Fetal-Maternal Morbidity and Mortality as Outcome of Premature Rupture of Membrane (PROM)

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ABSTRACT

Background: The risk of prenatal morbidity and death associated with PPROM is more than 20%, and the outcome is significantly impacted by the gestational age at delivery.
Objectives: The goal of the study was to determine the fetal/maternal outcomes for pregnant patients at Al-Azhar University Hospitals in Cairo who had PPROM as well as any possible risk factors for adverse fetal/neonatal outcomes.
Patients and Method: At the Al-Azhar University Hospitals in Cairo, cross-sectional research including 48 women with PROM was done. The trial was from February 2022 to August 2022. All patients were received a thorough history, a general examination, and laboratory tests.
Results: In terms of fetal result, 56.3% of infants experienced poor outcomes, such as fetal death and ICU admission, compared to 43.7% of infants who experienced positive outcomes (alive & well).The multivariate analysis revealed that later gestational age at PPROM (OR 0.7 CI 0.22 - 0.91) and gush type of PPROM (OR 1.6 CI 1.2 - 3.2), history of chorioamnionitis (OR 17.5 CI 13.9 - 129.7), delivery by CS (OR 3 CI 2.45 - 4.6), and women employment (OR 1.7 CI 1.3 - 3.3) were significant independent.
Conclusion: PPROM necessitates adequate prenatal care and therapy since it is linked to fetal/maternal morbidity and death.
Keywords: PPROM, Fetal outcome, Maternal Outcome.

INTRODUCTION

Fetal chorioamniotic membranes prematurely rupture before labor even begins [1]. Three percent of pregnancies result in premature rupture of the membranes (PROM), which causes around one-third of all preterm deliveries. Premature membrane rupture is a significant contributor to perinatal morbidity and death. It is specifically linked to quick turnaround periods between membrane rupture and birth, perinatal infections, and umbilical cord compression brought on by oligohydramnios. 50–60% of women with early PROM will give birth within a week of their membranes rupturing, even with conservative care. Early PROM is frequently accompanied by amnionitis (13–60%) and clinical placental abruption (4–12%). When the membranes rupture, the risk of severe problems rises with a shorter gestational age [2].

Genital tract infections and their function as PPROM pathogens have received a lot of attention in recent PPROM literature. There were many different species participating in the quest. The majority of the bacteria recovered from women's amniotic fluid and linked to PROM, according to a study of microbial invasion of the amniotic cavity, resembled those typically present in the lower genital tract [3].

Among the risk factors for PROM are maternal history of the condition, including previous pregnancies (risk of recurrence 16% to 32% compared with 4% in an uncomplicated term pregnancy), vaginal bleeding prior to delivery, long-term steroid use, collagen vascular diseases like Ehlers-Danlos syndrome and systemic lupus erythematosus, abdominal trauma, previous preterm births, smoking, substance abuse, anemia, low BMI Other risk factors in this group were maternal weight increase, invasive procedures including cervical cerclage and amniocentesis, and pregnancy problems like gestational diabetes or already-existing diabetes [4].

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This study's objective was to identify the fetal and maternal outcomes of pregnant patients with PPROM who presented to the Al-Azhar University Hospital in Cairo, as well as any possible risk factors for adverse fetal and neonatal outcomes.

PATIENTS AND METHODS

This cross-sectional study was conducted in the Emergency Department of Al-Azhar University Hospital, Cairo, in 48 women with premature rupture of membranes undergoing vaginal delivery between February 2022 and August 2022.

Sample size: Forty eight (48) women were included in the sample because there were a total of 7800 women who visited Al-Azhar University Hospitals in Cairo between February 2022 and August 2022 (population size) and early rupture of membranes was 4.7% of the

time. The following assumptions were used to compute samples using the Open EPI technique version 7 with a 90% confidence level and 5% confidence limitations.

Diagnostic criteria of cases: The existence of a history of fluid drainage through the vagina, direct view of fluid coming from the cervical OS, and ultrasound testing for fluid index all served to establish the diagnosis of instances with PPROM.

