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A Descriptive Study on the Causes of Respiratory Distress in Neonates at a Tertiary Care Center in Nepal

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Abstract:-

➢ ***Introduction:***

Respiratory distress is a common cause of NICU admission. It presents as tachypnea, retractions, nasal flaring, and grunting. Common causes of respiratory distress are transient tachypnea of newborns, pneumonia, respiratory distress syndrome, neonatal sepsis, birth asphyxia, and congenital heart disease. Limited studies have been done on respiratory distress in our setting. This study could enlighten the status of respiratory distress in neonates which could enhance understanding and help in tailoring the management of neonatal respiratory distress.

➢ ***Materials and Method:***

All the inborn neonates admitted to the NICU and neonatal ward of NMCTH, within the above specified period, with respiratory distress were recruited in the study after being informed vii consent from the parents. The neonates with respiratory distress were diagnosed clinically by the presence of at least 2 of the following criteria: respiratory rate (RR) of 60 breath/ min or more, subcostal indrawing, xiphoid retraction, suprasternal indrawing, flaring of alae nasi, expiratory grunt and cyanosis at room air. The data was analyzed and causes of respiratory along with its risk factor, outcome, and duration of hospital stay were identified. Data was entered in MS Excel 2013 and converted into SPSS 26 for statistical analysis.

➢ ***Result:***

The most common cause of respiratory distress in our study was transient tachypnea of newborns which comprised 82 (46.6%) of cases followed by meconium aspiration syndrome 35 (19.9%) and congenital pneumonia 21 (11.9%). The most common risk factor for respiratory distress was meconium-stained liquor followed by GDM.

➢ ***Conclusion:***

In our study, we concluded that TTN was the most common cause of respiratory distress followed by MAS, congenital pneumonia.

Keywords:- *Meconium, Neonate, Pneumonia, Respiratory Distress, Tachypnea.*

I. INTRODUCTION

Respiratory distress is one of the most common reasons for admission in the neonatal intensive care unit.[1] It occurs in about 4-7% of all neonates and is the reason for 30-40 % of admission to NICU. It is more common in preterm (30.0%) and post-term (21.0%) than among term neonates (4.2%).[2]

Respiratory distress in neonates can be defined as the presence of any two of the following[3-5]

- Respiratory rate (RR) >60 breath/minute
- Subcostal/intercostal retraction
- Expiratory grunt

In addition to the above features, the presence of nasal flaring, suprasternal retraction, and decreased air entry in auscultation of the chest, also indicate respiratory distress in neonates.[5] Multiple conditions can present with features of respiratory distress. Common causes in term neonates include transient tachypnea of the newborn (TTN), meconium aspiration syndrome (MAS), and persistent pulmonary hypertension (PPH) while respiratory distress syndrome (RDS) is one of the most common causes among preterm neonates.[6]

Respiratory distress may also result from developmental abnormalities like tracheoesophageal fistula (TEF), bronchopulmonary sequestration, bronchogenic cyst, congenital cystic adenomatoid malformation, pulmonary hypoplasia from congenital diaphragmatic hernia, however, these are rarer conditions. Some risk factors increase the likelihood of neonatal respiratory distress and these include prematurity, meconium-stained amniotic fluid (MSAF), caesarian section delivery, gestational diabetes, maternal chorioamnionitis, or prenatal ultrasonographic findings, such as oligohydramnios or structural lung abnormalities.[1]

Non respiratory causes include cardiac failure, septicemia, metabolic disorders, renal failure, renal tubular acidosis, anemia, polycythemia, meningitis/ intracranial bleeding, and miscellaneous causes.[3] The mode of delivery through elective cesarean sections has specifically increased the incidence of respiratory distress in term infants.[2] Gouyon et al. also noted that a major risk factor for respiratory distress in term infants was elective cesarean section at 37–

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38 weeks gestation.[6] The prevalence of RD varies with gestational age, 30% among preterm, and 20% among post terms to 4% in term babies.[3]

