

Investigation of risk factors according to gestational age in cases with premature rupture of membrane

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ABSTRACT

Objective: To determine the effects of the risk factors according to gestational age in pregnant women with premature rupture of membrane (PROM).

Methodology: Two hundred pregnant women that were hospitalized with premature rupture of membrane participated in the study and were divided into two groups according to 34 gestation week (gw).

Results: Mean of gestation weeks was 31.71 ± 3.43 and 96.5% preterm premature rupture of membrane. It was determined that being young (OR=1.64), advanced age (OR=2.41), low levels of education (OR=2.80), primigravida (OR=3.44), multiparity (OR=2.83), overweight before pregnancy (OR=4.66) and coitus frequency (OR=1.61) could be effective in the formation of membrane rupture in < 34gw in our cases.

Conclusion: Our results indicate that some risk factors, which are shown as preventable factors, could be significant in the formation of membrane rupture in < 34gw.

KEY WORDS: Pregnancy, Gestation week, Premature rupture of membrane (PROM), Risk factors.

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INTRODUCTION

Premature rupture of membranes (PROM) is the rupture of the foetal membranes (amniotic sac) before the onset of labour. It is called preterm premature rupture of membranes (PPROM) if occurs before the 37th week of gestation (gw).¹ PROM occurs in 3–18.5% of all pregnancies.^{1,2} The incidence of PROM varies for different countries and populations, because it is related with of the multiple risk factors.³ The PROM incidence was reported to be 4.8–4.9% in some studies of Turkish populations.⁴

Many conditions such as bleeding in pregnancy, genito-urinary infections, smoking, maternal weight, mechanical injury (trauma), coitus frequency, low socioeconomic status, nutrition, amniocentesis, foetal anomalies, intrauterine growth retardation (IUGR), uterine distension, history of PROM, etc. are associated with the occurrence of PROM.^{1,5-10} PROM is related to potential maternal, foetal and neonatal morbidity and mortality.³ Causing neonatal complications that require intensive

care, PROM and especially PPRM may alone lead to preterm labour and birth, which are most commonly encountered clinical situations.^{1,4} The management of patients with PROM is expensive and an important perinatal dilemma for clinicians. Therefore, PROM continues to be one of the most troublesome subjects in obstetrics.^{3,4,11} During treatment, clinicians try to increase the gestational period in order to improve the chance of the foetus living and at the same time deal with the many serious problems caused by PROM.^{5,12-14} However, a standard, non-invasive diagnostic method is not available.¹³ Although there have been many developments in the treatment of PROM, its incidence has not yet been reduced to the desired level. Moreover, the PPRM rate has increased.¹¹ The devastating consequences of PROM/PPROM make it necessary to develop health strategies to improve the outcome by predicting, preventing and treating this situation. To contribute to the management of PROM, this study was conducted with the purpose of assessing the distribution of risk factors causing PROM and their possible effects according to gestation weeks in pregnant women with PROM.

METHODOLOGY

This research was planned and implemented as a pilot study in high-risk pregnancy units of two hospitals affiliated with the Turkish Ministry of Health in Istanbul, Turkey. The sample consisted of a total of 200 pregnant women who were hospitalised in high-risk pregnancy units with a diagnosis of PROM. It is generally agreed that women with PROM should be expectantly managed until at least 34 gw.^{12,14} Thus, in this study, 200 pregnant women with PROM were divided into two groups. The first group consisted of women at <34gw (n=130; 65.0%) and the second group consisted of women at ≥34gw (n=70; 35.0%).

Written permission and approval of the ethics committee were obtained before the implementation of the study. Hospitalised pregnant women with PROM were informed about the study and written consent was given by the volunteers. Data were collected via questionnaires (consisting of 20 questions involving descriptive features), the "PROM risk factors evaluation form" (consisting of 30 questions), and patient files which included all clinical data about diagnosis, treatment and monitoring at the hospital. The first two forms were filled out by the researchers during face-to-face interviews. The body mass index (BMI) of each par-

ticipant was determined and recorded according to her pre-pregnancy weight and height.

