







Neonatal outcomes following preterm prelabor rupture of membranes during the periviable period

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ABSTRACT

Objective: Preterm prelabor rupture of membranes (PPROM) before 26 weeks of gestation presents a significant clinical challenge due to its association with high rates of neonatal morbidity and mortality. We aimed to assess neonatal outcomes and risk factors associated with perinatal mortality in pregnancies complicated by periviable preterm prelabor rupture of membranes (PPROM).

Material and Methods: This retrospective cohort study analyzed medical records of 119 pregnancies complicated by PPRM between 20+0 and 25+6 weeks' gestation, managed expectantly at a tertiary care center from 2015 to 2019. Data on maternal demographics, sonographic and laboratory parameters, and neonatal outcomes were collected. Statistical analyses included t-tests, Mann–Whitney U, chi-square, and ROC curve analysis to determine predictive cut-offs for perinatal mortality.

Results: Of 142 women with mid-trimester PPRM, 119 (83.8%) were managed expectantly. Of the 119 cases, 53 neonates survived to discharge (44.5%). Gestational age at delivery, birth weight, and latency period were significantly higher in the survival group ($p < 0.001$). ROC analysis revealed GA ≤ 23 weeks, latency ≤ 9 days, and birth weight ≤ 640 g as significant predictors of mortality. The combination model (AUC 0.78) yielded high sensitivity (90.38%) but limited specificity (50%).

Conclusion: This study confirms that key prognostic indicators for neonatal survival in periviable PPRM include gestational age at delivery, latency period, and birth weight. The survival benefit was most evident in pregnancies with latency beyond 9 days and deliveries occurring after 23 weeks. While ROC-derived models can guide clinical decision-making, their specificity limitations must be considered. Further prospective, multicenter research is needed to validate these findings.

Keywords: Chorioamnionitis, periviable birth, premature rupture of fetal membranes, preterm birth.

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INTRODUCTION

The period between 20+0 and 25+6 weeks' gestation is the earliest stage of fetal maturity and is called the periviable period.^[1] Although the prevalence of preterm prelabor rupture of membranes (PPROM) is less common before 26 or 27 weeks of gestation (0.5%), deliveries occurring during this period are associated with high rates of neonatal mortality, severe long-term morbidity, and significant maternal risks.^[2] Respiratory distress syndrome (RDS), necrotizing enterocolitis (NEC), intraventricular hemorrhage (IVH), periventricular leukomalacia (PVL), bronchopulmonary dysplasia (BPD), retinopathy of prematurity (ROP), infection, and neurodevelopmental impairment are some of the morbidities experienced by infants surviving extreme prematurity.

Management decisions in this critical period require careful consideration of gestational age, fetal viability, maternal health, and the wishes of the patient and their family due to the probable poor neonatal outcomes, which cause both socioeconomically and psychologically devastating effects for parents. Expectant management, which involves prolonging the pregnancy under close medical supervision to increase gestational age (GA) at delivery and enhance fetal maturity, is often pursued to improve neonatal outcomes.^[3] If the condition of the mother and fetus is reassuring and there is no indication for urgent delivery, such as chorioamnionitis, placental abruption, or umbilical cord compression, it has been observed that neonatal outcomes are not worse with prolonged latent phase.^[4,5] Advancements in neonatal intensive care and maternal-fetal medicine, such as the administration of antibiotics, antenatal corticosteroids, neuroprotective magnesium sulfate, postnatal surfactant therapy, and improved respiratory support, have led to a reassessment of the threshold of viability and the potential for improved survival following early membrane rupture.^[1]

This study aims to evaluate neonatal outcomes and identify risk factors associated with perinatal mortality in pregnancies complicated by PPROM during the periviable period in those managed expectantly.

MATERIAL AND METHODS

This retrospective cohort study was performed between January 2015 and December 2019 in the Maternal-Fetal Medicine Unit of Health Science University, İzmir Tepecik Research and Training Hospital. The data were obtained from the hospital's digital recording system. This study was conducted following the Helsinki Declaration Ethical Standards and was approved by the local ethics committee with the approval number 2019/15-8.

Patients

Women diagnosed with PPROM during the periviable period (from 20+0 to 25+6 weeks' gestation) were evaluated, and patients with expectant management were included in the study. Pregnancies known to have fetal structural or chromosomal abnormalities, multiple pregnancies, the presence of labor at the time of diagnosis, or giving birth within 24 hours of diagnosis were excluded.

Initial Approach

The diagnosis of PPROM was based on a maternal history of leaking fluid and a sterile speculum examination. When the pooling

of amniotic fluid in the posterior fornix was noted, no additional tests were used. If the amniotic fluid was not seen, an assay for placental alpha-microglobulin-1 protein in the vaginal fluid was used to confirm the diagnosis.^[6] Following the diagnosis of PPROM, all pregnancies were evaluated for the presence of labor, infection, and fetal well-being, fetal presentation, and amniotic fluid status on ultrasound examination. Oligohydramnios was defined as an amniotic fluid index (AFI) ≤ 5 cm and/or a deep vertical pocket (DVP) < 2 cm. Anhydramnios is defined by the lack of a measurable AFI or DVP. Gestational age was determined based on the date of the last menstrual period (LMP) and confirmed by crown-rump length (CRL) measurement during a first-trimester ultrasound.