Inclusion criteria: Patients showed up by ROM. Age at conception (29-37 weeks). The patient first complained of chorioaminities (fetal tachycardia-maternal fever) transparent amniotic fluid. There are no chronic illness patients or PTLs with poor health (diabetes and hypertension).

Exclusion criteria: After 37 weeks, the membranes burst. Fetal anomalies that are congenital. A placenta abnormality. Meconium hemorrhage and stains before delivery.

Ethical consent:
  The research was approved by the Al-Azhar University Faculty of Medicine's Research Ethics Committee, and all patients gave their written informed consent. The World Medical Association's Code of Ethics was followed when conducting this human research (Declaration of Helsinki).

Statistical analysis
  The collected data were handled and analyzed using the SPSS software version 20. using percentage and numerical distributions when updating, processing, analyzing, and tabulating data Normal distributed variables were presented as mean and standard deviation (SD) and compared using the Student's independent t-test. To compare categorical variables, either the chi-square test or the Fisher's exact test was utilized. Nonparametric data are presented as medians and interquartile ranges and compared using chi-square or Mann-Whitney U tests. When employing the correct statistical tests, a p-value of 0.05 or less was recognized as statistically significant.

RESULTS
  Table 1, women with PPROM presented between the ages of 17 and 45, with a mean age SD of (28 5 years). The mean SD (32 3 weeks) of gestational age at PPROM varied from 27 to 37 weeks. The bulk of the ladies (93.8%) were nonsmokers, housewives (66.7%), and had ruptured membranes that were in a gushy state.

Within 24 hours, 60.4% of women spontaneously went into labor. They were multigravida in the majority (54.1%).

Table (1): Socio–demographic characteristics of women with PPROM.

Socio-demographic Characteristics	N N=48	%
Maternalage:		
•<20years	6	12.5
•20-30years	32	66.6
• > 30 years	10	20.9
•Maternal age (years)	17 - 45 (Range)	28 ±5 (Mean ±SD)
Employment status		
• Employed	16	33.3
• Unemployed	32	66.7
Smoking (tobacco):		
•Smoker	3	6. 2
• Nonsmoker	45	93.8
Type of PPROM:		
• Drain	11	22.9
• Gush	37	77.1
Latency period (days)*		
• ≤ 1	29	60.4
• 2-3	11	22.9
• ≥ 4	8	16.7
Gravidity:		
• Primi gravida (Nulli-para)	12	25
• Multi gravida (1-4)	26	54.1
• Grand multi gravida ≥5	10	20.9

Table (2): showed that the gestational age (weeks) of the studied cases (n = 48) was 34.57 (± 2.7 SD) with a range (27.0 – 39.71), and the incubation period (days) was 4 (± 4.8 SD) with a range (0-5) and gestational age (weeks) at termination was 35.85 (±2.57 SD), range (29.14-40.29).

Table (2): Obstetric history of women with PPROM.

Obstetric history	Range	Mean±SD
GA at PPROM (weeks)	27.0 – 39.71	34.57 ± 2.70
Latency period (days)	0 - 5	4± 4.8
GA at delivery (weeks)	29.14 – 40.29	35.85 ± 2.57