The following parameters were assessed in all cases: socio-demographic and obstetric characteristics (number of pregnancies and births, type of previous birth, etc.), gynaecological history, and characteristics related to current pregnancy (antenatal follow-up, BMI before the pregnancy, infection in pregnancy, experience of trauma and physical violence, smoking, chronic illnesses, frequency of sexual intercourse, history of PROM in previous pregnancy, etc.) and current clinical findings regarding the mother and foetus (foetal anomalies, multiple pregnancy, amniocentesis, IUGR, intrauterine exitus, myoma, etc.). For the choice of parameters related to risk factors, properties which were easy to evaluate in the clinical area and results obtained in clinical practice that required less cost were considered.

Data were analysed by frequency values for descriptive statistics and arithmetic mean. The Student's t-test and one-way analysis of variance (ANOVA) were used as parametric tests. The chi-square test was used to evaluate the differences between groups in terms of independent variables. The Mann-Whitney U and Kruskal-Wallis H test were used as non-parametric tests in order to test the difference between the means of clinical findings. Logistic regression analysis was used to determine the effect of independent variables found to be statistically significant at $p < 0.05$ on the incidence of PROM at 34gw.

RESULTS

The mean gestational weeks of the participants who were hospitalised due to PROM was 31.71 ± 3.43 weeks (min:21, max:37). Almost all participants (96.5%, n=191) were PPRM; only 4.5% (n=9) were PROM and all of those were at 37gw.

The mean age of cases was 28.33 ± 5.57 years (min:17, max:45); only 2.5% were adolescent pregnancies. Most of the cases (74.5%) had a secondary or lower education level. The rate of multigravida was 76.0%. The primiparous and multiparous rate total was 63.5% (n=127), and more than half of the cases (55.1%) had previously experienced caesarean section delivery. The distribution according to mean gestational week and groups of the demographic and obstetric characteristics of cases are given in Table-I.

The majority of cases (83.5%) were housewives. Only 40% of cases had mentioned their economic level as good. It was determined that none of

Table-I: Frequency distribution of the socio-demographic, obstetric characteristics of the cases according to mean gestational week and groups.

Descriptive characteristics	n=200 n(%)	Gestation wk. Mean±SD	p-value	1st Group (<34gw) n=130 n(%)	2nd Group (≥34gw) n=70 n(%)	p-value
Age groups						
17-24	52(26.0)	30.94±3.67	p=0,005	40(76.9)	12(23.1)	P=0,000
25-34	114(57.0)	32.39±3.31		61(53.5)	53(46.5)	
≥35	34(17.0)	30.62±2.94		29(85.3)	5(14.7)	
Education levels						
Primary and lower(≤5 /y)	74(37.0)	30.72±3.08	p=0,004	62(83.8)	12(16.2)	P=0,000
Secondary(8/y)	75(37.5)	32.56±3.60		34(45.3)	41(54.7)	
high school and college(≥12/y)	51(25.5)	31.90±3.36		34(66.7)	17(33.3)	
Gravida						
Primigravida	48(24.0)	30.35±3.38	p=0,001	40(83.3)	8(16.7)	P=0,002
multigravida	152(76.0)	32.14±3.34		90(59.2)	62(40.8)	
Parity						
Nullipara	73(36.5)	31.86±3.71	p=0,127	40(83.3)	8(16.7)	p=0,021
Primipara	60(30.0)	32.26±3.28		33(55.0)	27(45.0)	
Multipara	67(33.5)	31.05±3.17		52(77.6)	15(22.4)	
Previous delivery mode(n=127)						
NSD*	57(44.9)	31.33±3.44	p=0,359	41(71.9)	16(28.1)	p=0,629
Sectio	70(55.1)	31.87±3.12		53(75.7)	17(24.3)	
PROM history						
Yes	68(34.0)	31.82±3.06	p=0,749	45(66.2)	23(33.8)	p=0.802
No	132(66.0)	31.65±3.61		85(64.4)	47(35.6)	

*: NSD: Normal spontaneous delivery.

them were attending antenatal follow-up regularly (43.5% never attended, 56.5% attended once or twice). It was found that 57% had never smoked, and 13% were smoking during their current pregnancy (59.3% of those women were smoking <10 cigarettes/day). The rate of PROM experienced was 34% in their previous pregnancies in primiparous cases. There was no significant difference in distribution between groups in terms of smoking and PROM ($p>0.05$).

