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# Perinatal outcome in pregnancies with preterm premature rupture of membranes inclusive of extreme pre term

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**Abstract**
**Background:** The major cause of neonatal morbidity and mortality is preterm birth due to: preterm premature rupture of membrane (PPROM), preterm labour, and early delivery resulting from medical intervention. PPROM is defined as a rupture of the amniotic membranes before 37 weeks' gestation and before the onset of labour, while extreme PPROM occurs before 26 weeks' gestation. PPROM is a serious condition leading to approximately one-third of preterm births and it complicates about 3% of pregnancies [1].
**Advances in Knowledge:** Few studies have looked at preterm premature rupture of membranes (PPROM) or possible outcomes for mothers and fetuses. This complication carries a significant morbidity and mortality rate and affects the perinatal outcome.
**Application to Patient Care:** The results of this study will help in increasing awareness of PPROM for both the obstetricians and neonatologists and encourage close follow-up, proper management and counselling for this high risk group.
**Aim:** To study perinatal outcome in preterm premature rupture of membrane and their associated risk factors.
**Methods:** A retrospective cohort study with a sample size of 100 consecutive pregnant women was conducted from January 2018 to December 2018. All the participants were women who presented with PPROM.
**Results:**
**Discussion:** PPROM was more common in age group of less than 25 years with a incidence of 58%. Ina study by Noor *et al* in Ayub medical college in 2006 demonstrated that (58.8%) higher incidence among younger age group.
**Conclusion:** PPROM was more common in younger age group. PPROM was not associated with previous history, booking status or previous abortion. Majority of neonatal morbidity was due to RDS In present study RDS was common in early preterm group
In current study most of patients delivered vaginally compared to 36% of LSCS.

**Keywords:** PPROM, respiratory disease

## Introduction
The major cause of neonatal morbidity and mortality is preterm birth due to: preterm premature rupture of membrane (PPROM), preterm labour, and early delivery resulting from medical intervention. PROM is defined as a rupture of the amniotic membranes before 37 weeks' gestation and before the onset of labour, while extreme PPROM occurs before 26 weeks' gestation. PPROM is a serious condition leading to approximately one-third of preterm births and it complicates about 3% of pregnancies [1]. It is associated with many perinatal complications including neonatal sepsis, respiratory distress syndrome (RDS), placental abruption, and eventually fetal death, and carries a 1 to 2% risk of fetal death [2]. In addition, PPROM puts the mother at risk for infection (Chorioamnionitis) and premature delivery, and increases the risk of Caesarean section delivery.
Risk factors for PPROM are trauma, passive smoking, bacterial infection, or inflammation. Women with darker skin tone are at higher risk compared to women with lighter skin [3]. Other higher risk groups are those with a previous history of preterm delivery, those who are experiencing vaginal bleeding, or those with uterine distension. In addition, low socioeconomic status, a history of sexually transmitted infections, genetic and/or enzymatic abnormalities, nutritional deficiencies, an incompetent cervix, and placental abruption are known predisposing

factors [4, 5]. Procedures like amniocentesis and cerclage may result in PPROM. PPROM has been suggested to be due to decrease collagen content of the amniotic membranes and is more likely a multifactorial phenomenon [6]. Proper evaluation and management are necessary in order to improve neonatal outcomes. Corticosteroids are effective in reducing many neonatal complications, especially RDS and intraventricular haemorrhage. Antibiotics can be used effectively to increase the latency period. However, management of PPROM varies according to the gestational age of the fetus. In the United States, approximately 1% of pregnancies are complicated by PPROM between 16 and 26 weeks' gestation, resulting in a potential risk of neonatal complications and death [7, 8].

Little has been published in the literature above PPROM and extreme preterm birth. Therefore, the purpose of the study was to look at foetal outcome in such a scenario.

The results of the study will help Obstetricians and Neonatologists in counselling couples.

## Methods

A retrospective cohort study with a sample size of 100 consecutive pregnant women was conducted from January 2018 to December 2018. All the participants were women who presented with PPROM. They delivered and received medical care at Govt. Kilpauk Medical College Hospital, Chennai and their data was available. The hospital database, including medical records, and labour ward and NICU registries were used to obtain the following information: 1) maternal demographics; 2) gestational age at PPROM and at admission; 3) neonatal outcomes (specifically Respiraory Tract Disease).

## Aim

To study perinatal outcome in preterm premature rupture of membrane and their associated risk factors.

## Methods

A retrospective cohort study with a sample size of 100 consecutive pregnant women was conducted from January 2018 to December 2018. All the participants were women who presented with PPROM.

