

ASSESSMENT OF NEONATAL SEPSIS AND ASSOCIATED FACTORS ON 70 NEONATES AT DJOUNGOLO DISTRICT HOSPITAL OLEMBE YAOUNDE

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Abstract: Introduction: Neonatal sepsis remains a critical public health issue and a leading cause of neonatal morbidity and mortality, especially in low- and middle-income countries. This study was conducted to assess neonatal sepsis and its associated factors among 70 neonates admitted at the Djoungolo District Hospital, Olembe, Yaoundé.

Materials and methods: A hospital-based descriptive and analytical cross-sectional study was conducted over a period of two months, involving a total of 70 neonates aged 0–28 days.

Data were collected through structured questionnaires administered to mothers, clinical examinations, and a review of hospital records.

Results: The results showed that the majority of neonates were aged 0–7 days and a significant proportion were diagnosed with neonatal sepsis. The prevalence rate observed reflects the persistent burden of this condition in primary healthcare settings. Analysis revealed associations between neonatal sepsis and several maternal factors (such as inadequate antenatal care, premature rupture of membranes, maternal infections), neonatal factors (such as low birth weight, prematurity, low Apgar scores), and healthcare-related factors (such as poor hygiene practices and exposure to invasive procedures).

Conclusion: These findings underscore the importance of early detection, improved maternal care, and adherence to infection prevention protocols to reduce the incidence of neonatal sepsis.

Keywords: neonatal sepsis, predisposing factors, Djoungolo District Hospital, Olembe.

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Introduction

Neonatal sepsis is a life-threatening clinical syndrome in newborns, characterized by signs of systemic infection and confirmed or suspected bacteremia within the first 28 days of life. It is a leading cause of neonatal morbidity and mortality globally, particularly in low- and middle-income countries [1]. Neonates, especially those born prematurely or with low birth weight, are particularly vulnerable due to their immature immune systems and limited capacity to mount effective inflammatory responses to infectious agents [2].

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The burden of neonatal sepsis is immense, with an estimated 3 million cases occurring globally each year and over 500,000 associated deaths [3]. Early-onset sepsis (EOS), which occurs within the first 72 hours of life, is usually caused by organisms transmitted vertically from the mother during labor or delivery. In contrast, late-onset sepsis (LOS), which occurs from 72 hours to 28 days post-delivery, is commonly acquired from the environment or healthcare settings [4]. Both forms are associated

with significant complications, including respiratory distress, neurological damage, and long-term developmental impairments.

In sub-Saharan Africa, neonatal sepsis contributes significantly to the high neonatal mortality rate. The WHO reports that sepsis is among the top three causes of neonatal deaths in the region, alongside prematurity and birth asphyxia [1]. Inadequate antenatal care, poor hygienic practices during delivery, and delays in identifying and managing infections contribute to the high incidence of neonatal sepsis in African settings [4]. Moreover, the lack of diagnostic resources and limited access to effective antibiotics exacerbate the situation.

In Cameroon, neonatal sepsis continues to pose a serious public health challenge. Studies conducted in various hospitals have reported high prevalence rates. For example, a study at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital found that 34.4% of admitted neonates had clinical features consistent with sepsis [5]. Another study in Douala showed that sepsis accounted for nearly one-third of neonatal admissions and a significant proportion of neonatal deaths [6]. Despite these alarming figures, there is a scarcity of localized data regarding the prevalence, risk factors, and outcomes of neonatal sepsis in other major health institutions, including Djoungolo District hospital olembe in Yaoundé.

Djoungolo District Hospital Olembe is a district-level health facility in Yaoundé that provides maternal and child health services to the surrounding communities, including neonatal care for newborns at risk of infection. Understanding the burden of neonatal sepsis in this setting is essential for improving prevention and management strategies at the community level. It is essential to identify both maternal and neonatal predisposing factors associated with sepsis, such as prolonged rupture of membranes, low birth weight, preterm delivery, unhygienic delivery practices, and invasive medical procedures.

This study is therefore designed to assess the neonatal sepsis and identify associated risk factors at Djoungolo District Hospital Olembe, Yaoundé. Findings from this research are expected to provide evidence-based insights that will inform clinical practice, strengthen infection prevention and control measures, and guide policy formulation aimed at reducing neonatal morbidity and mortality in Cameroon.

There is a critical need to generate evidence-based data on neonatal sepsis in Cameroon, particularly from district-level hospitals such as Djoungolo District Hospital Olembe, which serve as primary care points for many deliveries, including those at risk of complications. Despite the clinical importance of the condition, there is a paucity of updated and comprehensive studies assessing both the prevalence and contributing factors of neonatal sepsis in such community-level healthcare settings.

This study seeks to fill that gap by quantifying the burden of neonatal sepsis at the hospital, identifying modifiable risk factors, and providing recommendations for improving neonatal care. The findings will also contribute to strengthening infection prevention and control (IPC) protocols, enhancing health worker training, and guiding policy-makers and hospital administrators in resource allocation and maternal-child health planning.

Djoungolo District Hospital Olembe is a district-level health facility in Yaoundé that provides a range of maternal and neonatal health services to the surrounding communities. The

hospital manages deliveries and offers newborn care, including treatment for neonates with suspected infections such as sepsis. It also admits referrals from nearby primary health centers within its catchment area. Given its role in providing essential neonatal care at the community level, it offers an important opportunity to assess the prevalence and predisposing factors of neonatal sepsis in a district hospital setting.

In Cameroon, neonatal infections are a significant cause of neonatal mortality, accounting for a large proportion of deaths in NICUs. According to the Cameroon Demographic and Health Survey (DHS), the neonatal mortality rate stands at approximately 27 deaths per 1000 live births, and infections such as sepsis are among the leading causes [7]. Most cases of neonatal sepsis in Cameroon are diagnosed clinically due to the unavailability of blood culture facilities in many peripheral and district hospitals. Djoungolo District Hospital Olembe, like most district-level facilities, has limited laboratory capacity, and bacterial infections in neonates are often diagnosed based on clinical signs rather than confirmed through blood culture.

Although data on the national prevalence of neonatal sepsis are limited, studies conducted in urban hospitals such as Yaoundé Central Hospital and Douala General Hospital suggest that the burden remains high, especially among neonates delivered outside health facilities or born to mothers with poor antenatal follow-up. The most commonly identified risk factors include prematurity, low birth weight, prolonged rupture of membranes, maternal infections, and substandard delivery practices [8].

Understanding the magnitude of neonatal sepsis at this facility can inform health policies, enhance infection prevention strategies, and improve neonatal outcomes not only within the hospital but potentially in similar settings across Cameroon.

This study has practical, academic, and policy implications. Clinically, it will help healthcare providers identify high-risk neonates and implement early interventions. Academically, it will contribute to the growing body of research on neonatal infections in Sub-Saharan Africa. From a policy perspective, the findings can influence national and hospital-level protocols on maternal and neonatal health. Ultimately, reducing neonatal sepsis will contribute to achieving Sustainable Development Goal (SDG) 3, which seeks to end preventable deaths of newborns and children under five years of age by 2030 [10].

Statement of Problem

Despite the improvements in neonatal care, sepsis remains a major problem in Cameroon. High rates of neonatal mortality attributed to sepsis are reported, yet little is known about its local prevalence and associated risk factors [15,17].

Justification

Personal Justification

As a nursing student, I am motivated to contribute to improving neonatal outcomes by identifying gaps in early detection and management of neonatal sepsis.

Scientific Justification

Documenting the prevalence and risk factors will guide future research and policy aimed at reducing neonatal deaths due to sepsis.

Research Question

What are the associated maternal and neonatal factors contributing to neonatal sepsis among neonates admitted at Djoungolo District Hospital, Olembe, Yaoundé?

Research Hypothesis

There is a significant association between maternal/perinatal factors and the occurrence of neonatal sepsis.

Objectives

General Objective

To assess neonatal sepsis and identify the associated factors among neonates admitted to Djoungolo District Hospital, Olembe, Yaoundé.

Specific Objectives

- To determine the proportion of neonates diagnosed with neonatal sepsis during the study period.
- To identify maternal and perinatal factors associated with neonatal sepsis.

Operational Definition of Terms

Neonatal Sepsis: A systemic infection occurring in neonates within 28 days of life.

