

## Prevalence of the pattern of Pre-labor premature rupture of membranes among pregnant women at Al-Sadaqa Teaching Hospital, Aden, Yemen

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**Abstract:** Pre-labor rupture of membranes (PROM) is the rupture of membranes before the onset of labor. It is a common obstetric problem (3 -4%) in developed and developing countries. The aim of this study to describe the pattern of PROM in pregnancies at Al-Sadaqa Teaching Hospital, Aden, Yemen from January to February 2020.

This is a descriptive hospital based study of the patients diagnosed as PROMs managed in the Obstetrics and Gynecology Department.

In this study 151 pregnant women with PROM comprising 11.1% of 1360 total deliveries. Only 9 (0.7%) patients presented with preterm premature rupture of membranes (PPROM) and 142 (10.4%) with term premature rupture of membranes (TPROM). The mean maternal age with PROM was  $26.12 \pm 6.67$  years. With increasing parity, there was a decrease in the PROM; 6.0% in multipara to 4.6% in grand-multipara. The time interval from membrane rupture to delivery was >24 hours in 47% of them. Anemia was the main predisposing factor causing PROMs (47.0%) followed by history of abortion and urinary tract infection (UTI) (29.1%, and 19.9% respectively). About 81.5% of them delivered vaginally while 18.5% by lower segment cesarean section.

Conclusions: The prevalence of PROM in this study was comparably higher than the international average. A higher proportion of them delivered vaginally. The major contributing factors were anemia, history of abortion and UTI and increasing risk with prolonged rupture of membrane > 24hrs. It is of paramount importance to screen for UTI with timely treatment initiation and those with recurrent abortion require close monitoring on risk of PROM during subsequent pregnancies.

**Keywords:** Premature rupture of membranes (PROM)

## انتشار نمط التمزق المبكر للأغشية قبل الولادة بين الحوامل في مستشفى الصداقة التعليمي، عدن - اليمن

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**المستخلص:** التمزق المبكر للأغشية الجنينية هو تمزق للأغشية قبل بدء المخاض ويعتبر من مشاكل الولادة الشائعة في البلدان المتقدمة والدول النامية.

الهدف من هذه الدراسة هو وصف أنماط التمزق المبكر للأغشية الجنينية للحوامل المترددات على مستشفى الصداقة التعليمي في عدن - اليمن من يناير إلى فبراير 2020.

هذه دراسة وصفية أجريت للحوامل اللاتي شخصت بتمزق الأغشية الجنينية قبل بدء الولادة وتمت معالجتها في قسم النساء والولادة لحوالي 151 امرأة حامل من إجمالي 1360 ولادة في نفس فترة الدراسة. فقط (9) بنسبة (0.7%) لديهن تمزق للأغشية الجنينية مبكرا في

عمر الحمل قبل 37 أسبوع بينما 142 حالة بنسبة 10، 4% في العمر الحمل المكتمل. بمتوسط عمري  $26.12 \pm 6.67$  عاما. كلما زادت عدد الولادات قلت نسبة التمزق للأغشية الجنينية مبكرا (6%) للولادات 4-5 ونسبة 4.6% للولادات (6 فأكثر). ووجد أن 47% من الحوامل كان الوقت ما بين تمزق الأغشية الجنينية المبكر والولادة لأكثر من 24 ساعة. فقر الدم للحامل هو أهم عامل لحدوث التمزق المبكر بنسبة 47% يليه الحوامل ذوات الإجهاضات في الحمل السابقة والتهابات المجاري البولية بنسبة (29.1% و 19.9% لكل منهما). وحوالي 81.5% من الحوامل اللواتي أصبن بالتمزق المبكر للأغشية ولدن ولادة طبيعية وحوالي 18.5% ولدن بعملية قيصرية نستخلص من هذه الدراسة أن نسبة التمزق للأغشية الجنينية عالية مقارنة بالمعدل العالمي وأن غالبية الحوامل ولدن طبيعيا وأن فقر الدم وتعدد الإجهاضات السابقة مع التهابات المسالك البولية من أكثر العوامل لتمزق الأغشية الجنينية المبكر. وتزيد الخطورة كلما طالت الفترة للولادة بعد التمزق للأغشية لأكثر من 24 ساعة. مما يستوجب مسح للتهابات البولية لكل الحوامل أثناء الرعاية الأولية كما أنه لا بد أن يتوخى كل مقدمي الخدمة للحوامل للأخذ بعين الاهتمام عدد الإجهاضات السابقة كعامل للتمزق المبكر والترصد له في الحمل القادمة

الكلمات المفتاحية: تمزق الأغشية الجنينية المبكر.

