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Frequency of Neonatal Respiratory Distress among Newborns of Mothers with Preterm Premature Rupture of Membranes in Tertiary Care Hospital

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ABSTRACT

Respiratory distress leads to neonatal morbidity and mortality. The premature rupture of membranes before labor at less than 37 weeks. **Objectives:** To determine the frequency of neonatal respiratory distress in newborns delivered with preterm premature rupture of membranes. **Methods:** Cross-sectional study conducted in the Gynecology unit at Ayub Teaching Hospital Abbottabad from 1-4-2018 to 1-9-2018. Sample size 244 was calculated using WHO software by non-probability consecutive sampling using a convenience sampling technique. Pregnant women with singleton pregnancy, gestation 34-36 weeks, parity 0-4 with preterm rupture of membranes were included. After birth, an examination of the newborn for features of respiratory distress was done by a neonatologist. Data were analyzed with SPSS version 22.0. Mean ± SD was presented for quantitative variables and frequency percentage was computed for qualitative variables like respiratory distress. **Results:** The mean age was 28.733 ± 2.71, the mean gestational age was 34.750 ± 0.65 and the mean parity was 1.028 ± 1.11. Respiratory distress was observed in 40.2% of newborns. Stratification of Respiratory Distress concerning maternal age, parity, and gestation done. This was 87.9 % in newborns of women aged 18-27 and 25.3% in women aged 28-35 years. 43% of newborns developed respiratory distress at gestation less than 35 weeks and 20% at gestation more than 35 weeks. **Conclusions:** It was concluded that the frequency of neonatal respiratory depression was 40% in newborns with premature rupture of membranes. It was more common in younger ages and at less than 35 weeks of gestation.

INTRODUCTION

Respiratory depression is a major devastating and challenging problem in premature newborns. A significant number of newborns are admitted to NICU with respiratory distress [1]. According to every Newborn Action Plan (ENAP), complications associated with preterm birth contribute to a significant number of neonatal deaths which need to be addressed promptly [2]. Respiratory distress syndrome (RDS) contributes to 45 % of neonatal deaths in premature newborns in low and middle-income countries [3]. Several obstetrical risk factors are identified for this morbidity which include prematurity, meconium-stained liquor, operative delivery, gestational diabetes, pre-labour rupture of membranes, or neonatal congenital lung anomalies [4]. Other factors like antepartum bleeding, parity, antenatal steroid use and Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) score at birth are predictors of neonatal respiratory depression. Many fetal pulmonary congenital malformations like tracheoesophageal fistula, bronchopulmonary dysplasia, bronchogenic cysts lung parenchymal diseases, or pulmonary hypoplasia also contribute to respiratory diseases and undiagnosed respiratory depression in preterm infants [5]. The term PPROM is defined as premature rupture of amniotic membranes leading to per vaginal leaking of liquor before labour at gestation less than 37 completed weeks [6]. It is the ultimate cause of pulmonary depression in the majority of premature births leading to increased mortality. The management of PPROM is challenging for obstetricians concerning sepsis prevention and in-utero referral. The WHO recommends

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the use of corticosteroids for fetal lung maturity for women at risk of preterm labour. Other strategies like Kangroo mother care and enhancing training and skill in newborn resuscitation can also reduce the burden of the problem [7]. Sims demonstrated frequency of respiratory distress in 39% of newborns with rupture of membranes at less than 35 weeks of gestation [8]. Diriba et al., reported respiratory distress in 49% of neonates born with ruptured membranes [9]. Neonatal pulmonary depression can end up with serious respiratory compromise cardiac sequel and neonatal demise. It not only contributes to the sufferings of neonates but puts an economic expenditure burden on health provider services in low- and middle-income countries (LMIC) like Pakistan. Very few studies were available in the local population.

This study aimed to determine the frequency of respiratory distress in premature neonates born with ruptured membranes. This will help obstetricians and pediatricians to plan structured evaluation and early management of respiratory distress associated with PPROM.

