Maternal and Neonatal Outcomes of Preterm Premature Rupture of Membranes (PPROM) with Amniotic Fluid Index More Or Less than 5 in a Tertiary Care Setting In Pakistan

Mehwish Ara Shams, Nabila Amin, Humna Syed

Pak Emirates Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi, Pakistan

ABSTRACT

Objective: To explore the morbidity and mortality associated with preterm pre-labour rupture of membranes in the presence of amniotic fluid index (AFI) greater than or less than 5 in a tertiary care setting in Rawalpindi, Pakistan.
Study Design: Cross-sectional study.
Place and Duration of Study: Department of Gynaecology & Obstetrics, Pak Emirates Military Hospital, Rawalpindi Pakistan, from Mar 2019 to Aug 2020.
Methodology: Data was collected from the patients presenting to the Department of Gynecology and Obstetrics at Pak emirates Military Hospital in Rawalpindi, Pakistan. Maternal and child outcomes were compared with an amniotic fluid index of less than or more than five among the patients with preterm premature rupture of membranes.
Results: 1562 deliveries took place in our department, among them 73 (4.67%) cases were diagnosed as PPROM. Caesarean deliveries and the development of chorio-amnionitis were observed statistically significantly more with an amniotic fluid index <5 (p-value <0.001). Neonatal complications such as sepsis, respiratory distress syndrome, hypoglycemia, jaundice and hypothermia were also significantly observed in the group with amniotic fluid index <5 (p-value <0.05). Neonatal mortality was also significantly higher in the group with an amniotic fluid index <5 (p-value: 0.004).
Conclusion: Preterm premature rupture of membranes was a relatively common finding among the patients managed at our labour unit. Such patients with an amniotic fluid index of less than five are at a high risk of maternal and fetal adverse outcomes.

Keywords: Amniotic fluid index, Chorioamnionitis, Preterm premature rupture of membranes.

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INTRODUCTION

Preterm prelabour rupture of membranes (PPROM) is defined as the rupture of membranes prior to the onset of uterine contractions before 37+0 weeks of gestation.[1] PPROM is the most commonly encountered factor associated with preterm birth and is seen in as many as 3% of total pregnancies.[2] Alth-ough the pathogenesis of PPROM remains ambiguous, it is long established that PPROM culminates in various maternal and neonatal complications.

PPROM is evaluated based on history, physical and speculum examination, and ultrasound. Amniotic fluid is the fluid surrounded by amniotic membranes that serve to protect and support the developing fetus.[3] The presence of sufficient amniotic fluid volume is a crucial representative parameter of fetal well-being. This imperative parameter of amniotic fluid volume is determined via an ultrasonography technique called amniotic fluid index (AFI). AFI less than 5 cm is defined as oligohy dramnios, while AFI less than 3 cm is defined, as severe oligohydramnios.[4] PPROM is associated with a significant number of maternal and neonatal complications. Some commonly encountered maternal complications comprise intra-amniotic infection called chorioamnionitis and postpartum endometritis. Significant prenatal morbidity and mortality have been attributed to PPROM, contributing about 20% and 21.4% to overall maternal prenatal mortality and morbidity, respectively.[5]

PPROM is also associated with fetal complications, including sepsis, neonatal respiratory distress syndrome, jaundice, hypoglycemia, hypothermia, bronchopulmonary dysplasia, necrotizing enterocolitis, and intraventricular haemorrhage.[6]

Pakistan is a developing country with significantly high maternal and neonatal mortality rates. Pakistan's neonatal mortality rate (NMR) is as high as 46 deaths per 1,000 live births, given that the NMR in rural areas is 62 deaths per 1,000 live births and 47 deaths per 1,000 live births in urban areas with an urban-to-rural ratio of 0.8.6.[7,8] Additionally, the predominant cause of neonatal deaths in Pakistan, according

Correspondence: Dr Mehwish Ara Shams, Resident Gynecology, Pak Emirates Military Hospital, Rawalpindi Pakistan
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to a consensus in 2015 is prematurity amounting to approximately 39.3% of total neonatal deaths.[9,10]

Consequently, given the high numbers of neonatal deaths resulting from prematurity, it is eminent that health care professionals in developing countries such as Pakistan be highly vigilant in diagnosing and managing PPROM and its associated complications on time. We designed this study to explore the morbidity and mortality associated with preterm prelabour rupture of membranes in the presence of amniotic fluid index (AFI) greater than or less than 5 in a tertiary care setting in Rawalpindi, Pakistan.

METHODOLOGY

This cross-sectional study was performed at the Department of Obstetrics and Gynaecology, Pak Emirates Military Hospital Rawalpindi over six months from March 2019 to August 2020. The sample size was calculated by using the population prevalence proportion of PROM as 3%.[11]

Inclusion Criteria: All the pregnant subjects with a history of preterm pre-labour rupture of amniotic membrane (PPROM) or presented with draining of liquor prior to the onset of labour and delivered in our department regardless of the pregnancy outcomes were included in the study.

