European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 9, Issue 3, Winter 2022

Original Research

Pregnancy Outcome In Patients With Prelabour Rupture Of Membranes (Term And Preterm): A Retrospective Observational Study

[1]Dr Astha Lalwani, [2]Dr Yasmeen Farooq, [3]Dr Prachi Singh, [4]Dr Rehana Najam

[1,3]Associate Professor, [2]Assistant Professor, [4]Professor, Dept. of Obstetrics and Gynaecology, Teerthanker Mahaveer Medical College, Moradabad, Uttar Pradesh, India

Correspondence:
Dr Astha Lalwani
Associate Professor, Dept. of Obstetrics and Gynaecology, Teerthanker Mahaveer Medical College, Moradabad, Uttar Pradesh, India
Email: asthalalwanirastogi@gmail.com

ABSTRACT

Background: The fetal membranes (Amnion and Chorion) maintain their integrity throughout the pregnancy and rupture spontaneously during the second stage of labour or the late first stage of labour at term. Premature rupture of membranes (PROM) is defined as rupture of amniotic membranes prior to the onset of labour. If the membranes rupture after 37 weeks its called Premature Rupture of membranes (PROM) and if before 37completed weeks its called pre-term PROM (PPROM). The main aim of the study is to assess the pregnancy outcome, mode of delivery, neonatal outcome and the associated factors in patients presenting with premature rupture of membranes and comparing the outcome of term PROM with matched group of controls with intact membranes.

Methods: 182 cases having prelabour ruptured membranes and 514 controls were were collected with term gestational age and intact membranes for Observational Retrospective study over a period of 8 months from 1stJune 2019 to 31 January 2020 at TMMC&RC Moradabad UP. Progression and duration of labour, mode of delivery, latency period for PROM, PPROM and neonatal outcome were recorded.

Results: Prematurity and prolonged rupture of membranes are two important reasons of neonatal morbidity in PROM. Various factors like duration of labour, progression to clinical infection and gestational age affects the fetal outcome. Rates of Caesarean section is not increased by inducing the patients with ROM, and is comparable between patients of PPROM and PROM

Conclusion: With proper fetomaternal monitoring and timely interventions the neonatal outcome of premature rupture of membranes can definitely be optimized.

INTRODUCTION

During the intrauterine life, the fetus floats in the amniotic fluid, which keeps on increasingas the pregnancy advances. Its greatest at 34 weeks, nearly 800ml and then reduces to around 600ml. at 40 weeks. This amniotic fluid keeps circulating by the baby by his /her swallowing

and inhaling movements, exiting the fluid and replacing it by "exhalational" and urination.[1,2]
There are many functions of amniotic fluid for the fetus like:[3-5].

- By providing cushioning effect against sudden blows or jerky movement and thereby protecting the fetus from any injury.
- Making the free fetal movements possible and complete musculoskeletal development..
- Maintaining a constant environmental temperature around the fetus and hence protecting the it against the heat loss.
- Facilitating the proper lung development.

Normally the fetal membranes maintain their integrity throughout pregnancy and rupture spontaneously in the latter first stage or in the second stage of labour after 37 weeks.
Premature rupture of membranes PROM is defined as rupture of fetal membranes before the onset of labour after 37weeks.. Its called preterm (PPROM) i.e. membranes rupture before 37 weeks .[6]
PPROM is found in in 3% of pregnancies attributing to nearby 20 -30% of all preterm labour , contributing to neonatal morbidity and mortality.[7-8]
PPROM or PROM is can lead to fetal and maternal infections, neonatal sepsis, cord compressions and might be a marker of imminent delivery.[4]
It is also associated with other complications like placental abruption, cord prolapse and chorioamnionitis.
Various causes can be there like genetic, environmental , mechanical , microbiological or inflammatory . In 30% to 50% cases of PPROM , intraamniotic infection can be found ,thereby pointing towards the bacterial infection of the amniotic cavity as a strong causative factor for leaking. Many studies have also shown some genetic predisposing causes related to polymorphism of MMP-2, which can also lead to the highers incidence of PPROM [9]
Fetal membranes are made of outer chorion,inner amnion and collagen rich connective tissue. Weak membranes is the major mechanism of PPROM which may be due to reduction in size of membrane, reduction in type III collagen or overall reduction in collagen content. Bacterial infection liberating proteolytic enzymes is is also an important cause of PPROM[10].
Maternal complications associated with PPROM can be chorioamnionitis, placental abruption, post partum endometritis, dysfunctional labour, increased operative interference and increased chances of postpartum hemorrhage[11,12]. Neonatal complications following PPROM include prematurity, sepsis and respiratory distress syndrome, periventricular leucomalacia, IVH and cerebral palsy.[13,14]
The major clinical characteristics which affect the outcome include severity of oligohydramnios, gestational age at which is membranes rupture and the duration of oligohydramnios. The rupture of membranes at early gestational age was found to be associated with perinatal deaths, abnormal facies, Potters facies, deformities of extremities, growth delay and pulmonary hypoplasia[15].
The optimal management of pregnancy complicated by PPROM is still a matter of dilemma and controversy in obstetrics. There has to be a critical balance between the expectant management of pregnancy for better lund maturity vs termination of the pregnancy to prevent neonatal sepsis. Expectant management allows pregnancy prolongation with chances of improved neonatal outcome, but poses a significant risk of development of maternal

