

ORIGINAL ARTICLE

RISK FACTORS OF PREMATURE RUPTURE OF MEMBRANES IN AYUB TEACHING HOSPITAL: A CASE CONTROL STUDY**Mahwish Toqueer, Mahnoor Javaid, Zainab Nazneen*, Khalid Ahmed, Hizbar Hayauddin, Umair Toqueer**

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Background: Premature rupture of membranes (PROM) is one of the important causes of preterm delivery and is associated with increased incidence of neonatal and maternal morbidity and mortality worldwide. The aim of this study was to find out the risk factors associated with PROM in patients admitted to Obstetrics Ward of Ayub Teaching Hospital, Abbottabad. **Methods:** This case control study was conducted on pregnant females (>28 weeks gestation) from 1st November, 2018 to 30th May, 2019. The sample size was 195 patients (130 controls, 65 cases in 2:1 ratio) collected through convenience sampling. Data was analysed using SPSS-16. Odds ratio with confidence interval was used to estimate the strength of association of PROM with its risk factors, and $p \leq 0.05$ was considered significant. **Results:** The mean age of the patients was 25.48 ± 3.65 years ranging between 19–38 years. Most of the patients belonged to the age group 26–35 years. Most women were illiterate, unemployed, and had poor socio-economic background. The most important risk factors of PROM were PROM in previous pregnancies (OR=3.978, CI=1.484–10.666, $p=0.012$), foul smelling vaginal discharge (OR=2.700, CI=1.197–6.089, $p=0.014$), polyhydramnios (OR=2.5, CI=1.178–5.404, $p=0.015$), and vaginal bleeding (OR=2.486, CI=1.117–5.534, $p=0.023$). **Conclusion:** PROM in previous pregnancies, foul smelling vaginal discharge, vaginal bleeding, and polyhydramnios were found to increase the risk of PROM significantly.

Keywords: PROM, PPROM, pregnancy, risk factors, case control study

Pak J Physiol 2022;18(1):44–7

INTRODUCTION

The PROM is defined as ‘rupture of membranes at any time before the onset of uterine contractions’.¹ It is one of the common complications of pregnancy and occurs in 8–10% of pregnancies approximately.² Premature rupture of membranes, especially preterm PROM (PPROM) is one of the important causes of preterm delivery and is associated with increased incidence of neonatal and maternal morbidity and mortality worldwide.³ PROM can be divided into preterm PROM and term PROM. Preterm PROM occurs after 28 weeks and before 37 weeks of gestation, while term PROM occurs between 37 up to 42 weeks of gestation.² Preterm PROM and term PROM can be further divided on the basis of time after the rupture of membrane into: Early PROM (after the rupture of foetal membranes less than 12 hours have passed) and prolonged PROM (twelve or more hours have passed after the rupture of foetal membranes).^{4,5}

The prevalence of PROM is about 5–10% while PPROM occurs in 3% of all pregnancies approximately. PROM is responsible for complicating about 3% of all preterm pregnancies, 10% of term pregnancies, 11% of preterm deliveries, and is also responsible for causing 40–75% neonatal deaths in USA.^{6–8} Prevalence of PROM in a study from Karachi was 2.7%.⁹ A research conducted in 2006 in Abbottabad found that preterm PROM occurred in 9.6% of total

pregnancies.⁶ To our knowledge no recent data about the prevalence and risk factors of PROM is available at the regional level. The risk factors of PROM are numerous, but localized or systemic infection and inflammation is one of the most important causative factors.¹⁰ The others include low socioeconomic status, inadequate prenatal care, inadequate nutrition during pregnancy, sexually transmitted infections, vaginal bleeding and smoking during pregnancy.¹¹ Previous preterm delivery and uterine distension (e.g., polyhydramnios) are also well known risk factors. Cerclage and amniocentesis are also risk factors of preterm PROM.¹²

The most common maternal complication of PROM is amniotic cavity infection. Other complications include endometritis, abruptio placentae, retained placenta and haemorrhage, sepsis and death though uncommon can still occur.⁷ Preterm PROM is one of the leading causes of preterm birth thus foetal complications such as respiratory distress, infection, necrotizing enterocolitis, brain bleeds, muscle dysfunction, pulmonary hypoplasia and death are associated with prematurity.^{7,13}

Most typical sign of PROM is leakage of clear fluid or bleeding from vagina without any contractions. Diagnosis is made through detailed history from the patient and by a sterile speculum examination of vagina and is confirmed when there is

pooling of amniotic fluid in the posterior vaginal fornix or its leakage from the cervical os.^{2,14,15} However, 47% cases of PROM present with no visible symptoms.¹⁵ Its management depends on the gestational age as well as other complicating factors although it is still controversial.^{16,17} In case of preterm PROM the management mainly involves administration of antibiotics (reducing the risk of perinatal infection and increasing the latency period) and steroids (reducing perinatal morbidity and mortality), while in case of term PROM induction of labour is the course of action.^{2,16}

The aim of this study was to determine the important risk factors associated with PROM especially in our setup at Ayub Teaching Hospital, Abbottabad.

