ORIGINAL RESEARCH

To assess maternal and perinatal outcomes in preterm labor associated with asymptomatic bacteriuria

Dr. Ram Naresh Pandit

Senior Consultant, Department of Obstetrics and Gynaecology, Provincial Hospital, Janakpurdham, Nepal

Corresponding Author
Dr. Ram Naresh Pandit
Senior Consultant, Department of Obstetrics and Gynaecology, Provincial Hospital, Janakpurdham, Nepal

Received: 23 June, 2021 Accepted: 25 July, 2021

ABSTRACT

Aim: The aim of this study was to assess maternal and perinatal outcomes in preterm labor associated with asymptomatic bacteriuria (ASB) and to evaluate the impact of ASB on neonatal health and maternal complications across different gestational ages. **Materials and Methods**: This prospective observational study included 100 pregnant women aged 18-40 years, presenting with preterm labor between 28 and 36 weeks of gestation, and diagnosed with ASB. Urine samples were collected, and positive cultures were followed by sensitivity testing for antibiotic treatment. Maternal outcomes, including progression of labor and complications, and perinatal outcomes, such as birth weight, Apgar scores, neonatal sepsis, and NICU admissions, were monitored. **Results:** Birth weight increased significantly with advancing gestational age, ranging from 1.80 kg (28-30 weeks) to 2.60 kg (34-36 weeks) (P=0.001). NICU admissions were highest among neonates born at 28-30 weeks (85%) and lowest at 34-36 weeks (35%) (P=0.003). Apgar scores at 1 minute improved with gestational age, from 5.2 (28-30 weeks) to 7.6 (34-36 weeks) (P=0.015). Maternal complications were more frequent in earlier gestational ages, with 40% in the 28-30 week group compared to 10% in the 34-36 week group (P=0.022). Neonatal sepsis was observed in 15% of neonates at 28-30 weeks, decreasing to 5% at 34-36 weeks (P=0.035). **Conclusion:** The study demonstrates that ASB in preterm labor is associated with adverse maternal and perinatal outcomes, including higher rates of maternal complications, NICU admissions, and neonatal sepsis. Early detection and treatment of ASB are critical to improving outcomes in preterm births.

Keywords: Preterm labor, Asymptomatic bacteriuria, Maternal outcomes, Neonatal outcomes, NICU admissions.

INTRODUCTION

Preterm labor, defined as the onset of labor before 37 weeks of gestation, is a significant global health concern and one of the leading causes of neonatal morbidity and mortality. Infants born prematurely face a higher risk of various health complications, including respiratory distress syndrome, infections, and neurodevelopmental issues, making it a critical area of focus in maternal and child health. The causes of preterm labor are multifactorial, including maternal, fetal, and placental factors. Among the various maternal infections that contribute to preterm labor, asymptomatic bacteriuria (ASB) has emerged as an important risk factor.[1]Asymptomatic bacteriuria is a condition characterized by the presence of significant bacterial growth in the urine without the typical symptoms of a urinary tract infection (UTI). In pregnancy, the physiological changes that occur in the urinary tract, such as ureteral dilation, increased urine pH, and altered bladder tone, make pregnant women more susceptible to bacteriuria. If left untreated, ASB can lead to serious maternal and fetal complications, including pyelonephritis, preterm labor, and low birth weight. Despite its asymptomatic nature, ASB can cause inflammatory responses that may trigger uterine contractions, leading to preterm labor.[2]Routine screening for asymptomatic bacteriuria in pregnant women is widely recommended to prevent these adverse outcomes. Early detection and treatment of ASB can significantly reduce the risk of complications, particularly preterm labor. However, the association between ASB and preterm labor remains a critical area of research, as preterm births are responsible for a significant proportion of neonatal deaths globally. Understanding the impact of ASB on maternal and perinatal outcomes in cases of preterm labor is crucial for improving clinical management and reducing the burden of preterm births.[3]The maternal outcomes associated with preterm labor are varied and can include complications such as

chorioamnionitis, pyelonephritis, and sepsis. These complications can arise from untreated or inadequately treated ASB, leading to systemic infections that exacerbate preterm labor and adversely affect maternal health. Moreover, the progression of labor and the response to treatment are critical factors in determining maternal outcomes. Preterm labor can also lead to prolonged hospitalization, increased need for medical interventions, and a higher risk of obstetric complications, further highlighting the importance of timely management.[4]

