



A STUDY ON INCIDENCE AND AETIOLOGY OF PREMATURE RUPTURE OF MEMBRANES (PROM)

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ABSTRACT

Premature rupture of membranes (PROM) is a common obstetric complication. The aetiopathogenesis of PROM is ill understood. Hence, preventive measures are inadequate & complications are more. In this study, the definition of PROM adopted is – rupture of foetal membranes before the onset of true labour pain. The lower limit of gestational age is taken to be 28 weeks. The aim is to study the incidence of PROM in specific patient groups, and also the causal association of PROM with some risk factors. It is observed that incidence of PROM is higher in unbooked cases, multigravidae, low socioeconomic status etc., and that chorioamnionitis, malpresentations, non-engaged presenting part, coitus, previous preterm labour & cervical surgeries have a causal association with PROM. These results mostly corroborate with the findings of other researchers. It was concluded that further studies are required to describe the aetiopathogenesis of PROM so that complications can be prevented.

KEYWORDS: Premature rupture of membranes, aetiology, incidence.



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INTRODUCTION

The precise mechanism of PROM is ill understood in spite of extensive research on the subject. Hence, preventive measures are inadequate. PROM can lead to ample maternal and neonatal complications including death. So, the present study aims to outline some aetiological factors for PROM. Avoidance, timely detection & correction of such factors will lower the incidence of PROM and its complications. Normal foetal membranes are formed by amnion and chorion, bound together by extracellular matrix, which provides elasticity and tensile strength to the membranes. Any process weakening the matrix causes release of matrix metalloproteinases increasing the risk of PROM. Previous studies have shown that chorioamnionitis (ascending infection from vagina) may weaken the lower membranes overlying the internal os or lower uterine segment and cause PROM. But why this happens only in some cases and not others may be explained by the physical state of cervix (cervical length and condition of internal os) and protective immune mechanism of the cervix. Though foetal membranes are strong earlier in pregnancy but biophysical and biochemical changes occurring in the membranes approaching term pregnancy may weaken the membranes and predispose to rupture. When membranes rupture before the onset of labour, it is known as premature rupture of membranes (PROM). When PROM occurs before 37 completed weeks of gestation it is termed as preterm premature rupture of membranes (p PROM).¹

MATERIALS AND METHODS

This cross-sectional case control study was conducted in the Department of Obstetrics & Gynaecology, KPC

Medical College & Hospital, Kolkata, over a period of 2 years (1st March 2013 – 28th February 2015). Approval of the institutional ethics committee (Approval no. GYN101/13) and informed consent from cases and controls included in the study were taken before conducting the study. Study group has 100 patients having PROM & control group has 100 patients having rupture of membranes after the onset of true labour pain (with duration of gestational period beyond 28 weeks in both groups). Both booked & unbooked cases were included. Detailed history was taken using a pre-designed questionnaire in local language. Diagnosis of PROM was mainly clinical. In all cases, liquor amnii was collected with Sim's speculum, intracervical & high vaginal swabs and in cases of caesarean section, by amniocentesis just before making uterine incision. The samples were subjected to gram staining and aerobic culture & sensitivity test for detection of micro-organisms. The data collected was plotted on a Microsoft Excel spreadsheet. Most of the data was tabulated in 2 X 2 contingency tables with degree of freedom (df) 1 and analysed using Chi Square Test.² Everywhere, p value <0.05 is taken to be significant.

RESULTS

The total number of confinements during the study period was 2326 of which 100 patients had PROM. So the incidence of PROM as noted in this study is 4.3%. The incidence of PROM in relation to antenatal check up (booked & unbooked cases), gravida status, maternal age, socioeconomic status, chorioamnionitis, malpresentations, non-engaged vertex, antecedent coitus, twin pregnancy, previous preterm labour and previous operations on cervix have been studied as shown below.

Table I
Incidence of booked & unbooked cases in relation to PROM

	Number of booked cases	Number of unbooked cases
Study	30	70 (70%)
Control	38	62 (62%)

Table I shows that the incidence of unbooked cases was higher among PROM cases (70%) than controls (62%). A Chi Square Test was performed. For the Chi Square value obtained (1.18) and degree of freedom

(df) 1, p value is >0.05. So the higher incidence of unbooked cases in PROM compared to controls is not statistically significant.

Table II
Incidence of PROM in relation to gravida status

	Number of primigravida patients	Number of multigravida patients
Study	21(40.38%)	79 (53.38%)
Control	31	69

Table II shows that the incidence of PROM is more in multigravida patients (53.38%) than primigravida (40.38%). The Chi Square test done on Table II shows that for the obtained Chi Square value (2.6) & df 1, p

value is >0.05. So the higher incidence of PROM in multigravida patients compared to primigravida is not statistically significant.