chorioamnionitis and thereby neonatal sepsis. Hence the decision of conservative management requires close monitoring for placental abruption, infection, labour, cord compression etc , leading to non-reassuring fetal status. Several studies have compared expectant management with labour induction after 34 weeks and they found increased risk of chorioamnionitis, neonatal infection and increased length of hospital stay in expectant management. Few studies suggested that if there is no indication to deliver, one should try for expectant management in patients at 34 weeks to 36 weeks 6 days. Two RCT's (the PPROMEXIL trial and PPROMEXIL2) found no increased risk of neonatal sepsis with expectant management.[4-] 8,16-19

Hence, there has to be a proper balance between expectant management and planning delivery to optimize the neonatal outcome. Hence this study is undertaken to compare the mode of treatment and the neonatal outcome in patients with premature leaking per vaginum.

MATERIALS AND METHODS

Its a Retrospective study done for 8 months from 1st June 2019 to 31stJanuary 2020. In the duration of 8 months, 182 cases of rupture of membranes beyond 26weeks were studied. A similar term group of patients who came in labour without PROM, without meconium staining of liquor and without any risk factors were taken as control. Every detail including age, sociodemographic factors, obstetric history, obstetric score, period of gestation, menstrual history and any risk factors. Complete general examination details were recorded in the proforma . Obstetric Examination details at the time of admission were also noted.All otherinvestigations like CBC, Blood Sugar, Urine R/E, CRP were entered. Non-Stress Test; Ultrasound findings of serial Amniotic fluid index was noted.

All patients enrolled were found to be on broad spectrum antibiotics, steroids (betnesol) 12mg 2 doses 24 hrs apart. All the entry was made regarding any progression to chorioamnionitis, gestational age at termination, indication of termination and mode of termination was recorded.

Progress and duration of labour, latency period for PPROM, induction delivery interval was noted. Also neonatal birth APGAR, signs of prematurity , Respiratory distress, Sepsis, NICU admissions, neonatal morbidities and mortality were noted. If PPROM exceeded 18hours, all the babies were found to be started on empirical IV antibiotics and septic

screen including CRP, CBC, Blood and NasoGastric aspirate culture which was sent was noted.Confirmed cases of neonatal sepsis were entered**.**

INCLUSION CRITERIA

CASES

Singleton pregnancy between 28-42 weeks with confirmed cases of leaking per vaginumwith clear liquor, not in labour with cervical dilatation less than 3cm.

CONTROL

Singleton pregnancies at or beyond 37 weeks without PROM and noMedical conditions like Preeclampsia, GDM , anaemia and heart disease.

CRITERIA FOR NEONATAL SEPSIS [9]

1. Blood C/S positive (definite sepsis)
2. Other signs and symptoms of clinical sepsis.

RESULTS

Table 1: Comparison in the type of Presentations in PROM and PPROM

Presentation	PROM	PPROM
Cephalic	124	47
Breech	6	3
Brow	1	-
Umbilical Cord	-	1
Total	131	51

Incidence of breech was more with PPROM as compared to PROM (5.8% vs 4.5%). There was a single case of umbilical cord prolapse at 34 weeks gestation along with breech presentation, which was taken for emergency Caesarean section.

