

ORIGINAL ARTICLE**Prospective Evaluation of Maternal Infections During Pregnancy and Their Association with Neonatal Morbidities**¹Viradiya Hiral Babubhai, ²Hina Parimal Desai¹Assistant Professor, Department of Obstetrics and Gynaecology, Gian Sagar Medical College and Hospital, Patiala, Punjab, India;²Assistant Professor, Department of Pediatrics, Azeezia Medical College and Hospital, Kollam, Kerala, India**ABSTRACT:**

Background: Maternal infections during pregnancy are a significant cause of adverse neonatal outcomes worldwide. These infections, whether localized or systemic, can lead to complications such as preterm birth, low birth weight, neonatal sepsis, and respiratory distress. Despite advances in prenatal care, maternal infections remain underdiagnosed and undertreated, especially in resource-limited settings. **Aim:** To prospectively evaluate maternal infections during pregnancy and assess their association with neonatal morbidities in a tertiary care hospital setting. **Material and Methods:** This prospective observational study included 90 pregnant women evaluated for various infections, including urinary tract infections, bacterial vaginosis, sexually transmitted infections, dengue, malaria, and hepatitis. Maternal and neonatal data were recorded using structured proformas. Neonatal morbidities such as preterm birth, low birth weight, sepsis, respiratory distress, and NICU admission were assessed. Statistical analysis was performed using SPSS version 16.0, with a p-value <0.05 considered significant. **Results:** Maternal infections were identified in 72 (80.00%) participants. The most common infections were UTIs (31.11%) and bacterial vaginosis (21.11%). Neonatal morbidities observed included low birth weight (33.33%), preterm birth (26.67%), NICU admission (24.44%), sepsis (20.00%), and respiratory distress (16.67%). Preterm birth (30.56% vs. 11.11%, p = 0.048), neonatal sepsis (23.61% vs. 5.56%, p = 0.044), and NICU admission (29.17% vs. 5.56%, p = 0.027) were significantly associated with maternal infections. Multivariate analysis confirmed maternal infection (AOR = 3.21, p = 0.030), unbooked status (AOR = 2.88, p = 0.039), preterm delivery (AOR = 4.72, p = 0.003), and low birth weight (AOR = 3.96, p = 0.007) as independent predictors of neonatal morbidity. **Conclusion:** Maternal infections significantly contribute to neonatal morbidities. Urinary tract infections, STIs, and dengue showed the highest risk. Strengthening antenatal screening, early treatment, and ensuring regular follow-up care are vital strategies to reduce infection-related neonatal complications.

Keywords: Maternal infection, Neonatal morbidity, Urinary tract infection, Preterm birth, Low birth weight

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INTRODUCTION

Pregnancy is a physiologically complex state involving significant immunological and hormonal adaptations that enable maternal tolerance of the semi-allogeneic fetus. These adaptations, while crucial for maintaining pregnancy, also increase maternal vulnerability to various infections. Maternal infections during pregnancy represent a substantial global health burden, with serious implications for both maternal well-being and neonatal outcomes¹. The intrauterine environment, once considered sterile, is now recognized as susceptible to microbial invasion, which can disrupt normal fetal development and potentially result in a spectrum of neonatal morbidities.

The consequences of maternal infections vary widely, ranging from subclinical effects to overt fetal injury, including preterm birth, low birth weight, neonatal sepsis, and respiratory complications. Pathogens can reach the intrauterine compartment through ascending infection from the lower genital tract, hematogenous spread, or invasive procedures. Infections may induce a robust inflammatory cascade, triggering the release of cytokines and prostaglandins that can prematurely

activate the parturition pathway². This inflammatory milieu has been closely associated with preterm labor, which remains a leading cause of neonatal morbidity and mortality globally.

Among the most commonly implicated infections in pregnancy are urinary tract infections (UTIs), bacterial vaginosis, and sexually transmitted infections (STIs), all of which have well-documented associations with adverse obstetric outcomes. UTIs, in particular, are highly prevalent due to urinary stasis and other anatomical changes during pregnancy. If left untreated, they may progress to pyelonephritis, leading to systemic inflammation and triggering early labor. Bacterial vaginosis, characterized by a disruption in the normal vaginal flora, has been linked to ascending infection and intra-amniotic inflammation, which contributes significantly to fetal complications³.

Systemic infections, such as dengue, malaria, hepatitis, and other viral or parasitic diseases, also pose a serious threat during pregnancy. These infections can compromise placental function, reduce fetal oxygenation, and predispose neonates to growth

restriction, intrauterine fetal demise, or sepsis. Dengue in pregnancy, for example, has been associated with maternal thrombocytopenia, preterm labor, and hemorrhagic complications during delivery. Similarly, malaria can cause placental insufficiency and fetal anemia, contributing to low birth weight and poor neonatal adaptation⁴.