From a perinatal perspective, the outcomes of infants born to mothers with preterm labor associated with ASB are equally concerning. Preterm infants, particularly those born before 34 weeks of gestation, are at a heightened risk of adverse outcomes, including low birth weight, respiratory distress, intraventricular hemorrhage, necrotizing enterocolitis, and neonatal sepsis. These infants are more likely to require admission to neonatal intensive care units (NICU) and face extended hospital stays. Furthermore, preterm birth is a leading cause of long-term neurological impairments, including cerebral palsy, developmental delays, and sensory deficits.The relationship between maternal ASB and neonatal sepsis is also of particular concern, as untreated bacteriuria can lead to the vertical transmission of pathogens from mother to fetus during labor and delivery. Neonatal sepsis remains a leading cause of neonatal morbidity and mortality, particularly in preterm infants whose immune systems are underdeveloped. Thus, the timely identification and treatment of ASB are critical in preventing both maternal and neonatal infections and improving overall perinatal outcomes.[5]

Despite the known risks associated with asymptomatic bacteriuria, the exact mechanisms by which it contributes to preterm labor and adverse perinatal outcomes are still being studied. One theory suggests that bacterial colonization of the urinary tract triggers an inflammatory response, which can lead to the release of cytokines and other inflammatory mediators. These substances may induce uterine contractions, cervical changes, and eventually preterm labor. Furthermore, the systemic spread of bacteria from the urinary tract can result in intra-amniotic infections, which are a known cause of preterm labor.Given the serious implications of preterm labor and its association with asymptomatic bacteriuria, it is essential to assess the maternal and perinatal outcomes in affected pregnancies. By examining the outcomes of preterm labor in women with ASB, clinicians can better understand the risks and develop targeted interventions to reduce the incidence of preterm births and improve neonatal survival. Studies that focus on assessing birth weight, NICU admissions, Apgar scores, maternal complications, and neonatal sepsis can provide valuable insights into the impact of ASB on preterm labor outcomes.[6]This study aims to assess maternal and perinatal outcomes in cases of preterm labor associated with asymptomatic bacteriuria. By evaluating key parameters such as birth weight, NICU admissions, Apgar scores, maternal complications, and neonatal sepsis, this study seeks to contribute to the existing body of knowledge on the impact of ASB in pregnancy. The findings could inform clinical practice guidelines, emphasizing the importance of routine screening and treatment of ASB in pregnant women to prevent adverse maternal and neonatal outcomes, particularly in cases of preterm labor.

MATERIALS AND METHODS

This is a prospective observational study aimed at assessing maternal and perinatal outcomes in preterm labor associated with asymptomatic bacteriuria. The study was conducted in the Department of Obstetrics and Gynecology.A total of 100 pregnant women presenting with preterm labor (between 28 and 36 weeks of gestation) and diagnosed with asymptomatic bacteriuria were included in the study.

Inclusion Criteria

- Pregnant women aged 18-40 years.
- Gestational age between 28 and 36 weeks.
- Diagnosed with preterm labor.
- Positive urine culture for asymptomatic bacteriuria (defined as ≥105 CFU/mL of bacteria in a clean-catch midstream urine specimen, without any symptoms of urinary tract infection).
- Willingness to provide informed consent for participation in the study.

Exclusion Criteria

- Women with symptomatic urinary tract infection.
- Known history of renal diseases or other chronic medical conditions.
- Pre-existing maternal complications such as preeclampsia or gestational diabetes.
- Women with multiple pregnancies or fetal anomalies.

Methodology

Pregnant women presenting with preterm labor were recruited from outpatient and inpatient departments, and a detailed obstetric history was recorded. Routine antenatal investigations, including urine culture and sensitivity tests, were conducted to detect asymptomatic bacteriuria. Midstream clean-catch urine samples were collected from all participants for microbiological analysis, and positive cultures were followed by sensitivity testing to guide antibiotic treatment. Participants with asymptomatic bacteriuria were treated with antibiotics based on sensitivity results, typically for 7-10 days. Maternal outcomes were assessed by monitoring the progression of labor, occurrence of maternal complications such as chorioamnionitis, pyelonephritis, or sepsis, and response to antibiotic therapy. Perinatal outcomes included birth weight, gestational age at delivery,

Apgar scores at 1 and 5 minutes, NICU admissions, incidence of neonatal sepsis, stillbirths, or neonatal mortality. Participants were followed up until delivery, and both maternal and neonatal health were monitored for up to 7 days postpartum, with neonates requiring NICU admission monitored until discharge.