Figure (1): Maternal results showed that 35 (72.9%) had C.S, 13 (27.1%) had NVD, 46 (95.8) mothers had no adverse outcome, 5 (10.4) had chorioamnionitis, 2 (4.1%) had accidental mercury. There is no maternal mortality ratio.
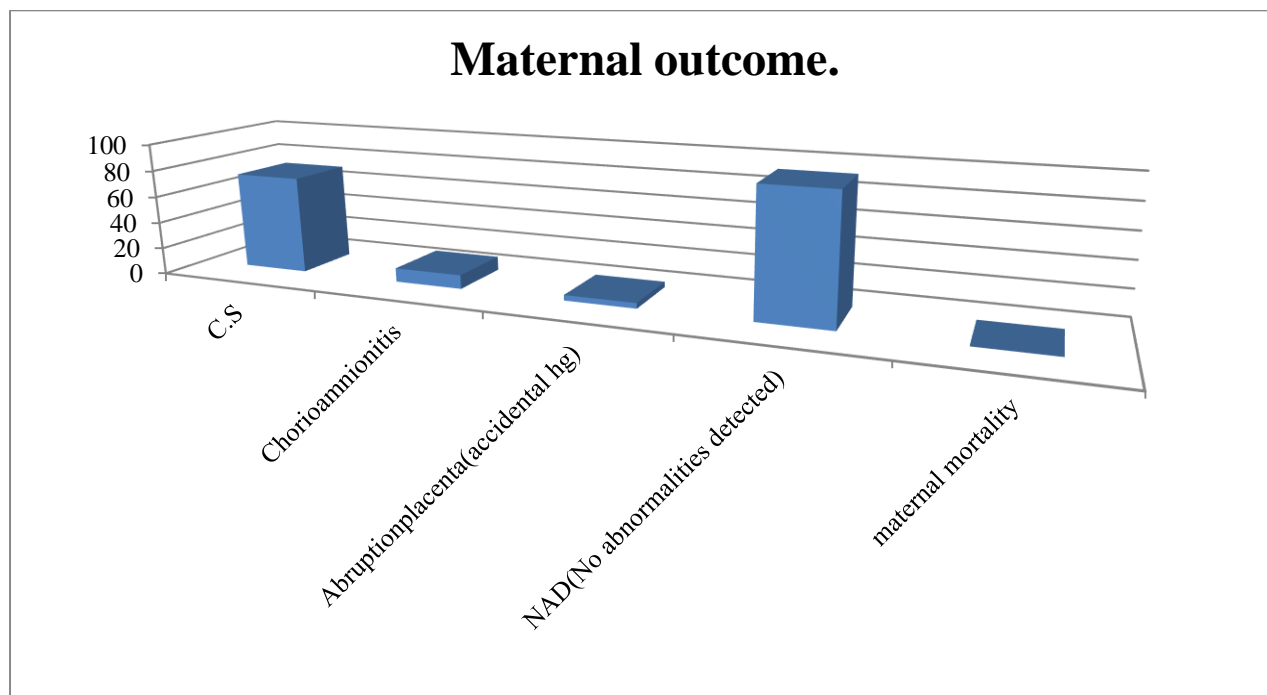

Figure (1): The percentage of maternal outcome of studied women.

Table (3): showed that regarding fetal/neonatal outcomes; 56.3% of infants had adverse fetal outcomes including: (fetal death, ICU admission), and 43.7% of babies had a good fetal outcome (alive and doing well).

Table (3): Fetal outcome of PPROM among neonates of studied women

Fetal outcome of PPROM	N N=48	%
Neonatal viability:		
•Alive	43	89.5
• Dead	5	10.5
Fetal outcome:		
1-Alive and well	21	.437
2-Alive but ill (n= 32)	22	45.8
▪ NICU admission	3	6.2
▪ PT & RDS[1]	17	35.4
Others [2]	2	4.2
3-Died	5	11.5
Fetal outcome*:		
•Good fetal outcome[3]	21	31.3
•Poor fetal outcome[4]	33	68.7
Infant Birth weight		
•Normal birth weight>2.5kg	11	23
• Low birth weight≤2.5kg	37	77
Birth weight of infant at birth(kg)		
Range (Min–Max)	1-3.4	
Mean ±SD	2 ± 5	

[1]PT = preterm, [2]foetal infection = jaundice, RDS = respiratory distress syndrome, [3]Good result: being born healthy, [4]Preterm delivery, admission to the newborn NICU, respiratory distress, or neonatal mortality are all examples of poor outcomes.

Table (4): Only maternal age, among sociodemographic factors, was substantially associated with a poor fetal fate, according to multivariate analysis (p 0.05). Regarding a pregnant woman's obstetric history, the style of delivery, kind of membrane rupture, history of chorioamnionitis, and mean gestational age at PPROM were all substantially associated with a poor infant outcome (p 0.05). However, multivariate analysis revealed that later PPROM gestational age (OR 0.7 CI 0.22 - 0.91) and female employment (OR 1.7 CI 1.3-3.3), surge PPROM (OR 1.6 CI 1.2-3.2), history of chorioamnionitis (OR 17.5 CI 13.9 - 129.7), CS delivery (OR 3 CI 2.45 - 4.6), and surge PPROM (OR 1.6 CI 1.2 - 3.2).