Predisposing Factors: Maternal or perinatal conditions increasing the risk of neonatal sepsis.

Literature Review

Introduction

Neonatal sepsis remains a significant global health concern and a major contributor to neonatal morbidity and mortality, particularly in low- and middle-income countries (LMICs) [18]. The first 28 days of life—the neonatal period—pose the greatest risk for child survival, with infections like sepsis accounting for a substantial proportion of neonatal deaths. This chapter presents a comprehensive literature review on the prevalence of neonatal sepsis and the predisposing factors, with a focus on studies conducted globally, across sub-Saharan Africa, and in Cameroon, including comparable settings to Djoungolo District Hospital Olembe in Yaoundé. The review is structured to highlight definitions, classifications, global and local epidemiology, risk factors, causative organisms, clinical manifestations, diagnostic challenges, management strategies, and preventive measures.

Definition and Classification of Neonatal Sepsis

Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of systemic infection in the first 28 days of life, often accompanied by bacteremia. According to the World Health Organization (WHO, 2018), neonatal sepsis is a life-threatening condition resulting from the body's response to infection in newborns [19].

Neonatal sepsis is generally classified into two categories:

- Early-Onset Sepsis (EOS): Occurs within the first 72 hours of life and is often acquired vertically from the mother during labor or delivery.
- Late-Onset Sepsis (LOS): Occurs after 72 hours and is typically acquired from the environment, including nosocomial infections.

Recent literature emphasizes that the classification is essential for determining etiology, treatment, and prevention approaches, as EOS and LOS have different risk factors and microbial profiles [20].

Global Burden and Epidemiology of Neonatal Sepsis

Globally, neonatal sepsis is among the top three causes of neonatal mortality, alongside prematurity and birth asphyxia [21]. The WHO (2020) estimates that around 2.4 million newborns died globally in 2019, with infections accounting for approximately 30% of these deaths [22].

A meta-analysis estimated the global incidence of neonatal sepsis at 2,202 cases per 100,000 live births, with the highest burden found in sub-Saharan Africa and South Asia [23]. The mortality rate associated with neonatal sepsis varies widely, ranging from 11% in high-income countries to over 40% in LMICs, reflecting disparities in healthcare access, diagnostic capabilities, and treatment protocols [23].

Burden in Sub-Saharan Africa

Sub-Saharan Africa carries the highest burden of neonatal sepsis [24]. A study by Oza et al. (2015) noted that over 30% of neonatal deaths in the region are due to sepsis. Limited access to quality maternal and neonatal care, high prevalence of home deliveries, inadequate infection control, and widespread antimicrobial resistance contribute to the high burden.

A systematic review by Opiyo and English (2019) found the prevalence of neonatal sepsis in African countries ranged from 17 to 40 cases per 1,000 live births, with significant underreporting due to limited diagnostic infrastructure [25].

In Nigeria, a tertiary hospital-based study revealed a neonatal sepsis prevalence of 37% [26], while in Ghana, Enweronu-Laryea et al. (2016) reported 22% [27], underscoring significant regional variations and high rates.

Epidemiology in Cameroon and Similar Contexts

In Cameroon, studies indicate a high prevalence of neonatal sepsis, especially in tertiary hospitals. At Douala General Hospital, Tchouambou et al. reported a neonatal sepsis prevalence of 32.6%, with a case fatality rate of 27.5% [28]. Similarly, research at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital found a prevalence rate of 28.5% [29]. These figures reflect a critical public health challenge.

However, specific studies at Djoungolo District Hospital Olembe remain limited, thereby justifying the need for targeted research in this institution to ascertain the burden and specific risk factors in its neonatal population.

Predisposing Factors to Neonatal Sepsis

Multiple factors influence the risk of neonatal sepsis. These can be grouped into maternal, neonatal, and environmental factors.

Maternal Factors

- Prolonged rupture of membranes (PROM): Defined as rupture of the amniotic sac for more than 18 hours before delivery, PROM significantly increases the risk of EOS [30].
- Maternal infections: Maternal urinary tract infections (UTIs), chorioamnionitis, and sexually transmitted

infections (STIs) during pregnancy are well-documented risk factors [20].

- Intrapartum fever: A maternal temperature $>38^{\circ}\text{C}$ during labor is often associated with neonatal sepsis.
- Premature labor and inadequate prenatal care are also correlated with higher risk due to reduced immunological protection [31].

Neonatal Factors

- Prematurity and low birth weight (LBW): Preterm neonates (<37 weeks) and LBW infants (<2.5 kg) have immature immune systems and are at higher risk [32].
- Male sex: Several studies report a higher incidence of neonatal sepsis in male infants, possibly due to X-linked immune regulatory genes [33].
- Birth asphyxia and invasive procedures: Resuscitation and use of invasive devices like umbilical catheters predispose neonates to sepsis [34].

Environmental and Health System Factors

- Home delivery and poor cord care practices: In rural and peri-urban settings, unsanitary delivery conditions increase neonatal sepsis risks.
- Overcrowding in neonatal units, lack of hand hygiene, and poor infection control practices contribute to high nosocomial infection rates [35].
- Limited access to skilled birth attendants and neonatal intensive care units (NICUs) further exacerbates the burden [36].

Causative Microorganisms

The etiology of neonatal sepsis varies geographically and temporally. Common causative organisms include:

Early-Onset Sepsis (EOS)

- Group B Streptococcus (GBS) – more common in high-income countries.
- Escherichia coli – prevalent in both developed and developing countries.
- Listeria monocytogenes, Klebsiella spp., and Enterobacter spp. are also common [37].

Late-Onset Sepsis (LOS)

Often caused by nosocomial and opportunistic pathogens, including:

- Staphylococcus aureus
- Coagulase-negative staphylococci
- Pseudomonas spp.
- Candida spp.

A study in Cameroon showed that Klebsiella pneumoniae, Escherichia coli, and Staphylococcus aureus were the leading isolates in neonatal sepsis cases [28].

Clinical Manifestations

Neonatal sepsis presents with non-specific signs that make early diagnosis challenging:

- Fever or hypothermia
- Poor feeding
- Lethargy
- Respiratory distress

- Apnea
- Jaundice
- Irritability
- Seizures

These symptoms can mimic other neonatal conditions such as hypoglycemia or respiratory distress syndrome, underscoring the need for high clinical suspicion [38].

Diagnostic Challenges

In resource-limited settings like Cameroon, diagnosing neonatal sepsis is complicated by limited access to blood cultures, biochemical markers, and imaging.

Blood Cultures

- The gold standard, but sensitivity is low due to prior antibiotic use and sample contamination.
- Time to result often exceeds 48 hours [39].

Biomarkers

- C-reactive protein (CRP) and procalcitonin are useful but rarely available in low-resource hospitals.
- Complete blood count (CBC), absolute neutrophil count, and platelet count may assist but are non-specific [40].

Clinical Algorithms

- In many settings, diagnosis is made using WHO Integrated Management of Childhood Illness (IMCI) criteria, which prioritize symptom-based assessment [41].

Management of Neonatal Sepsis

Empiric Antibiotic Therapy

- WHO recommends a combination of ampicillin and gentamicin as first-line treatment.
- In cases of resistance or treatment failure, third-generation cephalosporins or carbapenems may be used [42].

However, antimicrobial resistance (AMR) is a growing concern. Studies in Cameroon have shown increasing resistance to commonly used antibiotics, necessitating antimicrobial stewardship programs [29].

Supportive Care

- Includes fluid management, temperature regulation, oxygen therapy, and nutritional support.
- In advanced settings, NICUs provide mechanical ventilation and parenteral nutrition [43].

Preventive Strategies

Maternal Interventions

- Antenatal screening and treatment of infections
- Intrapartum antibiotic prophylaxis (IAP) for GBS-positive mothers
- Clean delivery practices

Neonatal Interventions

- Early initiation of breastfeeding (within 1 hour)
- Strict infection prevention and control (IPC) in neonatal units
- Timely cord care using antiseptics like chlorhexidine

The WHO's Every Newborn Action Plan (ENAP) advocate for high-impact interventions to reduce neonatal infections and improve survival rates globally [44].