One of the most important mechanisms linking maternal infection to adverse neonatal outcomes is the inflammatory response it triggers at the maternal-fetal interface. The release of cytokines such as interleukin (IL)-1, IL-6, IL-8, and tumor necrosis factor (TNF- α) can stimulate prostaglandin production, which in turn induces uterine contractions and cervical ripening. This inflammatory pathway is common to several causes of preterm labor, emphasizing the role of infection as a unifying mechanism⁵. Moreover, subclinical intrauterine infections may go undetected in standard obstetric evaluations but still elicit low-grade inflammation sufficient to compromise fetal growth and development.

Neonates born to mothers with antenatal infections are at a significantly increased risk of multiple morbidities. These include early-onset neonatal sepsis, respiratory distress syndrome, need for NICU admission, and prolonged hospitalization. The immature neonatal immune system makes it highly vulnerable to transplacental or peripartum transmission of pathogens. In particular, the first 72 hours of life are critical for the early identification and management of infection-related complications⁶.

Despite advancements in prenatal care, the detection and management of maternal infections remain inconsistent across healthcare settings, particularly in resource-limited areas. Many infections in pregnancy are asymptomatic or manifest with nonspecific signs, leading to underdiagnosis and delayed treatment. Unbooked pregnancies—those lacking consistent antenatal follow-up—are especially at risk, as infections may go unrecognized and untreated until complications arise during labor or postpartum. Lack of antenatal screening, poor health literacy, and limited access to healthcare services exacerbate the risks for both the mother and the fetus⁷.

Early identification and appropriate management of infections during pregnancy are therefore essential to reducing neonatal morbidity. Screening for common infections, timely antibiotic therapy, and preventive strategies such as vaccination can significantly mitigate risks. Nonetheless, the wide variability in infection types, transmission routes, and inflammatory responses makes it challenging to standardize interventions. Moreover, overlapping risk factors such as anemia, poor nutrition, and comorbid conditions further complicate clinical decision-making^{8,9}.

To address these challenges, it is crucial to generate local evidence that reflects the burden and impact of maternal infections within specific populations. Prospective observational studies conducted in tertiary care settings offer valuable insights into the types of

infections prevalent during pregnancy and their direct association with neonatal outcomes. Such studies not only contribute to our understanding of disease patterns but also guide public health interventions aimed at improving maternal and child health indicators.

MATERIAL AND METHODS

This prospective observational study was conducted at a tertiary care hospital, involving a total of 90 pregnant women who were enrolled after fulfilling the inclusion criteria. Participants were selected from antenatal clinics and inpatient departments after obtaining informed written consent. Ethical approval was obtained from the Institutional Ethics Committee prior to the commencement of the study.

Pregnant women presenting at various gestational ages were evaluated for maternal infections through clinical examination and relevant laboratory investigations. Infections assessed included urinary tract infections, bacterial vaginosis, sexually transmitted infections, and systemic infections such as dengue, malaria, and viral hepatitis. Diagnostic confirmation was made using appropriate microbiological and serological tests in accordance with standard hospital protocols. Participants with known chronic illnesses such as diabetes mellitus, hypertension, or immunosuppressive conditions were excluded to minimize confounding factors.

Data on maternal demographics, antenatal history, and infection-related findings were recorded in structured proformas. Following delivery, the neonates were closely observed and evaluated for any signs of morbidity including, but not limited to, prematurity, low birth weight, neonatal sepsis, respiratory distress, and NICU admission. Clinical assessments were supported by laboratory and radiological findings wherever applicable.

All collected data were coded and entered into Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) version 16.0. Descriptive statistics were used to summarize maternal and neonatal characteristics. Associations between maternal infections and neonatal morbidities were assessed using chi-square test or Fisher's exact test for categorical variables, and independent t-test for continuous variables where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Characteristics of the Study Population

The study enrolled 90 pregnant women, of whom 52 (57.78%) were aged ≥ 25 years, while 38 (42.22%) were younger than 25 years, indicating a relatively balanced distribution across age groups with a slight predominance of older women. Regarding parity, 46 women (51.11%) were primigravida and 44 (48.89%) were multigravida, showing an almost equal

representation. A majority of the participants, 61 (67.78%), were booked cases who received regular antenatal care, whereas 29 (32.22%) were unbooked, potentially placing them at higher risk for complications due to inadequate prenatal follow-up.

Table 2: Distribution of Maternal Infections Identified During Pregnancy

Out of the 90 participants, 72 (80.00%) were diagnosed with at least one maternal infection during pregnancy, while 18 (20.00%) had no identifiable infection. The most common infection was urinary tract infection (UTI), seen in 28 women (31.11%), followed by bacterial vaginosis in 19 women (21.11%). Other less frequent infections included sexually transmitted infections (8.89%), dengue (6.67%), hepatitis (7.78%), and malaria (4.44%). This distribution reflects a significant burden of both genitourinary and systemic infections during pregnancy, highlighting the need for routine screening and early intervention.