METHODS

This cross-sectional study was carried out in the obstetrics and gynecology unit of Ayub Teaching Hospital, Abbottabad from 1-4-2018 to 1-9-2018. The sample size was 244, calculated using WHO software for sample size calculations with the following assumptions: Confidence level=95% and anticipated proportion of respiratory distress=2.6% [9]. Absolute precisions=2% by non-probability consecutive sampling using a connivance sampling technique. Pregnant women 18-35 years old with singleton pregnancy on ultrasound and gestational age 34-36 weeks by Last Menstrual Period (LMP), parity 0-4, and preterm premature rupture of membranes were included in the study. Preterm premature rupture of membranes was diagnosed when the following conditions were observed at the period of gestation less than 37 weeks of pregnancy. (1) Amniotic fluid leaking from the vagina observed as soaking seen on pad or clothes. (2) A speculum examination reveals liquor pooling in the upper vagina or trickling through the cervical canal which will further increase by coughing or straining (Valsalva manoeuvres). Women with meconium aspiration syndrome (Infant's chest X-ray show asymmetric, patchy pulmonary opacities with pleural effusions), antepartum hemorrhage, and history of ABO/Rh hemolytic disease on medical record were excluded from the study. After ethical approval (letter no CPSP/REU/OBG-2016-010-7988), patients fulfilling the inclusion criteria were recruited from the indoor department. Basic demographics like age, parity, gestational age, etc. were recorded and Informed consent was taken. After delivery complete clinical examination of the newborn for the features suggestive of respiratory depression was done by an expert neonatologist. Respiratory distress was diagnosed as an infant showing all of the following: Tachypnea defined as a respiratory rate greater than 60 breaths per minute, nasal flaring, and chest grunting by physical examination. Respiratory distress data were entered on specially designed proforma. Data analysis was done with SPSS version 22.0. Mean ± SD was presented for quantitative variables like age, gestational age, and parity. Frequency and percentage were computed for qualitative variables like respiratory distress. Effect modifiers like age, gestational age, and parity were controlled by stratification. Post-stratification chi-square test was applied and p-value ≤0.05 was considered statistically significant.

RESULTS

The mean age of patients was 28.733 ± 2.71, with a mean period of gestation of 34.750 ± 0.65 weeks and a mean parity of 1.028 ± 1.11 (Table 1).

Table 1: Mean ± SD of Age, Gestational Age, and parity (n=244)

Demographic Variables	Mean ± S.D
Age (Days)	28.733 ± 2.71
Gestational Age (Weeks)	34.750 ± 0.65
Parity	1.028 ± 1.11

Respiratory distress was observed in 40.2% of newborns (Table 2).

Table 2: Frequency, %Age of Patients with Respiratory Distress

Respiratory Distress	Frequency Percentage
Yes	98 (40.2%)
No	146 (59.8%)
Total	244 (100%)

Stratification of Respiratory Distress concerning maternal age indicated that 87.9% of women between the age group 18- 27 and 25.3% of women between the age group 28-35 years old newborns developed respiratory distress. (p-value significant) (Table 3).

Table 3: Stratification of Respiratory Distress with Age

Age (Years)	Respiratory Distress		p-value
	Yes (Frequency %)	No (Frequency %)	
18-27	51 (87.9%)	7 (12.1%)	0.000
28-35	47 (25.3%)	139 (74.7%)	
Total	98 (40.2%)	146 (59.8%)	

Gestational age less than 34-35 weeks was associated with respiratory distress of 43% while gestation of more than 35 weeks was associated with respiratory distress of 20% (Table 4).