Table 2: Admission – Delivery Interval (latency period) in PROM and PPROM

Interval	**PROM**	**PPROM**
< 6 Hrs	26	6
6- 12 hrs	50	14
13- 24 hrs	25	13
24- 48 hrs	3	-
48- 72 hrs	-	4
72- 96 hrs	-	4
> 96 hrs	-	8
TOTAL	104	49

20 patients in PPROM group had h/o previous LSCS with unfavourable cervix, and 7 had malpresentations and hence were taken for repeat LSCS on admission. 104 patients were induced in PROM group; of these 73% (76 out of 104) delivered within 12 hrs of admission (post induction) and 97.1% delivered within 24 hrs. 2.8% of patients delivered after 24 hrs. The remaining 27 patients were offered direct CS without a trial of labour (because of previous LSCS with unfavourable cervix or malpresentation). In the PPROM group, 1 patient had more than 35 weeks gestation with previous LSCS and unfavourable cervix, and 1 patient had cord prolapse and were hence taken up for LSCS at admission ,49 patients were monitored for duration of labour.

Patients at and above 37 weeks were found to be terminated soon after leaking .Patients with gestational age from 34 weeks to 35 weeks were managed conservatively till steroid prophylaxis for lung maturity if no signs of chorioamnionitis were present.

Patients with GA from 28 weeks to 34 weeks were started on antibiotics, given steroids for lung maturity and tocolytic if needed till betnesol cover. Patients at or more than 35 weeks of gestation were induced. Term patients with previous LSCS who were not in labour with unfavorable cervix were taken up for repeat LSCS.

Patients with less than 32 weeks' gestation were managed expectantly till they progressed into labour, which occurred after an average of 7 days in spite of antibiotics. Patients above35 completed weeks were planned for induction at admission after confirmation of PPROM. Of these patients, 69% delivered within 24 hrs of induction.

Table 3: Nature of labour in PROM and PPROM

Nature	PROM	PPROM
Induction	104	34
Spontaneous	-	12

104 patients of term PROM were induced without a latency period .27 patients were taken for elective LSCS (for malpresentations or previous LSCS). Similarly, in PPROM group, 34 patients between 36-37 weeks were induced; 12 went into spontaneously labour and 5 were taken electively for LSCS (previous LSCS, malpresentations).

Table 4: Outcome of induction in PROM and PPROM

Outcome of Induction	PROM	PPROM	Total
Vaginal	84	28	112
LSCS	20	06	26
Total	104	34	138

The significance of the difference between the 2 groups viz. PROM and PPROM may be tested by using χ^2 Test .

H_0: There is no significant difference in the outcome of induction between the two groups of PROM and PPROM.

There is significant difference between the two groups.

Level of significance = 0.05

Degree of freedom = (2-1) (2-1) = 1

Expected Frequencies

	PROM	PPROM	Total
Vaginal	84.41	27.59	112
LSCS	19.59	6.41	26
Total	104	34	138

$$\chi^2 = \frac{\Sigma(O-E)^2}{E}$$

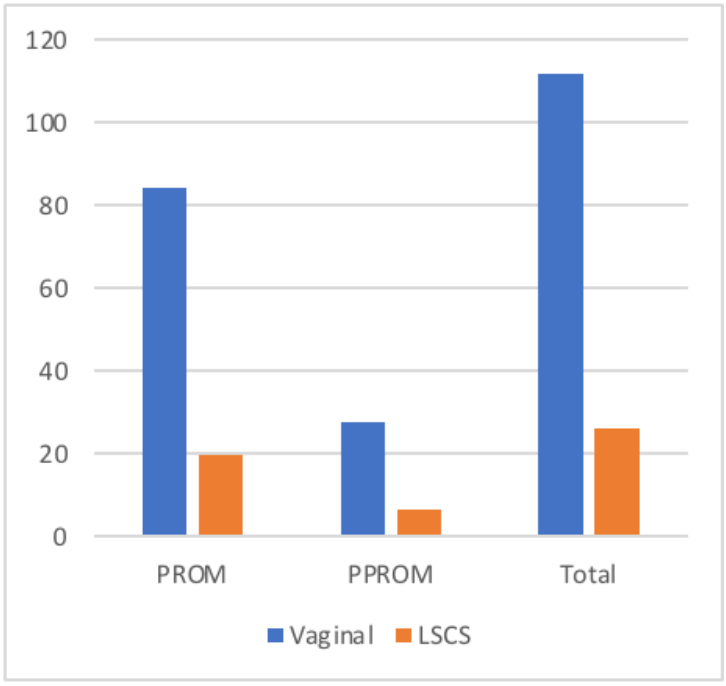
Calculation of χ^2s

O	E	(O-E)^2	(O-E)^2/E
84.00	84.41	0.17	0.00
20.00	19.59	0.17	0.01
28.00	27.59	0.17	0.01
6.00	6.41	0.17	0.03
		Total	0.04