## Study method

This was Retrospective cohort study which was carried out those pregnant women admitted with preterm premature rupture of membranes between 26-36 weeks of gestation.

Diagnosis of PPROM was based on history and vaginal examination. A history of sudden discharge of amniotic fluid from the vagina or feeling wet with a pooling of amniotic fluid in the posterior fornix on sterile speculum examination or ferning test confirmed the diagnosis. Finally, ultrasonography was done to assess the amniotic fluid index. The patients were managed conservatively in the obstetrical ward and monitored for signs of chorioamnionitis or fetal compromise. All patients received oral erythromycin for 10 days and steroids for fetal lung maturity at gestational ages of 24 weeks and above. The diagnosis of clinical chorioamnionitis was based on the presence of two or more of the following symptoms: purulent vaginal discharge, maternal pyrexia with uterine tenderness, fetal tachycardia, or non-reassuring fetal heart tracing on the cardiotocogram. Indications for delivery included clinical chorioamnionitis, fetal death, or advanced labour. Viability was defined as a gestational age of 24 weeks and above, or an estimated fetal weight of 500 gr or above. Patients who stopped leaking and had a normal amniotic fluid index were managed as outpatients with weekly complete blood count (CBC) and fetal ultrasound. They were asked to report to hospital for concerns such as fever, abdominal pains, foul smelling discharge, or reduced fetal movements. These patients were allowed to go to term. Patients who continued to leak were managed as inpatients and delivered at 34 weeks' gestation.

## Results

One hundred consecutive pregnant women with PPROM were included in this retrospective study. Univariate, Bivariate and Multivariarte Binary logistic regression analysis was carried out for all independent variables with respect to Respiratory Track Disease dependent variable. A multivariate analysis was used to find the association between PPROM and neonatal morbidities especially Respiratory Tract Disease by using Med calc 14 software. Appropriate charts, depending on the type of variables, were drawn to illustrate the results.

**Table 1:** N=100

| Age | Respiratory Disease N=77 | No N=23 |
|---|---|---|
| <=25 | 38 | 20 |
| 26-30 | 30 | 3 |
| >30 | 9 | 0 |
| **BMI** | | |
| Normal | 10 | 8 |
| Over weight | 47 | 12 |
| Obese | 20 | 3 |
| **Mode of Delivery** | | |
| Normal | 46 | 17 |
| LSCS | 31 | 6 |
| **GHT** | | |
| Yes | 2 | 6 |
| No | 75 | 17 |
| **GDM** | | |
| Yes | 8 | 3 |
| No | 69 | 20 |
| **Liquor** | | |
| AFI>8 | 49 | 20 |
| AFI 5-8 | 6 | 0 |
| FI <5 | 22 | 3 |

**Table 2:** Perinatal outcomes percentage

| | |
|---|---|
| NICU admission | 77 |
| NO | 23 |
| Photosynthesis | 60 |
| No Photosynthesis | 40 |
| Death | 10 |
| Alive | 90 |
| Respiratory Disease | 77 |
| No Respiratory Disease | 23 |

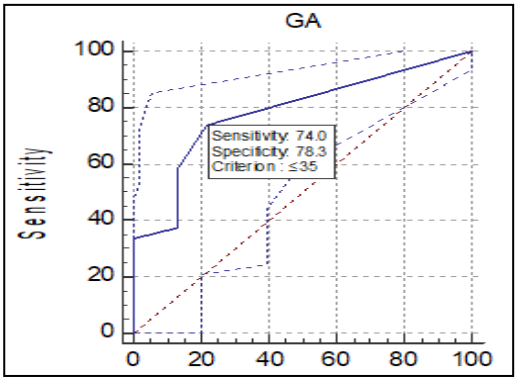


**Fig 1:** 100 specificity

**Table 3:** Logistic regression

| Dependent Y | RD |
|---|---|
| Method | Stepwise |
| Enter variable if P< | 0.05 |
| Remove variable if P> | 0.1 |
| Sample size | 100 |
| Cases with Y=0 | 23 (23.00%) |
| Cases with Y=1 | 77 (77.00%) |

**Overall Model Fit**

| | |
|---|---|
| Null model -2 Log Likelihood | 107.855 |
| Full model -2 Log Likelihood | 49.465 |
| Chi-squared | 58.391 |
| DF | 5 |
| Significance level | P < 0.0001 |

