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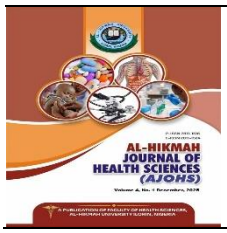

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Original Article

Maternal Infections and Neonatal Sepsis: A Cross-Sectional Study at General Hospital Ilorin

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ABSTRACT

Background: Neonatal sepsis remains a leading cause of neonatal morbidity and mortality in Nigeria, with maternal infections recognized as predisposing factors, particularly in resource-limited secondary healthcare settings.

Objective: This study assessed the association between maternal infections and neonatal sepsis occurrence at General Hospital, Ilorin.

Methods: A hospital-based cross-sectional quantitative study was conducted among 352 postnatal mothers and 100 healthcare providers between May and July 2025 using structured questionnaires. Neonatal sepsis status was determined primarily from questionnaire responses, based on mothers' report of a clinician-confirmed diagnosis documented during facility care. Laboratory confirmation was not consistently available. The obtained data were analyzed using SPSS version 26. A secondary provider component (100 healthcare providers) was included to contextualize maternal findings and identify modifiable facility-level barriers relevant to prevention strategies. Descriptive statistics, chi-square tests and logistic regression examined associations at a 5% level of significance.

Results: Neonatal sepsis prevalence was 28.6% among neonates born to mothers with infections compared with 14.2% among those without infections. Urinary tract infections (27.7%) and sexually transmitted infections (40.0%) were significantly associated with neonatal sepsis. Risk factors included prolonged rupture of membranes, intrapartum fever, and poor antenatal care attendance. Neonatal sepsis was linked with high morbidity and a 5.9% case fatality rate.

Conclusion: Maternal infections was significantly associated with the increased risk of neonatal sepsis at General Hospital, Ilorin. Strengthening antenatal care, routine screening and treatment, and improved infection prevention practices are essential to reducing neonatal sepsis and associated mortality.

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Introduction

Neonatal sepsis is a major cause of neonatal morbidity and mortality worldwide, accounting for an estimated 15–30% of neonatal deaths, with the greatest burden in low- and middle-income countries, including sub-Saharan Africa (UNICEF, 2021). Nigeria has one of the highest neonatal mortality rates **(**34–39 deaths per 1,000 live births**),** with neonatal sepsis contributing substantially (NPC, 2020; Okomo *et al.,* 2019). Preventable maternal factors continue to predispose newborns to severe infection (Adatara *et al.,* 2019).

Maternal infections increase the risk of neonatal sepsis, particularly early-onset (≤72 hours) and late-onset (>72 hours) sepsis, through vertical transmission during pregnancy, labour, or delivery (Zeitoun *et al.,* 2019). Common infections include UTIs, STIs, chorioamnionitis, and puerperal sepsis, with typical pathogens including *E. coli*, *S. aureus*, *Klebsiella* spp., and Group B Streptococcus; risk is further increased by complications such as PROM and intrapartum fever (Okomo *et al.,* 2019).

In Nigeria, the burden is amplified by suboptimal ANC attendance, limited routine infection screening (including lack of Group B Streptococcus screening), weak infection prevention and control practices, and limited diagnostic capacity in many secondary facilities, with antimicrobial resistance complicating management where cultures are unavailable. Ilorin West is a semi-urban area where General Hospital, Ilorin provides frontline maternal and neonatal care, yet evidence from secondary hospitals remains limited, constraining targeted planning. Recent regional evidence continues to highlight preventable health-system gaps and inadequate screening as drivers of adverse maternal and neonatal outcomes (Traoré *et al.,* 2024; WHO, 2024).

This study assessed the association between maternal infections and neonatal sepsis at General Hospital, Ilorin, estimating prevalence among exposed neonates, identifying infection types and risk factors, and describing neonatal outcomes to inform improvements in ANC, infection screening, and neonatal care practices.

