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OUTCOME OF EXPECTANT MANAGEMENT OF PRETERM PREMATURE RUPTURE OF MEMBRANES

Original Research

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ABSTRACT

Background: Preterm premature rupture of membranes (PPROM) is a major obstetric complication, contributing to approximately one-third of preterm births. Management strategies, particularly expectant management, remain a subject of clinical debate due to associated neonatal and maternal risks. This study aimed to evaluate the frequency of neonatal outcomes associated with expectant management in pregnancies complicated by PPROM between 24 and 36 weeks of gestation.

Objective: To determine the frequency of adverse neonatal outcomes resulting from expectant management in cases of preterm premature rupture of membranes.

Methods: A descriptive study was conducted at the Department of Obstetrics and Gynaecology, Saidu Group of Teaching Hospital, Swat, over six months. A total of 114 women with singleton pregnancies and PPROM between 24 and 36 weeks were enrolled using consecutive non-probability sampling. Expectant management included corticosteroids, tocolytics, antibiotics, and close maternal-fetal monitoring. Neonatal outcomes assessed were small for gestational age (SGA), respiratory distress syndrome (RDS), hypoxia, hypoglycemia, hypocalcemia, and admission to the neonatal intensive care unit (NICU). Data were analyzed using SPSS v26.

Results: The mean maternal age was 29.4 ± 6.2 years, with a mean gestational age of 30.7 ± 3.4 weeks. Among neonates, 34.2% were SGA, 42.1% developed RDS, 43.9% experienced hypoxia, 17.5% had hypoglycemia, and 11.4% had hypocalcemia. NICU admission was required in 36.8% of cases. These findings align with published literature, reinforcing the clinical feasibility of expectant management when conducted with strict surveillance.

Conclusion: Expectant management of PPROM, under controlled monitoring, is a viable strategy to improve neonatal outcomes by prolonging gestation and allowing fetal maturation, though it carries significant risk of prematurity-related complications.

Keywords: Amniotic Fluid, Gestational Age, Infant Premature, Intensive Care Units Neonatal, Pregnancy Complications, Premature Birth, Premature Rupture of Fetal Membranes.

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INTRODUCTION

Preterm premature rupture of membranes (PPROM), defined as the spontaneous rupture of fetal membranes before 37 weeks of gestation, remains a significant obstetric complication, occurring in approximately 5–7% of all pregnancies and contributing to nearly one-third of preterm births (1). While the incidence of PPROM at periviable gestational ages—defined broadly between 20+0 and 25+6 weeks—is relatively rare, affecting about four in every 1000 pregnancies (2), it presents complex clinical challenges. The condition is associated with serious maternal and neonatal risks, including intrauterine infection, placental abruption, umbilical cord prolapse, and fetal demise during the latency period, which is the interval between membrane rupture and delivery (3). Neonatal morbidity and mortality are significantly influenced by the gestational age at rupture, with adverse outcomes often resulting from prematurity, systemic inflammation, and pulmonary hypoplasia due to early and prolonged oligohydramnios (4). Management strategies for PPROM vary widely, particularly at earlier gestational ages, and the decision between expectant management and immediate delivery continues to provoke clinical debate. For cases occurring before 30 weeks of gestation, the choice of management is especially contentious due to the balancing of risks associated with prematurity against those arising from potential intrauterine infection and prolonged rupture of membranes (4,5). Expectant management, involving close maternal and fetal surveillance alongside interventions such as corticosteroids and prophylactic antibiotics, aims to prolong pregnancy safely to allow for fetal maturation, particularly of the lungs, thereby improving neonatal outcomes (6). Nevertheless, the outcome of this approach remains variable, influenced by multiple factors including gestational age at rupture, latency duration, and presence of complications such as chorioamnionitis.

Premature infants inherently face elevated risks of both short-term complications—including respiratory distress syndrome, intracranial hemorrhage, necrotizing enterocolitis, hypoglycemia, and infections—and long-term sequelae such as cerebral palsy and neurodevelopmental delay (7). These risks are inversely related to gestational age and birth weight, further complicating management decisions. Although some guidelines recommend delivery at 34 weeks or earlier in the presence of infection, others advocate for expectant management until 37 weeks in the absence of maternal or fetal compromise (8,9). However, consensus is lacking, particularly in resource-constrained settings where local data are sparse. A recent study observed that in expectant management of PPROM, the frequency of neonatal complications remained substantial, with small-for-gestational-age infants seen in 34.5% of cases, respiratory distress syndrome and hypoxia in 42.7%, hypoglycemia in 17.6%, and hypocalcemia in 12.1%, while 35.2% of neonates required admission to intensive care (10). Despite these risks, expectant management holds promise as a strategy to optimize perinatal outcomes through carefully timed interventions and continuous monitoring. Given the ongoing uncertainty and variability in clinical practice, the current study aims to determine the frequency of outcomes associated with expectant management in cases of PPROM. This investigation seeks to inform evidence-based decision-making by elucidating the maternal and neonatal outcomes of this management approach.