Table (4): Multivariate logistic regression analysis to identify predictors of poor fetal/neonatal outcome of PPROM

Covariates	Odds ratio	95% CI for Odds ratio Lower Upper		P-value
Employment	1.7	1.3	3.3	0.04*
Type of PPROM	1.6	1.2	3.2	0.03*
Chorioamnionitis	17.5	13.9	129.7	0.00*
Mode of delivery	3	2.45	4.6	0.02*
Later gestational age at PPROM	0.7	0.22	0.91	0.00*
Multi gravidity	0.8	0.37	1.5	0.38
Maternal age • 21-30years • >30years	1.5 2.5	0.47 0.07	2.5 6.5	0.04* 0.04*

* Statistically significant difference.

DISCUSSION

In comparison to rates reported in other nations, which varied between 13% and 60% in Victoria, Ireland, and Bangladesh, the rate of chorioamnionitis in the current study was lower [5,6,7].

The majority of births in the current study took place within 24 hours of PPROM, which may have contributed to the difference by lowering the prevalence of chorioamnionitis. Iran and Zambia, however, had lower chorioamnionitis incidence rates [8,9].

Poor fetal outcome was found to be 56.7% in the current research, which was higher than the 26.8% and 34% found in previous studies from Zambia and Ethiopia [9,10]. When compared to other nations, where the rate of fetal mortality ranges from 3.1 to 8%, 11.5% is high [9, 11, 8].

Due to the high occurrence of Respiratory Distress Syndrome (RDS) and low birth weight (LBW) (77%) in the current study, the increased percentage of fetal deaths may be explained (RDS). But when compared to 19.2%, 17.8%, and 29% in other nations, this rate is modest [12, 13, 14]. This variation may result from various patient PPROM and premature delivery rates in earlier research. Compared to prior studies' admission rates of 65.3% and 75.8%, the current study's low admission rate of 45.8% for newborns in the NICU [8, 15].

The reason why earlier studies' admission rates were greater than those in the current study was because those studies focused on preterm newborns, which led to more inquiries and a higher incidence of NICU admission than in the present study. This comprised children born at a variety of gestational ages. The odds ratio for having a poor fetal outcome for working moms was 1.7 (95% CI: 1.3–3.3). Stress from the workplace may be to blame; hard work and challenging travel conditions in Egypt may result in PPROM with all of its negative effects.

This finding is consistent with **Sathenahalli et al.** [16] who found a greater frequency of preterm and low birth weight to be a result of mother manual work during pregnancy. Delivery by CS was linked to a 3 percent increased chance of a poor fetal outcome. Similar to Jordan, birth via Caesarean section has been linked to an increased chance of NICU admission is one of the worst consequences for newborns [17].

This link is explained by the fact that CS often indicates worse health, whether it be foetal or maternal. Fetal reasons include fetal distress, which may need admission to the intensive care unit, or even fetal mortality. Additionally, comparable to a research done in China, chorioamnionitis was a strong predictor of poor fetal fate [18].

In the current study, earlier gestational age at PPROM was substantially related with worse fetal outcome, which is consistent with prior investigations [19,20]. This is due to the correlation between the frequency of respiratory distress syndrome and the length of hospital stay.

CONCLUSION & RECOMMENDATIONS

PPROM necessitates adequate prenatal care and therapy since it is linked to fetal/maternal morbidity and death. Through effective prenatal care and health education of pregnant women about PPROM risk factors, more efforts should be made to reduce the incidence of PPROM.

Newborn intensive care units (NICUs) at Al-Azhar University Hospitals in Cairo should be improved, increased their numbers, and better equipment should be provided to them in order to make them more capable

of handling such issues in order to enhance neonatal outcomes.

