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Original Article

Fetal and Maternal Outcomes due to Premature Rupture of Membrane (PROM)

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Abstract

Background: *About ten to fifteen percent of pregnancies result in premature Preterm Rupture of Membranes (PROM) which is responsible for one-third of preterm deliveries. A membrane's spontaneous rupture before the commencement of active labour is known as a Pre-labour Rupture of Membrane (PROM). About 70% of PROM occurrences happen during term pregnancies. Our main goal was to determine the maternal and newborn outcomes in PROM instances involving mother and child.*

Materials and methods: *This cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, Marine City Medical College and Hospital, Chattogram, between September 2024 and February 2025. About 104 women with PROM with more than 32 weeks of gestational age who were admitted to the above department for delivery were enrolled in this study.*

Results: *The participants' age ranged between 18-42 years. Overall, the median age of the respondents was 26 years (Interquartile range [IQR] 22, 28). Mean± SD – 25.49± 4.76 years. The maximum (40) participants were within the age group 23-27. Patientsaccording to the incidence of parity,reveal the highest number (50) of participants belong to the 2nd gravida. Most participants (38) in this study had achieved a secondary school certificate. Whereas, maximum patients (42.31%) didn't go for an Antenatal Checkup (ANC) although 27.88% of patients had a previous history of abortion, 16.35% had pre-existing hypertensive disorder and 10.58% had gestational HTN in pregnancy, 20.19% of the patients had pre-existing DM and 8.65% had GDM. 15.38% of patients had a history of PROM in a previous pregnancy. The PROM detection only by clinical assessment was a maximum of 73.08% and with the help of USG, along with clinical assessment was 26.92%. 62.5% of deliveries were made within 24 hours of detection. 81.73% of participants were given birth of their baby by spontaneous delivery, the mode of delivery was 56.73% for vaginal delivery and 43.27% for caesarian section. Most of the causes of the caesarian section were fetal distress (26.67%). Only 33.73% of pregnancies with PROM showed signs of infection and the majority (39.39%) were wound infections.*

Conclusion: *81.73% of mother were given birth of their baby by spontaneous delivery, the mode of delivery was 56.73% for vaginal delivery and 43.27% for caesarian section. Most of the causes of caesarian section were fetal distress (26.67%). Only 33.73% of pregnancies with PROM showed signs of infection and the majority (39.39%) were wound infections. Foetal outcomes revealed 59.62% of neonates scored 7-9 Apgar score at 1 minute and 64.42% scored 8-10 at 5 minutes. 44.23% of neonates needed admission to NICU and the highest neonatal complication was Neonatal Respiratory Distress Syndrome, which was experienced by 24.04% of neonates, 11.54% experienced neonatal jaundice and 8.54% developed neonatal sepsis.*

Key words: Maternal and perinatal; Morbidity and mortality; Pre-labour Rupture of Membrane (PROM); Pregnancy.

INTRODUCTION

When fetal membranes are disrupted before the onset of labour, amniotic fluid spontaneously leaks out. This condition is known as Premature Rupture of Membranes (PROM).[1] About 70% of occurrences of pre-labour rupture of membranes (PROM) a severe obstetric complication, occur at term and affect 5–10% of deliveries and 3% of pregnancies overall. Cervical incompetence, infections and poor prenatal care are linked to PROM.[2] Although PROM can happen at any stage of pregnancy, it is referred to as preterm premature rupture of membranes (PROM) if it occurs before 37 weeks. Due to the early loss of amniotic fluid and the ensuing disruption of the intrauterine environment, PROM is linked to several problems, making the timing of membrane rupture a critical factor in both maternal and fetal outcomes.[3] Studies suggest that PROM accounts for 14% of pregnancies in Ethiopia and has a substantial effect on fetal outcomes, including low birth weight and stillbirth.[4-7]

Maternal hypertensive problems are also found to be predictors of PROM in Saudi Arabia.[8] The incidence of PROM varies substantially between nations, ranging from 2.2% in India to 19% in China.[9,10] PROM has a complex aetiology that is poorly understood. Fetal membrane inflammation and infection, as well as genetic predisposition, may contribute to the physiological process of membrane rupture before labour.[11-13] Furthermore, other factors like a history of PROM, a history of miscarriage, a lack of prenatal care, a gestational age below 37 weeks, polyhydramnios, vaginal and urinary tract infections, and a low socioeconomic position may also be linked to PROM.[14-17]

