Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/zpzz7427

PRELABOUR RUPTURE OF MEMBRANES: AN ASSESSMENT OF MATERNAL AND PERINATAL OUTCOMES

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Abstract
Background: Despite medical progresses, prelabour rupture of membranes remains one of the leading causes of perinatal morbidity and mortality due to its complications. Thus, a thorough understanding of pathology as well as clinical signs are needed via constant research to get a favorable outcome in terms of maternal as well as foetal outcome. Maternal and foetal outcome may depend on the clinical profile, vaginal swab microbiology or even the blood parameters
Objective: To evaluate and understand various aspects of maternal and foetal outcome of mothers with Prelabour Rupture of Membranes.
Methods: Hospital based observational prospective study
Results: 75% of the mothers included in the study were healthy. Out of the remaining, 15% had puerperal fever, 6.3% had wound infection, 2.5% had PPH and death happened in 1 case (1.2%). A significant statistical difference between those with puerperal fever ($p < 0.042$), PPH ($p < 0.020$) and no complications ($p < 0.0001$) have been found between the two groups (high vaginal swab showing growth as compared to those with no growth.) Birth asphyxia is seen equally in both groups. About neonatal complications, statistically there is significant difference between the two groups in terms of stillbirths ($p < 0.045$), LBW ($p < 0.043$), neonatal death ($p < 0.034$), neonatal sepsis ($p < 0.045$), RDS ($p < 0.045$) and no complications (0.001).
Conclusion: It has been noted in this study that PROM is associated with adverse maternal outcomes such as puerperal fever, wound infection, PPH, maternal death as well as adverse perinatal outcome such as stillbirth, LBW, neonatal sepsis, neonatal death, RDS, MAS, birth asphyxia.
It has also been noted that positive high vaginal swab culture is associated with more incidence of maternal morbidity and neonatal morbidity and mortality.

Keywords- Complete Blood Count, C-Reactive Protein, Urine RE/ME/CS, High Vaginal Swab.

INTRODUCTION

In most pregnancies, labour begins at term in the presence of intact foetal membranes. Without intervention they usually remain intact until they spontaneously rupture near the end of the first stage of labour.
Prelabour rupture of membranes (PROM) refers to rupture of the foetal membranes prior to the onset of labour. When membrane rupture occurs before labour and before 37 weeks of gestation, it is referred to as preterm PROM (PPROM). PROM which occurs after 37 weeks of gestation is referred as term PROM.

The latent period is defined as the duration from rupture of the membranes until the onset of true labor.
Prolonged PROM refers to PROM greater than 24 hours, and is associated with an increased risk of ascending infection. The patients of PROM usually present with leakage of fluid, vaginal discharge, and pelvic pressure, but they are not having contractions.

PROM is largely a clinical diagnosis. It is confirmed on sterile speculum examination. The traditional minimally invasive gold standard for the diagnosis of PROM relies on clinician ability to document 3 clinical signs on sterile speculum examination:
(1) visual pooling of clear fluid in the posterior fornix of the vagina or leakage of fluid from the cervical os;
(2) an alkaline pH of the cervicovaginal discharge, which is typically demonstrated by seeing whether the discharge turns yellow nitrazine paper to blue (nitrazine test); and/or
(3) microscopic fern ing of the cervicovaginal discharge on drying.

Evidence of diminished amniotic fluid volume (by Leopold's examination or ultrasound) alone cannot confirm the diagnosis, but may help to suggest it in the appropriate clinical setting.

The diagnosis of chorioamnionitis remains primarily a clinical one, with evidence of foetal tachycardia, maternal tachycardia, maternal fever (defined as (≥ 100.4°F), and/or uterine tenderness which should be confirmed by bacteriological examination of the vaginal discharge.
It is seen that foetal membranes are made of an outer four to six layered chorions attached to a collagen rich connective tissue and an inner single cell layer amnion.