## Introduction.

Premature rupture of membranes (PROM) is defined as the spontaneous rupture of the fetal membranes prior to onset of labour.<sup>(1)</sup> It may occur when the fetus is 37 weeks or more of gestation term premature rupture of membranes (TPROM) or before 37 weeks of gestation preterm premature rupture of membranes (PPROM).<sup>(36)</sup>

Prelabour rupture of membranes (PROM), previously known as premature rupture of membranes<sup>(2)</sup> PROM occurs when the leakage of amniotic fluid occurs at least one hour before the initiation of labor. The fetal membranes normally rupture spontaneously during labor probably due to the physical effects of repetitive uterine contraction.<sup>(19)</sup> At term, PROM complicates approximately 8% of pregnancies,<sup>(5)</sup> while PPRM is responsible for one third of preterm births<sup>(26, 28)</sup> representing a major cause of neonatal mortality and morbidity.<sup>(11, 15)</sup> The most significant maternal consequence of PROM is intrauterine infection, the risk of which increases with the duration of membrane rupture<sup>(23)</sup>. The complications in neonates are prematurity<sup>(25)</sup> short-term neonatal disease (neonatal sepsis, neonatal pneumonia),<sup>(33)</sup> and long-term disability (cerebral palsy, blindness, and deafness).<sup>(10)</sup> Globally, the prevalence of PROM shows some variations that could be to the difference in the population studied. The incidence of PROM ranges from about 5% to 10% of all deliveries and PPRM occurs in approximately 3% of all pregnancies, 70% of cases occurs in pregnancies at term.<sup>(5)</sup> Worldwide it is reported that the prevalence of PPRM shows a great variation between different countries whereby in Uganda (13.8%), Brazi (3.1%), Manipur, India (2.2%),<sup>(17)</sup> Bangladesh (8%), Egypt (5.3%), and Oman (1.8%).<sup>(30)</sup>

As the time between the rupture of the membranes and the onset of labor increases, so may the risk of maternal and fetal infection. Due to this fact, many physicians recommend that labor should be induced if it a term pregnancy, that does not begin spontaneously shortly after the membranes rupture.<sup>(27)</sup> There are various associated obstetrics and gynecologic risk factors with PROM such as prior history of PROM or preterm labor, genital infections, prior abortions, multiple gestation, and prior cervical

procedures.<sup>(8)</sup> Chorioamnionic membrane rupture has several underlying causes, although in many cases TPROM and PPROM will not have recognized etiologies. The pathophysiology leading to PROM at term has been shown to be different from that leading to PPROM. At term, weakening of the membranes may result from physiologic changes combined with shearing forces induced by uterine contractions.<sup>(29)</sup> The complications resulting from PPROM include preterm labor and delivery, intra uterine infection and umbilical cord compression secondary to prolapse or oligohydramnios.<sup>(14)</sup> The problems encountered among women with PPROM are numerous and vast. Some initiating factors of labor may be endogenous and local in their effect (on the chorion-decidual interphase), whereas others may be exogenous (bacterial products). In either event, when certain chemical factors are released at any stage of gestation, the cascade process starts and labor begins.<sup>(34)</sup> The gestational age at the time of birth is strongly predictive of both immediate survival and long term morbidity. Early gestational ROM with an ongoing pregnancy is not without serious complication, which can include pulmonary hypoplasia, musculoskeletal abnormalities, fetal compromise and maternal and fetal infections.<sup>(7)</sup> The optimal management of PPROM is still controversial. Some obstetricians believe that expectant management in the hospital rather than at home (or waiting for labor to begin spontaneously) is preferable for mothers if there is no evidence of fetal or maternal compromise.<sup>(18)</sup> Oxytocin and prostaglandins are the most frequently used pharmacological agents for induction of labor.<sup>(32)</sup> Due to the ongoing continuous problem of PROM with unidentified etiologies encountered in Al-Sadaqa Teaching hospital for the past several years, this present study was conducted to investigate the pattern of pre-labor rupture of membranes in pregnancies, associated factors, and to identify the optimal maternal and fetal outcome of pre-labor PROM at term and preterm.

The main objectives in this study was to describe the pattern and frequency of pre-labor rupture of membranes in these pregnancies, identify some associated demographic and medical factors, evaluate the outcome of pregnancy and the common maternal and fetal complications.