Gaps in Literature and Justification for the Study

Although studies have highlighted the burden of neonatal sepsis in Cameroon, there is limited data specifically from Djoungolo District Hospital Olembe. Understanding the local prevalence, microbial patterns, and predisposing factors is essential for informing targeted interventions and clinical guidelines. This study seeks to fill that knowledge gap and contribute to evidence-based strategies for improving neonatal outcomes.

Antimicrobial Resistance (AMR) in Neonatal Sepsis

The management of neonatal sepsis is increasingly complicated by the emergence of antimicrobial-resistant organisms, especially in sub-Saharan Africa. The WHO 2021 has classified AMR as one of the top 10 global public health threats, and its implications for neonatal care are significant [45].

Resistance Patterns

In recent years, organisms such as *Klebsiella pneumoniae*, *Escherichia coli*, and *Staphylococcus aureus* have demonstrated resistance to commonly used antibiotics including ampicillin, gentamicin, and third-generation cephalosporins [46]. Multi-drug resistant (MDR) strains are increasingly reported in neonatal intensive care units (NICUs) across LMICs.

In Cameroon, a study revealed that over 60% of *Klebsiella* isolates from neonates were resistant to third-generation cephalosporins, raising serious concerns about empirical therapy protocols [47].

Impact on Treatment Outcomes

High resistance rates lead to delayed effective treatment, prolonged hospital stays, increased healthcare costs, and elevated mortality. A study conducted in Nigeria found that neonates with MDR infections had a 3-fold increase in mortality compared to those with sensitive infections [48].

This underlines the urgent need for local antibiograms to guide therapy and for national antibiotic stewardship programs, especially in neonatal units.

Regional Differences in Risk Factors and Outcomes

The burden and characteristics of neonatal sepsis are not uniform across regions or even within countries. Variations occur due to:

- Socioeconomic disparities
- Healthcare access
- Cultural practices
- Environmental sanitation

Rural vs Urban Settings

In rural settings, home births, poor hygiene, traditional cord-care practices, and limited access to antibiotics are key risk factors. In contrast, urban hospital-based deliveries may have better outcomes but are not immune to nosocomial infections due to overcrowded NICUs and resource constraints [49].

Cameroon Context

In Cameroon, data from urban centers like Yaoundé and Douala report higher incidence of late-onset sepsis, mostly nosocomial. In

contrast, rural districts show higher cases of early-onset sepsis linked to home births and maternal infections [50].

Thus, region-specific interventions are required, and studies like this one at Djoungolo District Hospital Olembe help identify facility-specific burdens and risk patterns relevant to district-level healthcare settings.

Long-Term Complications of Neonatal Sepsis

Beyond acute mortality, survivors of neonatal sepsis face multiple long-term health complications that can affect quality of life and development.

Neurodevelopmental Impairments

- Cerebral palsy
- Seizure disorders
- Cognitive delays
- Speech and language disorders

A multicenter cohort study found that 15–30% of neonates who survive sepsis have neurodevelopmental impairments by age 2 [51].

Growth and Immunological Challenges

- Failure to thrive
- Increased susceptibility to future infections
- Chronic lung conditions, especially in preterm infants

This underscores the importance of early diagnosis, effective treatment, and follow-up care after neonatal sepsis, especially in low-resource settings where long-term support services are limited.

Influence of Healthcare System Capacity

The availability and quality of neonatal care services play a crucial role in sepsis outcomes.

Infrastructure Limitations

Many hospitals in sub-Saharan Africa, including in Cameroon, struggle with:

- Limited NICU beds
- Inadequate staffing (nurse-to-baby ratios as high as 1:10)
- Lack of consistent electricity and oxygen supply
- Poor access to lab diagnostics (e.g., cultures, CRP, blood gases)

According to a report, over 40% of health facilities in LMICs lack the basic infrastructure to support safe neonatal care [52].

Training and Adherence to Protocols

- Limited continuing medical education on neonatal infection management.
- Inconsistent adherence to infection prevention and control (IPC) guidelines.
- Variable implementation of IMCI (Integrated Management of Childhood Illness) protocols.

Investing in healthcare worker training and implementing standardized protocols can reduce sepsis incidence and mortality significantly [53].

Role of Health Education and Community Practices

Community beliefs, knowledge levels, and cultural practices significantly influence neonatal health.

Traditional Cord Care Practices

In Cameroon and many other African nations, it is common to apply herbs, ashes, or oil to the umbilical cord, increasing the risk of umbilical infections and sepsis [54].

Delayed Care Seeking

- Mothers may delay seeking care due to:
- Lack of knowledge of sepsis symptoms
- Reliance on traditional healers
- Financial constraints

A study in Ethiopia found that over 65% of mothers delayed seeking care for their neonates, contributing to poor outcomes [55].

Community health education initiatives can help overcome these barriers.

Relevant Theoretical Frameworks

Using theoretical models helps to structure the understanding of how various factors contribute to neonatal sepsis.

Social Ecological Model (SEM)

This model considers multiple layers of influence:

- Individual level: Neonatal immune status, prematurity
- Interpersonal level: Maternal health, caregiver knowledge
- Organizational level: Hospital capacity, staffing
- Community level: Cultural practices, sanitation
- Policy level: National guidelines, antibiotic availability

Applying the SEM framework enables researchers to examine how broader systems interact to influence neonatal health outcomes [56].

Three Delays Model

Originally developed to understand maternal mortality, this model can be applied to neonatal sepsis:

- Delay 1: Delay in recognizing the need for care (due to lack of knowledge)
- Delay 2: Delay in reaching care (due to transportation or distance)
- Delay 3: Delay in receiving adequate care (due to facility limitations)

Each delay contributes to increased risk of complications or death in neonates with sepsis [57].

Global Initiatives and Policies Addressing Neonatal Sepsis

Several international organizations have highlighted neonatal sepsis as a priority.

Every Newborn Action Plan (ENAP)

Led by WHO and UNICEF, ENAP aims to end preventable neonatal deaths by 2030. It promotes:

- Clean birth environments
- Skilled birth attendance
- Early diagnosis and referral of neonatal infections
- Strengthening data and surveillance systems [58].

Who Guidelines

The WHO guidelines recommend:

- Early recognition using clinical signs
- Empirical treatment with narrow-spectrum antibiotics
- Promotion of exclusive breastfeeding
- Use of chlorhexidine for cord care in high-mortality settings

Countries like Cameroon are encouraged to integrate these into national neonatal health strategies [59].

Advances in Laboratory Diagnosis of Neonatal Sepsis

Early and accurate diagnosis of neonatal sepsis remains a global challenge, particularly in low-resource settings. Innovations in diagnostic technologies offer hope, but most remain underutilized in sub-Saharan Africa due to cost and infrastructure constraints.

Conventional Diagnostic Tools

Blood cultures remain the gold standard for confirming sepsis, but they have limitations such as:

- Low sensitivity (especially after empirical antibiotics)
- Long turnaround times (24–72 hours)
- High risk of contamination with skin flora
- Complete Blood Count (CBC): Leukocytosis or leukopenia, thrombocytopenia, and elevated neutrophil ratios may indicate sepsis but lack specificity.
- C-reactive Protein (CRP): Widely used as an inflammatory marker. Elevated CRP has good negative predictive value.
- Procalcitonin (PCT): More specific than CRP and rises earlier in the course of infection, but limited availability in LMICs [60].

Molecular and Rapid Diagnostic Tests

Recent advances include:

- Polymerase Chain Reaction (PCR): Detects bacterial DNA directly from blood, allowing for quicker identification.
- Point-of-care tests (POCTs): Tools like PCT strips and lateral flow assays are being piloted for use in rural settings.
- Automated blood culture systems: Such as BACTEC and Bac /ALERT, which reduce detection time and improve yield in high-income settings.

A study in Uganda showed that introducing rapid POCTs reduced antibiotic overuse by 28% and improved neonatal outcomes [61].

Infection Prevention and Control (IPC) Practices in Neonatal Units

Implementing IPC measures is one of the most cost-effective strategies to reduce neonatal sepsis, particularly late-onset sepsis (LOS), which is mostly nosocomial [62].

WHO Core Components of IPC

- Hand hygiene: Use of alcohol-based hand rub or soap and water. Whose “5 Moments for Hand Hygiene” has been adopted globally?
- Sterile techniques during invasive procedures
- Environmental cleaning
- Use of personal protective equipment (PPE)
- Education and training of healthcare workers

- Surveillance of healthcare-associated infections (HAIs) [63].

