

# Incidence of early-onset neonatal sepsis in relation to prolonged rupture of membranes

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## ABSTRACT

**Background:** Prolonged rupture of membrane (PROM) is an important risk factor for early-onset neonatal sepsis (EONS) and preterm births. **Objective:** The objective of this study was to determine the incidence of EONS in relation to PROM of more than 18 h. **Materials and Methods:** The study was conducted in a medical college in South India. All the neonates born to mothers with a history of PROM for >18 h were included in this study. Sepsis was diagnosed by clinical signs and symptoms and positive blood culture. **Results:** A total of 200 neonates were included in the study. Among these, confirmed sepsis was diagnosed in 18% (29); statistically, there was no significant difference ( $p>0.05$ ). A high incidence of sepsis was found in neonates born by normal vaginal (68.5%) delivery. There was no significant difference between incidence of sepsis and duration of PROM; the range was 18–72 h. **Conclusion:** Sepsis was diagnosed to be less in neonates born to mothers who had prenatal antibiotics.

**Key words:** Neonates, Prolonged rupture of membrane, Sepsis

Prolonged rupture of membrane (PROM) lasts for more than 18 h before labor. PROM was found in approximately 8–10% of all pregnancies [1,2]. It is an important risk factor for early-onset neonatal sepsis (EONS) [3,4] and preterm births [5]. It is associated with increased neonatal morbidity and mortality. According to the World Health Organization, approximately 4 million neonates die annually [6] and the global neonatal mortality rate was 2.3% [7]. About a million of these deaths are attributable to neonatal infections [8]. The incidence of neonatal sepsis according to the data from National Neonatal-Perinatal Database (2002–2003) was 3%. In developing countries, death due to PROM was reported to be 3 times higher compared to developed countries [9].

PROM is an important long-term neonatal complication in survived neonates [10]. Improved prenatal care and antenatal antimicrobial treatment of women with a history of PROM had significantly improved neonatal outcome in association with early detection of sepsis and its aggressive management in neonates [10,11]. The evaluation of neonatal sepsis is important and there is an urgent need to know whether the baby has sepsis to initiate treatment as quickly as possible. This study was conducted to determine the EONS in relation to PROM of more than 18 h.

## MATERIALS AND METHODS

The study was conducted in a teaching hospital in South India. The study protocol was approved by the Institutional Ethics Committee. Informed consent was taken from all the study

participants. All the neonates born to mothers with a history of PROMs >18 h were included in our study. Antepartum hemorrhage, toxemia of pregnancy, major medical illness to the mother other than infections, PROM <18 h, neonates with major congenital malformations, neonates presenting with symptoms after 72 h after birth, and neonates who had undergone any mode of resuscitation other than routine care were not considered.

A detailed history was taken including age, parity, obstetric history of the mother with emphasis on exact time of rupture of membrane, duration history, and antibiotics before labor. Detailed birth history including resuscitation details, Apgar score, and gestational age assessment was evaluated. Neonates pulse, respiratory rate, capillary refill time, and temperature were noted followed by systemic examination. Required investigations were done and followed during their hospital stay.

The diagnosis of neonatal sepsis was made by noting clinical signs and symptoms. Screening tests such as tests total leukocyte count by the automated analyzer, differential leukocyte count by peripheral smear, band count estimation by peripheral smear, C-reactive protein (CRP) semi-quantitative estimation by latex agglutination technique, and micro-erythrocyte sedimentation rate were used. Chi-square test was used to determine significant differences between three groups;  $p<0.05$  was considered statistically significant.

## RESULTS

A total of 200 neonates born to mothers with a history of PROM were included in the study. Among these, confirmed sepsis was

diagnosed in 14.5% (29); out of them, 9% (18) were male and 5.5% (11) were female (Table 1); statistically, there was no significant difference ( $p>0.05$ ).