Table III
Incidence of PROM in relation to maternal age

Maternal age	No. of patients <20 years (%)	No. of patients 20-25 years (%)	No. of patients 26-30 years (%)	No. of patients 31-35 years (%)	No. of patients >36 years (%)
Study	8 (8%)	62 (62%)	14 (14%)	14 (14%)	2 (2%)
Control	11 (11%)	65 (65%)	13 (13%)	9 (9%)	2 (2%)

Table III shows that the highest number of PROM occurred in the age group 20-25 years. Maximum

number of confinements also occurred in this age group.

Table IV
Incidence of PROM in relation to socioeconomic status

Socioeconomic status	Number of poor patients (%)	Number of middle class patients (%)	Number of rich patients (%)
Study	59 (59%)	32 (32%)	9 (9%)
Control	52 (52%)	39 (39%)	9 (9%)

The standardization of socioeconomic status in this study was done based on modified Kuppaswamy's

Socioeconomic Status Scale.³ Table IV shows that the incidence of PROM is highest in poor patients (59%).

Table V
Incidence of chorioamnionitis in the study & control groups

	Chorioamnionitis Positive	Chorioamnionitis Negative
PROM (Total no. 100)	30 (30%)	70 (70%)
Control (Total no. 100)	3 (3%)	97 (97%)

Table V shows that the incidence of chorioamnionitis is higher in PROM patients than controls. The Chi Square test done on Table V shows that, for the obtained Chi Square value & df 1, p value is < 0.05. Hence the

higher incidence of chorioamnionitis in PROM group compared to controls is statistically significant. Hence, there is a causal association of chorioamnionitis with PROM.

Table VI
Association of malpresentations with PROM cases & controls

Presentation	Vertex presentation	Malpresentation
Study	85	15 (15%)
Control	97	3 (3%)

There were 2 cases of twin pregnancies, all 4 babies had vertex presentation. The 15 cases of malpresentation included in the above table were 12 breech, 2 transverse lie & 1 face presentation in the study group. In the control group, there were 3 breech presentations. The incidence of malpresentations in the study group was higher than the control group. The Chi

Square test done on Table VI shows that for the obtained Chi Square value (8.79) & df 1, p value is <0.05. Hence, the higher incidence of malpresentations in PROM group compared to controls is statistically significant. So, malpresentation has a causal association with PROM.

Table VII
Association of non-engagement of vertex with PROM cases & controls

	Vertex engaged	Vertex not engaged
Study	28 (32.9%)	57 (67.1%)
Control	56 (57.7%)	41 (42.3%)

Table VII shows that the incidence of non-engaged vertex at initial examination was higher in study group (67.1%) than controls (42.3%). The Chi Square test done on Table VII shows that for the obtained Chi Square value (11.22) & df 1, p value is <0.05. Hence,

the higher incidence of non-engaged vertex in PROM group compared to controls is statistically significant. So, non-engaged vertex has a causal association with PROM.

Table VIII
Incidence of antecedent coitus in PROM cases & controls

Antecedent coitus	Yes	No
Study	73 (73%)	27
Control	31 (31%)	69

The incidence of antecedent coitus is higher in study group (73%) than controls (31%). The Chi Square test done on Table VIII shows that for the obtained Chi Square value & df 1, p value is <0.05. Hence, the

higher incidence of antecedent coitus in PROM group compared to controls is statistically significant. So, antecedent coitus has a causal association with PROM.

Table IX
Incidence of twin pregnancy in PROM cases & control group

	Twin pregnancy	Singleton pregnancy
Study	2 (2%)	98
Control	0 (0%)	100

Table IX shows that there were higher number of twin pregnancies in the study group compared to controls. The Chi Square test done on Table IX shows that for the obtained Chi Square value (2.02) & df 1, p value is

>0.05. Hence, the higher number of twin pregnancies in PROM group compared to controls is not statistically significant. Hence, there is no causal association between twin pregnancy and PROM.

Table X
Incidence of previous history of preterm labour in study & control groups

Previous history of preterm labour	Yes	No
Study	8 (8%)	92
Control	1 (1%)	99

Table X shows that the incidence of previous preterm labour (with or without PROM) is higher in PROM cases than controls. The Chi Square test done on table X shows that for the obtained Chi Square value (5.7) & df 1, p value is <0.05. Hence, the higher incidence of

previous preterm labour in PROM group compared to controls is statistically significant. Hence it can be said that there is a causal association between previous history of preterm labour and PROM in subsequent pregnancy.

Table XI
History of previous operation on cervix & PROM

History of previous operation on cervix	Yes	No
Study	24 (24%)	76
Control	3 (3%)	97

Table XII shows that in the study group, 24 patients had previous operations on cervix (suction & evacuation, dilatation & evacuation, dilatation & curettage, cervical biopsy including conisation, Fothergill's operation) & in the control group only 3 patients had previous operations on cervix. The Chi Square test done on

Table XI shows that for the obtained Chi Square value & df 1, p value is <0.05. Hence, the history of previous operation on cervix in PROM group is significantly higher than in controls. Hence there is a causal association between previous operation on cervix and PROM in subsequent pregnancy.

