations Children's Fund for global guidelines and reports.
Search strategy	Combination of Medical Subject Headings and free text keywords.
Keywords used	"Neonatal emergencies," "preterm birth"/"prematurity," "neonatal sepsis," "birth asphyxia"/"perinatal asphyxia," "congenital anomalies"/"birth defects," along with "causes," "risk factors," "management," and "treatment."
Search operators	Boolean operators (AND, OR) used to refine and structure the search.
Time frame	Publications from 2000 to 2025: Emphasis on studies published in the last 10 years.
Language criteria	English language articles only.
Access criteria	Full-text availability required.
Inclusion criteria	Peer-reviewed original studies, systematic reviews, meta-analyses, and clinical guidelines relevant to causes and/or management of neonatal conditions.
Exclusion criteria	Non-neonatal studies, studies with insufficient methodological detail, case

Table 2: Study selection process for the narrative review

Selection stage	Number of records (n)
Records identified through database searching	310
Duplicate records removed	60
Records screened (title and abstract)	250
Records excluded after screening	173
Full-text articles assessed for eligibility	70
Full-text articles excluded	30
Studies included in the narrative review	35

illness, intrapartum complications, infections, and genetic or environmental influences increase the risk of adverse neonatal outcomes. Many of these factors can be reduced through quality antenatal care and timely obstetric interventions.^[9]

Clinical features and early identification

Early recognition is challenging due to subtle and non-specific symptoms. Conditions such as sepsis and asphyxia may be easily missed, whereas preterm infants show more obvious signs requiring close monitoring. Accurate diagnosis depends on skilled healthcare providers, proper assessment tools, and vigilant observation.^[10]

Management approaches

Effective management relies on prompt intervention combining supportive care and targeted treatment. This includes respiratory support for preterm infants, early antibiotics for sepsis, resuscitation for asphyxia, and specialized care for congenital anomalies. Multidisciplinary teamwork is essential for improving outcomes.^[11]

Prevention and health system support

Prevention focuses on antenatal care, early risk identification, infection control, and proper maternal nutrition. Strong health systems with trained staff, NICU facilities, and standardized protocols are crucial. Cost-effective interventions such as kangaroo mother care and breastfeeding also reduce neonatal mortality.^[12]

INTEGRATED PERSPECTIVE

Neonatal emergencies are interconnected and require a comprehensive approach combining early detection, effective management, preventive strategies and strong healthcare systems to improve survival and long-term outcomes. The four key dimensions of neonatal emergencies are presented in Figure 1.

Preterm birth

Preterm birth, defined as delivery before 37 weeks of gestation, remains a leading cause of neonatal mortality worldwide. Major complications include respiratory distress syndrome, intraventricular hemorrhage, and infection. Advances such as antenatal corticosteroids, surfactant therapy, and non-invasive respiratory support have improved outcomes, although disparities in access remain. Preventive measures, including progesterone therapy in selected high-risk pregnancies, may reduce the risk of preterm delivery.^[13]

Neonatal sepsis

Neonatal sepsis remains a significant cause of neonatal morbidity and mortality and is classified as early onset or late onset disease. Major risk factors include maternal infection, prolonged rupture of membranes, prematurity, and inadequate infection control practices. Clinical manifestations commonly include temperature instability, poor feeding, lethargy, and respiratory distress. Early diagnosis and prompt antibiotic therapy, supported by appropriate monitoring and supportive care, are critical for improving outcomes.^[14]

Birth asphyxia

Birth asphyxia results from inadequate oxygen delivery before, during, or shortly after birth and may lead to hypoxic-ischemic encephalopathy and long-term neurological impairment. Common clinical features include low Apgar scores, respiratory difficulty, hypotonia, and altered consciousness. Prompt neonatal resuscitation and supportive care remain the cornerstone of management, while therapeutic hypothermia is recommended for eligible infants with moderate-to-severe hypoxic-ischemic encephalopathy.^[15]