Table 4: Stratification of Respiratory Distress Concerning Gestational Age

Variables	Respiratory Distress		p-value
Gestational Age (weeks)	Yes (Frequency %)	No (Frequency %)	
Less than 34-35	92 (43%)	122 (57%)	0.016
>35	6 (20%)	24 (80%)	
Total	98 (40.2%)	146 (59.8%)	

Maternal Parity of 0-2 and 3-4 was associated with 41% and

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35.95% respiratory distress in newborns respectively (Table 5).

Table 5: Stratification of Respiratory Distress Concerning Parity

Parity	Respiratory Distress		p-value
	Yes (Frequency %)	No (Frequency %)	
0-2	84(41%)	121(59%)	0.553
3-4	14(35.9%)	25(64.1%)	
Total	98(40.2%)	146 (59.8%)	

DISCUSSION

Respiratory depression is one of the major causes of neonatal death worldwide. Prematurity is a major contributing factor. The overall prevalence of preterm labour with ruptured membranes occurs in 7-10% of births [10]. The frequency of respiratory depression has an inverse association with gestational age [11]. The current study was carried out in a tertiary care facility situated in a remote area of the province of KPK Pakistan. The frequency of respiratory distress was found to be 40.2% in newborns of mothers with preterm ruptured membranes. This higher frequency correlates well with a study conducted by Niesłuchowska-Hoxha et al., who reported 52.29% of RDS in PPROM cases [12]. Another study conducted by Aslamzai et al., in Kabul Afghanistan reported 52% respiratory distress in premature newborns. In their study, the highest rates were observed in very premature and low birthweight babies [13]. This high prevalence of respiratory depression in premature newborns well explains the burden of disease across the world particularly in LMIC and emphasizes the significance of addressing risk factors leading to this morbidity. In our study, the frequency of respiratory depression was more common in pregnant women between the age of 18-27 years (87.9%) while it was less commonly observed in the age group 28-35 years (25.3%). This shows that younger women particularly with teenage pregnancies are more at risk of developing PPROM and the birth of newborns with higher percentages of respiratory depression. However, a study conducted by Bibi et al., in Abbottabad categorized the women in 18-23 years and 24-29 years' age groups for acute and chronic respiratory disease in pregnancies with preterm rupture of membranes and found more acute and chronic conditions in the age group 24-29 years. Very few studies in the literature address maternal age as a risk factor for PPROM because they pair PPROM cases with age-match controls [14]. Our results indicate that neonatal respiratory depression was more frequent at the gestational age of less than 35 weeks (43%) than at gestation of more than 35 weeks (20%). The better respiratory function and secretions of alveolar surfactants after 34 weeks of gestation are well documented and a known prognostic factor. The study conducted by Wang L in China compared respiratory depression at various gestation and found that newborns at lesser than 34 weeks' gestational age are in increased demand for surfactants [15]. Another research conducted by Lemyre et al., found similar results in very preterm newborns [16]. Maternal parity and neonatal respiratory depression share an association. In our study, the frequency of neonatal respiratory depression was more commonly observed in pregnant women having a parity of 0-2 (41%) as compared to a parity of 3-4 (35%). These results are comparable to other studies that show that PPROM is more common in prim gravidas or those having previous miscarriages [17, 18]. The assessment of respiratory depression could vary based on observer, equipment, and definition criteria [19, 20]. These limitations were part of our study. The confounding factors like maternal infections, antenatal corticosteroid use, and mode of delivery can impact respiratory outcomes. It is challenging to control all these variables. Increasing the sample size, conducting a study across multiple tertiary care hospitals, controlling confounding factors, including a control group, and extending follow-up beyond the neonatal period can provide a more comprehensive view of the study.

CONCLUSIONS

It was concluded that a significant proportion of respiratory depression occurs in neonates born with preterm premature membrane rupture. It was 40% in a current research study, more commonly seen in younger ages (18-27 years) and at less than 35 weeks of gestation.

Authors Contribution

Conceptualization: MN
Methodology: MN, SS, KI
Formal analysis: SS, SU
Writing review and editing: SA, NB

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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