## Patients and methods.

This cross-sectional hospital based study, was carried out in department of Obstetrics and Gynecology at Al-Sadaqa Teaching Hospital from January to February 2020. Patients who were admitted in this hospital with gestational age 28 weeks and more with pre-labor premature rupture of membrane (PROM) confirmed by speculum examination and ultrasound for gestational age and amniotic fluid index (AFI), were included.

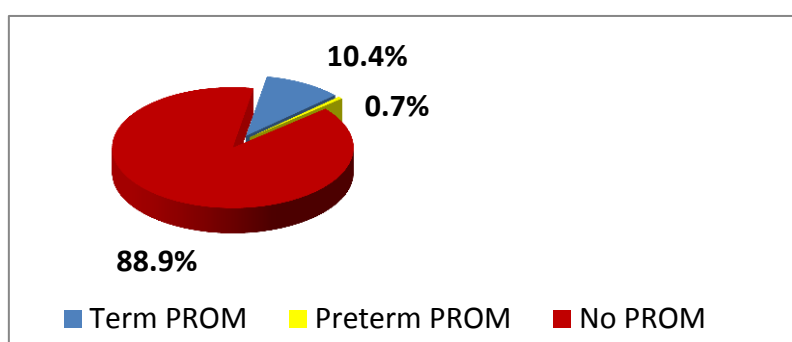
Data was taken from the clinical records of the admitted patients with diagnosis of pre-labor PROM at time of admission, after taken consent approval from the authority of the hospital.

The studied variables included, age of mother, place of residence, gravidity, parity, time at admission and time at rupture of membranes, duration of PROM to delivery, history of previous PROM, history of abortion, mode of delivery, onset of labor, color of liquor, baby's birth weight and sex, maternal

temperature, pulse rate, blood pressure (BP), hemoglobin level, and neonatal Apgar score were recorded. After data collection, analysis was done using SPSS version 22. Continuous variables were described as means  $\pm$ SD, and categorical variables were presented as absolute numbers (n) and percentage (%). Significance of outcome was expressed by the P value ( $< 0.05$ ).

## RESULTS:

In this study 151 pregnant women with PROM comprising 11.1% of 1360 total deliveries were diagnosed. Only 9 (0.7%) patients had preterm premature rupture of membranes (PPROM) and 142 (10.4%) with term premature rupture of membranes (TPROM). However, a higher proportion of the pregnant women 1209 (88.9%) did not have PROM illustrated in Figure 1.



**Fig (1) The incidence of pre-labor rupture of membranes**

The mean maternal age for these patients with pre-labor rupture of membranes (PROM) was  $26.12 \pm 6.67$  years. A higher proportion of the pregnant women with PROM 125 (82.8%) were in the age group from 20-39 years. The majority of pregnant women with PROM were nullipara and pluripara (44.4%, 45.0% respectively), revealing that with the increasing parity, there was a decrease in the percentage of PROM, 6 % in multipara to 4.6% in grand-multipara. Most of cases with pre-labor premature rupture of membranes were term gestational age (93.4%). The quality of antenatal care of pregnant women with pre-labor rupture of membranes varied. Related to the antenatal care, it was acceptably noticed in 37.7% of them. (Table 1)

**Table (1) Distribution of pregnant women with pre-labor rupture of membranes according to associated demographic and obstetric characteristics**

Variables	Categories	No.	%	Mean $\pm$ SD (years)
Maternal age group (years)	<20	20	13.2	26.12 $\pm$ 6.67
	20-29	86	57.0	
	30-39	39	25.8	
	$\geq 40$	6	4.0	
	Total	151	100.0	

Variables	Categories	No.	%	Mean $\pm$ SD (years)
Parity	Nullipara (zero children)	67	44.4	
	Pluripara(1-3 children)	68	45.0	
	Multipara (4-5 children)	9	6.0	
	Grand multipara ( $\geq$ 6 children)	7	4.6	
Gestational Age	Term	141	93.4	
	Preterm	10	6.6	
Antenatal care visits	No (zero visit)	21	13.9	
	Bad (1-3 visits)	73	48.3	
	Acceptable ( $\geq$ 4 visits)	57	37.7	

The time-period varied from ruptured membranes until the pregnant women arrived seeking obstetric help where 39.7% came early (<12 hours) while 25.2% arrived late (after 24 hours) with a mean of  $27.57 \pm 46.33$  hours.