In terms of the clinical findings for participants in their current pregnancy, the foetal abnormality rate was found to be 11.5%, multiple pregnancy 4.5%, intrauterine exitus 3.0%, IUGR 8.0%, pregnancy+myoma 4.0% and amniocentesis 7.5%. The mean gestational week was significantly lower in cases with foetal abnormalities, intrauterine exitus, IUGR and myoma, and the majority of these cases were in the <34gw group ($p<0.05$).

In terms of pre-pregnancy BMI, the rate of overweight/obese before becoming pregnant was 31.0%; 43.5% experienced bleeding problems;

the genital infection rate was 38.5%; the rate of having experienced trauma (harsh beatings, falls and accidents) was 46.5%; and coitus frequency of once or twice a week occurred in 35.0% of our cases in their current pregnancy. The distribution according to mean gestational week and groups of characteristics, in terms of risk factors that may cause PROM, are given in Table-II.

The results of logistic regression analysis: It was determined that age, education, gravida, parity, BMI, coitus frequency and trauma in <34gw and bleeding and genital infection in ≥34gw could be effective in the formation of membrane rupture in our cases (Table-III).

DISCUSSION

It has been reported that the average gestation week is decreasing and the PPRM rate is increasing compared to the previous years.¹¹ In our study of PROM, most of the cases were PPRM and <34gw, and the lowest gestation week was 21. Multigravida and multiparous or primiparous are indicated

Table-II: The distribution according to mean gestational week and groups of the characteristic that experienced in current pregnancies of the cases.

Characteristics	n=200 n(%)	Gestation wk. Mean±SD	p-value	1st Group (<34gw) n=130 n(%)	2nd Group (≥34gw) n=70 n(%)	p-value
<i>BMI before Pregnancy</i>						
Normal	138(69.0)	32.33±3.43	p=0,000	77(59.2)	61(44.2)	p=0,000
Overweight+obese	62(31.0)	30.33±3.02		53(85.5)	9(14.5)	
<i>Bleeding</i>						
No bleeding	113(56.5)	31.07±3.46	p=0,010	82(72.6)	31(27.4)	
Experience in 1st trimester	69(34.5)	32.47±3.02		41(59.4)	28(40.6)	p=0,010
Experience in 2nd/3rd trimester	18(9.0)	32.77±3.97		7(38.9)	11(61.1)	
<i>Genital infection *</i>						
Yes	77(38.5)	33.50±2.81	p=0,000	33(42.9)	44(57.1)	P=0,000
No	123(61.5)	30.59±3.31		97(78.9)	26(21.1)	
<i>Urinary infection</i>						
Yes	101(50.5)	32.23±3.16	p=0,029	61(60.4)	40(39.6)	p=0,168
No	99(49.5)	31.18±3.62		69(69.7)	30(30.3)	
<i>Trauma</i>						
Yes	93(46.8)	31.16±3.47	p=0,033	67(72.0)	26(28.0)	p=0,050
No	107(53.1)	32.19±3.33		63(58.9)	44(41.1)	
<i>Coitus frequency</i>						
One or more a week	70(35.0)	30.30±3.46		58(82.9)	12(17.1)	
Once in 15 days	74(37.0)	32.58±3.25	p=0,000	41(55.4)	33(44.6)	p=0.001
Once in a month	56(28.0)	32.33±3.10		31(55.4)	25(44.6)	

*: NSD: Normal spontaneous delivery.

as risk factors for PROM by many studies in the literature.^{4,11} In our study, the mean gestational week of primigravida cases was significantly lower than in multigravida; the majority of the cases were in the <34gw group, and the odds ratio (OR) of having membrane rupture in <34gw was 3.44. Moreover, our findings indicate that multiparity increases the risk of membrane rupture by 2.83 times. These findings are also considered to be important.

Lee et al¹⁵ reported that the repetition rate of PROM is 16.7%. Whereas this rate reported as a 25.3% in a study conducted in Turkey in 1995.⁹ Our study shows that this percentage has increased in recent years. Our findings demonstrated that cases with a history of PROM have to be carefully followed up.