From the table $\chi^2 = 0.042 < 3.84$

I.e. the calculated value is less than the tabulated value of χ^2 0.05 at 1 d.f. Hence H node is accepted.

Figure 1: Comparison of mode of delivery



84 patients (80.7%) out of 104 delivered vaginally in the PROM group, and the remaining20 were taken up for LSCS for failed induction, fetal distress, arrest of descent etc.

In the PPROM group, 28(82.3%) deliverd vaginally out of 34 inductions. Both results are comparable. Hence there was no increased risk of failed induction with induction of labour at admission. We had 514 term inductions in the control group during the study period for other reasons (with intact membranes), out of which 90 cases were taken up for failed induction.

Table 5: Outcome of Induction in PROM vs control

	PROM	**Control**	**Total**
Vaginal	84	424	508
LSCS	20	90	110
Total	104	514	618

The significance of the difference in the outcome of induction between the 2 groups viz. PROM and Control may be tested by using χ^2 Test

H_0: There is no significance difference in the outcome of inductions between the PROM and Control groups.

H_1: There is significant difference between the two groups

Level of Significance = 0.05
Degree of freedom = (2-1) (2-1) = 1
Expected Frequencies

	PROM	Control	Total
Vaginal	85.49	422.51	508
LSCS	18.51	91.49	110
Total	104	514	618

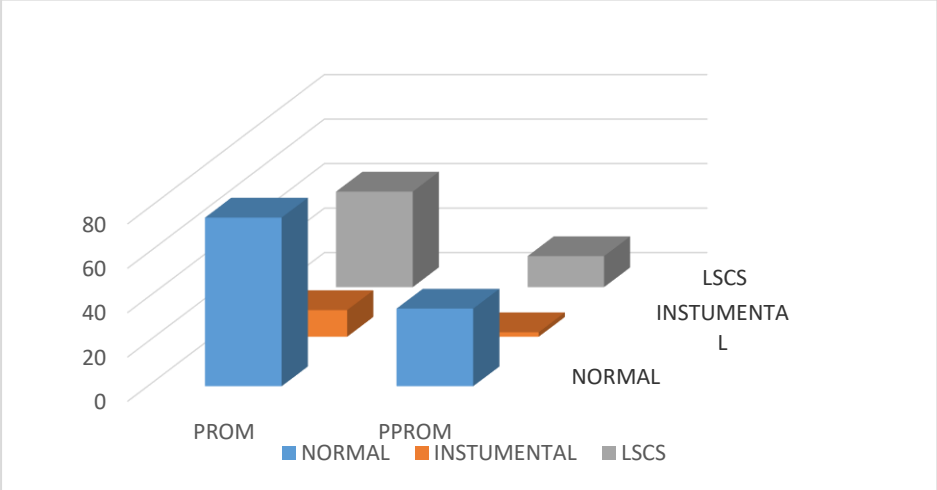
The value of $\chi^2 = \frac{\sum(O-E)^2}{E}$

Calculation of χ^2

O	E	$(O-E)^2$	$(O-E)^2/E$
84	85.49	2.22	0.03
20.00	18.51	2.22	0.12
424.00	422.51	2.22	0.01
90.00	91.99	2.22	0.02
Total			0.18

From the table $\chi^2 = 0.18 < 3.84$
i.e. the calculated value is less than the tabulated value of χ^2 0.05 at 1 d.f. Hence H_0 is accepted.

Figure 2: comparison of mode of deliveries in PROM and PPROM



NORMAL INSTUMENTAL LSCS

In both groups the number of normal vaginal deliveries was highest i.e. 76 in PROM and 35 in PPROM. This was followed by LCSC, 43 in PROM and 14 in PPROM; and by instrumental deliveries, 12 in PROM and 2 in PPROM.