The time interval from rupture of membranes to delivery was >24 hours in 47% of pregnant women with PROM whereby 37.1% was between 12 and 24 hours and 15.9% was <12 hours, with a mean of  $39.30 \pm 49.439$  hours. (Table 2)

**Table (2) Distribution of pregnant women with pre-labor rupture of membranes according to rupture time**

Time (hours)	Pre-labor rupture of membranes at term(n=151)		
	No.	%	Mean $\pm$ SD (hours)
<b>Time from rupture of membranes to admission</b>			
< 12	60	39.7	27.57 $\pm$ 46.331
12-24	53	35.1	
>24	38	25.2	
<b>Total</b>	151	100.0	
<b>The interval from rupture to delivery</b>			
< 12	24	15.9	39.30 $\pm$ 49.439
12-24	56	37.1	
>24	71	47.0	
<b>Total</b>	151	100.0	

In table 3, it was noticed that an increasing percentage of pregnant women with PROM had anemia (47.0%), history of abortion (29.1%), urinary tract infection (19.9%), hypertensive disorder during pregnancy (15.9%) and history of previous LSCS (10.6%). On the other hand, a decreasing percentage was seen among women with genital infection and cerculage (6%, 1.3% respectively).

**Table (4) Distribution of pregnant women with pre-labor rupture of membranes according to associated factors**

Associated factors	Pre-labor rupture of membranes (n=151)	
	No.	%
Anemia	71	47.0
Hypertensive disorders during pregnancy	24	15.9
Urinary tract infection UTI	30	19.9
Genital infection	9	6.0
Previous premature rupture of membranes	5	3.3
History of abortion	44	29.1
Cerculage in current pregnancy	2	1.3
History of previous LSCS	16	10.6

Table 5 : This table revealed that spontaneous management was applied to 51.7% of pregnant women with PROM. Five pregnant women (3.3%) out of total 78 (51.7%) with spontaneous management were managed by surgery due to obstetric complications. Surgical management was applied after failed induction in 7 (4.6%) and 16 (10.6%) were managed by LSCS with clear indications at presentation.

A total of 123 (81.4%) patients with PROM delivered vaginally being spontaneous in 48.3% and induced in 33.1%. The induced vaginal delivery with use of oxytocin was higher than prostaglandin (23.8% versus 9.3%).

Lower segment cesarean section was the mode of delivery in 18.5% of PROM, 10.6% with clear indication for LSCS at presentation, and 7.9% delivered abdominally after failed induction or obstetrics complications after spontaneous onset of labor.

**Table (5) Management and mode of delivery of pregnant women with pre-labor rupture of membranes**

Management	Pre-labor rupture of membranes (n=151)	
	No.	%
Spontaneous management	78	51.7
Induction management	57	36.4
Surgical management (n=28, 18.5%)		
Cesarean with clear indication at presentation	16	10.6
Cesarean after spontaneous management (due to obstetric complications)	5*	3.3
Cesarean after failed induction	7**	4.6
Mode of delivery		
Vaginal delivery		

Management	Pre-labor rupture of membranes (n=151)	
Spontaneous	73	48.3
<b>Induction</b>		
Induction by oxytocine	36	23.8
Induction by prostaglandin	14	9.3
Sub-Total	50	33.1
<b>Lower segment cesarean section</b>		
Clear indication at presentation after	16	10.6
spontaneous management (due to obstetric complications)	5	3.3
After failed induction	7	4.6
Subtotal	28	18.5

\* 5 cases failed expectant management      \*\*7 cases failed induction management

The common indications for LSCS comprised fetal distress in a higher percentage (32.1%) followed by failure of induction (25%) and Cephalopelvic disproportion (21.4%). (Table 6)

**Table (6) indications for cesarean section in Pre-labor rupture of membranes at term**

Indications	Cesarean section (n=28)	
	No.	%
Fetal distress	9	32.1
Cephalopelvic disproportion	6	21.4
Previous lower segment cesarean section	5	17.9
Failure of induction	7	25.0
Severe Oligohydromnious	1	3.6
Total	28	100.0

Regarding the fetal outcome of pregnant women with PROM, male comprised 43.7% and female 56.3%. The birth weight was 2500-3500 grams in a higher percentage of them 126 (83.4%). Apgar score in the first minute after birth was  $\geq 7$  in 84.8%. The fetal morbidity encountered in this study was 2 (1.3%) each with meconium aspiration syndrome and congenital malformation (hydrocephalus), while neonatal sepsis and neonatal hypoglycemia (0.7% each). In accordance to the perinatal mortality rate related to PROM was 3.7.1/1000 of total hospital births during the study period. This rate represented late fetal death (2.2/1000 hospital births) and early neonatal death (1.7/1000 hospital births). (Table 7)