Barriers to Implementation in LMICs

- Inadequate handwashing facilities
- Lack of disposable gloves and gowns
- Poor waste disposal systems
- Overcrowded NICUs with limited space and beds

In Cameroon, a study by Nana et al. (2020) found that only 35% of healthcare providers in neonatal units followed proper hand hygiene protocols consistently.

Promoting IPC education and investment in infrastructure are critical steps to reducing hospital-acquired neonatal infections [64].

Economic Burden of Neonatal Sepsis

Neonatal sepsis imposes a heavy economic toll on families, hospitals, and national health systems, particularly in low-resource settings.

Direct Costs

- Hospitalization fees (bed, medications, lab tests)
- Antibiotics and supportive care
- ICU or NICU admission
- Surgical interventions in severe cases (e.g., drainage of abscesses)

Indirect Costs

- Loss of parental income due to prolonged hospital stays
- Cost of transportation to referral centers
- Long-term rehabilitation for neurodevelopmental complications

A Nigerian study estimated that managing a single case of neonatal sepsis cost families the equivalent of 3–5 months' income, pushing many into catastrophic health expenditure.

Reducing the burden of sepsis through preventive measures and early diagnosis is both a health and economic priority [65].

Comparative Studies from Similar Settings

Several studies from sub-Saharan Africa and LMICs offer valuable lessons for understanding the dynamics of neonatal sepsis:

Uganda (Mulago Hospital)

- Prevalence: 33.8%
- Common organisms: Klebsiella, Pseudomonas, S. aureus
- Key risk factors: PROM >18 hours, low birth weight, unclean delivery environment
- Source: [66].

Ethiopia (Tikur Anbessa Hospital)

- Prevalence: 29%
- Risk factors: Home delivery, lack of antenatal care, chorioamnionitis
- High mortality among LBW and preterm neonates
- Source: [67].

Ghana (Korle Bu Teaching Hospital)

- Prevalence: 27.5%
- Resistance to ampicillin and gentamicin >50%
- Recommendation: Need to update empirical protocols

- Source: [68].

These studies reveal common trends, including high rates of resistance, delayed care, and lack of resources. They also emphasize the need for local research to tailor effective interventions.

Government Policy and Neonatal Health Strategy in Cameroon

Cameroon's Ministry of Public Health has included neonatal care in several strategic plans, although implementation remains inconsistent.

National Health Development Plan (NHDP) 2020–2027

- Focuses on reducing neonatal and infant mortality
- Includes targets for infection control, skilled birth attendance, and improved referral systems [69].

Cameroon Neonatal Strategy Guidelines

- Promote clean deliveries, breastfeeding, and immunizations
- Recommends management of neonatal infections using IMCI guidelines
- Training midwives and nurses in IPC protocols

However, gaps in funding, training, infrastructure, and monitoring limit the impact of these policies. [70].

Identified Gaps in the Literature

Although a substantial body of evidence exists on neonatal sepsis globally and in sub-Saharan Africa, there remain significant gaps:

- Lack of disaggregated data by facility – few studies have been conducted at Djoungolo District Hospital Olembe.
- Limited data on microbial resistance trends in Cameroonian NICUs.
- Scarce evaluation of maternal education and health literacy as predictors of neonatal sepsis.
- No standardized national surveillance system for neonatal infections.
- Minimal integration of socio-cultural and economic dimensions into clinical research on sepsis in Cameroon.

My proposed research will help fill these gaps by:

- Estimating the prevalence of neonatal sepsis in a major tertiary center.
- Identifying key predisposing factors.
- Offering evidence-based recommendations to reduce the burden [71].

The Role of Health Information Systems in Managing Neonatal Sepsis

An effective health information system (HIS) is critical for monitoring, evaluating, and responding to neonatal health issues, including sepsis. In low- and middle-income countries (LMICs), however, the underdevelopment of these systems poses significant barriers to real-time data collection and informed decision-making [72].

Importance of Data Systems

A robust HIS enables:

- Timely identification of outbreaks of sepsis in neonatal units.

- Monitoring of antimicrobial resistance patterns.
- Surveillance of health outcomes (morbidity and mortality).
- Data-driven policy formulation and resource allocation.

Challenges in Cameroon

In Cameroon, the health information system is still developing. Many hospitals, including tertiary facilities, rely on manual record-keeping, which is often incomplete or inconsistently updated. A 2021 report by the Ministry of Public Health highlighted that only 35% of public hospitals were submitting complete neonatal data to the DHIS2 platform.

- This weak surveillance capacity contributes to:
- Underreporting of neonatal infections.
- Delays in outbreak detection.
- Inefficient use of hospital and government resources.

To combat neonatal sepsis effectively, it is essential to strengthen facility-level data systems, enhance reporting accuracy, and integrate neonatal indicators into national electronic health records [72].

Stakeholder Engagement in Reducing Neonatal Sepsis

Engaging stakeholders at multiple levels of the healthcare system is essential to implementing sustainable strategies for preventing and managing neonatal sepsis.

Key Stakeholders

- Healthcare providers: Doctors, nurses, midwives, and lab technicians are on the frontline of care.
- Health administrators: Responsible for resource allocation and IPC implementation.
- Policy-makers: Develop national guidelines and funding structures.
- Parents and caregivers: Crucial for recognizing signs of sepsis and seeking early care.
- International organizations: WHO, UNICEF, Save the Children, and others support neonatal health programs in LMICs.

Community Involvement

Engaging traditional birth attendants, religious leaders, and community health workers (CHWs) has been shown to increase:

- Awareness of neonatal danger signs.
- Use of antenatal care services.
- Acceptance of hospital-based delivery and newborn care.

For example, in Sierra Leone, a study showed that community engagement reduced neonatal infection rates by 26% in intervention districts [73].

Integrating Neonatal Sepsis Control into Maternal and Child Health (MCH) Programs

Neonatal sepsis should not be addressed in isolation. Instead, it must be integrated into broader maternal and child health (MCH) frameworks that focus on the continuum of care, from pregnancy to the postnatal period.

Synergistic Interventions

- Maternal screening and treatment of urinary tract infections (UTIs), sexually transmitted infections (STIs), and Group B Streptococcus (GBS).
- Promotion of skilled birth attendance and institutional delivery.
- Postnatal follow-up visits to assess newborns in the first 7 days of life.
- Promotion of exclusive breastfeeding as an immune-boosting strategy.
- Umbilical cord care using chlorhexidine, as recommended by WHO in high-mortality settings [74,76].

National Program Alignment

Cameroon's MCH programs, such as the Expanded Program on Immunization (EPI), can serve as vehicles to:

- Deliver education on neonatal sepsis.
- Provide postnatal antibiotics in high-risk cases.
- Promote hygiene practices among mothers.

Integrated approaches improve cost-effectiveness, reduce duplication, and increase service coverage [75,77].

Ethical Considerations in Neonatal Sepsis Research

As your research involves vulnerable populations (neonates and their mothers), ethical considerations are paramount [78].

Key Ethical Issues

- Informed consent: Mothers or guardians must provide voluntary and informed consent.
- Confidentiality: Patient data must be protected and anonymized.
- Non-maleficence: Data collection must not interfere with medical care or cause distress.
- Justice: Inclusion criteria should ensure equitable representation across social groups.

Ethical clearance should be sought from the appropriate Institutional Review Board (IRB) and Ministry of Public Health in Cameroon, as applicable [79].

Conceptual Framework

This study could adopt a modified framework based on the WHO Pathway for Neonatal Sepsis, integrating both biological and social determinants [80].

Components of the Framework

- Neonatal factors: Prematurity, low birth weight, immune status.
- Maternal factors: ANC attendance, infections, parity, PROM.
- Environmental factors: Hygiene, mode of delivery, birth location.
- Healthcare system factors: Staffing, IPC adherence, diagnostic capacity.

This framework supports a multidimensional analysis of predisposing factors to inform targeted interventions [81].

Final Synthesis of the Literature Review

The global burden of neonatal sepsis remains unacceptably high, particularly in low-resource settings where health system

limitations, socioeconomic inequities, and cultural practices converge to increase risk. Despite advances in diagnostics, clinical management, and international guidelines, context-specific studies are necessary to generate actionable data for intervention.