**Coefficients and Standard Errors**

| Variable | Coefficient | Std. Error | P |
|---|---|---|---|
| AGE | 0.37307 | 0.14894 | 0.0122 |
| BMI | 0.51675 | 0.16764 | 0.0021 |
| GA | -0.73827 | 0.22593 | 0.0011 |
| GHT | -8.27633 | 2.21370 | 0.0002 |
| LIQUOR | 1.23754 | 0.55630 | 0.0261 |
| Constant | 4.1936 | | |

| Variables not included in the model |
|---|
| GDM |
| PRE_ECLA |

**Odds Ratios and 95% Confidence Intervals**

| Variable | Odds ratio | 95% CI |
|---|---|---|
| AGE | 1.4522 | 1.0845 to 1.9445 |
| BMI | 1.6766 | 1.2070 to 2.3287 |
| GA | 0.4779 | 0.3069 to 0.7442 |
| GHT | 0.0003 | 0.0000 to 0.0195 |
| LIQUOR | 3.4471 | 1.1586 to 10.2563 |

**Hosmer & Lemeshow test**

| | |
|---|---|
| Chi-squared | 30.2567 |
| DF | 8 |
| Significance level | P = 0.0002 |

**ROC curve analysis**

| | |
|---|---|
| Area under the ROC curve (AUC) | 0.931 |
| Standard Error | 0.0356 |
| 95% Confidence interval | 0.863 to 0.972 |

In Binary Logistic Regression Equation the following variables were statistically significant and the following are the equation format.

1. Age 2. BMI 3. Gestational Age 4. Gestational Hypertension 5. Liquor Adequate or Not.

BLR Equation = 4.1936+0.37307* AGE+0.51675* BMI-0.73827*GA-8.27633*GH+1.23754*Liquor

Using this above equation, Log values obtained and the ROC curve plotted.

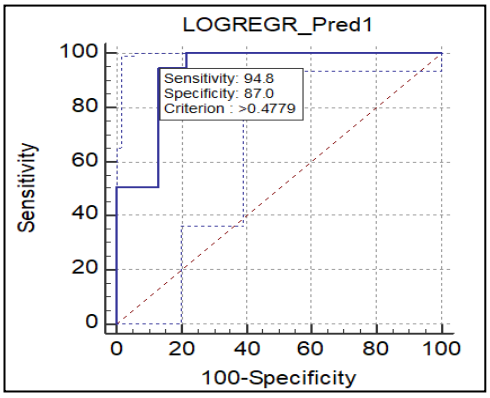


**Fig 2:** Logregr_pred 1

From above Receiving Operating Characteristi c curve, we got the optimum criterion >0.4779. Sensitivity is 94.8 and specificity is 87.0 and Area Under curve is 0.931. This conclude that through Binary logistic Regression scoring equation, we got the area under curve 0.931, which is a very good prediction. The associated risk parameters were, Age, BMI, Gestational Age, Gestational Hypertension and liquor in adequate.

**ROC curve**

| Variable | LOGREGR_Pred1 |
|---|---|
| Classification variable | RD |
| Sample size | 100 |
| Positive group : RD = 1 | 77 |
| Negative group : RD = 0 | 23 |
| Disease prevalence (%) | unknown |

**Area under the ROC curve (AUC)**

| Area under the ROC curve (AUC) | 0.931 |
|---|---|
| Standard Error[a] | 0.0362 |
| 95% Confidence interval[b] | 0.863 to 0.972 |
| z statistic | 11.922 |
| Significance level P (Area=0.5) | <0.0001 |

[a] DeLong *et al*., 1988

[b] Binomial exact

## Discussion

PPROM was more common in age group of less than 25 years with a incidence of 58%. Ina study by Noor *et al* in Ayub medical college in 2006 demonstrated that (58.8%) higher incidence among younger age group.

In our study 63% of patients had delivered vaginally and 37% had delivered by LSCS. In a study by Sheela at al 65% had vaginal delivery compared to 16% by LSCS.

Majority of neonatal morbidity noted in our study was Respiratory distress contributing to 77%. Respiratory distress was common in early PPROM.

## Conclusion

PPROM was more common in younger age group. PPROM was not associated with previous history, booked or un booked and previous abortion. Majority of neonatal morbidity was due to RDS in present study RDS was common in early preterm group

In current study most of patients delivered vaginally compared to 36% of LSCS. The sensitivity & Specificity of PProm in

detecting RDS, using ROC curve 74% to 78.3%. In Multivariate Binary Logistic Regression scoring equation, including risk parameters like age, BMI, GA, GHT and liquor status, the area under the curve was 0.931 (Sensitivity -94.8,Specificity-87.0), which indicates good prediction of RDS.

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