**Table (7) Fetal outcome in pregnant women with pre-labor rupture of membranes**

Items	Pre-labor rupture of membranes (n=151)	
	No.	%
<b>Sex of fetus</b>		
Male	56	43.7
female	85	56.3
Birth weight (grams)		

Items	Pre-labor rupture of membranes (n=151)	
	No.	%
<2500	20*	13.2
2500-3500	126	83.4
>3500	5	3.3
<b>Apgar score in the first minute of life</b>		
0-2	3	2.0
3-6	20	13.2
≥7	128	84.8
<b>Total</b>	<b>151</b>	<b>100.0</b>
<b>Fetal morbidity</b>		
Neonatal Sepsis	1	0.7
Meconium Aspiration syndrome	2	1.3
Neonatal hypoglycemia	1	0.7
Congenital malformation **	2	1.3
<b>Total</b>	<b>6</b>	<b>4.0</b>
<b>Perinatal mortality (Total birth 1360)</b>		
Early neonatal death	2	1.5 43-2
Late fetal death	3	2.2 49-9
<b>Total</b>	<b>5</b>	<b>3.7 33-4</b>
* Including 10 preterm		
** Hydrocephalus		

The time lapse from ruptured membranes to admission was >24 hours in 66.7% of pregnant women complicated by clinical chorioamnionitis, in 43.8% by postpartum hemorrhage, and one by abruption placenta. The time lapse from ruptured membranes to the point of admission was documented with statistical significant difference in relation to the occurrence of postpartum hemorrhage ( $P = 0.04$ ), but showed no significance to puerperal sepsis, clinical chorioamnionitis, nor to prolonged labor or abruption placenta.

Regarding the maternal morbidity in relation to time interval form membrane rupture to delivery in PROM of more than 24 hours, only postpartum hemorrhage showed a significance that was statistically different ( $P < 0.05$ ). The time relationship between maternal morbidity and ruptured membrane to delivery in occurrence of puerperal sepsis, chorioamnionitis, prolonged labor and abruption placenta showed a difference but was not significant. (Table 8)



**Table (8) the maternal morbidity related to the time from rupture of membranes to admission in pre-labor rupture of membranes**

Time from ruptured membranes to admission (hours)									
Maternal morbidity							Total	Statistics	
	<12		12-24		>24			No.	X <sup>2</sup>
	No.	%	No.	%	No.	%			
Clinical chorioamnionitis	0	0.0	1	33.3	2	66.7	3	3.314	0.191
Puerperal sepsis	2	66.7	0	0.0	1	33.3	3	1.714	0.424
Postpartum hemorrhage	2	12.5	7	43.8	7	43.8	16	6.178	0.046*
Prolonged labor	0	0.0	3	100.0	0	0.0	3	5.603	0.06
Abruptio placenta	0	0.0	0	0.0	1	100.0	1	2.994	0.252
Time interval from ruptured membranes to delivery (hours)									
Maternal morbidity							Total	Statistics	
	<12		12-24		>24			No.	X <sup>2</sup>
	No.	%	No.	%	No.	%			
Clinical chorioamnionitis	0	0.0	0	0.0	3	100.0	3	3.449	0.217
Puerperal sepsis	1	33.3	1	33.3	1	33.3	3	0.719	1.000
Postpartum hemorrhage	0	0.0	5	31.3	11	68.7	16	4.806	0.01*
Prolonged labor	0	0.0	1	33.3	2	66.7	3	0.749	0.830
Abruptio placenta	0	0.0	0	0.0	1	100.0	1	1.134	1.000
Percentage calculated in relation to the total of the row * statistically significant									

## Discussion.

This study investigated the pattern of pre-labor rupture of membranes in pregnancies and associated factors showing a prevalence of 11.1% of PROM among pregnant women above 28 weeks of gestation admitted at Al-Sadaqa Teaching Hospital, Aden. This prevalence of PROM did not differ from the literature reports within the worldwide range of 5 to 15% as reported by Huang et al, Lu Zhuang, et al. (2020) <sup>(41)</sup> The prevalence of TPROM in this study was 10.4%, higher than that reported in the same hospital of 3.75% (2005), <sup>(6)</sup> and in USA (8.0%) <sup>(24)</sup> Ethiopia (1.4%). <sup>(5)</sup>