Weakness in the chorioamnion membrane is the overall mechanism of PROM, which may be due to deficiency of type III collagen, reduced size of the membrane at the affected site and reduced collagen content.
In addition, it may be caused by proteolytic enzymes from bacteria.
Prelabour Rupture of Membranes (PROM) is an important cause of maternal and foetal morbidity.
It may result in immediate complications such as cord prolapse, cord compression and placental abruption and later problems such as maternal and neonatal infections as well as the use of interventions such as caesareans and instrumental vaginal deliveries.
Once the membranes rupture, delivery is recommended when the risk of ascending infection outweighs the risk of prematurity.

Evidence supports the idea that induction of labor, as opposed to expectant management, decreases the risk of chorioamnionitis without increasing the rate of Caesarean section.
The incidence of neonatal infections for infants born to mothers with PROM range from 1-2.6%. There can be neonatal sepsis, respiratory distress syndrome, neonatal death, and stillbirths.
Early and accurate diagnosis of PROM would allow for gestational age-specific obstetric interventions designed to optimise perinatal outcome and minimise serious complications, such as cord prolapse and infectious morbidity.

Conversely, a false-positive diagnosis of PROM especially preterm PROM may lead to unnecessary obstetric interventions, including hospitalisation, administration of antibiotics and corticosteroids, and even induction.
Studies in PROM especially preterm PROM are not adequate in our country. The studies that are available are mostly from the western countries. Studies from Eastern India especially our part are even more scarce.
Thus, it is our endeavor to find out the clinical and pathological signs of PROM and to find out the foetal and maternal outcome in this part of the country.

MATERIALS AND METHODS

Study design: Hospital based observational prospective study.

Sample size: 80 subjects fulfilling inclusion and exclusion criteria within study period following method of convenience and feasibility.
Sample size was calculated using the following formula: Sample size (n) = (1.96)2pq/d2 P= Prevalence =10% according to Sailaja Surayapalem et al[6] study q=100-p=100-10= 90% d=absolute precision=7% n= (1.96)2pq/d2 = (1.96)2×10×90/72 3457/49 = 70.56 = 71, which was rounded off to 80.

Inclusion Criteria: Pregnant mothers presenting with rupture of membranes between 32 weeks till onset of labour at Department of Obstetrics and Gynaecology, both OPD and Emergency.

Exclusion Criteria:
1. PPROM before 32 weeks 2. Maternal heart disease 3. Multiple pregnancy
4. Atypical presentations 5. Antepartum haemorrhage: Placenta Previa, Abruptio Placentae
6. Pre-eclampsia, eclampsia, chronic hypertension 7. Gestational diabetes mellitus
8. Patient needing immediate intervention due to any cause including severe chorioamnionitis.

RESULTS AND ANALYSIS

In our study, 46.3% have preterm PROM and 53.7% have term PROM. It is more common in age group of 21-30 years with mean age being 23.43 ± 5.039 years. Primigravida are more affected than multigravida. Majority mothers underwent vaginal delivery and in 45% cases delivery was induced. Amongst 36.3% cases with Caesarean section, the most common indication is foetal distress followed by oligohydramnios and induction failure. 45% cases have a positive CRP, 28.8% have a raised total leucocyte count more than 15000, 23.8% have urinary pus cells more than 5. 43.8% high vaginal swabs were positive for microorganisms and remaining were sterile.

Table No.1: Distribution according to Maternal complications

Maternal complications	Frequency	Percentage (%)
Puerperal fever	12	15
Wound infection	5	6.3
PPH	2	2.5
Maternal death	1	1.2
No complications	60	75
Total	80	100

The above table shows that 75% of the mothers included in the study were healthy. Out of the remaining, 15% had puerperal fever, 6.3% had wound infection, 2.5% had PPH and death happened in 1 case (1.2%).