The literature reveals that:

- Neonatal sepsis is influenced by a complex interplay of biological, maternal, environmental, and systemic factors [82].
- Early-onset and late-onset sepsis differ in etiology, risk factors, and outcomes [83].
- Antimicrobial resistance is a growing threat that undermines standard treatment protocols [84].
- Facility-level IPC, education, and policy enforcement are pivotal in prevention [85].
- Integration into maternal and child health programs increases effectiveness [86].

In Cameroon, where national strategies are often limited by infrastructure, human resources, and financing, evidence from primary health centers like Djoungolo District Hospital Olembe is crucial for improving neonatal care [87].

Maternal Socioeconomic Status and Risk of Neonatal Sepsis

Link between Poverty and Neonatal Infections

Multiple studies have established a correlation between low maternal socioeconomic status (SES) and increased risk of neonatal sepsis. Factors associated with poverty—such as poor nutrition, limited access to clean water and sanitation, inadequate housing, and low health literacy—can contribute to maternal infections and adverse birth outcomes, which are precursors to neonatal sepsis [88].

In urban slums and rural areas of Cameroon, studies reveal that mothers from low-income households are less likely to attend the recommended number of antenatal care (ANC) visits [89]. This lack of ANC follow-up reduces opportunities for:

- Screening for asymptomatic bacteriuria.
- Identification of maternal infections (e.g., syphilis, malaria, HIV).
- Health education on neonatal hygiene and sepsis symptoms [89].

Education and Maternal Awareness

Educational attainment also plays a major role in neonatal health. Mothers with no formal education or only primary education often exhibit limited understanding of early signs of neonatal illness, resulting in delayed care-seeking behavior [90]. Furthermore, these mothers may rely on traditional remedies or spiritual interventions rather than seeking biomedical care during neonatal illnesses [90].

Environmental and Household Hygiene Factors

Environmental exposure to pathogens significantly contributes to neonatal infections. Neonates are particularly vulnerable due to their underdeveloped immune systems [91].

Water, Sanitation, and Hygiene (WASH) in the Home

Households with poor WASH infrastructure—such as lack of clean water, soap, or latrines—create a breeding ground for pathogens. Studies from Nigeria and Ethiopia report that neonates born into homes with no access to clean water were 2–3 times more likely to develop sepsis [92].

Cultural Practices and Cord Care

In Cameroon, as in many African settings, umbilical cord care remains a significant risk factor for neonatal sepsis. Harmful substances such as ash, cow dung, or herbal mixtures are still applied to the cord stump in some communities despite WHO guidelines recommending dry cord care or chlorhexidine application [93].

An ethnographic study in the Center region of Cameroon found that nearly 40% of mothers applied unsterile substances to the cord stump due to traditional beliefs and advice from elders [94].

The Role of Breastfeeding in Neonatal Sepsis Prevention

Colostrum as Natural Immunity

Colostrum, the first milk produced after birth, is rich in immunoglobulins (especially IgA), lactoferrin, and leukocytes, which are vital for protecting neonates against infections [95]. Early initiation of breastfeeding (within the first hour) has been associated with a 33% reduction in neonatal infection-related deaths [95].

Despite this, delayed breastfeeding remains prevalent in some parts of Cameroon due to cultural taboos, postpartum fatigue, or misconceptions about colostrum being “dirty” or “bad” [96].

Exclusive Breastfeeding

Exclusive breastfeeding (EBF) for the first six months creates a protective barrier against enteric and respiratory pathogens. A study in the Littoral region of Cameroon found that neonates not exclusively breastfed were twice as likely to be admitted for infection-related illnesses in the first month of life [97].

Impact of Skilled Birth Attendance and Place of Delivery

Institutional vs. Home Deliveries

Home births, especially those assisted by unskilled attendants, are strongly associated with neonatal infections due to:

- Use of unsterile instruments.
- Lack of antiseptic practices.
- Absence of skilled neonatal resuscitation.

According to Cameroon DHS 2018, only 66% of deliveries were conducted in health facilities, with lower rates in rural areas. This underutilization of institutional delivery services increases exposure to sepsis-causing pathogens, especially in cases of prolonged labor or PROM [98].

Clean Birth Practices

Clean birth kits, including sterile blades and cord clamps, are often unavailable or unused in-home settings. WHO’s “6 Cleans” guideline (clean hands, clean surface, clean perineum, clean cutting instrument, clean cord tie, and clean cord stump) is rarely adhered to outside health facilities [99].

Role of Traditional Birth Attendants (TBAs) and Informal Care Providers

In many Cameroonian communities, TBAs are still used either due to accessibility, cost, or cultural preferences.

Training and Risks

Untrained TBAs often lack knowledge on infection prevention. Practices such as:

- Reusing unsterilized blades.
- Using contaminated cloths for swaddling.
- Delaying referral for complications contribute to neonatal infections [100].

A qualitative study in the Northwest Region showed that 70% of TBAs had no formal training, yet were managing complicated deliveries at home, including prolonged labor and breech births [101].

Late-Onset Sepsis (LOS) and Nosocomial Infections

Definition and Sources

Late-onset sepsis (occurring after 72 hours of life) is typically hospital-acquired. Sources include:

- Contaminated equipment (e.g., incubators, IV lines).
- Poor hand hygiene among healthcare workers.
- Overcrowded NICUs [102].

Common Pathogens

In Cameroon, LOS is frequently caused by *Klebsiella* spp., *Pseudomonas aeruginosa*, and MRSA, many of which are multidrug-resistant. A retrospective study at Douala Laquintinie Hospital found that 54% of late-onset cases were resistant to first-line antibiotics [103].

Antimicrobial Stewardship and Resistance

Global Threat of AMR

Inappropriate use of antibiotics is accelerating antimicrobial resistance (AMR), particularly in NICUs. In LMICs, antibiotics are often:

- Prescribed empirically without sensitivity testing.
- Purchased over the counter without prescriptions.
- Inappropriately dosed in neonates [104].

Cameroon's AMR Profile

According to the Cameroon National Action Plan on AMR (2018–2023), resistance among neonatal pathogens is rising, especially for:

- Ampicillin
- Gentamicin
- Third-generation cephalosporins

This situation necessitates the establishment of antimicrobial stewardship programs (ASPs) in neonatal units, including regular antibiogram updates [105].

Neonatal Sepsis Surveillance Systems in Africa

Countries like South Africa, Rwanda, and Ghana have piloted national surveillance systems to track neonatal infections and resistance patterns. These systems help:

- Detect hospital-based outbreaks.
- Monitor mortality trends.
- Improve antibiotic policies [106].

Cameroon has yet to implement a robust neonatal sepsis registry, although the DHIS2 platform is expanding [107].

Research Gaps in Neonatal Sepsis in Cameroon

Despite the high burden, data on neonatal sepsis in Cameroon is limited. Identified gaps include:

- Few multicenter prevalence studies.
- Limited local antibiograms.
- Inadequate research on maternal risk factors and cultural practices.
- Sparse analysis of socioeconomic determinants [108].

This gap emphasizes the importance of the current study at Djoungolo District Hospital Olembe, a major primary facility [109].

Chapter Summary

Chapter Two has extensively reviewed the global, regional, and local literature on neonatal sepsis. It has explored:

- Definitions, epidemiology, and classification of neonatal sepsis.
- Pathogens and antimicrobial resistance patterns.
- Risk factors, clinical manifestations, and diagnosis.
- Treatment guidelines and preventive strategies.
- Health system influences and policy considerations.
- Stakeholder roles and integration into broader health frameworks [110].

This review provides the foundational rationale for this study, which seeks to assess the prevalence and predisposing factors of neonatal sepsis in a major Cameroonian primary hospital, addressing key knowledge and practice gaps and contributing to policy and clinical improvements.

Materials and Methods

Study Area

The study has been conducted at Djoungolo District Hospital Olembe, a district-level facility providing essential maternal and neonatal healthcare services to the surrounding communities.

Description of Study Area

Located in Yaoundé, the capital of Cameroon, the hospital serves as a referral point for primary health centers within its catchment area in the central region.

Description of Structure

The Neonatal Unit/ pediatric unit is equipped with basic incubators and phototherapy units, and provides essential care for newborns, although diagnostic services for neonatal infections remain limited.