Pregnancy Management

We discussed the potential risks and benefits of expectant management versus termination of pregnancy with parents for all pregnancies before 22 weeks' gestation and offered the option of pregnancy termination by induction of labor. Patients who preferred active neonatal resuscitation and expectant management before 22 weeks and all pregnancies over 22 weeks were hospitalized and monitored for maternal and fetal well-being. Patients who refused hospitalization were discharged and scheduled for twice-weekly outpatient visits. We recommended delivery at 34 weeks' gestation unless the following occurred: nonreassuring fetal heart rate, placental abruption, clinical chorioamnionitis, cord prolapse, or the presence of spontaneous labor. Inpatients were closely monitored for signs and symptoms of chorioamnionitis and fetal well-being. We performed daily non-stress tests, twice-weekly biophysical profiles, and AFI status, daily maternal temperature, presence of uterine tenderness, presence of foul-smelling amniotic fluid, and maternal heart rate. White blood cell (WBC) count and C-reactive protein (CRP) levels were assessed twice weekly. All women were treated with prophylactic antibiotics, preferably azithromycin, 1 gram orally, plus ampicillin, 2 grams intravenously 4 times a day for 2 days, and then amoxicillin 500 mg orally 3 times daily for an additional 5 days. Women who presented between 23 and 34 weeks' gestation were given two doses of betamethasone 24 hours apart. Prophylactic tocolysis was only used in selected patients to delay delivery by 48 hours to administer corticosteroids.^[7] Magnesium sulfate was used for fetal neuroprotection in women with the possibility of an immediate delivery between 24 and 32 weeks' gestation, and active resuscitation was performed for all infants.

Outcomes

Maternal demographic characteristics and pregnancy and neonatal outcomes were evaluated. Maternal demographics included age, gravidity, parity, body mass index, and refugee status. Risk factors for PPROM, such as antepartum hemorrhage, history of PPROM and multiple D&C, smoking, cervical cerclage, and short cervix (cervix length < 25 mm by transvaginal ultrasound), were examined. Maternal complications included chorioamnionitis, retained placenta, postpartum hemorrhage, sepsis, and death. Pregnancy outcomes included sonographic and laboratory findings, latency period (the days between membrane rupture and delivery), indication for delivery, GA at delivery, and delivery mode. Neonatal

outcomes included gender, birth weight, admission to the neonatal intensive care unit (NICU), death, and major morbidities. Major neonatal morbidities included severe BPD, NEC \geq stage 2, grades III or IV IVH, ROP \geq stage 3, and PVL.

We compared characteristics and outcomes of pregnancies with neonatal survival to those with perinatal deaths, including pre-viable births, deaths in the delivery rooms, stillbirths, and neonatal deaths.

Statistical Analysis

Data were analyzed using SPSS Statistics version 24.0 (IBM Corp., Armonk, NY, USA) and IBM AMOS. Descriptive statistics included number (n), percentage (%), mean \pm standard deviation, minimum and maximum values, median, and interquartile range (IQR). Normality of quantitative variables was assessed using the Shapiro-Wilk test and Q-Q plots. Homogeneity of variances was evaluated with Levene's test. Comparisons between two groups were performed using the independent samples t-test for normally distributed data, and the Mann–Whitney U test for non-normally distributed data. Relationships between categorical variables were analyzed using Fisher's exact test, the continuity correction test, and Pearson's Chi-square test in 2 \times 2 and r \times c contingency tables. A p-value of <0.05 was considered statistically significant. Receiver operating characteristic (ROC) curves were constructed to evaluate predictors of neonatal mortality, and the area under the curve (AUC) was used to assess diagnostic performance.

RESULTS

Between January 2015 and December 2019, 142 pregnancies were diagnosed with periviable PPROM in our clinic. A total of 14 (9.8%) pregnancies were excluded based on multifetal pregnancies, 3 (2.1%) were excluded due to lethal fetal anomalies, 4 (2.8%) were lost to follow-up, and 2 (1.4%) opted for termination before 22 weeks' gestation. The remaining 119 (83.8%) women were managed expectantly and included in this study (Fig. 1). The mean maternal age was 29.4 \pm 6.6 years, and 17.6% were primigravid. The median GA at admission was 23 (IQR 2) weeks.

Forty-five newborns (44.5%) were discharged alive from NICU. The remaining 74 pregnancies (55.4%) resulted in perinatal mortality, including pre-viable births, stillbirths, deaths in the delivery room, and neonatal deaths. The maternal demographics and risk factors were similar between the two groups. Four women from the perinatal mortality group had PPROM after an invasive diagnostic procedure (within 15 days after genetic amniocentesis), and four women had pregnancies with assisted reproductive techniques (ART). The rate of pregnancies with outpatient follow-up was higher in the neonatal survival group (26.7% versus 8.1%, $p<0.05$). The median latency period was 7 (IQR 21) days, with a range of 1–80 days, and nearly half of the fetuses (47.1%) were born during the first seven days of latency. Pregnancies in the neonatal survival group had a longer latency period, (16 [IQR 35] versus 4.5 [IQR 14.2] days, $p<0.05$) compared with the perinatal mortality group. A comparison of the characteristics and risk factors of the neonatal survival and perinatal mortality groups is presented in Table 1.