Materials and Methods

Study Design

A hospital-based quantitative cross-sectional survey design was adopted for this study using structured questionnaires. This design was appropriate as it enabled the collection and analysis of numerical data from a defined population at a single point in time, and supported assessment of associations between maternal infections and neonatal sepsis, as well as identification of key risk factors. Neonatal sepsis status was ascertained primarily from maternal questionnaire responses based on mothers' reports of a clinician-confirmed diagnosis**,** with limited laboratory confirmation due to facility constraints. Healthcare providers were included as a secondary population to assess facility-level practices and system-related barriers (e.g., IPC gaps, training needs, screening limitations, and resource constraints) affecting prevention and management, thereby complementing maternal findings and strengthening triangulation.

Study Location

The study was conducted at General Hospital, Ilorin, a secondary healthcare facility located in Ilorin West Local Government Area, Kwara State, Nigeria. The hospital provides maternal and neonatal services to a large semi-urban population and functions as a referral center for surrounding primary healthcare facilities.

Study Population

The study population consisted of two groups: Postnatal mothers who delivered at General Hospital, Ilorin, and their neonates (aged 0–28 days) and healthcare providers (doctors, nurses, and midwives) involved in maternal and neonatal care at the facility.

Sample Size and Sampling Technique

A total of 352 postnatal mothers–neonate pairs were recruited for the study using a purposive sampling technique based on eligibility criteria. In addition, **100** healthcare providers were selected using convenience sampling due to work schedules and availability. These sample sizes were considered adequate for estimating prevalence and assessing associations in a cross-sectional study.

Data Collection Instruments

Data were collected using structured questionnaires developed from previous related studies and adapted to the study context. The maternal questionnaire captured information on sociodemographic characteristics, antenatal care attendance, and history of maternal infections, intrapartum factors, and neonatal outcomes. A separate structured questionnaire was administered to healthcare providers to obtain information on neonatal sepsis management practices and perceived system-level challenges. The questionnaires were pretested and refined before data collection to improve clarity and enhance content validity (Boateng *et al.,* 2018).

Data Collection Procedure

Data collection was conducted between May and July 2025. Questionnaires were administered to consenting participants by trained research assistants. For mothers, information was obtained through interviewer-administered questionnaires, while

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healthcare providers completed self-administered questionnaires.

Data Analysis

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics, including frequencies and percentages, were used to summarize maternal characteristics, prevalence of neonatal sepsis, types of maternal infections, risk factors, and outcomes. Inferential statistics were applied to examine associations between maternal infections and neonatal sepsis using chi-square tests. Binary logistic regression analysis was conducted to identify predictors of neonatal sepsis, with odds ratios and 95% confidence intervals reported. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval for the study was obtained from the Kwara State Ministry of Health Ethics Committee and the management of General Hospital, Ilorin and was issued the approval reference number: *ERC/MOH/2025/09/516*. Written informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of respondents were ensured, and participation was entirely voluntary, in accordance with ethical guidelines for research involving human subjects (Ibrahim *et al.,* 2020).

Results

Sociodemographic Characteristics of Respondents

A total of 352 postnatal mothers and 100 healthcare providers participated in the study. Most mothers were aged 25–34 years (48.3%), married (40.6%), and had attained tertiary education (48.9%). Over half of the respondents (58.8%) were civil servants, while 51.1% were primiparous. Among healthcare providers, nurses constituted the majority (72.0%), followed by midwives (16.0%) and medical doctors (12.0%). Nearly half of the providers (48.0%) had between 6 and 10 years of professional experience.

Table 1: Prevalence of Neonatal Sepsis by Maternal Infection Status

Maternal Infection Status	Neonates with Sepsis (n)	Total (n)	Prevalence (%)	Chi-Square (χ^2)	p-value
Infected	40	140	28.6	11.01	0.001
Non-Infected	30	212	14.2		

As presented in Table 1, the prevalence of neonatal sepsis among neonates born to mothers with documented infections was 28.6%, compared with 14.2% among neonates born to mothers without infections. This difference was statistically significant (χ^2=11.01, p=0.001).