Table 3: Neonatal Morbidities Observed

Among the neonates born to the study participants, low birth weight (LBW) was the most common morbidity, affecting 30 (33.33%) of newborns, followed by preterm birth in 24 cases (26.67%). NICU admission was required for 22 neonates (24.44%), while neonatal sepsis and respiratory distress occurred in 18 (20.00%) and 15 (16.67%) neonates, respectively. Notably, 37 (41.11%) neonates had no identifiable morbidity. These findings suggest that maternal infections might be contributing to adverse neonatal outcomes in a significant proportion of cases.

Table 4: Association Between Maternal Infections and Neonatal Morbidities

A comparative analysis of neonatal outcomes between mothers with and without infections revealed statistically significant associations in several domains. Preterm birth was significantly more common in the infected group (30.56%) than in those without infection (11.11%), with a p-value of 0.048. Similarly, neonatal sepsis showed a significant difference (23.61% vs. 5.56%, p = 0.044), as did NICU admissions (29.17% vs. 5.56%, p = 0.027).

Although low birth weight and respiratory distress were more frequent among neonates of infected mothers, their p-values (0.082 and 0.176, respectively) did not reach statistical significance. These results underscore the strong association between maternal infections and select neonatal morbidities.

Table 5: Type of Maternal Infection and Associated Neonatal Outcomes

When stratified by specific infections, UTI was associated with the highest burden of neonatal morbidity, contributing to 39.29% preterm births, 46.43% LBW, and 28.57% neonatal sepsis. Sexually transmitted infections (STIs) and dengue were also linked to adverse outcomes, each showing 50% or greater incidence of LBW and a 33.33–37.50% rate of neonatal sepsis. Hepatitis, bacterial vaginosis, and malaria also contributed to neonatal complications, although to a slightly lesser extent. These findings highlight that a range of infections, both systemic and localized, carry a substantial risk for adverse neonatal outcomes, with some infections like STIs and dengue showing particularly high morbidity.

Table 6: Multiple Logistic Regression Analysis for Predictors of Neonatal Morbidity

Multivariate logistic regression analysis was conducted to identify independent predictors of neonatal morbidity. Maternal infection was found to be a significant predictor, with an adjusted odds ratio (AOR) of 3.21 (95% CI: 1.12–9.21, p = 0.030), indicating that infected mothers were over three times more likely to have neonates with complications. Similarly, unbooked status showed a significant association (AOR = 2.88, p = 0.039), suggesting inadequate antenatal care also increases the risk. Among the neonatal factors, preterm delivery (AOR = 4.72, p = 0.003) and low birth weight (AOR = 3.96, p = 0.007) were both strongly associated with overall neonatal morbidity. Other variables such as maternal age ≥ 25 years and primigravida status were not statistically significant predictors. This analysis confirms that maternal infections, poor antenatal care, and key neonatal parameters (prematurity and LBW) are critical factors in determining neonatal health outcomes.

Table 1: Baseline Characteristics of the Study Population (n=90)

Variable	Frequency (n)	Percentage (%)
Maternal Age < 25 years	38	42.22%
Maternal Age ≥ 25 years	52	57.78%
Primigravida	46	51.11%
Multigravida	44	48.89%
Booked cases	61	67.78%
Unbooked cases	29	32.22%

Table 2: Distribution of Maternal Infections Identified During Pregnancy

Type of Infection	Frequency (n)	Percentage (%)
Urinary Tract Infection (UTI)	28	31.11%
Bacterial Vaginosis	19	21.11%
Sexually Transmitted Infections (STIs)	8	8.89%
Dengue	6	6.67%
Malaria	4	4.44%
Hepatitis (A/B/C/E)	7	7.78%
No Infection Detected	18	20.00%

Table 3: Neonatal Morbidities Observed (n=90)

Neonatal Outcome	Frequency (n)	Percentage (%)
Preterm Birth	24	26.67%
Low Birth Weight (<2.5 kg)	30	33.33%
Neonatal Sepsis	18	20.00%
Respiratory Distress	15	16.67%
NICU Admission	22	24.44%
No Morbidity	37	41.11%

Table 4: Association Between Maternal Infections and Neonatal Morbidities

Neonatal Morbidity	With Infection (n=72)	Without Infection (n=18)	p-value
Preterm Birth	22 (30.56%)	2 (11.11%)	0.048*
Low Birth Weight	27 (37.50%)	3 (16.67%)	0.082
Neonatal Sepsis	17 (23.61%)	1 (5.56%)	0.044*
Respiratory Distress	14 (19.44%)	1 (5.56%)	0.176
NICU Admission	21 (29.17%)	1 (5.56%)	0.027*