Table 6: Comparison of causes for LSCS in PROM and PPROM		
	PROM	PPROM
Failed Induction	7	3
Arrest of Descent	2	0
Failure to Progress	5	2
Fetal Distress	3	3
Malpresentations	6	4
Previous LSCS	20	2
Total	43	14

The most common indication of LSCS in PROM group was h/o previous LSCS with unfavorable cervix, followed by mal presentation. Incidence of failed induction was comparable to control as discussed above. Mal presentation (breech) was the most common cause in preterm PROM. Combined failure to progress and arrest of descent was other significant cause in PROM patients.

Table 7: Comparison of APGAR at birth in PROM and PPROM			
APGAR	PROM	PPROM	Total
LOW APGAR	4	6	10
NORMAL APGAR	127	45	172
Total	131	51	182

If PPROM exceeded 18 hours, all the babies were found to be started on empirical IV antibiotics and septic screen including CRP, CBC, Blood and NasoGastric aspirate culturewas sent.

Most of babies at term had good APGAR at birth. In preterm babies, incidence of low APGAR was higher due to prematurity.

Table 8: Comparison of NeoNatal Outcome in PROM, PPROM and Control Groups			
Neonatal Condition	PROM	PPROM	Control (Term)
Ventilated (Prematurity)	-	4	-
Birth Asphyxia	2	-	10
RDS	2	7	12
Abdominal Distension, Poor Feeding	4	2	-
Seizures	1	3	8
Hypovolemia, Poor Perfusion	-	1	2
Culture Positive Sepsis	2	3	2
Skin Pustules	4	-	4

The main morbidity was in terms of - prematurity in PPROM less than 32 weeks; sepsis with most common presentation as RDS in preterm babies and Gl symptoms in term babies; perinatal asphyxia with low birth Apgar. Babies with suspicion of sepsis were admitted in NICU, tested for CRP and blood culture. Clinical sepsis was diagnosed with symptoms of sepsis and raised CRP. Babies with raised CRP or with other signs / symptoms of sepsis\ and

blood culture positive were started on i.v antibiotics. Birth asphyxia was found in 2 patients with PROM. Clinical sepsis was found in 9 PROM babies (6.8%) and 16 PPROM babies (31.3%). Blood culture was positive for 5 babies. (4 Klebsiella, 1 Gram positive bacilli). In the control group (520 patients with term gestation, with intact membranes before labour with clear liquor and non-complicated pregnancies), over 2 years, we had 12 cases of RDS and 10 cases of birth asphyxia. Results were comparable to patients with term PROM.

Table 9: The incidence of neonatal sepsis with duration of labour

Neonatal Sepsis	>= 18 Hrs	< 18 Hrs
25	17	8

Out of 25 cases of neonatal sepsis, 17 cases (68%) were associated with prolonged labour of more than 18 hrs as compared to 8 cases with less than 18 hrs of labour.

DISCUSSION

Neonatal outcome was mainly in terms of low birth apgar with perinatal asphyxia prematurity leading to ventilator support and long NICU care, in terms of neonatal sepsis either with clinical signs (culture negative) and its systemic manifestations or culture positive sepsis; and lastly in terms of mortality mainly due to extreme prematurity (its complications) and Severe sepsis syndrome.

In PPROM patients low apgar was around 11.7%, and in PROM patients incidence of low birth apgar was 3%. Out of total cases of PPROM, 7.8% required ventilator support due to extreme prematurity. 31.3% of PPROM cases had neonatal sepsis with various signs and symptoms. 6.8% of PROM cases had neonatal sepsis with various signs and symptoms.

Respiratory distress (tachypnea) was most common symptom of early onset sepsis in my study (26.6%), followed by GI symptoms of poor feeding, vomiting and abdominal distension (23%), seizures were found in (10%), and hypervolemia / poor perfusion in (3.3%) of babies. Chaudhari et al found the most common symptom of sepsis as refusal to feed followed by lethargy in his study[20].

RDS was more in preterm PROM babies, whereas Gl symptoms were more in term PROM babies. Prematurity was the main cause for morbidity in preterm PROM (< 32 weeks), requiring prolonged NICU admissions.

Iv antibiotics was given for all babies with raised CRP and clinical signs of sepsis (even if blood culture was negative) along with those babies who had prolonged rupture of membranes (>18 hrs).

Sita Ram Shrestha[21]study revealed that 24% of term neonates had infection and out of these, septicaemia was seen in 15%, pneumonia in 7% and meningitis in 2% of cases, these results were comparable to study done by Anjana Devi[22].