In contrast to the rupture of the membranes during the commencement of labour, PROM is linked to an elevated risk of maternal and neonatal morbidity and mortality regardless of gestational age. Known consequences of PROM include infection, maternal and neonatal sepsis, abruptio placenta, accidents involving the umbilical cord, Premature Birth (PTB) and associated complications, and perinatal death.[18-20] Because of inadequate maternal healthcare facilities, PROM-related newborn mortality is still common in undeveloped nations like Ethiopia. On the other hand, Germany's sophisticated healthcare system reduces the likelihood of unfavorable outcomes.[4] Medical measures, such as the administration of corticosteroids or antibiotics, may be necessary to enhance fetal lung maturity and lower the risk of infections in cases when there is a prolonged delay between membrane rupture and labour.[21] Reducing maternal and neonatal morbidity and mortality requires prompt detection and treatment of PROM.[22] Among the strategies are preventing ascending infections with appropriate treatment and identifying high-risk cases through risk scoring based on demographic variables.[1] Regional disparities underscore the need for improved maternal healthcare services in developing countries to address the adverse outcomes associated with PROM. This study aims to identify the factors associated with premature rupture of membranes in pregnancy and evaluate maternal and perinatal morbidity and mortality linked to PROM. It searches for long-term outcomes for infants born after PROM and compares the outcomes of PROM at various gestational ages.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Obstetrics and Gynecology at Marine City Medical College and Hospital in Chattogram, from September 2024 to February 2025. The study sample consisted of 104 women with Premature Rupture of Membranes (PROM). The study utilized mutually inclusive criteria, encompassing women with PROM of any gravida, a gestational age exceeding 32 weeks, and a duration of spontaneous membrane rupture before the onset of labour. Patients with membrane rupture during established labour, membrane rupture with antepartum haemorrhage, severe pre-eclampsia, eclampsia, malpresentation and congenital malformations of the fetus were excluded from the study. The data were gathered through interviews, physical examinations and laboratory assessments, utilizing a systematic questionnaire encompassing all relevant factors. All sample cases were monitored for perinatal and maternal outcomes up to 7 days post-delivery. Categorical variables were compared with a chi-square test, the p value was calculated with Graph Pad Prism-8 Software. All statistical tests were evaluated at the 0.05 significance level. The IRB committee of Marine City Medical College Hospital approved the conduct of the study after protocol review.

RESULTS

The participants' age ranged between 18-42 years. Overall, the median age of the respondents was 26 years (Interquartile range [IQR] 22, 28). Mean± SD – 25.49± 4.76 years. The maximum (40) participants were within the age group 23-27 (Figure 1). Distribution of the study patients according to incidence of parity reveals the highest number (50) of participants belongs to 2nd gravida (Figure 2). According to educational status most participants (38) in this study achieved secondary school certificate (Figure 3).

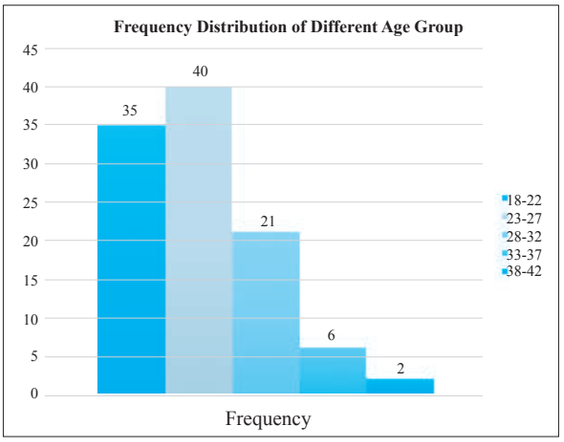

Figure 1 Age Distribution of the Study Patients (n=104)

