Original Article

# Third trimester preterm and term premature rupture of membranes: Is there any difference in maternal characteristics and pregnancy outcomes?

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## Abstract

*Background*: The clinical significance and management of preterm premature rupture of membranes (PPROM) remains a topic of a controversy. Although PROM is associated with a low rate of complications, PPROM may lead to significant neonatal and maternal morbidity.

*Methods*: We performed a retrospective study of 714 women who presented to Jiangsu Province Hospital with third trimester PPROM or PROM between January and December 2015. The data were analyzed by SPSS; the significance of maternal characteristics, and maternal and neonatal outcomes were tested using Student's $t$ test and the $\chi^2$ test. A two-sided $p$ value $< 0.05$ was considered statistically significant.

*Results*: There were 714 women included in this analysis. We identified 577 (80.8%) women with PROM and 137 (19.2%) with PPROM. In the PPROM group, we further divided the women into $28^{+0}-31^{+6}$ weeks ($n = 21$) and $32^{+0}-36^{+6}$ weeks ($n = 116$) of gestational age. PPROM was associated with a significantly lower gestational age, and patients in this group showed higher C-reactive protein and body temperature when admitted to the hospital ($p < 0.05$). Breech presentation and history of previous cesarean section were associated with occurrence of PPROM compared with PROM ($p < 0.05$). The PPROM group showed a significantly longer latency period compared with the PROM group, in which the latency period increased with the lower gestational age ($28^{+0}-31^{+6}$ weeks). Significantly higher neonatal intensive care unit (NICU) admission rate was shown in the PPROM group as compared with the PROM group, and gestational age $28^{+0}-31^{+6}$ weeks yielded a significantly higher rate of NICU admission than $32^{+0}-36^{+6}$ weeks did ($p < 0.05$).

*Conclusion*: Higher C-reactive protein and body temperature in the PPROM group suggest an asymptomatic infection that requires close monitoring to prevent any adverse effect on pregnancy outcome. Longer latency period in PPROM group is predictable in order to minimize perinatal morbidity and mortality because of prematurity itself. Therefore, an increase in gestational age plays an important role that can affect a clinician's decision making regarding whether to transfer to the NICU.

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*Keywords:* pregnancy outcomes; premature rupture of membranes prematurity; preterm premature rupture of membranes

## 1. Introduction

Premature rupture of membranes (PROM) is the rupture of the fetal membranes before the onset of labor. The incidence of PROM is 2.7−7% in China and 5−15% in America.[1] In most cases, this occurs near term; however, when membrane rupture occurs before 37 weeks' gestation, it is known as preterm PROM (PPROM). PPROM is one of the clinical subtypes of preterm birth, and occurs in ~3% of pregnancies, resulting in one-third of preterm births. It remains the leading cause of preterm deliveries and neonatal mortality and morbidity.[2] Preterm births can be subdivided according to gestational age: about 5% of preterm births occur at $< 28$ weeks (extreme prematurity), ~15% at 28−31 weeks (severe prematurity), ~20% at 32−33 weeks (moderate prematurity), and 60−70% at 34−36 weeks (near term).[3]

Factors associated with PPROM include lower socioeconomic status, prior preterm delivery, previous PROM, sexually transmitted diseases, vaginal bleeding, connective tissue disorders, smoking, and overdistension of the uterus. However, there are cases when recognizable causes of PROM are absent. Clinical significance and management of PPROM is still controversial. Although PROM is associated with a low rate of complications, PPROM may lead to significant neonatal and maternal morbidity.[4] The purpose of this retrospective study was to evaluate maternal characteristics and pregnancy outcomes in different gestational ages in patients with third trimester cases of PPROM or PROM.

## 2. Methods

This was an observational retrospective study, and approval was obtained from the Institutional Review Board of our hospital. A manual search was performed through electronic medical records, and annual reports of Jiangsu Province Hospital from January 2015 to December 2015. There were 897 women who presented to Jiangsu Province Hospital with PPROM or PROM between January and December 2015. We only included pregnant women in this study in third trimester, which was defined as $28^{+0}-42^{+0}$ weeks' gestation. We divided the women into PROM and PPROM groups. We further divided the PPROM group into $28^{+0}-31^{+6}$ weeks' gestational age, and $32^{+0}-36^{+6}$ weeks' gestational age. Recognizable risk factors for PPROM and PROM were already excluded: history of sexually transmitted diseases, uterine distension (e.g., polyhydramnios and multifetal pregnancy), systemic lupus erythematosus, cervical incompetence, fever, uterine morphology abnormality, or procedures that may result in PROM or PPROM (e.g., cerclage). Additionally, women who did not deliver in our hospital and who had missing data files were also excluded. The first complete blood count (CBC) and C-reactive protein (CRP) level were recorded when pregnant women presented to the hospital with the above-referenced symptoms.