Justification of Study Area

The hospital manages a considerable number of neonatal admissions and plays a key role in providing essential newborn care within its catchment area, making it a relevant setting for this study.

Study Design

This was a descriptive cross-sectional study aimed at assessing neonatal sepsis and its associated factors. Data were collected at a single point in time to describe the prevalence and identify relationships between maternal, neonatal, and healthcare-related factors.

Study Type

This was a quantitative study, where numerical data were collected and analyzed to objectively measure the prevalence of neonatal

sepsis and its associated factors among neonates at Djoungolo District Hospital.

Duration of Study

The study was carried out over a period of 6 months from protocol to data analysis.

Duration of Data Collection

Data has been collected for a period of 2 months.

Materials for Collection

Data collection forms, medical records, laboratory results, and computers for data entry.

Study Population

70 neonates admitted to the neonatal unit / pediatric unit during the study period.

Target Population

70 neonates aged 0–28 days admitted to the neonatal unit.

Inclusion Criteria

Neonates admitted within 28 days of life with complete medical records.

Exclusion Criteria

Neonates with incomplete records or transferred after >48 hours of admission.

Sampling Method

Consecutive sampling has been used to enroll all eligible neonates during the study period.

Data Management

Data has been entered into Microsoft Excel and analyzed using SPSS version 25.

3.10 Limitations of Study

The study has been limited because of incomplete documentation or loss of lab results.

3.11 Data Analysis and Presentation

Data were analyzed using descriptive statistics and presented using bar charts and pie charts to illustrate the distribution of neonatal sepsis and its associated factors among the study population. Frequencies and percentages were used to summarize the data.

3.12 Ethical Consideration

Ethical approval has been obtained in the health care setting. Informed consent has been secured from parents/guardians. Data was anonymized.

CHARACTERISTICS	FREQUENCY (%)
Mother's age (years)	
15-24	34 (48,6)
25-34	31 (44,3)
35-47	5 (7,1)
Mother's occupation	
Employed	28 (40)
Unemployed	17 (24,3)
Student	25 (35,7)
Mother's status	
Married	38 (54,2)
Divorced	2 (2,9)
Single	30 (42,9)
Mother's education	
Primary	9 (12,8)
Secondary	41 (58,6)
Tertiary	20 (28,6)

PRESENTATION AND ANALYSIS OF RESULTS

Table 1: socio-demographics characteristics of mothers of the neonates studied

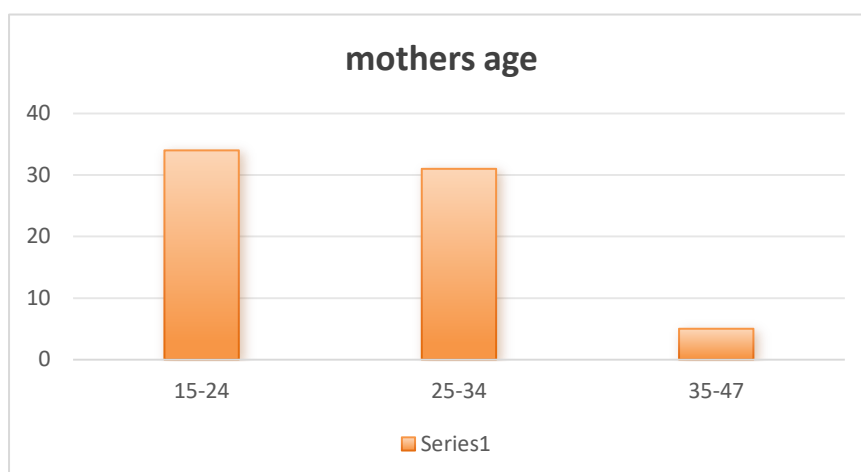


Figure 1: Age Distribution of Mothers of Neonates Studied

Among the 70 mothers, the age group 15–24 years had the highest representation with 34 mothers (48.6%), followed closely by 25–34 years with 31 mothers (44.3%). Only 5 mothers (7.1%) were aged between 35–47 years.

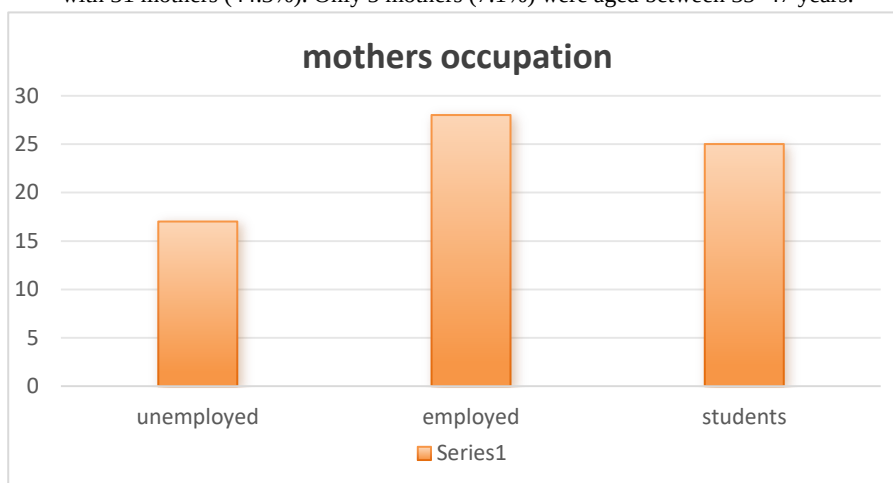


Figure 2: Occupational Status of Mothers of Neonates Studied

Out of the 70 mothers, 28 (40%) were employed, 25 (35.7%) were students, and 17 (24.3%) were unemployed. Employed mothers formed the majority.

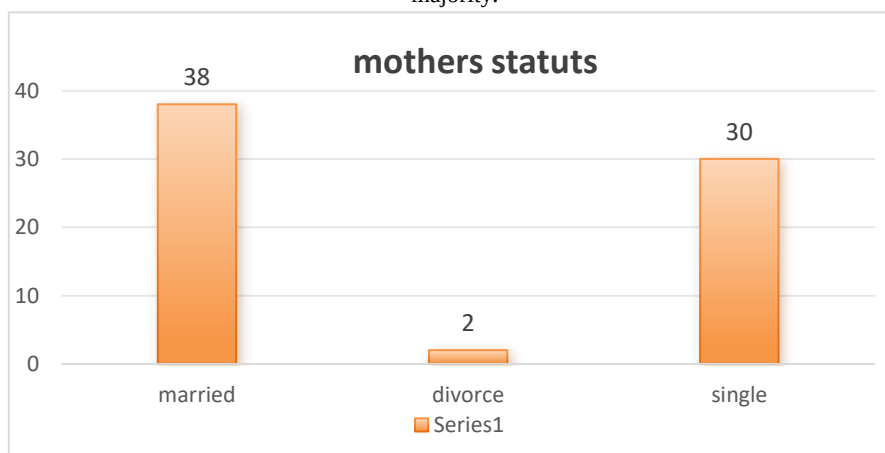


Figure 3: Marital Status of Mothers of Neonates Studied

Out of the 70 mothers, 38 (54.2%) were married, 30 (42.9%) were single, and only 2 (2.9%) were divorced. Married mothers were the most represented.

Table 2 : OBSTETRICAL CHARACTERISTICS

CHARACTERISTICS	FREQUENCY (%)
Mode of delivery	
Vaginal	50 (71,4)
Cesarean section	20 (28,6)
Complications during preg-	
Yes	25 (35,7)
No	45 (64,3)
Disease during pregnancy	
STI	13 (18,6)
UTI	8 (11,4)
Malaria	16 (22,9)
Non	33 (47,1)
Use of antibiotics	
Yes	27 (38,6)
No	43 (61,4)
Membrane rupture	
<12hrs	21 (30)
12-24hrs	33 (47,1)
>24hrs	16 (22,9)
Fever during labour	
Yes	22 (31,4)
No	48 (68,6)
CHARACTERISTICS	FREQUENCY (%)
Mode of delivery	
Vaginal	50 (71,4)
Cesarean section	20 (28,6)
Complications during preg-	
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Fever during labour	
Yes	22 (31,4)
No	48 (68,6)

complication during pregnancy

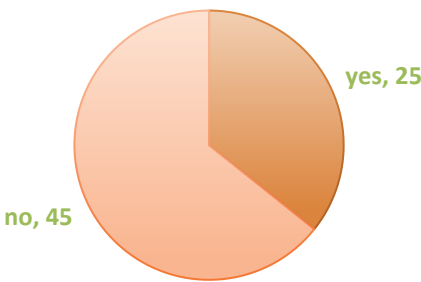


Figure 4: Occurrence of Pregnancy Complications Among Mothers

Among the participants, 25 mothers (35.7%) experienced complications during pregnancy, while 45 (64.3%) did not.