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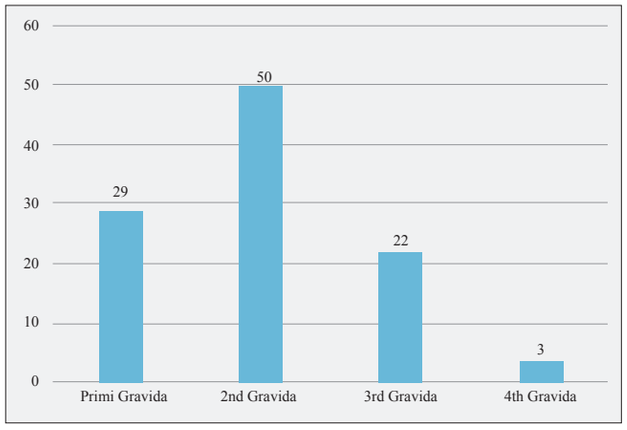

Figure 2 Distribution of the study patients according to incidence of parity (n=104)

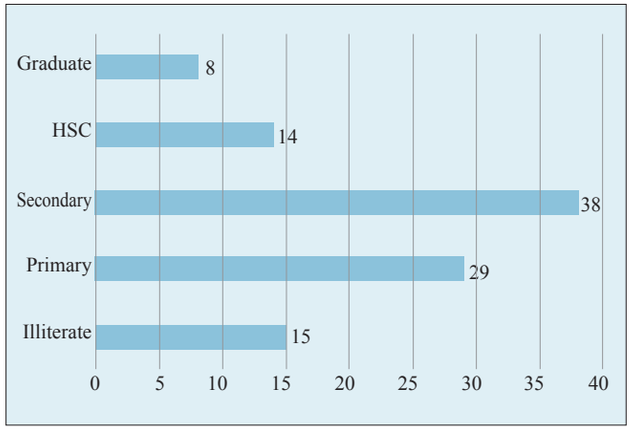

Figure 3 Distribution of the study patients according to educational status (n=104)

The distribution of the patients along the gestational age (Weeks) revealed the minimum age of 32 weeks, the maximum age of 42 weeks with a mean gestational age of 37 weeks. The standard deviation is ±2.4. The majority (67.31%) of patients were within the ≥37 gestational weeks group. Maximum patients (42.31%) didn't go for an Antenatal Checkup (ANC) 27.88% of patients had a previous history of abortion, 16.35% had pre-existing hypertensive disorder and 10.58% had gestational HTN in pregnancy. 20.19% of the patients had pre-existing DM and 8.65% had GDM. 15.38% of patients had a history of PROM in a previous pregnancy. All those variables in this study have no statistically significant associations (Table 1).

Table 1 Characteristics of Study Sample (n=104)

Clinical Presentation	Number of Patients	Percentage	p Value
Gestational age (Weeks)			
32-34	14	13.46	
35-36	20	19.23	0.920
≥37	70	67.31	
Mean ±SD	37±2.4		
Range (Min, Max)	32,42		
Antenatal Checkup (ANC)			
Regular	39	37.5	
Irregular	21	20.19	0.826
No	44	42.31	
History of Abortion			
Yes	29	27.88	
No	75	72.12	
Hypertensive Disorder of Pregnancy			
Gestational	11	10.58	
Pre-existing	17	16.35	0.881
No	76	73.08	
Diabetes			
GDM*	9	8.65	
Pre-existing	21	20.19	0.112
Non- Diabetic	74	71.15	
History of PROM in Previous Pregnancy			
Yes	16	15.38	0.943
No	88	84.62	

*GDM- Gestational Diabetes Mellitus.
*Not Significant at p value <0.05.

The PROM detection only by clinical assessment was a maximum of 73.08% and with the help of USG, along with clinical assessment was 26.92%. 62.5% of deliveries were made within 24 hours of detection (Table II).

Table 2 Relation between PROM detection method and Time Interval of Delivery (n=104)

PROM Detection by Clinical Assessment	Frequency	Percentage	p value
Yes	76	73.08	0.536
Clinical Assessment+ USG	28	26.92	
Time interval between PROM and Delivery			
Within 24 hours	65	62.5	0.949
25-48 hours	28	26.92	
>48 hours	11	10.58	

*Not Significant at p value <0.05

87.5% of participants were given birth of their baby by spontaneous delivery, the mode of delivery was 56.73% for vaginal delivery and 43.27% for caesarian section. Most of the causes of caesarian section were fetal distress (46.67%). Only 33.73% of pregnancies with PROM showed signs of infection and the majority (39.39%) were wound infections. 92.31% of patients needed antibiotic therapy administration, with 32.69% needing corticosteroids for foetal lung maturity, and 20.19% experienced Postpartum Haemorrhage (PPH) (Table III).