Types of Maternal Infections Associated with Neonatal Sepsis

Table 2: Neonatal Sepsis by Type of Maternal Infection

Infection Type	Neonates with Sepsis (n)	Total Infected Mothers (n)	Prevalence (%)	Chi-Square (χ^2)	p-value	Odds Ratio (OR)	95% CI
UTIs	36	130	27.7	7.12	0.008	2.10	1.22–3.61
STIs	4	10	40.0	2.61	0.106	2.79	0.76–10.16
Chorioamnionitis	5	23	21.7	2.34	0.126	1.65	0.87–3.12
Puerperal Sepsis	7	27	25.9	3.15	0.076	1.90	0.94–3.84
Malaria	10	92	10.9	1.87	0.172	0.75	0.36–1.56

Table 2 presents neonatal sepsis by type of maternal infection. Urinary tract infections were the most common maternal infection and were significantly associated with neonatal sepsis (p=0.005). Although sexually transmitted infections were less frequent, they showed a higher proportion of neonatal sepsis (40.0%); however, this association did not reach statistical significance, as reflected by wide confidence intervals crossing unity.

Maternal and Perinatal Risk Factors

Prolonged rupture of membranes (PROM), intrapartum fever, and inadequate antenatal care (ANC) attendance were significantly associated with

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neonatal sepsis. Neonatal sepsis occurred in 34.7% of cases involving PROM and 39.2% of cases where intrapartum fever was present. Neonates born to mothers with fewer than four ANC visits had a sepsis prevalence of 28.0%**.** Logistic regression analysis revealed that PROM (OR=2.15, 95% CI: 1.34–3.47), intrapartum fever (OR = 2.28, 95% CI: 1.18–4.39), and low ANC attendance (OR = 1.80, 95% CI: 1.05–3.10) were independent predictors of neonatal sepsis.
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Table 3: Neonatal Sepsis by Risk Factors

Risk Factor	Neonates with Sepsis (n)	Total (n)	Prevalence (%)	Chi-Square (χ^2)	p-value	Odds Ratio (OR)	95% CI
PROM	24	69	34.7	6.82	0.009	2.15	1.34–3.47
Intrapartum Fever	20	51	39.2	7.45	0.006	2.28	1.18–4.39
Low ANC (< 4 visits)	20	71	28.0	5.12	0.024	1.80	1.05–3.10

Outcomes of Neonatal Sepsis

Neonatal sepsis was associated with substantial morbidity. Of the 70 neonates diagnosed with sepsis, 20 (28.6%) were reported as early-onset (≤72 hours) and 50 (71.4%) as late-onset (>72 hours). However, sepsis stage was unknown for most respondents (280/352, 79.5%), limiting firm conclusions on onset classification. The most common clinical features were lethargy or poor feeding (68.8%) and fever (54.5%). Among neonates diagnosed with sepsis, 79.2% recovered following treatment, while 14.9% were still receiving care at the time of data collection. The case fatality rate was 5.9%.

Healthcare Provider–Reported Barriers

Only 22.0% of healthcare providers (n=100) reported receiving training on neonatal sepsis management within the previous two years. Major barriers identified included delayed recognition of symptoms, inadequate infection prevention and control practices, limited diagnostic facilities, and inconsistent availability of antibiotics. Training status was significantly associated with perceived barriers. (χ^2 = 4.68, p = 0.031).

Discussion

This study found a high prevalence of neonatal sepsis among neonates born to mothers with infections at General Hospital, Ilorin, with 28.6% of exposed neonates affected. This prevalence is comparable to reports from other secondary and tertiary facilities in sub-Saharan Africa, where neonatal sepsis remains a major contributor to neonatal morbidity and mortality. The significantly higher prevalence among neonates born to mothers with infections highlights the importance of maternal health in determining neonatal outcomes.

Maternal urinary tract infections and sexually transmitted infections were associated with neonatal sepsis. While UTIs were more prevalent, STIs showed a higher relative proportion of neonatal sepsis. These findings are consistent with previous studies identifying maternal genitourinary infections as key sources of vertical transmission during pregnancy and delivery. Limited routine screening for infections, including Group B Streptococcus, in many Nigerian secondary healthcare facilities may further increase the risk of early-onset neonatal sepsis (Barinov *et al.,* 2020).