Incidence of perinatal asphyxia in this study was 1.5% in term PROM and 8% in non PROM, suggesting that incidence of asphyxia due to cord compression or subclinical chorioamnionitis in itself is very low in term PROM. Also incidence of neonatal sepsis in non PROM was 8%, thereby suggesting that term PROM in itself doesn't lead to increased incidence of neonatal sepsis.

Sita Ram[21]showed that incidence of fetal distress in PROM group was 5% and in non PROM group it was 2%. Also it showed that incidence of sepsis in PROM group was 24% as

compared to 1% in non PROM group. No mortality was reported in both PROM and non PROM group in the study. It suggests that PROM itself does not increases incidence of mortality unless patient is not monitored, or associated with other obstetric complications.

Yu H, Wang X et al reported 7.4 % of neonatal mortality with PPROM , major neonatal complications in 40% and NICU admissions in 72.9% neonates.[23]

In my study total inductions were 75% out of which 26.8 were in PPROM group (mostly above 35 weeks) and 73.2% were in PROM group.

Only 10% of total cases progressed spontaneously into labour of which all were PPROM lesser than 35 weeks of gestation age. Rest of 25% were with previous ceasarean sections, with unfavorable cervix taken up electively for repeat Caesarean section. Out of 34 inductions in PPROM group, 28(82.3%) delivered vaginally, and out of 104 inductions in PPROM group, 84 (80.7%) delivered vaginally. Both values are almost same and the difference is insignificant. Also incidence of vaginal delivery after induction due to other reasons was found to be about 82.4% which is comparable to 80.7% rate after induction in PROM patients. Hence by inducing the term PROM patients, we didnt increase the cesarean section.

Duration of labour (admissions-delivery interval) for 49.5% patients with PROM who were induced was between 6-12 hours. 25.7% patients delivered within 6 hours. 24.7% delivered in 13-24hr. Hardly 2.9% patients delivered in 24 to 48 hours.

In patients with PPROM with less than 34 weeks completed, latency period was maintained for steroid prophylaxis along with antibiotics. These patients went in spontaneous labour maximum within 7 days of admission in spite of antibiotics. All of these patients delivered vaginally. Those patients with over 35 weeks and above for induced for labour without latency period. Hence, admissions- delivery interval (latency period) was 6 to 12 hours was 28.8% of PPROM patients, 13-24hours for 27% ; more than 96 hours for 15.3% of patients, less than six hours for 11.5% patients and 48 to 72 hours for 9.6% of patients and 72 to 96 hours for 7.6% patients. As already mentioned duration of labour was important predictor of neonatal and maternal chances of postnatal infection. 68% of babies with early onset sepsis delivered after 18 hours and 32% of babies with sepsis before 18 hours. Mode of delivery was divided as normal vaginal, instrumental or by cesarean section. In PPROM patients normal delivery rate was about 78% followed by cesarean section as 28% and instrumental as 4%. In PROM patients normal delivery rate was 57.5% followed by Caesarean section rates of 33.3% and instrumental delivery was 9%. In Anjana Devi study[22], 42.5% delivered to vaginally, 42.2% by cesarean section and 12.4% by instruments in PROM patients Most common cause of cesarean section in total PROM patients was failed induction (43%) followed by failure to progress and arrest of labour. In PPROM malpresentation was the other major course.

Thus we conclude that, the neonatal morbidity was mainly because of pre-maturity in PPROM group leading to RDS (ventilator support and prolonged in NICU admissions) neonatal sepsis either clinical sepsis or culture positive of sepsis. In clinical sepsis apart from a RDS, babies had seizures, GIT symptoms and hypovolaemia. The important factors affecting neonatal outcomes were gestational age and duration of labour, suggesting that preterm babies had increased incidence of neonatal sepsis and prolonged duration of labour (more than 18 hours) babies had more incidence of neonatal sepsis.