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Table III Maternal Outcome According to the Status of PROM (n=104)

Variable	Outcome	Frequency	Percentage
Nature of Delivery	Spontaneous Delivery	91	87.5
	Induced Delivery	13	12.5
	Vaginal Delivery	59	56.73
Mode of Delivery	Caesarian Section	45	43.27
	Cephalopelvic Disproportion	7	15.56
Cause of Caesarian Section delivery	Fetal Distress	21	46.67
	Prolong 1st Labour	12	26.67
	Twin Pregnancy	5	11.11
Sign of Infection	Yes	33	31.73
	No	71	68.27
Cause of Infection	Chorioamnionitis	7	21.21
	Wound Infection	15	39.39
	Puerperal Sepsis	11	21.21
Antibiotic Therapy Administered	Yes	96	92.31
	No	08	7.69
Corticosteroids Given for Foetal Lung Maturity	Yes	34	32.69
	No	70	67.31
Post Partam Haemorrage	Yes	21	20.19
	No	83	79.81

Distribution of weight of the babies after birth revealed that the maximum body weight was within the (2.6-3) kg group and the frequency was 39 (Figure 4). Foetal outcomes revealed 59.62% of neonates scored 7-9 Apgar score at 1 minute and 64.42% scored 8-10 at 5 minutes. 44.23% of neonates needed admission to NICU and the highest neonatal complication was Neonatal Respiratory Distress Syndrome, which was experienced by 24.04% of neonates, 11.54% experienced neonatal jaundice and 8.54% developed neonatal sepsis. 25% of NICU baby stay for 7-11 days, 19.23% needed admission to NICU for 2-6 days and 6.73% of neonates expired (Table IV).

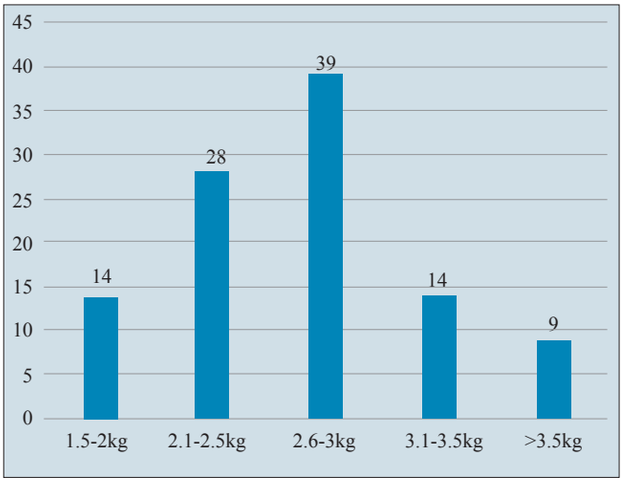

Figure 4 Distribution of Weight of the Baby after Birth (n=104)

Table IV Foetal Outcome According to the Status of PROM

Apgar Score			
Apgar Score at 1 minute Range (1-10)		**Apgar Score at 5 minutes Range (1-10)**	
Score 4-6	42(40.38%)	Score 5-7	37(35.58%)
Score 7-9	62(59.62%)	Score 8-10	67(64.42%)
Neonatal Admission in NICU			
Yes	46(44.23%)		
No	58(55.77%)		
Neonatal Complications			
Neonatal Sepsis	9(8.65%)		
Neonatal Jaundice	12(11.54%)		
Neonatal Respiratory Distress Syndrome	25(24.04%)		
Duration of Stay in NICU			
2-6 days	20(19.23%)		
7-11 days	26(25%)		
Neonatal Mortality			
Yes	7(6.73%)		
No	97(93.27%)		

DISCUSSION

PROM remains a complex condition with significant implications for maternal and neonatal health. Continued research and refinement of management protocols are essential to improve outcomes for affected pregnancies. Second gravida had the largest number of research participants, suggesting a significant occurrence in this population. Parity and PROM are significantly correlated, according to several research. Compared to primiparous women (First-time mothers) multiparous women (Those who have given birth more than once) are frequently more prone to have PROM.[23-26] This statement goes contrary to research conducted in 2013 and 2022 in Vietnam and India, which found that primigravida cases accounted for most PROM cases (50.06% and 47.1%, respectively).[27,28] Multiparous and grand multiparous women (Those who have given birth more than once) are said to have a higher incidence of PROM. According to some studies, this is because of factors like reduced cervical flexibility and excessive uterine motility.[25,26,29,30]