MATERIAL AND METHODS

This case control study was carried out from 1st November 2018 to 31st June 2019 on patients admitted to Obstetrics Unit of Ayub Teaching Hospital, Abbottabad after taking ethical approval. Study population comprised of admitted pregnant women with and without PROM beyond 28 weeks of gestation.

Using Open Epi online software Version 3 for sample size estimation for case control studies, the sample size was calculated as 189 rounded to 195, (65 cases and 130 controls). The case to control ratio was 1:2. The assumed 2-sided confidence interval was 95% and power of the study was 80%. For the purpose of hypothetical exposure value in controls for sample size calculation, abnormal discharge from vagina was used with a frequency of 36.8%, and assumed Odds ratio of 2.4 was taken from a previous study from Uganda.¹⁷ Convenience sampling technique was used for sample selection.

Pair matching was done by matching age of the cases with controls. For cases, only those patients were selected who were diagnosed to be a case of PROM including both early and prolonged PROM. For controls, all other pregnant women were selected who were of the same age as cases and who didn't have PROM, and were admitted for reasons other than PROM. Patients with multiple pregnancies, unwilling patients, those who did not know the local language, and patients in labour were excluded. The cases of PROM were diagnosed on the basis of speculum examination and history of leakage of clear fluid from vagina enough to wet the sides of thighs and perineum without any uterine contractions.

A pre-tested structured questionnaire that included bio data as well as various risk factors that predisposes to PROM was developed. Pilot testing of the questionnaire was done on 10 patients admitted in Obstetric Unit before collection of actual data. Informed consent was taken from all the subjects.

Data was analysed on SPSS-16. Mean and standard deviation for continuous variables and frequencies and percentages for categorical variables were determined. Chi-square test was used to determine association between PROM and its risk factors. Odds ratio with 95% confidence interval was used to measure strength of association between PROM and its risk factors. Confidence interval excluding 1 and $p \leq 0.05$ was considered statistically significant.

RESULTS

A total of 195 patients (65 cases and 130 controls) were interviewed. The overall mean age of the patients was 25.48±3.65 years (Range: 19–38 years). The mean age of the cases was 25.47±3.67 years while the mean age of the controls was 25.49±3.66 years. Majority of patients were in the age group 26–35 years, most of them were housewives, illiterate, and belonged to low socio-economic class. Presentation was cephalic in most of the patients (Table-1).

Table-1: Socio-demographic variables (n=195)

Variables	Frequency	Percentage
Age Groups (Years)		
16–25	83	42.6
26–35	108	55.4
36–45	4	2.1
Area of Residence		
Rural	79	40.5
Urban	81	41.5
Semi-urban	35	17.9
Occupational Status		
Professional	4	2.1
Housewife	191	97.9
Socioeconomic status		
Low	115	59.0
Middle	67	34.4
Upper	13	6.7
Literacy level		
Illiterate	83	42.6
Primary	47	24.1
Secondary	47	24.1
Graduate	18	9.2
Presentation of Foetus		
Cephalic	158	81.0
Breech	36	18.5
Others	1	0.5

PROM was found to be strongly associated with history of PROM in previous pregnancy, polyhydramnios, foul smelling discharge from vagina, and vaginal bleeding during current pregnancy. Odds ratio with 95% confidence interval for each risk factor found to be associated with PROM is given in Table-2.

History of intrauterine growth retardation (IUGR), urinary tract infection (UTI), McDonald's stitch in current pregnancy, presence of any systemic disease, previous Caesarean sections, and abortions were not found to be significant risk factors for developing PROM (Table-2).

Table-2: Risk factors for PROM

Risk Factors	Cases (n=65)		Controls (n=135)		Odds ratio	95% CI	p
	n	%	n	%			
Previous history of PROM							
Yes	12	63.2	7	36.8	3.978	1.484–10.666	0.012*
No	53	30.1	123	69.9			
Polyhydramnios in current pregnancy							
Yes	17	51.5	16	48.5	2.5	1.175–5.404	0.015*
No	48	29.6	114	70.4			
Foul smelling discharge during pregnancy							
Yes	15	53.6	13	46.4	2.7	1.197–6.089	0.014*
No	50	29.9	117	70.1			
Bleeding during pregnancy							
Yes	15	51.7	14	48.3	2.486	1.117–5.334	0.023*
No	50	30.1	116	69.9			
Intrauterine Growth Retardation							
Yes	5	50	5	50	2.08	0.58–7.4	0.25
No	60	32.4	125	67.6			
Urinary Tract Infection							
Yes	20	35.1	37	64.9	1.11	0.58–2.1	0.73
No	45	32.6	93	67.4			
McDonald's stitch							
Yes	6	54.5	5	45.5	1.11	0.58–2.1	0.12
No	59	32.1	125	67.9			
Systemic disease							
Yes	6	24	19	76	1.6	0.63–4.4	0.28
No	59	34.7	111	65.3			
Previous Caesarean Section(s)							
Yes	23	28.4	58	71.6	0.68	0.36–1.2	0.21
No	42	36.8	72	63.2			
History of abortion(s)							
Yes	19	33.9	37	66.1	0.96	0.50–1.8	0.91
No	46	33.1	93	66.9			