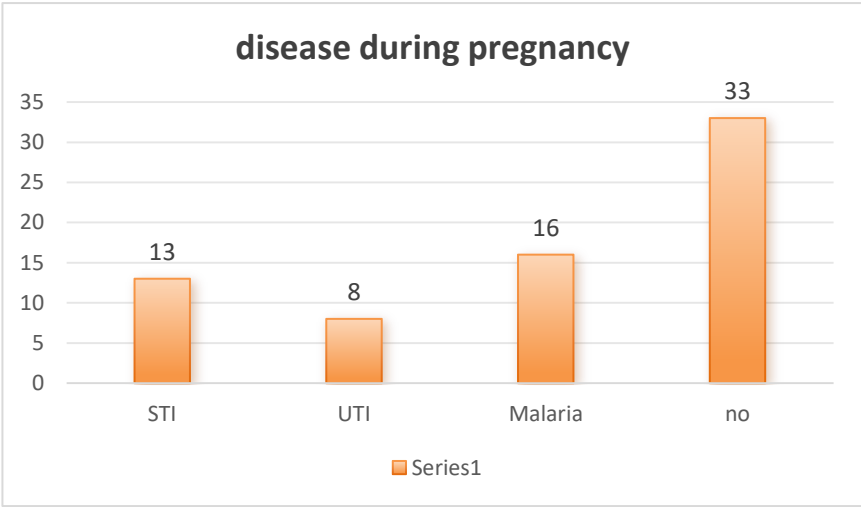


Figure 5: Types of Diseases Experienced During Pregnancy Among Mothers Studied

Out of 70 mothers, 13 (18.6%) had sexually transmitted infections (STIs), 8 (11.4%) had urinary tract infections (UTIs), 16 (22.9%) had malaria, while 33 (47.1%) reported no disease during pregnancy.

Table 3: NEONATAL CHARACTERISTICS OF THE STUDY POPULATION (n=70)

CHARACTERISTICS	FREQUENCY (%)
Age (days)	
0-7	41 (58,6)
8-28	29 (41,4)
Sex	
Male	45 (64,3)
Female	25 (35,7)
Birth weight (g)	
<2500	30 (42,9)
_>2500	40 (57,1)
Maturity	
<37 weeks	14 (20)
_>37 weeks	56 (80)
APGAR score 1st minute	
<3	6 (8,6)
4-6	23 (32,8)
_>7	41 (58,6)
APGAR score 5th minute	
<3	3 (4,3)
4-6	11 (15,7)
_>7	56 (80)

CHARACTERISTICS	FREQUENCY (%)
Cried immediately	
Yes	58 (82,8)
No	12 (17,2)
Resuscitation	
Yes	9 (12,9)
No	61 (87,1)

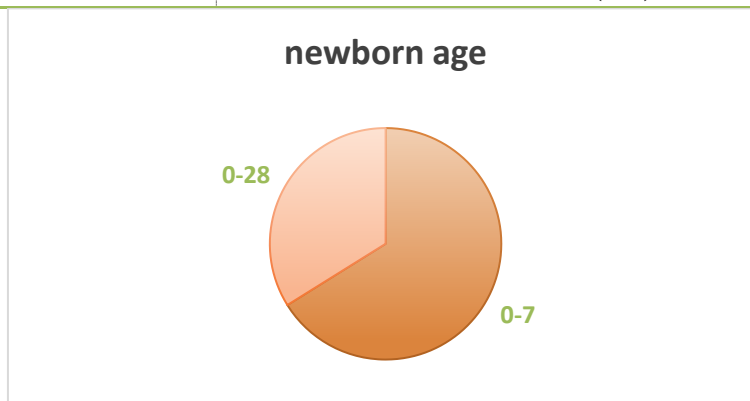


Figure 6: Age Distribution of Neonates at Admission

Majority of neonates, 41 (58.6%), were aged between 0–7 days, while 29 (41.4%) were aged between 8–28 days at the time of the study.

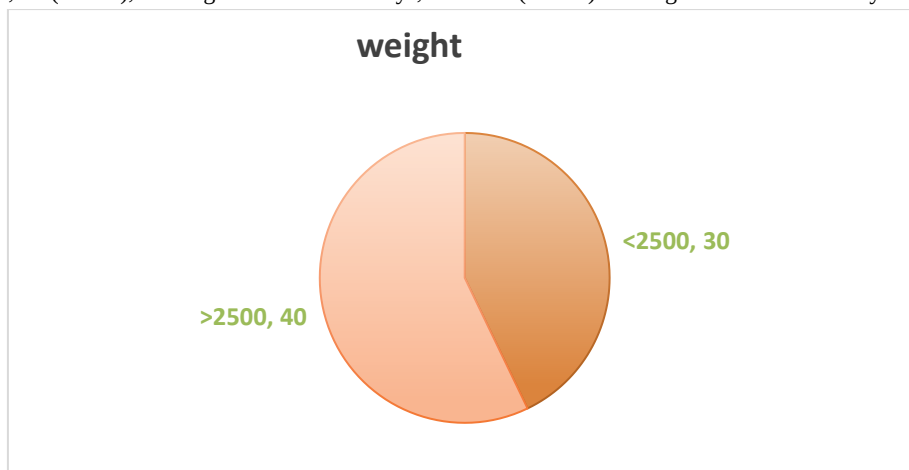


Figure 7: Birth Weight Distribution of Neonates Studied

A total of 40 neonates (57.1%) had a birth weight above 2500g, whereas 30 (42.9%) were born with a weight less than 2500g.

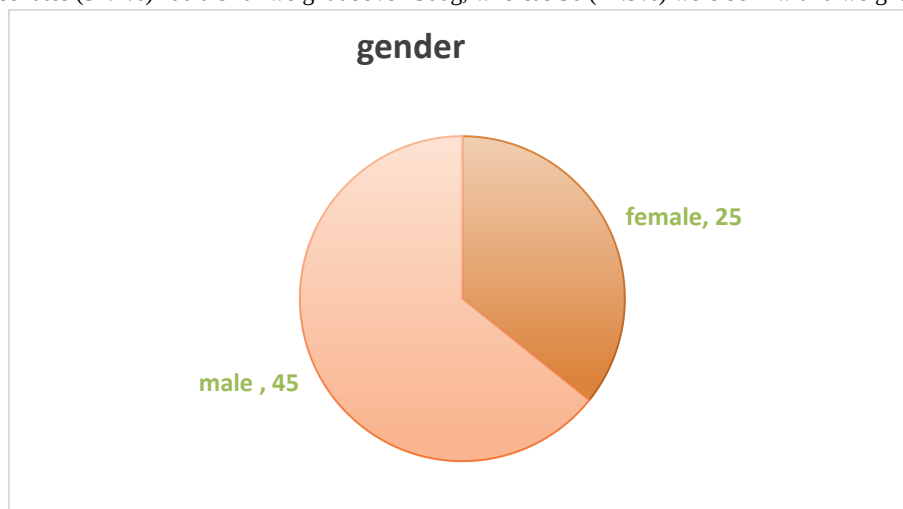


Figure 8: Gender Distribution of Neonates Studied

Out of the 70 neonates studied, 45 (64.3%) were male while 25 (35.7%) were female, indicating a higher proportion of male neonates in the population

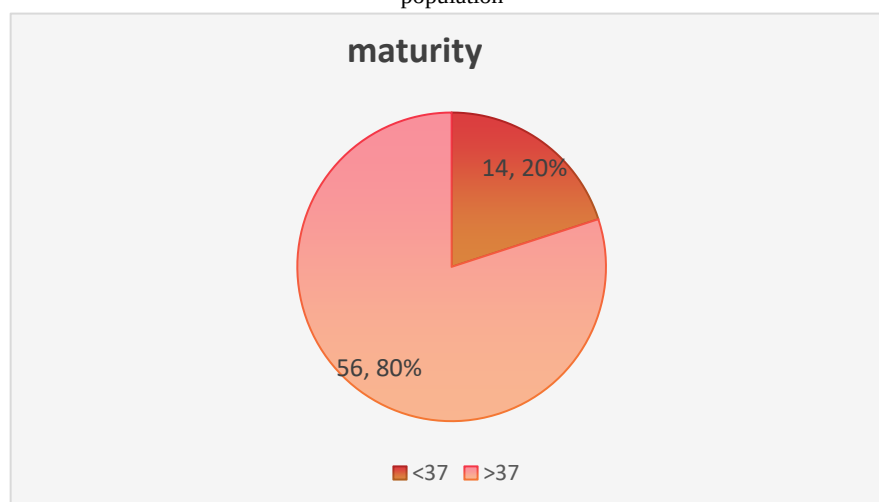


Figure 9: Gestational Maturity of Neonates Studied

Among the neonates, 56 (80%) were born at term (≥ 37 weeks of gestation), while 14 (20%) were preterm (< 37 weeks), showing that the majority were delivered at full term.