CONCLUSION

1. Prelabour rupture of membranes is not associated with increased neonatal morbidity unless associated with prematurity and prolonged rupture of membranes.
2. In Preterm prelabour rupture of membranes, prematurity is the main cause of neonatal morbidity and mortality.
3. The fetal outcome largely depends on duration of labour , progression to clinical infection and gestational age, more incidence of neonatal sepsis in preterm babie with long duration of labour.
4. Neonatal outcome was optimised by immediate induction of labour in patients with leaking at term ,s without increasing the incidence of LSCS.
5. Induction of labour in PPROM patients beyond 35 weeks had comparable neonatal outcome to term PROM patients without increasing maternal morbidity.
6. Fetomaternal monitoring and timely interventions definitely play an important role in optimizing fetomaternal outcome and reduce serious neonatal morbidities.

REFERENCES

1. Mereer BM. Preterm premature rupture of the membranes, ObstetGynecol 2003;101;178-193.
2. Gomez H. The fetal inflammatory response syndrome. AJOG 1998;
3. 179:194-202. 3) Yoon P. Serum CRP, WBC, AF WBC in PPROM. Obstet gynecol 1996; 88: 1034- 1040.
4. Bek KM. CRP and pregnancy. An early indicator of chorioamnionitis- A review. Eu J obstetgynecol Repod 1990; 35: 29-33.
5. Ohlsson M. An analysis of antenatal test to detect infection in PROM. AJOG 1990; 162: 809-819.
6. Trochez C. Use of CRP as a predictor of chorioamnionitis in PPROM. BJOG 2007; 114: 796-801.
7. Mercer BM, Petraglia F,Strauss GF, Gabbe SG. Premature rupture of membrane in complicated preganancy. Informa Health care London 4th edition. 2007.pp.713-727.
8. Weissmann-Brenner A, O'Reilly-green C, Ferber A, Divon MY. Values of amniotic fluid index on cases of preterm premature rupture of membranes.J Perinat Med 2009;37(3):232-235
9. Ernesto Gonzalez-Mesa et al, Obstetric and Perinatal outcomes after very early Preterm Premature rupture of membranes- A retrospective anaylysis over a period 2000-2020 , Medicina 2021, 57,469
10. Khan S et al. Int J Reprod Contracept Obstet Gynecol.2016;5(8): 2768-74. 4- ACOG Committee on Practice Bulliten-Obstetrics.
11. ACOG Practice Bulliten No. 80:premature rupture of membranes.Clinical management guidelines for obstetrician gynaecologists. Obstet Gynnecol 2007;109:1007-10.
12. El-Messidi A, Cameron A.Diagnosis of premature rupture of membranes: inspiration from past and insights for the future.J Obstet Gynaecol Can. 2010;32(6):561-9.
13. Ratanahorn W, Srijariya W,Chamnanvana HS,Saengaroon P.Incidence of Neonatal

Infection in Newborn Infants with a maternal hstory of PROM for 18 hours or longer at Phramongkutklao Hospital.Clinical Practice Guidelines (CPG Med Assoc Thai).2005;88(7):973.

14. Walling AD, Henyon S. Antibiotics for the preterm rupture of membranes:A systemic review.ObstetGynecol.2004;(104):105-7.
15. Kayem A. IL-6 detection in vaginal fluid with PPROM & its association with neonatal infection; A rapid immunochromatographic test. AJOG 2005; 192; 140-145.
16. Morris J M et al ; PPROMT Collaboration. Immediate delivery compared with expectant management after preterm prelabour rupture of membranes close to term: a randomised controlled trial.Lancet.2016;387:444-452.
17. Vander Ham DP,et al. Management of Late Preterm Premature Rupture ofMembranes: the PPROMEXIL-2 trial Am J Obstet Gynecol 2012;207:276
18. Mercer H, Kenyon E. Antibiotic therapy for reduction of infant morbidity after PROM.
19. Kenyon E. Broad spectrum antibiotics for PPROM, Oracle-1Randomized trial. LANCET 2001; 357:979-986.
20. K Chaudhary, B Shah and D Gosai " Study of etiology , risk factors , clinicalfeatures and outcome in blood culture proven late onset septicaemia" International Journal Of Scientific Research, vol.4, no.12,pp.119-121,2016
21. Sita Ram Shrestha. Fetal outcome of PPROM. N J obstetgynecol Nov 2006;1:19-24.
22. Devi A. PROM: A clinical study obstetgynecol 1996; 46:63-76. 23) YuH, Wang X et al . Perinatal Outcomes of pregnancies complicated by preterm premature rupture of membranes before 34 weeks of gestation in a tertiary centre in China : A Retrospective review. Biosci Trends. 2015; 9(1): 35-41