Table 2 shows sonographic and laboratory findings between groups. The median AFI was similar between the two groups (30,

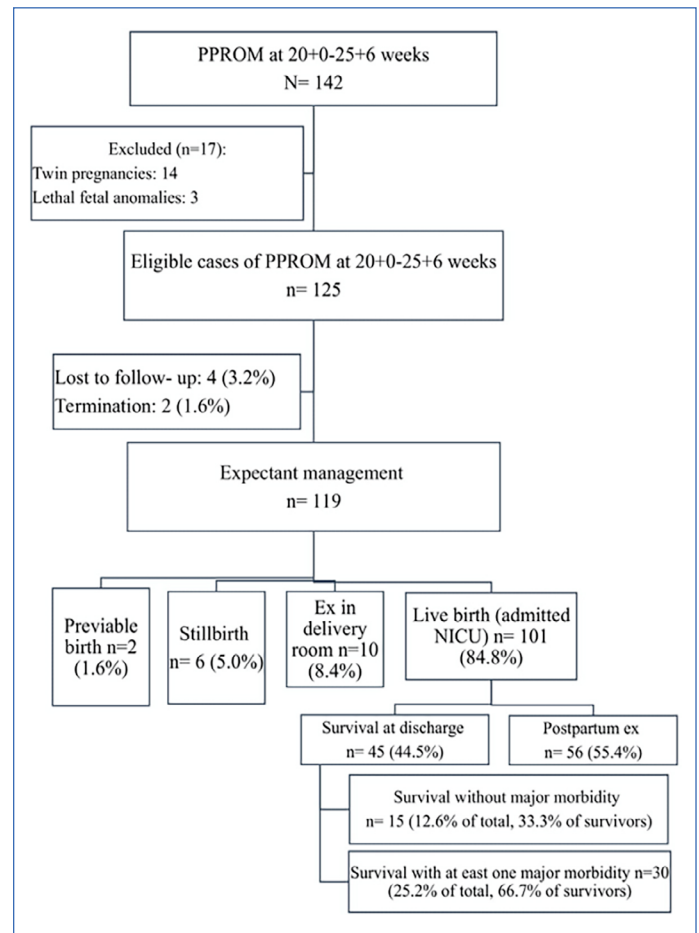


Figure 1: Study flow chart and outcomes of pregnancies with periviable preterm prelabor rupture of membranes (PPROM).

IQR [22.5] versus 25, IQR [60], $p=0.644$). Oligohydramnios was present at admission in 46.7% of those in the neonatal survival group, but it was present in only 27% of those in the perinatal mortality group ($p=0.060$). Among laboratory findings, only CRP levels at admission were lower in the neonatal survival group (8.5 [IQR 9.0] vs. 16.0 [IQR 27.0] mg/L; $p<0.001$). The infants of pregnancies in the neonatal survival group were born at a more advanced GA, (26 [IQR 4.5] versus 23 [IQR 2.2] weeks, $p<0.05$); and had a higher birth weight, (910 [IQR 570] versus 590 [IQR 226] grams, $p<0.05$). The majority of fetuses (82.3%) were born extremely preterm, <28 weeks. Only two infants (1.7%) were delivered at 34 weeks' gestation. The mode of delivery was different among groups, and the rate of cesarean section was significantly higher in the neonatal survival group (75.6% versus 50%, $p=0.010$). The indications for delivery were similar between the two groups ($p=0.153$), and the most common indication for delivery before 34 gestational weeks was the spontaneous onset of labor (57.1%). Maternal complications were similar between the two groups, and no maternal sepsis or death occurred during the expectant management period. The main causes of maternal morbidity were clinical chorioamnionitis (12/119, 10.0%), retained placenta (8/119, 6.7%), postpartum hemorrhage (2/119, 1.7%), and in one case (0.8%) hysterectomy because of placenta accreta spectrum.

Table 1: Characteristics and outcomes of pregnancies

	Neonatal survival group n= 45			Perinatal mortality group n= 74			p
	n	%	Median (Q1–Q3)	n	%	Median (Q1–Q3)	
Maternal age [¶]			29.6±7			29.1±6	0.735*
Maternal age >35	9.0	20.0		16.0	21.6		1.000**
Gravidity			2.0 (2.0–4.0)			3.0 (2.0–3.0)	0.881***
Parity			1.0 (0.0–2.0)			1.0 (0.0–2.0)	0.850***
Primiparous	29.0	64.4		56.0	75.7		0.269**
BMI (kg/m ²) [¶]			26±4			27±4	0.682*
Refugee	6.0	13.3		10.0	13.5		1.000**
Risk factors of PPRM							
Antepartum hemorrhage ^μ	10.0	22.2		16.0	21.6		1.000**
History of PPRM	5.0	11.1		17	23.0		0.170**
History of multiple D&C	8.0	17.8		10	13.5		0.715**
Smoker	6.0	13.3		11	14.9		1.000**
Cervical cerclage	2.0	4.4		3	4.1		1.000**
Cervical length, mm, n=45			29.0 (24.2–38.5)			32.0 (18.0–38.0)	0.668***
Short cervix, n=45 ^δ	4.0	22.2		8	29.6		0.735****
Type of follow up							
Inpatient	33.0	73.3		68.0	91.9		0.013**
Outpatient	12.0	26.7		6.0	8.1		
GA at admission (weeks) [¶]			22±1.6			22±1.3	0.144*
Latency period (days)			16.0 (6.0–41.0)			4.5 (2.0–16.25)	0.000***
Latency <7 days	13.0	28.9		43.0	58.1		0.004**

Data are given as mean (SD[¶], standart deviation), median (Q1–Q3), or n (%). ^μ: First and/or second trimester vaginal bleeding; ^δ: Patients whose cervical length was <25 mm at admission; *: Independent sample t test; **: Continuity Correction; ***: Mann-Whitney U; ****: Fisher's Exact Test. BMI: Body mass index; GA: Gestational age; PPRM: Preterm premature rupture of membranes; D&C: Dilatation and curetage.