Discussions, Conclusion and Recommendations

Discussion

Socio-demographic Data

The neonatal profile in this study highlights important predisposing factors to neonatal sepsis. Most neonates (58.6%) were within the early neonatal period (0–7 days), a critical window when the immune system is immature and exposure to pathogens during labor and delivery is high. This explains why early-onset sepsis was predominant. Male neonates accounted for 64.3% of cases, suggesting a biological vulnerability possibly linked to X-linked immune regulatory genes and hormonal influences.

Birth weight and gestational age were also significant. About 42.9% of neonates had low birth weight (< 2500 g), while 20% were preterm. Both conditions are well-recognized risk factors, as such neonates have weaker immune defenses and often require invasive procedures in neonatal care, which may facilitate hospital-acquired infections. Apgar scores also revealed that while most neonates adapted well at birth, a small proportion with very low scores faced increased risks due to resuscitation and intensive care needs. Similarly, 17.2% did not cry immediately, indicating perinatal asphyxia, which often necessitates interventions that can increase infection risk. Although only 12.9% required resuscitation, this subgroup remains clinically important, especially in low-resource settings where infection control may be limited.

Maternal Characteristics

Maternal characteristics further influenced neonatal outcomes. Nearly half of mothers were 15–24 years old, an age group often associated with fewer pregnancy complications but possible gaps in health awareness and access. Occupation and marital status also played roles: student and unemployed mothers may face financial and psychosocial challenges, while married mothers may benefit from better support. Education levels were relatively high, yet sepsis persisted, suggesting that healthcare delivery and intrapartum practices may contribute more significantly to infections than maternal knowledge alone. Mode of delivery was another determinant. Most mothers (71.4%) delivered

vaginally, which increases exposure to vaginal flora, while cesarean sections carry risks of nosocomial infections. Pregnancy complications were frequent (35.7%), especially malaria, STIs, and UTIs, all of which predispose neonates to early-onset sepsis. Antibiotic use was reported by 38.6% of mothers, but inadequate or inappropriate use may fail to prevent transmission and could introduce resistant organisms.

Neonatal Characteristics

Among intrapartum risk factors, prolonged rupture of membranes was the most striking, with over half of mothers exceeding 12 hours and nearly a quarter beyond 24 hours both strongly associated with early sepsis. Additionally, 31.4% of mothers developed fever during labor, suggesting possible intra-amniotic infection such as chorioamnionitis, a well-known contributor to neonatal sepsis.

Overall, both neonatal and maternal factors were closely linked to sepsis in this study. Low birth weight, prematurity, perinatal distress, prolonged rupture of membranes, and maternal infections emerged as the most significant contributors. Strengthening antenatal care, improving intrapartum infection control, and timely management of maternal complications are therefore crucial in reducing the burden of neonatal sepsis.

These findings are consistent with evidence from a tertiary hospital study in North West Nigeria, which also identified maternal infections, prematurity, and low birth weight as major predisposing factors, thereby reinforcing the relevance of our results within the Sub-Saharan African context (Ugochukwu et al., 2020).

Strengths and Weaknesses

Strengths

1. Focused setting: Conducted in a specific healthcare facility (Djoungolo District Hospital), which allowed for targeted data collection.

2. Real-time hospital data: Use of clinical records and direct observation gave credibility and practical relevance to your findings.
3. Use of structured tools: Structured questionnaires ensured consistency in data collection.
4. Relevance of topic: Neonatal sepsis is a major public health issue, especially in low-resource settings, making your study significant.

Weaknesses:

1. Limited sample size: 70 neonates may not be large enough to generalize findings to a wider population.
2. Short study period: A two-month duration may have limited the observation of seasonal variations in sepsis rates.
3. Recall bias: Some information obtained from mothers (e.g., antenatal history) could be affected by memory lapses.
4. Incomplete records: Missing data or poorly filled hospital records might have affected data completeness.

Conclusion

This study has demonstrated that neonatal sepsis remains a significant threat to newborn survival, with both neonatal and maternal factors contributing to its occurrence.

The findings revealed that prematurity, low birth weight, low Apgar scores, and the need for resuscitation increase neonatal vulnerability to infection. Likewise, maternal conditions such as infections during pregnancy, prolonged rupture of membranes, and intrapartum fever were strongly associated with the risk of neonatal sepsis. Although a relatively high proportion of mothers had attained secondary or tertiary education, the persistence of sepsis highlights that knowledge alone is insufficient in the absence of effective healthcare practices and system support. Overall, these results emphasize that neonatal sepsis is a multifactorial condition arising from the interplay of biological, clinical, and socio-demographic determinants. Strengthening antenatal and intrapartum care, improving neonatal monitoring, and reinforcing infection control measures are therefore critical to reducing its burden. By addressing both maternal and neonatal risk factors in a coordinated manner, significant progress can be made toward lowering the incidence of neonatal sepsis and improving newborn outcomes in similar settings.

Recommendations

Strengthen Antenatal Care Services

- Encourage early and consistent antenatal clinic (ANC) attendance, with emphasis on screening and treating common maternal infections (urinary tract infections, STIs, and malaria) to reduce vertical transmission risks.
- Integrate maternal education on hygiene, nutrition, and safe pregnancy practices into ANC visits to empower mothers with preventive knowledge.

Enhance Intrapartum and Delivery Practices

- Establish strict infection control measures during labor and delivery, particularly in cases of prolonged rupture of membranes or maternal fever.

- Improve timely identification and management of prolonged rupture of membranes (≥ 12 hours), including prompt antibiotic prophylaxis where indicated.
- Strengthen monitoring of maternal temperature and infection status during labor to reduce intrauterine infection risks.

Improve Neonatal Care and Early Identification of At-Risk Infants

- Prioritize close monitoring of neonates with low birth weight, prematurity, low Apgar scores, and those requiring resuscitation, as they are highly vulnerable to sepsis.
- Standardize neonatal resuscitation practices with emphasis on sterility to reduce hospital-acquired infections.
- Introduce early sepsis screening protocols for neonates exposed to maternal risk factors such as prolonged rupture of membranes or maternal fever.

Capacity Building and Resources for Healthcare Providers

- Train healthcare workers in infection prevention and control (IPC) measures, neonatal resuscitation, and early sepsis recognition.
- Ensure adequate availability of sterile resuscitation equipment, antibiotics, and laboratory facilities for timely diagnosis and management of neonatal sepsis.

Strengthen Community and Maternal Support Systems

- Promote community health education targeting young and single mothers to improve knowledge of safe pregnancy and neonatal care practices.
- Enhance social support networks for student and unemployed mothers to improve access to healthcare services and reduce neonatal vulnerability.

Policy and Health System Recommendations

- Develop and enforce hospital protocols for management of maternal infections and prolonged rupture of membranes.
- Integrate neonatal sepsis surveillance systems within maternal and child health programs to improve data-driven interventions.

Future Research

- Conduct longitudinal studies to assess the long-term outcomes of neonates who survive sepsis.
- Investigate the role of antimicrobial resistance in neonatal sepsis in this setting to guide more effective antibiotic policies.
- Explore the impact of socio-economic and healthcare system barriers on sepsis prevention and management.

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