The diagnosis of PROM and PPROM was based on taking of patient history, physical examination, and laboratory studies. Gestational age was determined from the date of last menstrual period when reliable and sonographic confirmation was obtained during the first 20 weeks' gestation and/or the first trimester sonographic measurement of crown lump length. Patients often report a sudden gush of fluid with continued leakage. Physical examination included: (1) sterile speculum examination to see if fluid was pooling in the vagina; (2) nitrazine paper turned blue; and (3) fern test. Fern test was performed when nitrazine test was negative. We included the cases if at least two of these examinations were positive.

### 2.1. Statistical analysis

The data were collected using Microsoft Excel 2007 (Window XP; Microsoft Corp., Redmond, WA, USA) and analyzed using statistical software package SPSS version 20.0 (SPSS Inc.). Data were expressed as the mean ± standard deviation or rate (%) and were tested for significance using Student's $t$ test and the $\chi^2$ test. A two-sided $p$ value < 0.05 was considered statistically significant.

## 3. Results

Among 897 women admitted to Jiangsu Province Hospital with PROM from January 2015 to December 2015, there were 183 who did not meet our study criteria. Only 714 women were included in this analysis. We identified 577 (80.8%) women with PROM and 137 (19.2%) women with PPROM.

Comparison of maternal characteristics and comorbidity between PROM and PPROM groups are shown in Table 1. The maternal characteristics were similar, with no significant difference in maternal age, parity, time since last delivery, systolic blood pressure, diastolic blood pressure, and body mass index ($p > 0.05$). There were significant differences between the two groups in terms of gestational age when rupture of the membrane occurred (39 ± 1.5 weeks vs. 34.3 ± 2.0 weeks, $p <0.05$), gravidity (1.92 ± 1.16 vs. 2.18 ± 1.34, $p < 0.05$), CRP (6.43 ± 5.63 vs. 7.76 ± 6.59 mg/L, $p <0.05$), and body temperature when admitted (36.67 ± 0.31 vs. 36.76 ± 0.34, $p < 0.05$). Regarding maternal comorbidity, there were no significant differences between patients who had hypertensive disorders, gestational diabetes mellitus, placenta previa, fetal factors, and carriers of hepatitis B virus ($p > 0.05$). The rates of patients with a history of cesarean section and patients with breech presentation were significantly higher in the PPROM group compared with the PROM group (14.6% vs. 4.7% and 9.5% vs. 1.9%, $p < 0.05$).

Table 1
Maternal characteristics and comorbidity between PROM and PPROM group.

|  | PROM (n = 577) | PPROM (n = 137) | p |
|---|---|---|---|
| **Maternal characteristics (mean ± SD)** | | | |
| Age (y) | 29.16 ± 4.50 | 28.69 ± 4.91 | 0.27 |
| Gravidity | 1.92 ± 1.16 | 2.18 ± 1.34 | 0.02 |
| Parity | 0.26 ± 0.45 | 0.31 ± 0.5 | 0.33 |
| Last delivery (y) | 1.74 ± 3.71 | 1.93 ± 3.85 | 0.60 |
| Gestational age (wk) | 39.0 ± 1.50 | 34.30 ± 2.0 | 0.0 |
| SBP (mmHg) | 119.66 ± 10.74 | 120.54 ± 10.63 | 0.38 |
| DBP (mmHg) | 76.05 ± 7.73 | 75.48 ± 8.37 | 0.45 |
| BMI (kg/m²) | 27.09 ± 3.15 | 27.22 ± 3.83 | 0.67 |
| CRP | 6.43 ± 65.63 | 7.76 ± 6.59 | 0.01 |
| Temperature when admitted (°C) | 36.67 ± 0.31 | 36.76 ± 0.34 | 0.0 |
| **Maternal comorbidity, n (%)** | | | |
| Hypertensive disorder[a] | 10 (1.7) | 6 (4.4) | 0.06 |
| GDM | 121 (21) | 26 (19) | 0.60 |
| Previous CS | 27 (4.7) | 20 (14.6) | 0.0 |
| Breech presentation | 11 (1.9) | 13 (9.5) | 0.0 |
| Placenta previa | 1 (0.2) | 0 (0.0) | 0.62 |
| Hepatitis B carrier | 11 (1.9) | 6 (4.4) | 0.08 |
| Fetal factors[b] | 12 (2.1) | 4 (2.9) | 0.55 |

BMI = body mass index; CRP = C-reactive protein; CS = cesarean section; DBP = diastolic blood pressure; GDM = gestational diabetes mellitus; PPROM = preterm premature rupture of membranes; SBP = systolic blood pressure; SD = standard deviation.
[a] Gestational hypertension, preeclampsia.
[b] Fetal distress, fetal congenital anomaly.