Congenital anomalies

Congenital anomalies are important contributors to neonatal morbidity and mortality. Common conditions include congenital heart defects, neural tube defects, and gastrointestinal malformations. Early diagnosis through prenatal screening and newborn assessment enables timely intervention and improved outcomes. Management often requires multidisciplinary care and, in some cases, surgical treatment.^[16]

CAUSES

Approximately 75% of neonatal deaths occur during the 1st week of life, with a substantial proportion occurring within the first 24 h after birth. The leading causes of neonatal mortality include preterm birth, birth complications such as asphyxia, neonatal infections, and congenital anomalies. Although mortality rates have declined globally, these conditions continue to account for a large share of under-five deaths, emphasizing the importance of quality maternal and newborn healthcare services.^[15,16]

Neonatal emergencies, including preterm birth, neonatal sepsis, birth asphyxia and congenital anomalies, remain major contributors to neonatal morbidity and mortality worldwide. Understanding their causes is essential for developing effective prevention and management strategies.

Preterm birth

Preterm birth, defined as delivery before 37 weeks of gestation, is a major cause of neonatal mortality and long-term developmental complications. Its etiology is multifactorial and includes maternal infections, multiple pregnancies, chronic maternal illnesses such as hypertension and diabetes, and lifestyle factors including smoking and poor nutrition. Prematurity remains one of the leading causes of infant mortality globally.^[17]

Neonatal sepsis

Neonatal sepsis is a severe infection occurring within the first 28 days of life and remains a leading cause of neonatal mortality. It is primarily caused by bacterial pathogens, although viral and fungal infections may also occur. Early onset sepsis is usually acquired from the mother during pregnancy or delivery, whereas late onset sepsis is often associated with environmental or healthcare-related exposures.^[18] Major risk factors include maternal infection, prolonged rupture of membranes, and prematurity. Early diagnosis and prompt treatment are essential for improving outcomes.^[18,19]