Neonatal Outcomes

Of 119 expectantly managed pregnancies, 101 (84.8%) newborns were alive and admitted to the NICU; 45 (44.5% of live births or 37.8% of the overall cohort) of these survived to discharge, and among these, 15 (33.3% of survivors or 12.6% of the overall cohort) had no major morbidities at NICU discharge. However, 30 (66.7% of survivors or 25.2% of the overall cohort) had at least one major morbidity at discharge. Table 3 shows the neonatal demographics and outcomes of neonatal survivors. The median gestational age of delivery was 26 (IQR, 4.5) weeks, and the median birth weight was 910 (IQR, 570) grams in neonatal survivors. The most common neonatal complications were associated with respiratory problems, RDS (84.4%), and severe BPD (60.0%). The other major morbidities included PDA (57.8%), ROP stage 3–4 (24.4%), PVL (11.1%), NEC ≥ stage 2–3 (11.1%), and IVH > grade 2 (4.4%).

A total of 56 (55.4%) infants died in the postpartum period, primarily (58.9%) in the first seven days following birth (early neonatal death). The primary cause of early neonatal deaths was pulmonary hypoplasia (79%).

Area under the curve of receiver operating characteristic (ROC) curves was obtained to determine risk factors for perinatal mortality based on four indicators, including GA at admission, GA at delivery, latency period, and birth weight (Fig. 2). Gestational age at PPRM was not predictive of perinatal mortality (p=0.079). Gestational age at delivery, latency period, and birth weight were valuable predictors of adverse outcomes. Specifically, GA at delivery ≤23 weeks, latency period ≤9 days, and birth weight ≤640 grams were associated with an increased risk of perinatal mortality. Table 4 shows the cut-off points and sensitivity analysis for GA at delivery, latency period, birth weight, and their combination for perinatal mortality.

Area under the curve of ROC for a multivariable regression model that included GA at delivery, latency period, and birth weight was determined to assess the prediction ability for perinatal death in pregnancies complicated by PPRM undergoing expectant management and active neonatal resuscitation. The area under the curve was 0.78 (sensitivity 90.38%, specificity 50.00%, p<0.001), showing that combination probability >0.4414 was significantly related to an increased risk of the presence of perinatal mortality in the combined ROC (Fig. 3).

Table 2: Comparison of sonographic and laboratory findings between neonatal survival and perinatal mortality groups in periviable PPROM

	Neonatal survival group n=45			Perinatal mortality group n=74			p
	n	%	Median (Q1-Q3)	n	%	Median (Q1-Q3)	
Sonographic findings							
AFI (mm)			30.0 (20.0–44.5)			25.0 (0.0–60.0)	0.644***
Normal	7.0	15.6		22.0	29.7		0.060****
Oligohydramnios	21.0	46.7		20.0	27.0		
Anhydramnios	17.0	37.8		32.0	43.2		
Anhydramnios at any time	22.0	48.9		39.0	52.7		0.830**
Breech presentation	22.0	48.9		34.0	45.9		0.902**
Laboratory findings							
WBC count at admission ($\times 10^3$ /uL) [†]			13573 \pm 3100			13900 \pm 4400	0.666*
WBC >15000 $\times 10^3$ /uL	15.0	33.3		27.0	36.5		0.880**
CRP levels at admission (mg/L), n=90			8.5 (4.0–15.0)			16.0 (7.0–34.25)	0.010***
CRP >5 mg/dL, n=90 (%)	26.0	72.2		40.0	83.3		0.337**
GA at delivery (weeks)			26.0 (24.5–29.0)			23.0 (22.75–25.0)	0.000***
Birth weight (grams)			910.0 (682.5–1252.5)			590.0 (491.0–717.5)	0.000***
Delivery before 28 gw	30.0	66.7		66.0		89.2	0.017****
Type of delivery							
Vaginal delivery	11.0	24.4		37.0		50.0	0.010****
Cesarean section	34.0	75.6		37.0		50.0	
Fetal gender							
Female	29.0	64.4		34.0		45.9	0.077**
Male	16.0	35.6		40.0		54.1	
Indications of delivery							
Clinical chorioamnionitis	8.0	17.8		4.0		5.4	0.153****
Placental abruption	6.0	13.3		15.0		20.3	
Non-reassuring fetal status	5.0	11.1		8.0		10.8	
Spontaneous labor	26.0	57.8		42.0		56.8	
34 th gestational weeks	–	–		2.0		2.7	
Cord prolapse	–	–		3.0		4.1	
Maternal morbidity	11.0	24.4		13.0		17.6	0.502**

Data are given as median (Q1-Q3), mean (SD), standard deviation or n (%). *: Independent sample t test; **: Continuity Correction; ***: Mann-Whitney U; ****: Pearson chi-square. AFI: Amniotic fluid index; WBC: White blood cell; CRP: C-reactive protein.