Statistical Analysis

Data were collected using a structured data sheet. Maternal and perinatal outcomes were compared between different gestational ages and analyzed using statistical software (SPSS version 25.0). Continuous variables were expressed as mean ± standard deviation (SD) and compared using t-tests, while categorical variables were compared using chi-square tests. A P-value <0.05 was considered statistically significant.

RESULTS

Table 1: Birth Weight Distribution Based on Gestational Age

The birth weight of neonates varied significantly across gestational age groups. For infants born between 28-30 weeks of gestation, the mean birth weight was 1.80 kg. As gestational age increased, there was a notable rise in birth weight, with infants born at 31-33 weeks having a mean birth weight of 2.20 kg, and those born between 34-36 weeks having a mean birth weight of 2.60 kg. The P-value of 0.001 indicates a statistically significant difference in birth weight across the gestational age groups, demonstrating that birth weight increases with gestational age.

Table 2: Neonatal ICU Admissions Based on Gestational Age

Neonatal ICU (NICU) admissions were notably higher among infants born at earlier gestational ages. Of the 25 infants born between 28-30 weeks, 85% (n=21) required NICU admission. In the 31-33 week group, 60% (n=21) were admitted to the NICU. The lowest NICU admission rate was observed in the 34-36 week group, with 35% (n=14) of neonates requiring NICU care. The P-value of 0.003 indicates a significant reduction in NICU admissions as gestational age increases, suggesting that neonates born later in gestation require less intensive care.

Table 3: Apgar Scores at 1 Minute Across Gestational Age Groups

Apgar scores at 1 minute also showed significant variation based on gestational age. The mean Apgar score for infants born between 28-30 weeks was 5.2, indicating moderate distress at birth. Infants born at 31-33 weeks had a higher mean Apgar score of 6.8, while those born at 34-36 weeks had a mean score of 7.6. The P-value of 0.015 suggests that there was a statistically significant improvement in Apgar scores with increasing gestational age, reflecting better initial neonatal health in more mature infants.

Table 4: Maternal Complications Based on Gestational Age

Maternal complications, including conditions such as chorioamnionitis, pyelonephritis, or sepsis, were more common in the earlier gestational age groups. Among mothers delivering between 28-30 weeks, 40% (n=10) experienced complications. This decreased to 20% (n=7) in the 31-33 week group and further to 10% (n=4) in the 34-36 week group. The P-value of 0.022 indicates a significant reduction in maternal complications with advancing gestational age, suggesting that earlier preterm labor is associated with a higher risk of maternal complications.

Table 5: Incidence of Neonatal Sepsis Across Gestational Age Groups

The incidence of neonatal sepsis was highest among infants born at earlier gestational ages. In the 28-30 week group, 15% (n=4) of neonates developed sepsis. This incidence decreased to 10% (n=4) in the 31-33 week group and further to 5% (n=2) in the 34-36 week group. The P-value of 0.035 indicates that the differences in neonatal sepsis across gestational age groups were statistically significant, with a higher incidence of sepsis observed in neonates born at earlier gestational ages.

Table 1: Birth Weight Distribution Based on Gestational Age

Gestational Age (Weeks)	Number of Participants (n)	Mean Birth Weight (kg)	Standard Deviation (SD)	P-value
28-30	25	1.80	0.25	
31-33	35	2.20	0.35	0.001*
34-36	40	2.60	0.30	

Table 2: Neonatal ICU Admissions Based on Gestational Age

Gestational Age (Weeks)	Number of Participants (n)	NICU Admissions (n)	NICU Admissions (%)	P-value
28-30	25	21	85%	
31-33	35	21	60%	0.003*
34-36	40	14	35%	

Table 3: Apgar Scores at 1 Minute Across Gestational Age Groups

Gestational Age (Weeks)	Mean Apgar Score (1 min)	Standard Deviation (SD)	P-value
28-30	5.2	1.2	
31-33	6.8	1.0	0.015*
34-36	7.6	0.9	

Table 4: Maternal Complications Based on Gestational Age

Gestational Age (Weeks)	Number of Participants (n)	Maternal Complications (n)	Maternal Complications (%)	P-value
28-30	25	10	40%	
31-33	35	7	20%	0.022*
34-36	40	4	10%	

Table 5: Incidence of Neonatal Sepsis Across Gestational Age Groups

Gestational Age (Weeks)	Number of Participants (n)	Neonatal Sepsis (n)	Neonatal Sepsis (%)	P-value
28-30	25	4	15%	
31-33	35	4	10%	0.035*
34-36	40	2	5%	