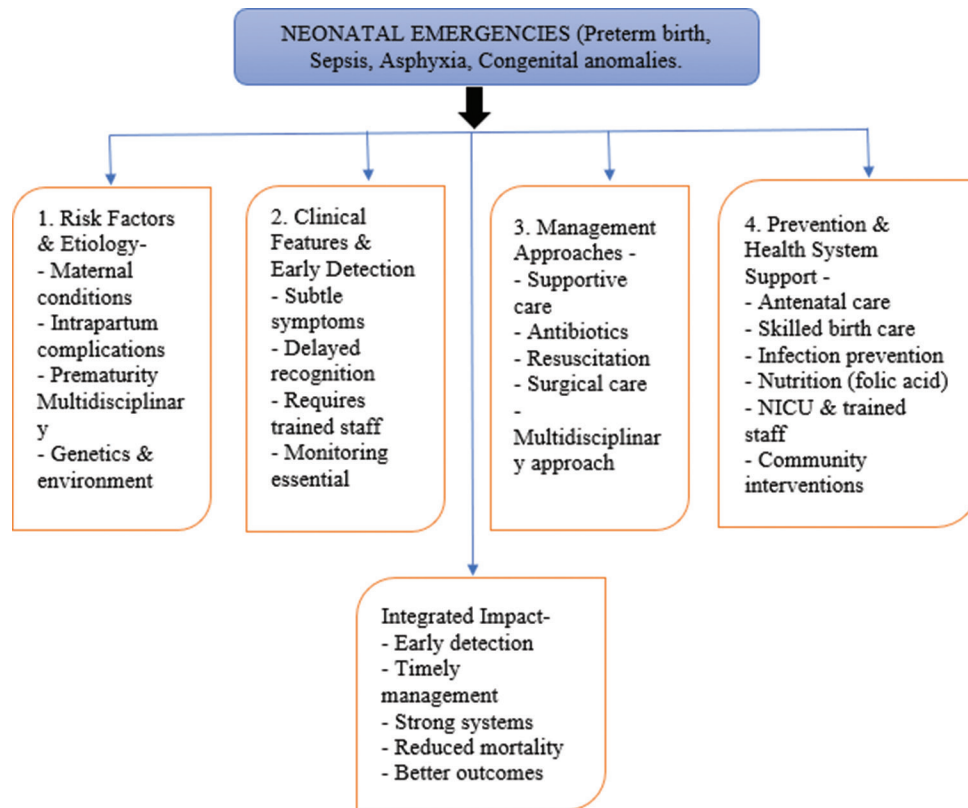


Figure 1: Integrated framework of neonatal emergencies

Birth asphyxia

Birth asphyxia refers to the failure to establish and maintain adequate breathing at birth, resulting in impaired oxygen delivery to vital organs. It remains a significant cause of neonatal mortality and neurological injury.^[19] Common risk factors include maternal complications, prolonged or obstructed labor, fetal distress, placental abnormalities, and umbilical cord complications. Early recognition and timely neonatal resuscitation are critical to reducing morbidity and mortality.^[20]

Congenital anomalies

Congenital anomalies are structural or functional abnormalities present at birth and are important causes of neonatal death and disability. Their etiology is often multifactorial, involving genetic, environmental, and maternal factors. Common examples include congenital heart defects, neural tube defects, and renal or limb malformations. Prenatal screening and routine ultrasonography play a vital role in early detection and management, helping to improve neonatal outcomes.^[21] The principal risk factors for these conditions are summarized in Table 3.

MANAGEMENT

Management of neonatal emergencies requires early recognition, prompt stabilization and condition-specific treatment to reduce morbidity and mortality. Initial care follows the principles of airway, breathing and circulation,

Table 3: Causes and key risk factors of neonatal emergencies

Neonatal emergency	Key risk factors
Preterm birth	Previous preterm delivery, multiple pregnancy, maternal infections, hypertension, diabetes, poor maternal nutrition, smoking, substance abuse, and inadequate antenatal care.
Neonatal sepsis	Premature rupture of membranes, maternal infection, preterm birth, low birth weight, prolonged labor, invasive procedures, and poor infection control practices.
Birth asphyxia	Prolonged or obstructed labor, fetal distress, placental insufficiency, maternal hypertension, umbilical cord complications, and delayed or inadequate resuscitation at birth.
Congenital anomalies	Genetic abnormalities, chromosomal disorders, maternal infections, diabetes, exposure to teratogenic drugs or environmental toxins, nutritional deficiencies (especially folic acid), and advanced maternal age.

with attention to thermoregulation, respiratory support, adequate circulation and correction of metabolic abnormalities. Intravenous access, continuous monitoring and timely referral to a NICU are essential. Multidisciplinary care and parental counseling further contribute to improved outcomes.^[22]

Effective management varies according to the underlying condition. Preterm infants often require thermal support, respiratory assistance, nutritional optimization, and infection prevention. Neonatal sepsis demands early diagnosis, prompt

initiation of empiric antibiotic therapy, and supportive care. Birth asphyxia requires immediate neonatal resuscitation and, when indicated, therapeutic hypothermia. Congenital anomalies may require medical management, surgical intervention and long-term multidisciplinary follow-up.^[23]

Preterm birth

Management of preterm birth focuses on maintaining thermoregulation, respiratory support, adequate nutrition and prevention of infection. Antenatal corticosteroids, NICU care and evidence-based newborn interventions have significantly improved survival. Kangaroo mother care, breastfeeding support and close monitoring play important roles in optimizing outcomes. Prevention involves identification and management of high-risk pregnancies, timely referral, and appropriate obstetric care.^[22,23]

Neonatal sepsis

Successful management of neonatal sepsis depends on early recognition and prompt administration of appropriate antibiotics. Supportive measures include fluid management, oxygen therapy, and continuous monitoring. Empiric antibiotic therapy should be initiated when sepsis is suspected and adjusted according to culture results and local guidelines. Adherence to infection control practices and antimicrobial stewardship is essential to improve outcomes and limit antimicrobial resistance.^[24]