DISCUSSION

In this study, we examined the association between maternal and perinatal characteristics of periviable PPROM cases with perinatal and neonatal outcomes. The controversial problem with periviable PPROM is, on the one hand, the increased rates of neonatal morbidity and mortality due to extremely preterm deliveries, and on the other hand, the high risk of maternal infections and other maternal complications during the expectant management

period. Therefore, providing proper counseling to families about the benefits and risks of management options is important. Our results revealed that approximately one-third of newborns were discharged alive from the NICU, and one-third of these infants had no major morbidities at discharge. Pregnancies with longer latency, higher GA at delivery, and birth weight were more likely to result in neonatal survival, highlighting the importance of these parameters in clinical decision-making.

Table 3: Neonatal characteristics and outcomes of neonatal survivors

	n=45			n=45	
	n	%		n	%
GA at delivery [¶] (weeks)	26.0 (24.5–29.0)		PDA	26.0	57.8
Birth weight (grams) [¶]	910.0 (682.5–1252.5)		Cultur proven sepsis	14.0	31.1
APGAR 5. minute <7	21.0	46.7	ROP stage 3–4	11.0	24.4
Need of NRP	27.0	60.0	NEC stage 2–3	5.0	11.1
Type of NRP			PVL	5.0	11.1
PPV	13.0	29.0	Pulmoner hemorrhage	4.0	8.9
Intubated	10.0	22.0	Konvulsion	4.0	8.9
Compression	3.0	6.7	Positional deformity	3.0	6.7
Drugs	1.0	2.2	IVH grade 3–4	2.0	4.4
Need of MV	33.0	73.3	Duration NICU stay (days) [¶]	73.0 (53.0–108.0)	
Need of Nasal MV	41.0	91.1	Survival to discharge with no major morbidity	15.0	33.3
Need of HFO	6.0	13.3	Survival to discharge with at least one major morbidity	30.0	66.7
Neonatal morbidities					
RDS	38.0	84.4			
Severe BPD	27.0	60.0			

Data are given as median (Q1-Q3) ¶ or n (%). GA: Gestational age; NRP: Neonatal resuscitation program; PPV: Positive pressure ventilation; MV: Mechanical ventilation; HFO: High frequency oscillation; RDS: Respiratory distress syndrome; BPD: Bronchopulmonary dysplasia; PDA: Patent ductus arteriosus; ROP: Retinopathy of prematurity; NEC: Necrotizing enterocolitis; PVL: Periventricular leucomalacia; IVH: Intraventricular hemorrhage; NICU: Neonatal intensive care unit.

Table 4: The sensitivity analysis for GA at delivery (weeks), latency period (days), birth weight (gram) and their combination for perinatal mortality

	Cut-off	OR	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	AUC± standard error	p
GA at delivery	≤23	14.78	51.35 (39.4–63.1)	93.33 (81.7–98.6)	92.7 (80.6–97.5)	53.8 (47.7–59.9)	0.79±0.04	<0.001
Latency period	≤9	5.04	71.62 (59.9–81.5)	66.67 (51.0–80.0)	77.9 (69.5–84.5)	58.8 (48.5–68.4)	0.71±0.05	<0.001
Birth weight	≤640	9.62	67.57 (55.7–78.0)	82.22 (67.9–92.0)	86.2 (76.6–92.3)	60.7 (51.9–68.8)	0.82±0.04	<0.001
Combination	>0.44	*	90.38 (79.0–96.8)	50 (33.4–66.6)	50 (33.4–66.6)	79.2 (60.9–90.3)	0.78±0.05	<0.001

*: Odds ratios were calculated for the individual ROC-based cut-offs (gestational age at delivery, latency period and birth weight). The combined ROC model was based on a logistic regression-derived predicted probability, therefore an odds ratio could not be calculated at the cutoff level. GA: Gestational age; OR: Odds ratio; PPV: Positive predictive value; NPV: Negative predictive value; AUC: Area under curve.

In recent years, there have been many studies published about neonatal survival in PPRM cases. In prior studies with a similar population, the overall neonatal survival rate ranged from 26.8% to 63.2%, and the discharge rate without major morbidity ranged

from 10.5% to 76.7%.^[8–12] The overall neonatal survival rate in our cohort was 37.8%, with a substantial proportion of survivors (66.7%) experiencing at least one major morbidity. Our results are largely consistent with previously published literature, highlighting