DISCUSSION

In this study, there was a significant increase in birth weight with advancing gestational age. Neonates born between 28-30 weeks had a mean birth weight of 1.80 kg, while those born between 34-36 weeks had a mean birth weight of 2.60 kg. Similar findings have been reported in previous studies, where increasing gestational age was strongly associated with higher birth weights. According to a study by Wang et al. (2018), neonates born at 28-30 weeks had a mean birth weight of around 1.7 kg, and this value increased to approximately 2.5 kg for neonates born after 34 weeks.[7] Another study by McIntire and Leveno (2008) also demonstrated that preterm neonates born earlier have significantly lower birth weights compared to those born at later gestational ages. The significant difference observed in birth weights across gestational age groups in the present study is consistent with these earlier findings, emphasizing the critical importance of prolonging gestation to improve neonatal weight.[8]

The rate of NICU admissions was significantly higher among neonates born at earlier gestational ages, with 85% of neonates born between 28-30 weeks requiring NICU care, compared to only 35% of neonates born between 34-36 weeks. This trend is consistent with earlier studies that indicate preterm neonates, particularly those born before 32 weeks, are more likely to face complications requiring intensive care. Research conducted by Stoll et al. (2010) reported that NICU admissions for neonates born between 28-30 weeks were around 80%, closely matching the findings in this study.[9] Similarly, a study by Liu et al. (2019) found that NICU admission rates significantly decreased with advancing gestational age, with 40% of neonates born at 34-36 weeks requiring NICU care. These findings reinforce the importance of prolonging gestation to reduce the need for NICU admissions.[10]

The Apgar scores at 1 minute were found to increase with gestational age, with neonates born between 28-30 weeks having a mean Apgar score of 5.2, while those born between 34-36 weeks had a mean score of 7.6. This aligns with prior studies, which indicate that preterm neonates, especially those born before 32 weeks, tend to have lower Apgar scores due to respiratory and cardiovascular challenges immediately after birth. A study by Casey et al. (2001) found that neonates born at 28-30 weeks had significantly lower Apgar scores compared to those born at later gestational ages, with a similar trend of increasing scores as gestational age increased. The results of the current study further support the association between gestational age and initial neonatal well-being, as reflected in higher Apgar scores.[11]

Maternal complications, including chorioamnionitis, pyelonephritis, and sepsis, were more common in mothers who delivered earlier, with 40% of mothers in the 28-30 week group experiencing complications. This incidence decreased to 10% in the 34-36 week group. These findings are supported by earlier studies that have demonstrated a higher risk of maternal infections and complications in cases of early preterm labor. A study by Romero et al. (2014) reported that the incidence of maternal complications, particularly chorioamnionitis, was significantly higher in mothers delivering before 32 weeks compared to those delivering at later gestational ages.[12] Similarly, a study by Hitti et al. (2001) found that maternal infection rates were significantly elevated in early preterm deliveries, with rates declining as gestational age increased. These results underscore the need for close monitoring and management of maternal health in cases of early preterm labor.[13]

The incidence of neonatal sepsis was found to be significantly higher in neonates born at earlier gestational ages, with 15% of neonates born at 28-30 weeks developing sepsis, compared to only 5% of neonates born at 34-36 weeks. Previous research has shown that preterm neonates, especially those born before 32 weeks, are at a higher risk of sepsis due to

immature immune systems and prolonged hospital stays. A study by Adams-Chapman and Stoll (2006) reported similar findings, with the incidence of sepsis being around 18% in neonates born at 28-30 weeks.[14] Another study by Polin (2012) found that the incidence of neonatal sepsis decreased with advancing gestational age, particularly after 32 weeks. The results of the present study confirm the higher risk of neonatal sepsis in earlier gestational ages, emphasizing the importance of infection prevention strategies in preterm neonates.[15]

CONCLUSION

In conclusion, this study highlights the significant impact of asymptomatic bacteriuria on maternal and perinatal outcomes in preterm labor. The findings demonstrate that untreated ASB is associated with higher rates of maternal complications, neonatal sepsis, and NICU admissions, particularly in earlier gestational ages. Early detection and appropriate antibiotic treatment of ASB can reduce the risks of adverse outcomes. These results emphasize the importance of routine screening and management of ASB in pregnancy to improve maternal and neonatal health, especially in preterm births.

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