Birth asphyxia

Birth asphyxia requires immediate resuscitation to restore adequate oxygenation and circulation. Infants with moderate to severe hypoxic-ischemic encephalopathy may benefit from therapeutic hypothermia initiated within the first 6 h of life. Ongoing management includes respiratory support, monitoring of neurological status, maintenance of normal glucose levels and body temperature, and treatment of associated complications. Care is primarily supportive and aimed at minimizing secondary organ injury.^[18]

Congenital anomalies

Congenital anomalies depend on the nature and severity of the anomaly and may include medical treatment, surgical correction, rehabilitation, and long-term follow-up. Early prenatal or postnatal diagnosis enables timely intervention and improves outcomes. Multidisciplinary care involving neonatologists, pediatric specialists, nurses, and rehabilitation teams is often required. Family education and psychosocial support are also important components of care.^[25]

PREVENTION

The principal prevention and management strategies for neonatal emergencies, including interventions across the continuum of care and health system strengthening measures, are summarized in Table 4. Prevention of neonatal emergencies requires a continuum of care from preconception through the neonatal period. Key evidence-based interventions include folic acid supplementation, antenatal risk assessment,

Table 4: Prevention and management strategies for neonatal emergencies

Domain	Key interventions/strategies
Overall approach	Multi-level strategy including public awareness, education and promotion of girl child health to reduce neonatal morbidity and mortality.
Continuum of care	Preconception counseling, antenatal and postnatal care, safe delivery, essential newborn care, early breastfeeding, cord care, thermal regulation, infection control, immunization, and family-centered care.
High-risk neonates	Premature, low birth weight, hyperbilirubinemia, hypothermia, and congenital anomalies increase risk of morbidity and mortality, especially perioperative complications.
Preconception and antenatal care	Risk assessment, folic acid supplementation, reduction of harmful exposures, and antenatal screening for early detection of high-risk pregnancies and congenital anomalies.
Preterm birth prevention	Progesterone therapy and cervical cerclage (in selected cases) to reduce risk of preterm birth and neonatal mortality.
Intrapartum care	Skilled birth attendants, continuous monitoring, timely management of complications, and effective neonatal resuscitation to prevent birth asphyxia.
Neonatal resuscitation impact	Can prevent up to 30% of intrapartum-related deaths and 5–10% of mortality from preterm complications.
Sepsis prevention	Intrapartum antibiotics, strict hand hygiene, sterile techniques, limited invasive procedures, early feeding and breastfeeding, and antimicrobial stewardship.
Preterm-specific care	Probiotic supplementation reduces late-onset sepsis, hospital stay, and improves outcomes in preterm infants.
Congenital anomalies management	Early detection via clinical examination, pulse oximetry, and ultrasound; timely referral, surgery, and supportive care.
Health system strengthening	Training of healthcare providers, NICU availability, quality improvement programs, and surveillance systems for neonatal conditions.

screening for high-risk pregnancies and congenital anomalies, progesterone therapy or cervical cerclage for women at risk of preterm birth, and timely referral to specialized care. During labor, skilled birth attendance, continuous fetal monitoring and prompt neonatal resuscitation are essential to prevent birth asphyxia. Prevention of neonatal sepsis relies on strict infection control practices, including hand hygiene, aseptic techniques, appropriate maternal antibiotic prophylaxis, early breastfeeding and antimicrobial stewardship.^[19] Early newborn screening and timely intervention can reduce morbidity associated with congenital anomalies. Neonatal nurses play a critical role in prevention through ongoing assessment, infection prevention, thermal care, support of breastfeeding, parent education, early recognition of danger signs, and adherence to evidence-based protocols. These measures significantly reduce neonatal morbidity, mortality, and long-term complications.^[19,20]

Reducing neonatal morbidity and mortality requires a continuum of care that includes preconception counseling, quality antenatal and postnatal care, safe delivery practices, early breastfeeding, thermal care, proper cord care, immunization, and strict infection control measures. Neonatal nurses play a key role through hand hygiene, aseptic practice, monitoring, parent education, and early recognition of danger signs. These evidence-based interventions significantly improve neonatal outcomes and reduce complications, particularly among preterm, low birth weight, and surgically managed neonates.^[21,22]