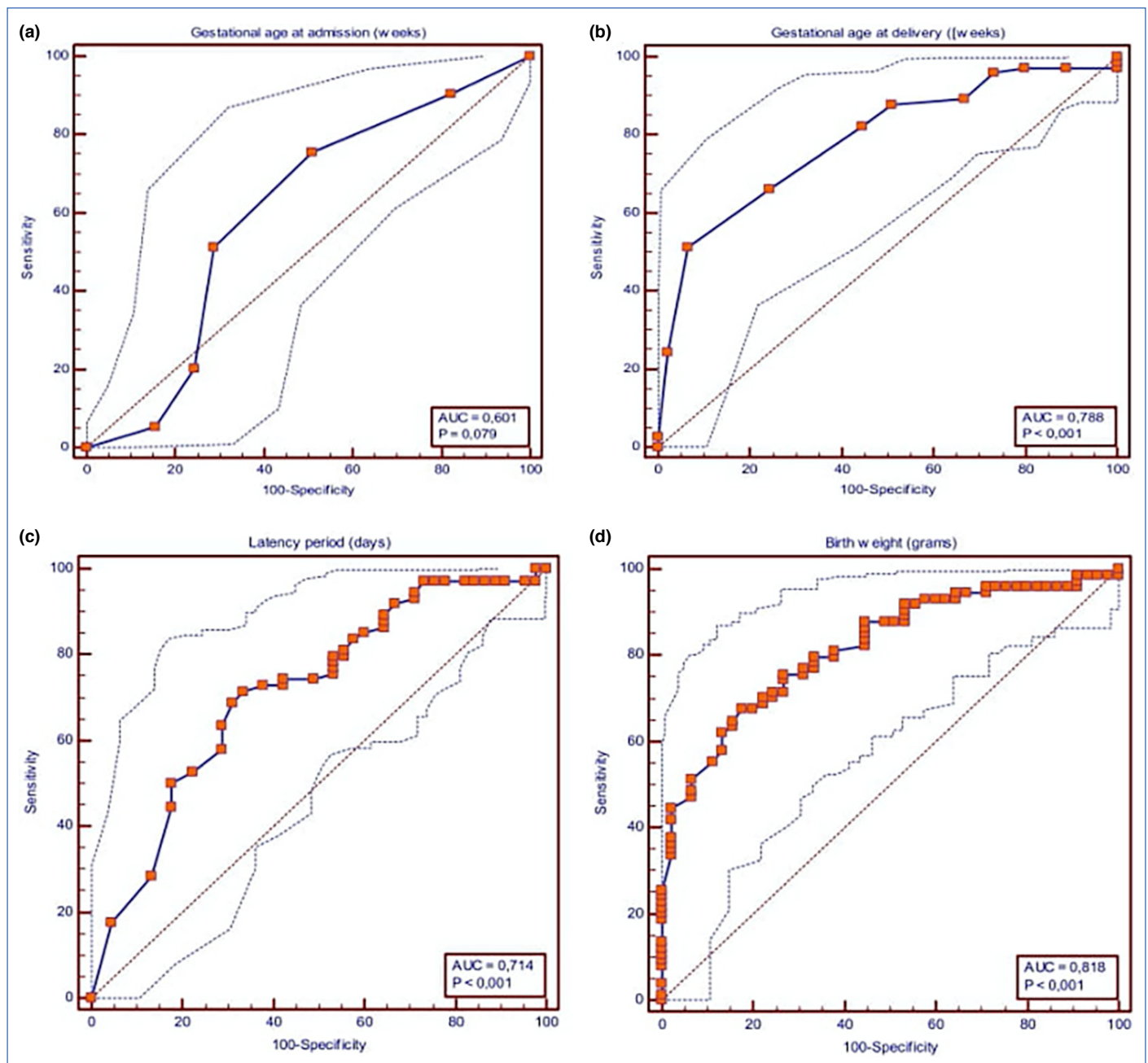


Figure 2: Receiver-operator characteristic (ROC) curves for determining the presence of perinatal mortality. **(a)** ROC curves for determining the presence of not-benefiting expectant management. The area under the curve (AUC) gestational age at admission (weeks) is 0.60 ± 0.06 with $p=0.079$. **(b)** ROC curves for determining the presence of not-benefiting expectant management. The area under the curve (AUC) gestational age at delivery is 0.79 ± 0.04 with $p<0.001$. **(c)** ROC curves for determining the presence of not-benefiting expectant management. The area under the curve (AUC) latency period is 0.71 ± 0.05 with $p<0.001$. **(d)** ROC curves for determining the presence of not-benefiting expectant management. The area under the curve (AUC) birth weight is 0.82 ± 0.04 with $p<0.001$.

the severe impact of extreme prematurity and the inherent complications of early membrane rupture. This difference in neonatal mortality and morbidity rates between studies may be related to postnatal care in the NICU, and the high incidence of neonatal mortality underscores the need for multidisciplinary neonatal care and emphasizes the challenges in managing extremely preterm infants delivered after PPRM. Another factor may be associated with persistent exposure to oligo-anhydramnios in the second

trimester, which can be related to pulmonary hypoplasia and early neonatal deaths, although the pregnancy resulted in a live birth. Lee et al.^[9] described the significant relationship between persistent oligohydramnios and low survival rates in their study published in 2015. A statistically significant difference was not found between the two groups according to the presence of oligo-anhydramnios, but we evaluated the admission AFI levels and the presence of anhydramnios at any time, not persistent oligo-anhydramnios, and