The prevalence of preterm premature rupture of the membranes (PPROM) was similar between developed countries and developing countries: China (2.5%) Pakistan (3.27%), <sup>(38)</sup> Nigeria (2.5%) <sup>(31)</sup>. Another study in Turkey reported a high prevalence of PPRM (43.14%) <sup>(21)</sup>. The low prevalence documented in this study (0.7%) is quite difficult to clarify at this current time. The accuracy of the

diagnosis of rupture membranes and estimation of gestational age may probably be other variables that may affect the apparent prevalence of PPRM.

A higher proportion of these patients fell in the age range of 20-29 years (57.0%) with maternal mean age  $26.12 \pm 6.67$  years and 44.4% were primi-gravida which was previously reported in Aden<sup>(6)</sup>, with similar results in Turkey with the maternal mean age of  $26 \pm 5$  years<sup>(39)</sup>. In contrast this was comparably higher than the reports of Pakistan, with maternal mean age with pre-labor ROM was  $25 \pm 10$  years (16-36 years), 40% of the patients were primigravida,<sup>(4, 31)</sup> The studied patients who had bad antenatal care comprised 48.2% and 13.9% did not pay any visit to the antenatal care showing a likelihood that probably the booking status of the mothers did not appear to show any decrease in the risk of prelabor PROM.

In the present study, the duration of prelabor PROM and latency were significantly associated with unfavorable maternal outcome. Mothers with duration of PROM greater than or equal to 24 hours were more likely to experience un-favorable outcome than those with duration of PROM less than 12 hours. This finding corroborates the results of other studies.<sup>(16)</sup>

In this study, there was no maternal mortality, which is similar to the report from Inida.<sup>(20)</sup>

The history of abortion was apparent in one third of the studied patients (29.1%) which could be explained by the fact to be a probable risk factor for PROM. This is supported by studies done in USA, Lithuania, India, China and Uganda<sup>(9, 12, 13, 22, 40)</sup>

Moreover, this study revealed no significant association between history of preterm birth and premature rupture of membranes. This falls in agreement with other reports from Lithuania, India, Pakistan and Uganda<sup>(12, 22, 37)</sup>

Prelabor PROM is reported in many literature reviews to be associated with an increased risk of maternal morbidity. Maternal morbidity increased with increase in duration of PROM. The rate of maternal morbidity was 17.2%, postpartum hemorrhage (PPH) was found in 10.6% (16 out of 151), followed by prolonged labor in 2.6%. In addition, other maternal morbidities were clinical chorioamnionitis (2.0%), puerperal sepsis (2.0%), abruptio placenta (0.7%). There was evidence of any maternal mortality seen in the study. In a Yemeni study, the maternal morbidity was seen in 34.4% of patients with prelabor PROM,<sup>(6)</sup> clinical chorioamnionitis 12.6%, puerperal sepsis 9.4%, PPH 6.3% and prolonged labor in 3.6%.

Clinical chorioamnionitis was a common maternal morbidity reported by many authors,<sup>(41)</sup> but in this study it was found to be comparably lower which could be explained by the fact due to the presence of a protocol of starting antibiotics in patients of pre-labor PROM in the studied hospital.

The relationship of pre-labor PROM to the consequential fetal hazard is a matter of concern. In the present study, perinatal mortality rate was 3.7 per 1000 total hospital birth delivery (5 out of 151). Two of the six neonatal deaths were due to meconium aspiration syndrome and two were due to

congenital malformations (hydrocephalus). Ba-Deeb 2005 reported perinatal mortality rate of 1.8 per total hospital birth delivery,<sup>(6)</sup> and another study in West Bengal, the perinatal mortality was 5% and morbidity was 32%.<sup>(37)</sup>

## Conclusion.

Pre-labor ROM is an inscrutable condition associated with high risk of maternal and perinatal morbidity and mortality. The overall prevalence of Pre-labor ROM was 11.1% of all deliveries during the study period. A higher proportion of pre-labor ROM delivered vaginally documenting anemia, history of abortion and urinary tract infection being probably the main risk factors associated with increased the risk of prolonged rupture of membrane of more than 24hrs. It is of paramount importance to screen for UTI with timely treatment initiation and those with recurrent abortion require close monitoring on risk of PROM during

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