The distribution of patients' gestational ages in this investigation is essential for comprehending the results and management tactics. In the context of PROM, the data indicate a mean gestational age of 37 weeks, a minimum of 32 weeks, and a maximum of 42 weeks. The 37-week mean gestational age is consistent with results from other research, which frequently divide PROM cases into those that occur before and after 37 weeks to evaluate variations in therapeutic approaches and outcomes.[27,30] According to a study on Antenatal Care (ANC) and pregnancy-related outcomes, 42.31% of patients did not attend any antenatal checks. Given that ANC is crucial for tracking and enhancing mother and newborn health

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outcomes, this draws attention to a serious deficit in maternal healthcare. There are notable regional and national variations in the use of ANC. Lack of ANC visits, for example, is linked to increased newborn mortality in Kenya.[31] Only 6% of mothers in Bangladesh obtained the eight or more ANC visits that are advised, and 21% did not receive any ANC services at all.[32] Despite a high average number of visits, some groups in South Korea, such as non-Korean women and teenagers, had higher percentages of inadequate ANC.[33] Media exposure, education, urban versus rural residency, and socioeconomic position are some of the factors that affect ANC attendance. More frequent ANC visits are linked to both urban life and a higher socioeconomic status.[32,34] Regional differences are apparent in Ethiopia, where ANC visits are influenced by maternal age, household wealth and education.[35]

In this PROM study, 27.88% of patients had a history of abortion. Research shows that the history of abortion is linked to a higher incidence of PROM. 9.25% of patients with a history of spontaneous abortion, for example, developed PROM in their subsequent pregnancy, according to one study.[36] With an odds ratio of 2.35, a different study found that prior abortion was a substantial risk factor for PROM.[37] In this PROM study, 10.58% of pregnant women had gestational hypertension and 16.35% had pre-existing hypertension. About 10% of pregnancies are affected by hypertension problems, which are prevalent during pregnancy. This encompasses pre-eclampsia, gestational hypertension and chronic hypertension.[38-40] An elevated risk of PROM is substantially linked to gestational hypertension. In one study, PROM was statistically significant in 38% of women with gestational hypertension as compared to other groups.[41] It's unclear how pre-eclampsia and PROM are related. While one study revealed no significant correlation between pre-eclampsia and PROM, another reported that pre-eclampsia cases were much more likely to have PROM.[41,42] Pregnant women who suffer from hypertension disorders are more likely to have cardiovascular ailments in the future. Both the hypertension condition itself and other underlying predispositions are to blame for this risk.[43,44]

In this study, 8.65% of patients had GDM and 20.19% of patients had pre-existing DM. In contrast, 24.5% of women with preterm membrane rupture were diagnosed with gestational diabetes mellitus.[45] In this study, 15.38% of patients had a history of PROM during a prior pregnancy. On the other hand, a substantial risk factor for subsequent Premature Rupture of Membranes (PROM) is prior preterm rupture of membranes (34.2% of instances).[46] The following factors are linked to an increased risk of premature: low body mass index, two years between pregnancies, prior abortion, preterm birth, prior PROM, history of caesarean section, gestational hypertension, GDM, abnormal vaginal discharge, reproductive tract infection, malpresentation, and elevated abdominal pressure.[37]

While Ultrasonography (USG) accounts for 26.92% of cases, clinical assessment alone can identify PROM with a high accuracy of 76.08% in this study, suggesting that USG can be a useful supplementary tool in some circumstances. Furthermore, 62.5% of deliveries take place within 24 hours of PROM discovery, underscoring the significance and efficacy of prompt management. A considerable percentage of women, almost 81.73%, give birth on their own. Of them, 56.73% give birth naturally. Approximately 43.27 percent of women have a caesarean section. When difficulties such foetal distress, infection or other obstetric indications render vaginal delivery risky, this surgical intervention is usually taken into consideration.[47]