Table 2: Association between high vaginal swab and maternal complications

Maternal complications	High vaginal swab			P value
	Positive	Negative	Total	
Puerperal fever	11(91.7%)	1(8.3%)	12(15%)	0.0001(Significant)
Wound infection	5(83.3%)	1(16.7%)	6(7.5%)	0.042(Significant)
PPH	4(100%)	0(0%)	4(5%)	0.020(Significant)
Maternal death	1(100%)	0(0%)	1(1.2%)	0.254
No complications	14(25.5%)	41(74.5%)	55(68.8%)	0.0001(Significant)
Total	35(43.8%)	45(56.3%)	80(100%)	

Table 3: Association between high vaginal swab and Neonatal outcome

Neonatal outcome	High vaginal swab			P value
	Positive	Negative	Total	
Still births	3(100%)	0	3(3.8%)	0.045(Significant)
LBW	9(69.2%)	4(30.8%)	13(16.3%)	0.043 (Significant)
Birth asphyxia	3(50%)	3(50%)	6(7.5%)	0.748
MAS	0	1(100%)	1(1.3%)	0.375
RDS	3(100%)	0	3(3.8%)	0.045(Significant)
Neonatal sepsis	3(100%)	0	3(3.8%)	0.045(Significant)
Neonatal death	3(75%)	1(25%)	4(5%)	0.034(Significant)
Healthy	10(21.3%)	37(78.7%)	47(58.8%)	0.0001(Significant)
Total	35(43.8%)	45(56.2%)	80(100%)	

Table 4: Association between gestational age and Neonatal outcome

Neonatal outcome	Gestational age		P value
	Pre term	Term	
Still births	3(100%)	0	0.057
LBW	13(100%)	0	0.0001(Significant)
Birth asphyxia	3(50%)	3(50%)	0.848
MAS	0	1(100%)	0.351
RDS	2(66.7%)	1(33.3%)	0.47
Neonatal sepsis	3(100%)	0	0.057
Neonatal death	3(75%)	1(25%)	0.237
Healthy	10(21.3%)	37(78.7%)	0.0001(Significant)
Total	37(46.3%)	43(53.7%)	

Test done: **Chi Square Test**. A value of $p < 0.05$ is considered as significant.

DISCUSSION

This study included 80 pregnant women and their foeto-maternal outcome could be followed up as the patients remained admitted till delivery (Maximum duration of admission was 3 weeks). Hence no patients were lost to follow up. Multiple variables and outcomes that were obtained are discussed below.

In this study, it was seen that 25% mothers had unfavourable outcome - 15% had puerperal fever, 6.3% had wound infection, 2.5% had PPH and death happened in 1 case (1.2%). The estimated occurrence of unfavourable maternal outcome in the study by S. Naveen Chandra et al[4] was 24.5% and the commonest maternal outcome was fever (67.3%) followed by puerperal sepsis (12.3%), wound infection (6.1%), postpartum haemorrhage (PPH) (6.1%), urinary tract infection (UTI) (4.1%), and lower respiratory tract infection (LRTI) (4.1%).

Amulya and Ashwini[8] had reported the estimated occurrence of maternal morbidity as 16.6%, of which febrile morbidity accounted to a maximum with 9.6%, wound infection 3.3 and 1.6% PPH and puerperal sepsis each.

Vishwakarma et al[9] in their study found nearly 15.0% to have any maternal morbidities and there were differences in the common maternal morbidities, wherein wound infection was noted among 6.3% of patients, fever and abdominal distention in around 3.5% each, and symptoms of chorioamnionitis in 2.1% of patients.

The differences in the noted findings have varied and might be due to the difference in the duration of PROM before admission and different sociodemographic profile of the patients. From our study, it has been seen that puerperal fever (91.7%), wound infection(83.3%), PPH (100%) and maternal death (100%) are more in those with a high vaginal swab showing growth as compared to those with no growth whereas no complications are much more in those with high vaginal swab negative (74.5%) for any growth rather than in those positive for growth.

Regarding maternal outcome, In the sterile group,62.5% of women and 45.45% of women in the non-sterile group had no maternal complications. PPH and puerperal pyrexia were more in those with a sterile swab and significant statistical association was found between the two groups ($p < 0.002$).

There is a significant statistical difference between those with puerperal fever ($p<0.0001$), wound infection ($p < 0.042$), PPH ($p<0.020$) and no complications ($p<0.0001$) between the two groups.