Prolonged rupture of membranes and intrapartum fever were significant maternal and perinatal predictors of neonatal sepsis, in line with earlier Nigerian and regional studies that identified these factors as major contributors to ascending infection and fetal exposure to pathogens (Medugu *et al.,* 2019; Adatara *et al.,* 2019). Inadequate antenatal care attendance was also independently associated with neonatal sepsis, reflecting missed opportunities for early detection and treatment of maternal infections during pregnancy (Adedokun *et al.,* 2020).

Although the observed case fatality rate was relatively low (5.9%), this finding should be interpreted cautiously. Limited diagnostic capacity, referral of critically ill neonates, and possible underdiagnosis may have contributed to lower reported mortality. Nonetheless, neonatal sepsis was associated with substantial morbidity, with lethargy or poor feeding reported in 68.8% of cases, underscoring its ongoing burden on families and the healthcare system (Fleischmann-Struzek *et al.,* 2018).

Consistent with recent Nigerian hospital-based studies, the findings reflect a persistent burden of neonatal sepsis and challenges related to diagnostic limitations and antimicrobial resistance (Shwe *et al.,* 2024; Anosike *et al.,* 2025). Healthcare provider–reported barriers, including limited recent training and suboptimal infection prevention and control practices, further complicate effective prevention and management. Overall, these findings underscore the need to strengthen antenatal care, improve routine

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screening and management of maternal infections, reinforce infection prevention and control, and enhance healthcare worker training in secondary healthcare settings such as General Hospital, Ilorin.

Conclusion

This study found a significant association between maternal infections and the occurrence of neonatal sepsis at General Hospital, Ilorin West Local Government Area. Neonates born to mothers with documented infections had a higher prevalence of sepsis compared with those born to mothers without infections. Urinary tract infections were the most frequently reported maternal infection and showed a statistically significant association with neonatal sepsis, while sexually transmitted infections were associated with a higher proportion of neonatal sepsis but did not reach statistical significance. Prolonged rupture of membranes, intrapartum fever, and inadequate antenatal care attendance were also associated with an increased likelihood of neonatal sepsis.

Although the observed case fatality rate was relatively low, neonatal sepsis was associated with considerable morbidity, underscoring its continued clinical and health system burden in this secondary healthcare setting. Challenges related to limited diagnostic capacity, infection prevention practices, and recent training among healthcare providers may further influence prevention and management efforts.

Overall, the findings suggest that improvements in antenatal care utilization, screening and management of maternal infections, intrapartum monitoring, and healthcare provider training may contribute to reducing the burden of neonatal sepsis in similar secondary healthcare settings in Nigeria. (National Population Commission [NPC], 2020; Ibrahim *et al.,* 2020).

Recommendations

Based on the findings of this study, the following recommendations are proposed to reduce the burden of maternal infections and neonatal sepsis in Ilorin West:

1. Strengthen ANC uptake and quality by promoting early booking and completion of at least four ANC visits, with routine documentation and follow-up of maternal infection screening and treatment during pregnancy.
2. Institutionalize routine screening and timely treatment of key maternal infections, particularly urinary tract infections and sexually transmitted infections, using clear facility protocols for treatment, partner management where appropriate, and verification of resolution when feasible.
3. Improve intrapartum risk management by standardizing monitoring and early response to prolonged rupture of membranes and intrapartum fever (consistent assessment, documentation, and protocol-driven escalation/antibiotic initiation when indicated).
4. Strengthen neonatal sepsis prevention and care capacity through reinforced infection prevention and control in maternity/neonatal units, regular staff training, and use of standardized neonatal sepsis screening/management algorithms where laboratory confirmation is limited.

Study Limitations

1. Limited generalizability: The purposive sampling strategy employed included only mothers who delivered at General Hospital, Ilorin, which may limit the applicability of findings to mothers delivering outside the facility.

2. **Recall and reporting bias:** Maternal infection history and ANC attendance were self-reported and may be affected by recall errors or social desirability bias, potentially leading to misclassification of exposures and delivery experiences.

3. **Inability to access hospital records**: Limited access to hospital records constrained the validation of self-reported maternal infection histories and neonatal sepsis cases.

4. **Causality limitation:** Due to the cross-sectional design used, temporal relationships could not be established; therefore, the findings indicate associations and do not permit causal inference.

Conflict of Interest

The author declares no conflict of interest associated with this study.

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