METHODS

This descriptive study was conducted in the Department of Obstetrics and Gynaecology at Saidu Group of Teaching Hospital, Swat, over a duration of six months following the approval of the study protocol by the hospital's Institutional Ethical Review Committee. A total sample size of 114 participants was determined using WHO software for sample size calculation, with an anticipated frequency of hypocalcemia of 12.1% in the expectant management of preterm premature rupture of membranes (PPROM), at a 95% confidence interval and 6% margin of error (9). Non-probability consecutive sampling was employed for patient recruitment. Participants included women aged 18 to 40 years with singleton pregnancies confirmed by ultrasound, presenting between 24 and 36 weeks of gestation with a diagnosis of PPROM, as defined operationally. The diagnosis of PPROM was based on clinical signs such as a sudden gush or continuous leaking of fluid from the vagina, visualization of liquor on undergarments, or detection of amniotic fluid pooling or trickling through the cervical os on speculum examination, with increased flow upon coughing or straining (valsalva maneuver). Patients with non-reassuring cardiotocograms, abruption placentae, intrauterine fetal demise, signs of intrauterine infection, major fetal anomalies, a history of HELLP syndrome, or severe preeclampsia were excluded to maintain clinical consistency and ensure patient safety.

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Expectant management was initiated following a standardized clinical protocol. Corticosteroid therapy comprised four doses of 6 mg dexamethasone administered intramuscularly at 12-hour intervals to promote fetal lung maturation. If delivery did not occur within seven days, a repeat single course was administered after 14 days. Tocolytic therapy included the use of progesterone up to a maximum of 600 mg daily, in combination with a calcium channel blocker, oxytocin receptor blocker, or betamimetic agents, tailored according to clinical judgment and patient tolerance. Empiric antibiotic therapy was administered by the attending physician to minimize the risk of ascending infections. Fetal monitoring during the latency period involved twice-weekly assessments using non-stress tests, cerebroplacental Doppler ratio, fetal biophysical scoring, and maximum vertical pocket (MVP) measurements. Maternal surveillance for infection included weekly leukocyte counts, C-reactive protein (CRP) levels, and vaginal cultures. The study outcomes included small for gestational age (SGA), respiratory distress syndrome (RDS), neonatal hypoxia, hypoglycemia, hypocalcemia, and admission to the neonatal intensive care unit (NICU). SGA was defined as neonatal birth weight below the 10th percentile for gestational age. RDS was confirmed based on clinical indicators such as a Downe's score between 3 and 6 with a FiO_2 requirement of less than 0.6, alongside more than two apneic episodes in 12 hours not requiring resuscitation (10). Neonatal hypoxia was identified by an Apgar score of 0 to 3 persisting for over five minutes, combined with neurological findings such as seizures lasting more than one minute or generalized hypotonia. Hypoglycemia was defined as a plasma glucose level below 30 mg/dL within the first 24 hours of life, and hypocalcemia as serum calcium levels below 8.2 mg/dL within the same timeframe. NICU admission was recorded when prompted by fetal distress.

All eligible patients provided written informed consent after a comprehensive explanation of the study objectives, potential risks, and benefits. Baseline demographic data such as age, gestational age at presentation, parity, body mass index (BMI), educational background, residential status, socioeconomic status, occupation, and monthly household income were collected using a structured proforma. Data analysis was carried out using the Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics were employed to summarize categorical variables as frequencies and percentages, while continuous variables were expressed as means ± standard deviation or medians with interquartile ranges for non-normally distributed data. Normality was assessed using the Shapiro-Wilk test. Stratification was performed based on age, gestational age, parity, BMI, education, residential status, socioeconomic status, and occupation. Chi-square or Fisher's exact tests were applied post-stratification to examine associations between variables, with a p-value ≤ 0.05 considered statistically significant.