DISCUSSION

Incidence of PROM varies widely in different series by various workers because of variation of study population characteristics & variable criteria for definitions adopted by them. Incidence noted by different workers ranges from 0.7% (Christensen KK et al 1976) to 17.5% (Albrecht JL 1996).^{4,5} Majority of the workers reported the incidence below 10%. In the present study the incidence of 4.3% closely resembles the incidence reported by Kodkany (1991) (4.01%).⁶ Low incidence reported by Christensen KK (1976) was because of inclusion of higher number of cases below 34 weeks, even upto 24 weeks of pregnancy.⁴ Booked cases are those who made at least 3 antenatal visits during present pregnancy, one of them after 28 weeks of gestation. The association between antenatal check up & PROM has been studied to see if there is any prospect of preventing PROM by proper regular antenatal check up & screening for genital tract infection, but no significant association has been found (vide Table I). The importance of number of

pregnancies in terms of gravida & parity has not been defined properly, in connection with causation of PROM. The higher incidence of PROM in multigravida (though not statistically significant) may be due to infection in the cervix, traumatized by the outcome of previous pregnancy, a bigger opened up external os facilitating the entry of micro-organisms or history of any previous operations on cervix causing shortening of cervical length or increased diameter of the cervical canal & external os (vide Table II). Bianco A et al (1996) showed higher incidence of PROM in multigravida.⁷ Calkins LA (1952) found no relation of gravida & parity status with PROM.⁸ The maximum occurrence of PROM in women aged 20-25 years (vide Table III) is explained by the fact that most pregnant patients attending antenatal clinics, maternity ward & emergency obstetric unit are aged between 20-30 years. In general, marriage & child birth occur at an earlier age in our country. The highest incidence of PROM in poor patients (vide Table IV) may be due to deficiency of zinc & vitamin C in their diets and poor awareness & attendance for antenatal check up.^{9,10,11}

A causal association of PROM with chorioamnionitis has been found in this study (vide Table V). Ascending infection from the lower genital tract leads to chorioamnionitis predisposing to PROM. Bacteria from lower genital tract ascend before membranes rupture and gain access to the amniotic membranes, where inflammatory process sets in to weaken the membranes, which subsequently rupture resulting in PROM. Various possible mechanisms causing PROM due to infection have been described by Bejar R et al (1981), Varner MW et al (1981), Lopez Bernal A et al (1989).^{12,13,14} The causal association between malpresentations & PROM found in this study (vide Table VI) can be explained by the gap between irregular, ill-fitting presenting part & birth passage, thus allowing the unsupported membranes to rupture. The causal association between non-engaged vertex & PROM found in this study (vide Table VII) may be explained by the fact that the ill-fitting, high up vertex allows the gap to be wider between the forewater & hindwater, and any raised intrauterine pressure during exaggerated Braxton-Hicks contraction may trigger PROM. Coitus during pregnancy, especially in the last 1 month, increases the chance of vaginal colonization, ascending infection & chorioamnionitis which is responsible for PROM. Prostaglandins of semen & orgasm during coitus may increase uterine contractions & intra-uterine pressure leading to PROM.^{15,16,17,18} This explains the causal association between antecedent coitus and PROM found in this study (vide Table VIII). In multiple pregnancy, excessive stretching of chorioamniotic membranes in overdistended uterus may be responsible for PROM.¹⁹ In this study, the incidence of twin pregnancy in PROM patients is higher than controls, but no causal association has been found (vide Table IX). The present study showed that there is a causal association of PROM with previous preterm labour (vide Table X) & previous operations on cervix (vide Table XI). Ekwo EE et al (1993) reported that women having PROM in the index pregnancy were 6.34 times more likely than controls to have history of PROM or premature labour in their preceding pregnancies.²⁰ Operations on cervix reduce the length of the cervical

canal & increase the diameter of the internal os, which may subsequently favour ascending infection & chorioamnionitis leading to PROM.^{21,22,23,24} Treadwell MC et al (1991) reported higher incidence of ascending infection in patients having cervical os >2 cm resulting in chorioamnionitis in 41.7% of patients who had Bishop score >6 at initial examination.²¹ Bishop score >6 was associated with higher incidence of early onset of labour & lower incidence of caesarean section.

CONCLUSION

It is observed from the present study that the incidence of PROM is higher in unbooked cases, multigravida patients, pregnant women aged 20-25 years & patients of low socioeconomic status. No causal association of PROM with antenatal check up, gravida status & twin pregnancy was found. It was observed that chorioamnionitis, malpresentations, non-engaged vertex, antecedent coitus, previous preterm labour & previous operations on cervix may have aetiological role in PROM. Hence, it may be concluded that the aetiopathogenesis of PROM is ill understood even today. Probable predisposing factors as revealed from the present study were chorioamnionitis, malpresentations, non-engaged vertex, previous history of preterm labour, past history of operations on cervix & antecedent coitus. Further studies are required in future to establish the aetiological role of other probable risk factors in PROM and thereby prevent PROM and its complications.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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