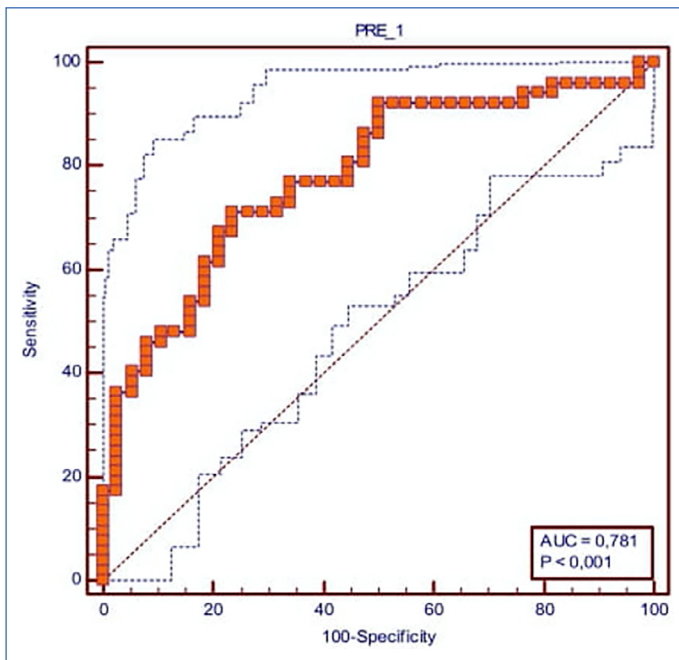


Figure 3: Receiver-operator characteristic (ROC) curves for determining the presence of not-benefiting expectant management. The area under the curve (AUC) of combined ROC analysis 0.78 ± 0.05 with $p < 0.001$.

the unknown length of oligo-anhydramnios exposure. These results are related to the variability of AFI during the latency period.

Considering the antenatal characteristics of the neonatal survival group, the higher outpatient rate, lower CRP levels at admission, and higher cesarean section rate were not surprising findings. The relationship between maternal CRP levels and neonatal survival has been reported recently.^[13,14] Since CRP is an inflammatory marker, it may indicate a relationship between chorioamnionitis and a short latency period, with poor neonatal outcomes as a consequence of the short latency period. Similar to previous studies showing that outpatient follow-up can be safe in selected patients, the benefit of expectant management was higher among women who were managed as outpatients.^[15–18] Our more active approach to hospitalized women included multiple digital vaginal examinations. This may have accelerated the onset of spontaneous labor and a shortening of latency because stimulation of the cervix can cause prostaglandin release, resulting in the onset of uterine contractions, earlier GA at delivery, and poorer neonatal outcomes.^[19,20] Nosocomial infection may be less common in patients who are followed as outpatients, resulting in a longer latency period.

Consistent with the literature, we found that GA at birth, latency period, and birth weight were key predictors of perinatal mortality in this cohort. Through ROC analysis, we established cut-off values for these three indicators and their combinations, thus identifying risk factors for perinatal mortality. While gestational age at delivery, latency, and birth weight showed moderate to high predictive value individually, the combination model improved sensitivity but reduced specificity, suggesting it may be more suitable for ruling out low-risk cases rather than definitively identifying all high-risk ones. Unlike previous studies, GA at PPRM, while historically

considered an important factor, did not independently predict outcomes in multivariable analysis.^[21–23] Instead, the findings suggest that prolonging latency and achieving delivery beyond 23 weeks significantly improves survival. This underlines the critical role of expectant management in extending pregnancy duration, when safely possible, to enhance neonatal viability. These variables can be used to guide clinical counseling, anticipate outcomes, and individualize care plans. Maternal complications were relatively rare, suggesting that, under careful inpatient monitoring, expectant management does not pose excessive risk to maternal health, even in early gestation. The use of ROC analysis offers a valuable clinical decision-making aid to identify pregnancies at the highest risk of poor outcomes, facilitating timely interventions or delivery planning.

In this study, we included all features related to PPRM, as well as maternal and pregnancy characteristics, and examined all parameters that may affect the management of periviable PPRM cases. The primary limitations of this study include its retrospective design and the single-center experience, which may limit the generalizability of the findings. Additionally, our study included only short-term neonatal outcomes. While mentioned, the clinical implications of oligohydramnios were not fully explored, and its role in guiding prognosis or management could benefit from further analysis.

CONCLUSION

In conclusion, expectant management can offer favorable outcomes in select cases of periviable PPRM, particularly in pregnancies with longer latency periods, higher GA at delivery, and greater birth weight. However, careful patient selection and close monitoring are essential to optimize outcomes and minimize complications. Further research is warranted to refine predictive models and improve risk stratification in this challenging obstetric population.

Statement

Ethics Committee Approval: The Izmir Tepecik Training and Research Hospital Ethics Committee granted approval for this study (date: 24.10.2019, number: 2019/15-8).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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REFERENCES

1. American College of Obstetricians and Gynecologists; Society for Maternal-Fetal Medicine. Obstetric care consensus no. 6: periviable birth. *Obstet Gynecol* 2017;130:e187–99.
2. Heyden J van der. Preterm prelabor rupture of membranes: different gestational ages, different problems. 2014. Available at: <https://cris.maastrichtuniversity.nl/>