*Statistically significant (p < 0.05)

Table 5: Type of Maternal Infection and Associated Neonatal Outcomes (Selected Outcomes Only)

Type of Infection	Preterm Birth (%)	LBW (%)	Neonatal Sepsis (%)
UTI (n=28)	11 (39.29%)	13 (46.43%)	8 (28.57%)
Bacterial Vaginosis (n=19)	5 (26.32%)	6 (31.58%)	4 (21.05%)
STIs (n=8)	3 (37.50%)	4 (50.00%)	3 (37.50%)
Dengue (n=6)	2 (33.33%)	3 (50.00%)	2 (33.33%)
Malaria (n=4)	1 (25.00%)	2 (50.00%)	1 (25.00%)
Hepatitis (n=7)	2 (28.57%)	3 (42.86%)	2 (28.57%)

Table 6: Multiple Logistic Regression Analysis for Predictors of Neonatal Morbidity

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p-value
Maternal Infection (any)	3.21	1.12 – 9.21	0.030*
Maternal Age ≥ 25 years	1.43	0.58 – 3.51	0.426
Unbooked Status	2.88	1.05 – 7.89	0.039*
Primigravida	1.15	0.48 – 2.78	0.752
Preterm Delivery	4.72	1.71 – 13.02	0.003*
Low Birth Weight	3.96	1.46 – 10.77	0.007*

DISCUSSION

The present study observed that the majority of pregnant women (57.78%) were aged ≥25 years and 51.11% were primigravida. A notable finding was that 32.22% of participants were unbooked, suggesting suboptimal antenatal coverage in a significant proportion. These demographic characteristics align with findings by Singh et al. (2012), who reported that unbooked status and maternal age >25 years were common among women presenting with pregnancy complications, indicating a consistent demographic profile in similar tertiary care settings¹⁰.

In terms of maternal infections, 80.00% of the study participants had at least one diagnosed infection, with UTIs (31.11%) and bacterial vaginosis (21.11%) being the most frequent. This is in line with findings from Desai et al. (2011), who reported a 29% prevalence of UTIs in pregnant women and highlighted its association with adverse outcomes. Their study emphasized the high burden of genitourinary infections in resource-limited settings and the need for routine antenatal screening¹¹. Neonatal outcomes in the current study revealed that low birth weight (33.33%) and preterm birth (26.67%)

were the most common morbidities. These findings are comparable to those of *Chaudhary et al.* (2014), who reported a 35% prevalence of LBW and 27% of preterm births among neonates born to mothers with antenatal infections. These similarities underscore the critical impact of maternal health on birth outcomes¹². A statistically significant association was found between maternal infections and adverse neonatal outcomes in this study. Preterm birth ($p = 0.048$), neonatal sepsis ($p = 0.044$), and NICU admission ($p = 0.027$) were significantly higher among neonates born to infected mothers. *Khan et al.* (2010) reported similar associations, with maternal infections contributing to a threefold increase in neonatal sepsis and a twofold increase in NICU admissions. Their findings reinforce the direct link between maternal infections and neonatal morbidity¹³.

When examining specific types of infections, our data revealed that UTIs, STIs, and dengue were most commonly associated with adverse neonatal outcomes. For example, STIs were associated with 50% LBW and 37.50% neonatal sepsis. This closely mirrors findings by *Gomes et al.* (2002), who found that neonates born to mothers with untreated STIs had a significantly higher risk of sepsis and preterm delivery, emphasizing the need for early diagnosis and treatment¹⁴.

The logistic regression model confirmed that maternal infection (AOR: 3.21), unbooked status (AOR: 2.88), preterm delivery (AOR: 4.72), and LBW (AOR: 3.96) were independent predictors of neonatal morbidity. *Rathore et al.* (2005) also found that maternal infections and poor antenatal attendance were among the strongest predictors of neonatal complications, supporting the robustness of our findings¹⁵.

Although maternal age and gravidity were not significantly associated with neonatal morbidity in our study, other studies have shown varying results. For instance, *Sharma et al.* (2009) observed that younger maternal age and primigravidity were significant predictors of neonatal complications in rural populations. The difference may be due to variations in socioeconomic and healthcare access factors across populations¹⁶.

CONCLUSION

This study highlights a strong association between maternal infections during pregnancy and adverse neonatal outcomes, particularly preterm birth, low birth weight, neonatal sepsis, and increased NICU admissions. Urinary tract infections and systemic infections like dengue and STIs were key contributors to neonatal morbidity. Unbooked status and lack of antenatal care further amplified risks. Early detection, routine screening, and timely treatment of maternal infections are essential to improving neonatal health outcomes.

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