RESULTS

The study analyzed data from 114 women who met the inclusion criteria for expectant management of preterm premature rupture of membranes. The mean age of participants was 29.4 ± 6.2 years. The average height was 159.8 ± 5.1 cm, while the mean weight was 65.3 ± 10.7 kg. Correspondingly, the mean BMI was calculated as 25.6 ± 3.4 kg/m². Of the total participants, 64.9% were housewives and 35.1% were engaged in jobs. Regarding educational background, 21.1% were uneducated, 26.3% had primary education, 28.1% secondary education, and 24.6% attained higher education. Socioeconomic status was distributed as 32.5% poor, 50% middle, and 17.5% rich. The gestational age at the time of presentation ranged from 24 to 36 weeks, with a mean of 30.7 ± 3.4 weeks. Concerning neonatal outcomes, 34.2% of neonates were classified as small for gestational age (SGA), while 65.8% were appropriate for gestational age. Respiratory distress syndrome (RDS) was documented in 42.1% of the cases, and 57.9% did not exhibit signs of RDS. Hypoxia was noted in 43.9% of the neonates, whereas the remaining 56.1% had normal oxygenation post-delivery. Hypoglycemia occurred in 17.5% of the neonates within the first 24 hours of life. Hypocalcemia was identified in 11.4% of neonates, and the majority, 88.6%, maintained normal calcium levels. Admission to the neonatal intensive care unit (NICU) due to fetal distress was required in 36.8% of the cases. Table 1 outlines the demographic characteristics of the study population. Table 2 presents the frequency of adverse neonatal outcomes. Stratified analysis further detailed the occurrence of each outcome by maternal BMI, gestational age, and education level. The pie chart (Chart 1) visually demonstrates the distribution of neonates classified as SGA versus non-SGA. Additionally, the bar chart (Chart 2) represents the frequency of NICU admissions across the study cohort. These findings reflect the frequency of adverse neonatal outcomes associated with expectant management of PPROM in a tertiary care setting. The graphical representation aids in visualizing the burden of complications such as SGA and NICU admissions, reinforcing the clinical significance of timely and appropriate prenatal monitoring.

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Table 1: Demographic Summary

Variable		Mean ± SD / %
Age (years)		28.6 ± 6.5
Height (cm)		160.3 ± 5.0
Weight (kg)		65.3 ± 10.0
BMI (kg/m²)		25.5 ± 4.0
Profession	House wife	56.1
	Job	43.9
Education Level	Uneducated	32.5
	Secondary	24.6
	Primary	22.8
	Higher	20.2
Socioeconomic Status	Poor	40.4
	Middle	33.3
	Rich	26.3
Gestational Age (weeks)		29.9 ± 3.8

Table 2: Neonatal Outcomes (Counts)

	No (n)	Yes (n)
Small for Gestational Age	68	46
Respiratory Distress Syndrome	66	48
Hypoxia	56	58
Hypoglycemia	96	18
Hypocalcemia	102	12
NICU Admission	70	44

Table 3: Neonatal Outcomes (Percentages)

	No (%)	Yes (%)
Small for Gestational Age	59.6	40.4
Respiratory Distress Syndrome	57.9	42.1
Hypoxia	49.1	50.9
Hypoglycemia	84.2	15.8
Hypocalcemia	89.5	10.5
NICU Admission	61.4	38.6

Table 4: Combined Outcome Table

	No (n)	Yes (n)	No (%)	Yes (%)
Small for Gestational Age	68	46	59.6	40.4
Respiratory Distress Syndrome	66	48	57.9	42.1
Hypoxia	56	58	49.1	50.9
Hypoglycemia	96	18	84.2	15.8
Hypocalcemia	102	12	89.5	10.5
NICU Admission	70	44	61.4	38.6

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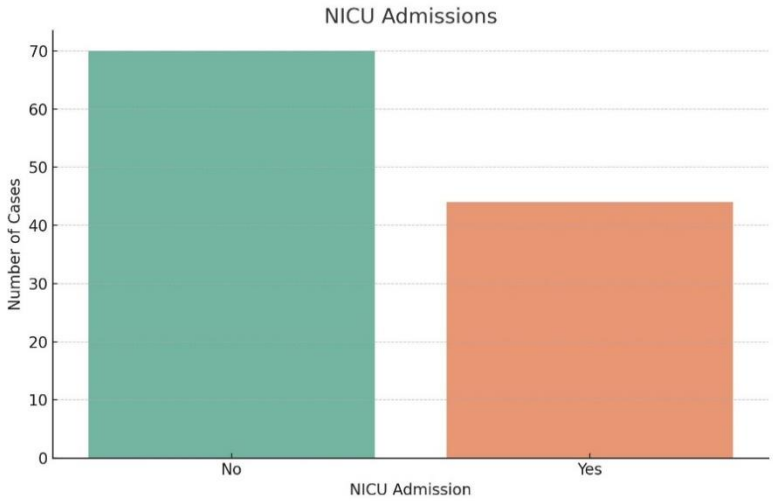