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REFERENCES
1. **Battarbee A (2020):** Use of Antenatal Corticosteroids in Preterm Prelabor Rupture of Membranes. Obstet Gynecol Clin North. Am., 47(4):587-594.
2. **Linehan L, Walsh J, Morris A *et al.* (2016):** Neonatal and maternal outcomes following midtrimester preterm premature rupture of the membranes: a retrospectivr cohort study. BMC Pregnancy and Childbirth, 16(1): 25. doi: 10.1186/s12884-016-0813-3.
3. **Xie A, Zhang W, Chen M *et al.* (2015):** Related factors and adverse neonatal outcomes in women with preterm premature rupture of membranes complicated by histologic chorioamnionitis. Medical Science Monitor, 21: 390-95.
4. **Choudhary M, Rathore S, Chowdhary J *et al.* (2015):** Pre and post conception risk factors in PROM. Int J Res Med Sci., 3(10): 2594-98.
5. **Akter S, Akter R, Rashid M (2010):** Preterm Prelabour Rupture of the Membrane & Feto-Maternal outcome: an Observational Study. Journal of Bangladesh College of Physicians and Surgeons, 28: 17-23.
6. **Mohamad H (2013):** The Management of Pregnancies Complicated by Late Preterm Pre-labour Rupture of Membranes between 34 and 37 Weeks of Gestation. Med J Cairo Univ., 81(1): 929-34.
7. **Boskabadi H, Maamouri G, Mafinejad S (2011):** Neonatal Complications Related with Prolonged Rupture of Membranes. Macedonian Journal of Medical Science, 4: 93-98.
8. **Yang L, Donald R, Kaufman Hume R *et al.* (2004):** Maternal and Fetal Outcomes of Spontaneous Preterm Premature Rupture of Membranes. J Amer Osteopath Assoc., 104: 537-42.
9. **Fishman S, Gelber S (2012):** Evidence for the clinical management of chorioamnionitis. Semin Fetal & Neonatal Medicine, 17: 46–50.
10. **Moustafa M, Gadallah M (2012):** Student notes on medical statistics and research methods. 4th edition. Inferences from samples-Confidence Interval., pp. 42-51. https://personalpages.manchester.ac.uk/staff/chris.roberts/MATH38071/MATH38071_Notes1_2012.pdf
11. **Afza N, Nargis W, Ahmed B (2011):** The incidence, risk factors and common fetal outcome of chorioamnionitis in women with preterm premature rupture of membrane (PPROM): A single centre study. J Obstet Gynaecol., 26(1): 10-19.
12. **Azzaz M, Maestre M, Cardoso R (2016):** Antenatal care visits during pregnancy and their effect on maternal and fetal outcomes in pre-eclamptic patients. J Obstet Gynaecol Res., 42(9): 1102-10.
13. **Mehmet A, Osmanaðaoðlu D, Sevilay Ü (2005):** Chorioamnion it is risk and neonatal outcome in preterm premature rupture of membranes. Arch Gynecol Obstet., 271: 33-9.
14. **Tanir H, Sener T, Aksit A *et al.* (2003):** PROM and Neonatal Outcome prior to 34 weeks of Gestation. Int J Gynaecol Obstet., 82(2): 167-72.
15. **Nabhan A, Elhelaly A, Elkadi M (2014):** Antibiotic prophylaxis in prelabor spontaneous rupture of fetal membranes at or beyond 36 weeks of pregnancy. Int J Gynaecol Obstet., 124(1): 59-62.
16. **Sathenahalli V, Dwivedi D, Bajaj N *et al.* (2016):** Predictors of poor outcome in neonates with respiratory distress. Int J Contemp Pediatr., 3: 76-79.
17. **Zhang H, Wang L, Wang J *et al.* (2015):** Premature rupture of the fetal membrane combined with subclinical chorioamnionitis negatively affects pregnancy outcomes by amechanism associated with reduced levels of matrix metalloproteinase-2. Exp Ther Med., 10(2): 561–66.
18. **Deutsch A, Deutsch E, Totten C (2010):** Maternal and neonatal outcomes based on the gestational age of mid-trimester preterm premature rupture of membranes. J Matern Fetal Neonatal Med., 23(12): 1429-34.
19. **Patil S, Patil V (2014):** Maternal and fetal outcome in premature rupture of membranes. Journal of Dental and Medical Sciences, 13(12): 56-83.
20. **Afza N, Nargis W, Ahmed B (2011):** The incidence, risk factors and common fetal outcome of chorioamnionitis in women with preterm premature rupture of membrane (PPROM): A single centre study. J Obstet Gynaecol., 26(1): 10-19.