According to this study, 33.73% of fetuses with PROM had infection symptoms, with wound infections accounting for 39.39% of cases. A considerable risk of infections such as endometritis and chorioamnionitis is linked to PROM. In cases with PROM, the prevalence of puerperal infection might reach 27%.[48] PROM raises the possibility of infections in newborns, such as sepsis, which leads to high rates of perinatal death.[49] Prolonged latency periods can increase the risk of intra-amniotic and postpartum infections in women with PROM.[50,51] Furthermore, 32.69% of patients needed corticosteroids for foetal lung maturity, and 92.31% of patients needed antimicrobial therapy. Antibiotics have been demonstrated to dramatically lower the incidence of endometritis and chorioamnionitis in cases with a latency of more than 12 hours. Its efficacy in lowering infections in mothers and newborns is up for discussion, though. Except in situations with extended latency, some research indicates that antibiotics do not substantially reduce the prevalence of chorioamnionitis or newborn sepsis.[51,52] In preterm newborns, antenatal corticosteroids effectively lower neonatal problems like intraventricular haemorrhage, neonatal mortality and respiratory Distress Syndrome (RDS). To improve foetal lung maturity, they are advised for women who are at risk of preterm birth, especially those who have PROM.[53-55]

Postpartum Haemorrhage (PPH) affected 20.19% of the participants in this study. Postpartum haemorrhage has a variable incidence. According to one study, the PPH rate for PROM instances that occurred prior to or at the limit of viability was 5.3%.[56] According to a different study, 2.5% of women with preterm PROM experienced PPH.[57] These numbers imply that PPH rates can vary based on the study population and management approaches. One known risk factor for PPH is PROM. PPH risk is significantly increased by factors like preeclampsia, placental problems (Such as placental adhesion or placenta previa) and preterm membrane rupture itself.[58,59] Furthermore, a higher risk of PPH is linked to caesarean birth, which is typical in PROM cases.[58,60]

The majority of neonates in this study had fairly positive initial outcomes, with 59.62% scoring between 7-9 on the Apgar scale at 1 minute and 64.42% scoring between 8-10 at 5 minutes.[61,62]

Neonatal Respiratory Distress Syndrome was the most common neonatal consequence, affecting 24.04% of newborns, jaundice affected 11.54%, sepsis affected 8.54% and 6.73% of newborns died. According to research, the incidence of respiratory distress syndrome and newborn sepsis is especially high, at 24.2% and 24.5%, respectively.[62,63] Neonatal mortality rates can also be high,particularly when preterm PROM is present.[63,64]

LIMITATIONS

A small sample size could limit the power of the study, making it difficult to draw strong conclusions or generalize the results to larger populations. The study only included one centre thus, the findings might not be representative of women from other socioeconomic, cultural, or geographic backgrounds. Variations in the definition of PROM or differences in the diagnostic criteria used at various study centres may lead to misclassification of cases, potentially influencing the study's findings. The current study only measures short-term outcomes, it might miss long-term effects of PROM on both maternal and fetal health, such as developmental delays or chronic health issues for the child.

CONCLUSION

The purpose of this study was to assess the maternal/perinatal morbidity and mortality of Premature Rupture of the Membrane (PROM) which is linked to increased fetal morbidity and mortality. In the current study, 81.73% of mothers gave birth of their baby by spontaneous delivery, the mode of delivery was 56.73% for vaginal delivery and 43.27% for caesarian section. Most of the causes of caesarian section were fetal distress (46.67%). Only 33.73% of pregnancies with PROM showed signs of infection, and the majority (39.39%) were wound infections. Foetal outcomes revealed 59.62% of neonates scored 7-9 Apgar score at 1 minute and 64.42% scored 8-10 at 5 minutes. 44.23% of neonates needed admission to NICU and the highest neonatal complication was Neonatal Respiratory Distress Syndrome, which was experienced by 24.04% of neonates, 11.54% experienced neonatal jaundice and 8.54% developed neonatal sepsis.

RECOMMENDATION

Given the high prevalence of maternal and newborn outcomes in gestational age less than 32 weeks, adequate educational materials and appropriate procedures should be used to avoid preterm labour and preterm rupture of the membranes. High-quality prenatal screening will assist in identifying the risk factors for PROM, preventing morbidity, and perhaps designing large-scale studies to evaluate and contrast the precision and effectiveness of various therapeutic strategies.

DISCLOSURE

Both the authors declared no competing interest.

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