Exclusion Criteria: Pregnant women with multiple gestation or fetal malformations were not included in the study.

Patients with a preliminary working diagnosis of preterm prelabour rupture of membranes made by a consultant gynaecologist were included via non-probability consecutive sampling technique. The gestational age of the patients was estimated beginning from the first day of the last menstrual period or with the help of a dating ultrasound scan if available. All patients with incomplete data were excluded from the analysis.

The study parameters were; maternal age, gestational age, time since the rupture of membranes at the time of presentation, time from PPROM to delivery, any antibiotics given, maternal complications of chorioamnionitis and endometritis, AFI, and mode of delivery. Additionally, neonatal parameters were also recorded, including birth weight, APGAR scores at 1 minute and 5 minutes, Neonatal Intensive Care Unit (NICU) admission, and any neonatal complications, including respiratory distress syndrome, sepsis, jaundice, hypoglycemia and hypothermia.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. The extracted data were tabulated and compared between the two groups, divided as AFI <5 and AFI ≥5. Pearson chi-square test was used to evaluate and compare the relation of different variables with maternal and neonatal outcomes of PPROM. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 1562 deliveries took place in our Gynaecology and Obstetrics Department, among which a total of 73 (4.67%) cases were diagnosed as PPROM. Due to incomplete data, three patients were excluded from the study, and the total numbers of patients included in the analysis were seventy.

The first group included patients with AFI less than five, and the second group included patients with AFI more than or equal to 5. 22 (31%) patients were in the AFI <5, while 48 (69%) patients were in the AFI ≥ five group (Table-I).

Table-I: Maternal socio-demographic and obstetric characteristics with respect to amniotic fluid index.

Maternal Characteristics	Amniotic fluid index <5 (n=22)	Amniotic fluid index ≥ 5 (n=48)
Patient Age (Mean years)	23.2 ± 6.77	26.8 ± 7.38
Gestational Age at the Time of Delivery (Mean Weeks)	33.1 ± 9.53	35.6 ± 8.98
Time Since Rupture of Membranes at the Time of Presentation (Hours)	5.3 ± 2.75	6.1 ± 3.65
Time from PPROM to Delivery (Hours)	>24	<24

In terms of maternal outcomes, the group with AFI <5 had a higher number of cesarean deliveries performed compared to the group with AFI ≥5. 7 (31.8%) cesarean deliveries were performed in the group with AFI <5 versus 4 (8.33%) in the group with AFI ≥5 (*p*-value<0.01). Chorioamnionitis 6 (27.3%) was also observed more frequently in the group with AFI <5 versus 3 (6.25%) in the group with AFI ≥5 (*p*-value <0.01). There was no statistically significant difference in terms of endometritis between the two groups (Table-II).

Thirteen (59.1%) neonates had APGAR scores <7 in AFI < 5 group as compared to 12 (25%) in the second group, which improved in both groups at 5 minutes. NICU admission rates were higher in the AFI <5 groups amounting to a total of 8 (36.4%) as compared to 13 (27.1%) in the AFI ≥5 group. All other complica-

tions, including sepsis, respiratory distress syndrome, jaundice, hypothermia, and hypoglycemia, were noted significantly more in the group with AFI <5 (*p*-value <0.05). Table-III showed that neonatal mortality was higher in the AFI <5 group with a prevalence of 13.6% compared to 10.4% in the group with AFI ≥5 (*p*-value 0.04) as shown in the Table-III.

Table-II: Maternal outcomes comparison between PPROM with amniotic fluid index <5 and amniotic fluid index ≥5.

Maternal Outcome		Amniotic fluid index < 5 (n=22)	Amniotic fluid index ≥ 5 (n=48)	*p*-value
Mode of Delivery	Vaginal	15 (68.2%)	44 (91.7%)	<0.001
	Caesarean	7 (31.8%)	4 (8.3%)	
Chorioamnionitis		6 (27.3%)	3 (6.25%)	<0.001
Endometritis		1 (4.5%)	1 (2.1%)	0.560

Table-III: Neonatal outcomes comparison between preterm premature rupture of membranes with amniotic fluid index <5 and amniotic fluid index ≥5.