*significant

DISCUSSION

According to our study previous history of PROM, polyhydramnios, foul smelling vaginal discharge and vaginal bleeding during pregnancy were found to have significant association with PROM. In our study, majority (55.4%) of the women were in the age group 26–35 years. It is in agreement with a study done by Mishra S *et al*¹⁴. Dars *et al*¹¹ also showed that incidence of PROM was more among patients aged 20–30 years.

We observed a strong association between PROM and history of PROM in previous pregnancies. It is in line with the studies conducted by Al-Hussain TK *et al*¹⁸ and Lee T *et al*¹⁹. It may be due to untreated cervico-vaginal infection by bacterial vaginosis or *Chlamydia*, cervical incompetence, or short cervical length.^{4,7,20} Patients with history of foul smelling discharge during pregnancy had 2.7 times increased risk of PROM. This is in line with Assefa NE *et al*⁷ and Choudhary M *et al*²⁰. Organisms causing infections of the genital tract that have been associated with PROM include *Chlamydia trachomatis*, *Gardnerella vaginalis*, *Trichomonas vaginalis*, Candidiasis etc. Abnormal vaginal discharge indicates infection that results in inflammation of the

membranes ultimately leading to their rupture.^{20–22} Unhygienic practices of majority of the population makes it a significant risk factor in developing countries.²²

In our study, another important risk factor associated with PROM was polyhydramnios. Our results match with results of the research conducted by Mishra S *et al*¹⁴, but are contradictory to the work of Assefa NE *et al*⁷. Over distension of the uterus due to increase in amniotic fluid volume increases the intrauterine pressure and thus increases the risk of PROM.^{14,20}

Vaginal bleeding was also found to be a risk factor for PROM increasing the risk by 2.4 times. Chronic abruption of placenta may result in necrosis of decidua which weakens membranes or predisposes to intra-amniotic infection, eventually resulting in membrane rupture.²⁰ Hossain R *et al*²³ reported that bleeding specially in second trimester can lead to preterm labour and PROM.

The UTI was considered one of the main risk factors for PROM by Moore RM *et al*²⁴. In our study, however, it was not found to be strongly associated with PROM and the history of UTI was strong both in cases and controls which could be the reason of insignificance. This can be attributed to wide prevalence of UTI in females of reproductive age due to inability to maintain good hygienic conditions.

In this study, McDonald stitch was not found to be a significant risk factor which is contradictory to the study conducted by Choudhary M *et al*²⁰. The reason may be fewer number of cerclage in cases and controls in this study.

Previous Caesarean section, IUGR, abortions, and any systemic illness did not have significant effect on PROM in this study. The frequency of Caesarean section was 28.4% in cases and was found not to be significant risk factor of PROM. This rate was 30.5% in a study conducted by Kayiga *et al*²⁵ which is quite similar to our results; however, it is low as compared to the work of Pasquier JC *et al*²⁶ in which the frequency of Caesarean section was 58.7%.

The frequency of abortion was 32.4% in cases while it was 67.6% in controls. Abortion was also not a significant risk factor for PROM in the study of Choudhary M *et al*²⁰; however, it contradicts the work done in Tigaray⁷. The reason may be comparable sample size of the studies.

History of both systemic illness and trauma were not significant risk factors in a research done by Assefa NE *et al*⁷ which supports our results.

Some limitations of this study were that matching of cases and controls was done with one variable only, i.e., age; and it was conducted in only one tertiary care hospital.

CONCLUSION

The most important risk factors in our setup found to be associated with PROM were previous history of PROM, foul smelling vaginal discharge, polyhydramnios, and vaginal bleeding. With the help of this knowledge, obstetricians will be able to pinpoint high risk patients and thus will be able to provide rapid and effective management. It will also help them to establish prevention protocols so as to decrease the burden of this disease in this area.

ACKNOWLEDGEMENT

We would like to acknowledge all Obs/Gynae Unit staff of Ayub Teaching Hospital for their help. We would also like to thank Mr. Sajid for his technical assistance.

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Received: 20 Jun 2021

Reviewed: 27 Jan 2022

Accepted: 29 Jan 2022

Contribution of Authors:

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KA: Data collection and reference writing

HH: Data collection and reference writing

UT: Literature search and data entry

Disclaimer: The work has not been presented or published anywhere

Conflict of interest: There was no conflict of interest

Funding: None to declare