When the mode of delivery was considered, high incidence (55%) of sepsis was found in neonates born by normal vaginal delivery compared to cesarean section (45%). A total of 48% and 52% of newborns had a history of PROM for 18–24 h and 24–72 h, respectively. There was no significant relationship between the incidence of sepsis and duration of PROM, as shown in Table 1.

## DISCUSSION

In the present study, the incidence of EONS was more in male babies (62%); statistically, the difference was significant ( $p<0.05$ ). This was consistent with the studies by Assudani *et al.* [12], Aletayeb *et al.* [13], and Cecilia *et al.* [14]. However, a study by Chacko and Sohi [15] reported that the incidence of neonatal sepsis was similar among the gender. Bias for male gender and place of study may be responsible for increased number of male cases in these studies.

The rate of sepsis was less during 18–24 h PROM and there was no significant difference between two groups ( $p>0.05$ ). Ratanakorn *et al.* [16] reported that sepsis during 18–24 h period was more compared to 24–72 h period, which is not consistent with the present study. In the present study, the percentage of neonatal sepsis was higher in mothers with PROM who did not receive prenatal antibiotics (20.65%) compared to mothers who took prenatal antibiotics (9.25%). Similar results were obtained by Al-Qaqa and Al-Awaysheh [17], who reported that neonatal sepsis occurred in only 4.4% of neonates born to mothers who received prenatal antibiotics compared to 11% of neonates whose mothers did not receive prenatal antibiotics for PROM.

Preterm PROM defined as rupture before 37 weeks. This occurs in 2–4% of pregnancies, associated with intrauterine infection and increased risk of neonatal sepsis. Many previous studies have shown that antibiotics prolonged the latency period until delivery, reduced maternal chorioamnionitis and neonatal complications, including respiratory distress syndrome, intraventricular hemorrhage, pneumonia, and sepsis, as in the present study.

**Table 1: Gender-wise distribution of the participants; n (%)**

Variables	Total cases (%)	Confirmed sepsis (%)	p value
Gender			
Male	101 (50.5)	18 (9)	0.24877
Female	99 (49.5)	11 (5.5)	
Mode of delivery			
Normal vaginal delivery	121 (60.5)	16 (55)	0.584447
Cesarean section	79 (39.5)	13 (45)	
Duration of prolonged rupture of membrane (h)			
18–24	116 (58)	14 (48)	0.323223
24–72	84 (42)	15 (52)	

The sensitivity and specificity of CRP in the present study were higher with 90.90% and 85.71%, respectively. Chauhan *et al.* [18] reported 92.30% and 85.71% for sensitivity and specificity, respectively. However, West *et al.* [19] reported lower sensitivity and specificity. CRP passes the placenta only in very low quantities; therefore, any elevation in the neonate always represents endogenous synthesis. *De novo* hepatic synthesis starts very rapidly after a single stimulus with serum concentrations rising above 5 mg/l by about 6 h and peaking around 48 h. Raised CRP is not necessarily diagnostic for sepsis, as elevations may as well occur due to the physiologic rise after birth.

Blood culture positivity in the present study was 36.66%. Kayange *et al.* [20] reported 47% blood culture positivity and El-Din *et al.* [21] mentioned 40.4% sepsis cases. Low blood culture positivity in the present study might be due to small sample size compared to other two studies. However, these results were comparable with the studies by Ahmed *et al.* [22] and Mugalul *et al.* [23]. In this study, organism wise, *Staphylococcus aureus* (10, 45.4%) was the predominant isolate followed by coagulase-negative *Staphylococcus* (6, 27%) and *Klebsiella* and *Escherichia coli* (3, 13.6%) each, respectively. There were few limitations of the study. The sample size was small and the other maternal variables were not considered.

## CONCLUSION

We conclude that a significant number of EONS cases were diagnosed due to PROM; sensitivity for the diagnosis of sepsis was highest for CRP. However, studies on large samples for long time are recommended.

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