Chen et al¹⁶ determined that overweight or obese before becoming pregnant in terms of BMI increases the risk of PROM significantly. In our study, the findings indicated that the average gestational weeks of cases that were overweight/obese before becoming pregnant were lower, and the odds ratio (OR=4.66) for PROM in <34gw was

significantly increased in these cases. This shows that overweight/obese cases should be taken as a risk factor for PROM; it would be useful to observe these cases carefully in the pre-conception and antenatal periods.

Bleeding during pregnancy is reported to be a cause of PROM by many studies in the literature.^{5,7,11} Selo-Ojeme and Tewari¹⁷ reported that early pregnancy bleeding was a cause of PROM. In our study, the odds ratio (OR=4.01) of having membrane rupture in ≥34gw in cases who experienced bleeding in trimester 2/3 was significantly increased. This suggested that bleeding in trimester 2/3 may trigger PROM. Hossain et al⁷ reported that especially second trimester bleeding may cause preterm labour and PROM. The literature and our results emphasise that bleeding during pregnancy, in any period, is a risk factor for PROM.

Recent studies have revealed that infections experienced during pregnancy raise the risks of preterm labour and PROM.^{6,18} In our study, the experience of genital infection rate was found to be more in the ≥34gw group, and the odds ratio was 4.97 for

Table-III: Logistic regression results of the risk factors in cases (according to 34gw).

Factors	OR*	95.0% CI** for OR		p-value
		Lower	Upper	
17-24 age	1.64	1.16	2.30	0.034
≥35 age	2.41	1.15	5.04	0.019
Lower education level (≤ 5 years)	2.80	1.17	6.71	0.021
Primigravida	3.44	1.50	7.86	0.003
Multiparity	2.83	1.31	6.10	0.008
BMI (overweight/obese)	4.66	2.13	10.20	0.000
Coitus frequency	1.61	1.13	2.30	0.008
Exposure to trauma	1.80	0.99	2.09	0.053
Bleeding (first trimester) ***	0.216(1/0.216=4.62)	0.67	0.69	0.010
Bleeding (2/3 trimester) ***	0.249(1/0.249=4.01)	0.73	0.84	0.026
Genital infection ***	0.201(1/0.210=4.97)	0.10	0.37	0.000

*OR = Odds Ratio, **CI= Confidence Interval

***:As B values of these variables in the variables in the equation table were -1, negative result, (there is an inverse relationship in these variables), positive effective rate was obtained through dividing by OR value. This situation that the value of B is negative is indicate of factors less effective in <34gw, but more effective in ≥34gw.

PROM in this group. Thus, our results show that prevention and control of infection risk factors could reduce PROM.

In our study, it was found that trauma experienced in pregnancy could trigger membrane rupture formation in the short term, and the odds ratio was significantly increased (1.80 times) in <34gw. Therefore, pregnant women should be educated on this issue and exposure to trauma should be carefully monitored. On the other hand, some studies have emphasised that coitus frequency increases the risk of PPRM.^{11,19} In our results, it was determined the majority of cases whose coitus frequency was once or twice a week above were in the <34gw group, and the odds ratio rate for this group was 1.61. This result shows that frequent coitus during pregnancy increased the risk of PROM.

This study was conducted only with PROM cases. For this reason, the results cannot be generalised to all pregnant women; however, they can be used as a guide for further research. In the study, there were other risk factors that could play a role in the formation of PROM—such as genetic, immunologic, biochemical, etc. parameters—that were not analysed. Rather, properties which are easy to evaluate in the clinical area and where the results could be obtained inexpensively in clinical practice were assessed. According to the results, it can be said that most of the parameters evaluated in terms of risk factors that play a role in the formation of PROM are preventable. For the management of PROM, the study results will be particularly useful in the areas

of pre-conception and prenatal services, regarding risk assessment and the monitoring of these parameters for expectant mothers, as well as taking protective measures. Furthermore, education and consulting services regarding these factors may increase individuals' susceptibility. Thus, continuous and qualified services will contribute to the reduction of the incidence of PROM.

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