Neonatal emergencies can be largely prevented through effective care before, during, and after pregnancy.^[23] Key interventions include antenatal risk assessment, folic acid supplementation, screening for high-risk pregnancies and congenital anomalies, and prevention of harmful maternal exposures. Skilled birth attendance, continuous fetal monitoring, timely management of complications and prompt neonatal resuscitation are essential to reduce preterm birth complications and birth asphyxia, thereby improving neonatal survival and outcomes.^[26]

Prevention of neonatal sepsis relies on rigorous infection control and comprehensive maternal–newborn care. Key measures include intrapartum antibiotic prophylaxis for selected maternal infections, strict hand hygiene, judicious use of invasive devices, early initiation of enteral feeding and breastfeeding, and implementation of antimicrobial stewardship, all of which mitigate both early and late-onset sepsis. In preterm neonates, additional interventions such as multistrain probiotic supplementation, particularly at low doses, have been shown to reduce the incidence of late-onset sepsis, shorten hospitalization duration and potentially improve survival outcomes. For congenital anomalies, scaling up low-cost neonatal and fetal screening modalities, including clinical examination, pulse oximetry and ultrasonography, strengthening referral networks and ensuring timely access to surgical and supportive care are critical to decreasing mortality and long-term morbidity.^[23] Across these domains, sustained investment in healthcare provider training, perinatal quality improvement initiatives and national surveillance systems for birth defects and neonatal infections is essential to support effective prevention strategies and to inform policy development and resource allocation.

DISCUSSION

This narrative review highlights that preterm birth, neonatal sepsis, birth asphyxia and congenital anomalies remain the leading causes of neonatal morbidity and mortality worldwide, despite substantial advances in perinatal and neonatal care. A key finding is that many of these conditions share common and potentially modifiable maternal, fetal and healthcare-related risk factors, emphasizing the importance of preventive strategies across the continuum of care.^[24] The review demonstrates that early identification, timely intervention, and

adherence to evidence-based clinical guidelines significantly improve neonatal outcomes. Advances such as antenatal corticosteroid therapy, neonatal resuscitation programs, therapeutic hypothermia for hypoxic-ischemic encephalopathy, infection control measures, and improved prenatal screening have contributed to reductions in neonatal mortality and long-term disability. Furthermore, enhanced neonatal intensive care and multidisciplinary management have improved survival rates among high-risk neonates.^[25]

An important observation is the pivotal role of neonatal nursing practice in preventing complications and optimizing outcomes. Continuous monitoring, infection prevention, thermal regulation, breastfeeding support, family education, and early recognition of clinical deterioration are essential components of high-quality neonatal care.^[26]

In resource-limited settings, low-cost and practical interventions can have a substantial impact. Approaches such as kangaroo mother care, early initiation of breastfeeding, and community education on essential newborn care have proven effective in improving survival rates and reducing neonatal mortality.

Overall, the findings underscore that many neonatal emergencies are preventable or manageable when evidence-based interventions are implemented promptly. Strengthening maternal and newborn healthcare services, expanding access to specialized neonatal care, and investing in healthcare workforce training are critical for reducing the global burden of neonatal emergencies and improving long-term neonatal health outcomes.^[27]

CONCLUSION

Preterm birth, neonatal sepsis, birth asphyxia, and congenital anomalies remain major causes of neonatal morbidity and mortality worldwide. This review highlights the importance of prevention, early diagnosis, timely intervention, and evidence-based management in improving neonatal outcomes. Strengthening maternal and neonatal healthcare services, ensuring access to specialized care, and promoting multidisciplinary collaboration are essential to reducing preventable neonatal deaths. Continued efforts in early detection, healthcare capacity building, and implementation of cost-effective interventions are needed to further improve neonatal survival, particularly in resource-limited settings.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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