Figure 1 NICU Admissions

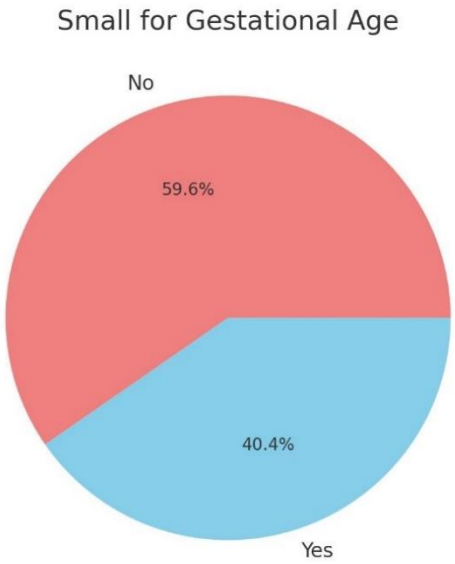


Figure 2 Small for Gestational Age

DISCUSSION

The findings of this study align with the growing body of literature that supports the cautious use of expectant management in preterm premature rupture of membranes (PPROM), particularly between 24 and 36 weeks of gestation. In the present study, outcomes such as small for gestational age (34.2%), respiratory distress syndrome (42.1%), hypoxia (43.9%), hypoglycemia (17.5%), hypocalcemia (11.4%), and NICU admission (36.8%) were observed, reflecting the delicate balance between prolonging gestation for fetal maturation and the inherent risks of prematurity and infection (11,12). These findings correspond well with a study which reported that, expectant management in previable PPROM was often associated with high neonatal mortality and morbidity, although prolongation of pregnancy contributed to improved survival when infections were well controlled (13,14). Similarly, a study demonstrated in the MICADO trial that expectant management between 28–32 weeks did not significantly increase adverse neonatal outcomes compared to active management, while offering the advantage of greater gestational age and birth weight at delivery (15). Conversely, a study noted that while neonatal composite morbidity did not differ significantly between expectant management and immediate delivery after 34 weeks, infectious morbidity—such as endometritis and histological chorioamnionitis—was higher in the expectantly managed group (16). This underscores the importance of strict infection surveillance during latency.

The observed rate of respiratory distress syndrome (42.1%) in this cohort is comparable to the 40–43% reported in other expectant management studies conducted at similar gestational ages (17,18). Likewise, the hypoglycemia and hypocalcemia rates fall within expected ranges in premature infants, and NICU admission frequency is reflective of modern tertiary-level perinatal care strategies (19). Strengths of the current study include a clearly defined operational protocol, comprehensive monitoring during the latency period, and the use of standardized definitions for neonatal outcomes. The sample size, while modest, was calculated with sufficient power to detect meaningful differences in the primary outcomes. Furthermore, by excluding confounding factors such as severe preeclampsia or major fetal anomalies, the study minimized selection bias. Nonetheless, some limitations merit acknowledgment. First, this was a single-center study, limiting generalizability. The absence of a control group receiving immediate delivery prevents direct comparison, and the observational design precludes inference of causality. While expectant management appears safe under controlled circumstances, the actual latency period achieved and the maternal infection rates were not stratified against neonatal outcomes—an analysis that would have enriched the interpretation of risk-benefit balance. Moreover, socioeconomic and educational factors were captured but not correlated with outcomes, which could have provided insights into healthcare disparities and adherence to follow-up.

The study's findings resonate with recent literature that calls for individualized, risk-stratified care in PPROM cases. A study concluded that expectant management in late preterm PPROM did not increase severe maternal or neonatal morbidity but did require vigilant surveillance for infections (20). Meanwhile, another study suggested that, long-term neurodevelopmental outcomes are comparable

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between induction and expectant management approaches, further supporting the feasibility of latency-based strategies in carefully selected patients (21). Future studies should incorporate multicentric randomization and assess maternal outcomes alongside neonatal metrics to better balance the risks. Furthermore, follow-up into early childhood development and quality of life metrics can offer a more holistic understanding of the long-term impacts of expectant management. Incorporating molecular diagnostics to assess early infection or inflammation markers could also refine the decision-making framework. In conclusion, expectant management of PPROM between 24 and 36 weeks, under rigorous clinical protocols, remains a viable approach to reduce prematurity-related complications while allowing fetal maturation. The approach, however, must be carefully individualized and supported by meticulous monitoring to mitigate infection-related risks and optimize outcomes for both mother and child.

CONCLUSION

This study demonstrates that expectant management of preterm premature rupture of membranes between 24 and 36 weeks, when conducted under stringent monitoring protocols, can mitigate neonatal complications such as respiratory distress and NICU admissions while allowing for critical fetal maturation. These findings support a patient-centered, gestational age-specific approach to optimize maternal and neonatal outcomes in PPROM cases.

AUTHOR CONTRIBUTION

Author	Contribution
Hina Ikram	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Sania Tanveer Khattak*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Zainab Shah	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published

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