As for neonatal outcome, stillbirths (100%), LBW (69.2%), RDS (100%), neonatal sepsis (100%) and neonatal death (75%) are more in those with a high vaginal swab showing growth as compared to those with no growth whereas no complications are much more in those with high vaginal swab negative for growth (78.7%). Meconium aspiration syndrome (100%) is seen in those with swab showing no growth.

Birth asphyxia is seen equally in both groups with positive growth and no growth. Statistically there is significant difference between the two groups in terms of stillbirths ($p < 0.045$), LBW ($p<0.043$), neonatal death ($p<0.034$), neonatal sepsis ($p<0.045$), RDS ($p<0.045$) and no complications (0.001).

In this study it has been seen that the neonatal outcome in terms of stillbirth, birth asphyxia, MAS, RDS, neonatal sepsis and neonatal death is the same in both term and preterm PROM. However, a statistically significant difference existed between term PROM and preterm PROM groups in terms of LBW ($p<0.0001$), all of which is seen with preterm birth and healthy babies ($p<0.0001$) which is more in term PROM (78.7%) than in PPROM (21.3%).

Similar to findings in the present study, Charu Mahajan et al[10], reported more still births, Birth asphyxia MAS, cord sepsis, RDS in the non-sterile group compared with the sterile group, whereas healthy babies were noted more in those with a sterile swab culture and a statistically significant association was noted with a p value < 0.001.

SUMMARY

- Maximum number of mothers (51.2%) in our study population are between 21-30 years of age followed by 35% who are < 6 and 45% cases had a positive CRP of ≥ 6.
- The total leucocyte count is found to be ≤15000/cu. mm in 28.8% cases and in 71.2% cases >15000/cu. mm.
- Maximum patients (76.2%) did not have significant number of pus cells in urine. Only 23.8% patients had pus cells more than 5.
- Out of all the high vaginal swabs sent, 43.8% showed growth of organisms and were thus positive and 56.2% showed no growth and were thus negative.
- The organisms found in the swabs which came back positive are maximum (45.7%) MRSA followed by Escherechia coli in 25.7% cases, Acinetobacter baumanii in 11.4% cases, 8.6% for Proteus mirabilis, 5.7% for Klebsiella pneumoniae and 2.9% for Enterobacter species.
- Culture sensitivity of those organisms found in high vaginal swabs to antibiotics shows that maximum sensitivity was found in 36.7% to 66 Linezolid followed by 20% sensitivity to Amikacin and equal sensitivity of 16.7% to Colistin and Vancomycin. 6.6% shows sensitivity to Gentamycin and 3.3% to Levofloxacin.
- Out of 80 cases, 77 had livebirth whereas 3 cases had stillbirths. • Majority babies have birth weights between 2500-3000 followed by 25% between 1800 and 2500, 23.8% less than 1800 and 13.8% above 3000. The mean birth weight is 2390.36 ± 655.943 gms.
- 27 babies required SNCU admission for indications such as LBW, RDS, MAS, birth asphyxia whereas 50 babies were healthy.

• 58.9% neonates were healthy. Out of the remaining, most common outcome was LBW (16.3%) followed by birth asphyxia (7.5%), neonatal death (5%), stillbirth (3.8%), neonatal sepsis (3.8%), RDS (3.8%) and MAS (1.3%).

CONCLUSION

Prelabour Rupture of Membranes is a condition associated with high risk of maternal and perinatal morbidity and mortality. Thus, there is need for early diagnosis and management of PROM to reduce the adverse outcomes because of PROM.

LIMITATIONS

1. The study has been done at a tertiary care centre. It would have been better if mothers with prelabour rupture of membranes presenting to each level could be studied.
2. Our study did not include patients with high-risk conditions such as hypertension, gestational diabetes mellitus, multiple gestation, atypical presentation, etc. Thus, a detailed study with broader inclusion criteria should have been undertaken for validating the results so obtained.

DECLARATION:

Conflicts of interests: The author declare no conflicts of interest.
Author funding: Nill

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