- files/1321285/guid-4cb916da-43f5-40e3-ba3d-1a8d2e001b0f-ASSET1.0.pdf. Accessed May 28, 2022.
3. Anderson JG, Baer RJ, Partridge JC, Kuppermann M, Franck LS, Rand L, et al. Survival and major morbidity of extremely preterm infants: a population-based study. *Pediatrics* 2016;138:e20154434.
 4. Frenette P, Dodds L, Armson BA, Jangaard K. Preterm prelabour rupture of membranes: effect of latency on neonatal and maternal outcomes. *J Obstet Gynaecol Can* 2013;35:710–7.
 5. Lorthe E, Torchin H, Delorme P, Ancel PY, Marchand-Martin L, Foix-L'Hélias L, et al. Preterm premature rupture of membranes at 22-25 weeks' gestation: perinatal and 2-year outcomes within a national population-based study (EPIPAGE-2). *Am J Obstet Gynecol* 2018;219:298.e1–e14.
 6. Cousins LM, Smok DP, Lovett SM, Poeltler DM. AmniSure placental alpha microglobulin-1 rapid immunoassay versus standard diagnostic methods for detection of rupture of membranes. *Am J Perinatol* 2005;22:317–20.
 7. ACOG PRACTICE BULLETIN Clinical Management Guidelines for Obstetrician-Gynecologists. Prelabor Rupture of Membranes. 2020. Available at: <https://tjodistanbul.org/uploads/prelabor-rupture-of-membranes-number-217.pdf>. Accessed Feb 4, 2025.
 8. van der Heyden JL, van der Ham DP, van Kuijk S, Notten KJ, Janssen T, Nijhuis JG, et al. Outcome of pregnancies with preterm prelabor rupture of membranes before 27 weeks' gestation: a retrospective cohort study. *Eur J Obstet Gynecol Reprod Biol* 2013;170:125–30.
 9. Lee JY, Ahn TG, Jun JK. Short-term and long-term postnatal outcomes of expectant management after previable preterm premature rupture of membranes with and without persistent oligohydramnios. *Obstet Gynecol* 2015;126:947–53.
 10. Esteves JS, de Sá RA, de Carvalho PR, Coca Velarde LG. Neonatal outcome in women with preterm premature rupture of membranes (PPROM) between 18 and 26 weeks. *J Matern Fetal Neonatal Med* 2016;29:1108–12.
 11. Azria E, Anselem O, Schmitz T, Tsatsaris V, Senat MV, Goffinet F. Comparison of perinatal outcome after pre-viable preterm prelabour rupture of membranes in two centres with different rates of termination of pregnancy. *BJOG* 2012;119:449–57.
 12. Nipastpong P, Phupong V. Neonatal survival rate after expectant management of previable preterm premature rupture of membranes at gestational age 15-23+6 weeks. *J Matern Fetal Neonatal Med* 2025;38:2434066.
 13. Ryu HK, Moon JH, Heo HJ, Kim JW, Kim YH. Maternal c-reactive protein and oxidative stress markers as predictors of delivery latency in patients experiencing preterm premature rupture of membranes. *Int J Gynaecol Obstet* 2017;136:145–50.
 14. Acaia B, Croveto F, Ossola MW, Nozza S, Baffero GM, Somigliana E, et al. Predictive factors for neonatal survival in women with previable preterm rupture of the membranes. *J Matern Fetal Neonatal Med* 2013;26:1628–34.
 15. Bouchghoul H, Kayem G, Schmitz T, Benachi A, Sentilhes L, Dussaux C, et al. Outpatient versus inpatient care for preterm premature rupture of membranes before 34 weeks of gestation. *Sci Rep* 2019;9:4280.
 16. Guckert M, Clouqueur E, Drumez E, Petit C, Houfflin-Debarge V, Subtil D, et al. Is homecare management associated with longer latency in preterm rupture of membranes? *Arch Gynecol Obstet* 2020;301:61–7.
 17. Abou El Senoun G, Dowswell T, Mousa HA. Planned home versus hospital care for preterm prelabour rupture of the membranes (PPROM) prior to 37 weeks' gestation. *Cochrane Database Syst Rev* 2014;2014:CD008053.
 18. Dussaux C, Senat MV, Bouchghoul H, Benachi A, Mandelbrot L, Kayem G. Preterm premature rupture of membranes: is home care acceptable? *J Matern Fetal Neonatal Med* 2018;31:2284–92.
 19. Alexander JM, Mercer BM, Miodovnik M, Thurnau GR, Goldenberg RL, Das AF, et al. The impact of digital cervical examination on expectantly managed preterm rupture of membranes. *Am J Obstet Gynecol* 2000;183:1003–7.
 20. Adoni A, Ben Chetrit A, Zacut D, Palti Z, Hurwitz A. Prolongation of the latent period in patients with premature rupture of the membranes by avoiding digital examination. *Int J Gynaecol Obstet* 1990;32:19–21.
 21. van der Marel I, de Jonge R, Duvekot J, Reiss I, Brussé I. Maternal and neonatal outcomes of preterm premature rupture of membranes before viability. *Klin Padiatr* 2016;228:69–76.
 22. Kibel M, Asztalos E, Barrett J, Dunn MS, Tward C, Pittini A, et al. Outcomes of pregnancies complicated by preterm premature rupture of membranes between 20 and 24 weeks of gestation. *Obstet Gynecol* 2016;128:313–20.
 23. Sim WH, Araujo Júnior E, Da Silva Costa F, Sheehan PM. Maternal and neonatal outcomes following expectant management of preterm prelabour rupture of membranes before viability. *J Perinat Med* 2017;45:29–44.