Neonatal Outcomes		Amniotic Fluid Index <5 (n=22)	Amniotic Fluid Index ≥5 (n=48)	*p*-value
APGAR at 1 min	<7	13 (59.1%)	12 (25%)	<0.001
	>7	9 (40.9%)	36 (75%)	
APGAR at 5 min	<7	4 (18.2%)	2 (4.2%)	<0.001
	>7	18 (81.8%)	46 (95.8%)	
NICU Admission		8 (36.4%)	13 (27.1%)	0.04
Neonatal Sepsis		7 (31.8%)	9 (18.7%)	0.03
Respiratory Distress Syndrome		5 (22.7%)	6 (12.5%)	0.03
Hypothermia		4 (18.2%)	4 (8.4%)	0.02
Hypoglycemia		3 (13.6%)	5 (10.4%)	0.04
Neonatal Death		3 (13.6%)	5 (10.4%)	0.004

DISCUSSION

This analysis was aimed to evaluate the impact of PPROM in a developing country like Pakistan and determine the difference in maternal and neonatal outcomes in mothers with AFI <5 and AFI ≥5. Our study revealed the occurrence of PPROM to be 4.67% which was comparable to other developing countries such as Nigeria, where an incidence of 4.46% was revealed by Endale *et al*.[5] However, PPROM in our hospital located in a metropolitan city of Pakistan was much higher than that reported by other studies. An incidence of only 2.4% reported by Eleje *et al*,[8] and 3.2% by Idrisa *et al*,[1] reported in developing countries of Ethiopia and Nigeria respectively.

In our study, no statistically significant difference was revealed between maternal socio-demographic and obstetric characteristics, including maternal age, gestational age at the time of delivery, time since the rupture of membranes, and time from rupture of membranes till delivery in the two groups with respect to AFI. This is in accordance with a research by Mousavi *et al*, published recently in 2018, which noted no relationship between maternal age and gestational age at the time of PPROM or delivery with the AFI index. Additionally, the authors also noted no relation of AFI index with other maternal factors such as parity, gravidity, and body mass index.[9]

Our analysis revealed a higher number of cesarean deliveries performed in the group with AFI <5 compared to AFI ≥ 5. A higher reliance could explain this on cesarean deliveries due to non-reassuring fetal status. This is in accordance with results in other studies such as by Borna *et al*, who also reported higher cesarean than vaginal deliveries in the group with AFI <5.12

Chorio-amnionitis was observed with a higher prevalence in the group with AFI < 5 than AFI ≥5, with a prevalence of 27.2% versus 6.25%. Chorioam-nionitis has been reported more frequently with oligohydramnios in several studies performed both in developing and developed countries and is one of the reasons antibiotic administration is encouraged with PPROM.[13,14] Furthermore, the development of chorioamnionitis is also associated with a shorter latency period in PPROM.[15]

There was no statistically significant difference in terms of endometritis between the two groups. Postpartum infections can be reduced with the administration of antibiotics. The incidence of post-partum infections is independent of AFI, as reported by other studies.[12] Other maternal morbidities not noted in the present study have also been described as unrelated to AFI by other authors, including placental abruption, uterine atony following delivery and retention of the placenta.[9]

Neonatal Intensive Care Unit (NICU) admission rates were higher in the AFI <5 groups in our study with a total of 36.4% as compared to 27% in the AFI ≥5 group, which is different from studies in other developing countries that have reported no significant impact of AFI on the duration of NICU admission.[9] Neonatal complications were higher in our study in the group with AFI <5, including sepsis, respiratory distress syndrome, jaundice, hypothermia, and hypoglycemia. Neonatal sepsis has been reported with a higher frequency with oligohydramnios in other studies such as by Passos *et al*, strengthening the significance of antibiotics, as lower incidence of sepsis,

including both puerperal sepsis neonatal sepsis, occur with pre-labour use of antibiotics.[16]

Although studies have observed an association between respiratory distress syndrome and PPROM, in contrast to our studies, no difference has been noted with AFI values. Sims *et al,* reported 17% incidence of respiratory distress syndrome with PPROM without any significant impact of AFI.[17]

Hypoglycemia and hypothermia were noted with higher frequencies with AFI <5. Although it is established that hypoglycemia and hypothermia have a higher prevalence in preterm infants than in term infants,[18,19] no studies have attempted to compare their incidence with variable AFI to the best of our knowledge.

Neonatal mortality was significantly greater with AFI < 5 groups compared to AFI ≥ 5 with a prevalence of 13.6% compared to 10.4%, respectively. Although no maternal mortality was observed in our study, perhaps owing to prompt administration of antibiotics, the reported neonatal mortality was significantly higher than that reported by other studies in developing countries, such as 9.6% reported by Idrisa *et al,* in Nigeria and by Endale *et al,* in Ethipoia.[1,20]

CONCLUSIONS

Preterm premature rupture of membranes was a relatively common finding among the patients managed at our labour unit. Such patients with an amniotic fluid index of less than five are at a high risk of maternal and fetal adverse outcomes.

Conflict of Interest: None.

Authors' Contribution

MAS: Design acquistion, Analysis and intepretation of data, NA: Conception, design and final approval, HS: Article drafting and interpretation of data.

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