Regardless of the cause, if not recognized early, respiratory distress can progress to respiratory failure and cardiopulmonary arrest. In Nepal, Neonatal Mortality Rate is 22 per 1000 live births. Among the causes of neonatal death, the conditions associated with respiratory distress are prematurity (30.8%), birth asphyxia (23.4%), sepsis (18.4%) and acute respiratory infection (5.6%). Early diagnosis and management can reduce the morbidity and mortality in the neonatal period.[7, 8]

A study was conducted to study the scenario of respiratory distress in neonates in Kathmandu, Nepal. It showed that 34.3% of cases admitted to NICU were due to respiratory distress.[8] The various risk factors that were identified as the cause of respiratory distress were prematurity, low birth weight, cesarean section, and meconium-stained liquor. The neonatal period is the most vulnerable and is susceptible to various diseases. Due to the immaturity of the vital organs and physiology neonates face different problems immediately after birth. Furthermore, prematurity, low birth weight, and growth restriction complicate and they are more prone to morbidity and mortality. Despite the advancement in neonatal care and management still, many deaths occur worldwide during the neonatal period even in developed countries which can be prevented. The majority of deaths in the developing countries still occur in the neonatal period.[9]

In our country, only very few studies on the cause of respiratory distress in newborns have been done. The results of such studies are also variable in different centers. This study might help us to identify the risk factors of neonatal respiratory distress and its common causes in our center enabling us the proper management and thereby ultimately reduce the morbidity and mortality resulting from it. This study will further enlighten our knowledge regarding the scenario of respiratory distress in neonates. It will be a positive step towards preventing various causes of respiratory distress in neonates in developing countries and building guidelines regarding the management. This will prevent the unnecessary deaths which still occur in our country.

II. METHODS

Type of Study: Hospital based descriptive study

Study population: All the inborn neonates with respiratory distress were admitted to NMCTH during the period of study.

Study Duration: July 2021 to July 2022.

Sample size calculation

The sample size is calculated by using the formula, $n = z^2 * p * (1 - p) / d^2$

z = 1.96 for a confidence level (α) of 95% d = 7%

p will be 34.3%, taken from Rijal et8 n = 177

Hence, the total sample size was calculated to be 177.

➢ *Materials And Tools*

- Birth weight was taken from a standard electronic weighing machine
- Saturation was taken from pulse oximetry
- APGAR score was used for assessing birth asphyxia
- Downes and Silverman Anderson score was used to grade the severity of respiratory distress in terms and preterm respectively

Table 1 Downe's Score[13]

Score	*0 point*	*1 point*	*2 points*
Respiratory Rate	< 60	60 - 80	> 80
Cyanosis	None	In room air	In 40% Oxygen
Retraction	None	Mild	Moderate to severe
Grunting	None	Audible with stethscope	Autdible without stethoscope
Air entry	Clear	Decreased	Barely audible

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The demographic and clinical data of all the patients were collected and compiled by the principal investigator. The collected data was entered in Microsoft Excel Spreadsheet and data was analyzed and expressed as frequency and percentage.

III. RESULTS

A total of 177 neonates admitted to the NICU of Nepal Medical College and Teaching Hospital fulfilling the criteria for respiratory distress during the study period were included in this study.

Table 2 Demographic Characteristics of Neonates with Respiratory Distress

Characteristics		Frequency (n=177)	Percentage (%)
Gender	Male	121	68.3%
	Female	56	31.7%
Birth weight	< 1000 gm	0	0.0%
	1000 - 1500 gm	2	1.1%
	1500 - 2500 gm	25	14.2%
	2500 - 4000 gm	148	83.6%
	< 4000 gm	2	1.1%
Gestational Age	Pre-term	28	15.8%
	Full term	149	84.2%
Mode of delivery	Normal	55	31.1%
	LSCS	122	68.9%
Parity of Mother	Primigravida	93	53%
	Multigravida	84	47%

As shown in Table 2, out of the total neonates with respiratory distress 68.3% were males and 31.7% were females. Among them there were zero cases of extremely low birth weight (less than 1000 gms), 1.1% belonged to the very low birth weight group (1000 to 1500 gms), 14.2% belonged to the low birth weight group (1500 to 2500 gms), 83.6% belonged to normal birth weight groups (2500 to 4000 gms) and 1.1% belonged to more than 4000 gms. About 84.2% of babies were born full term and the remaining were born preterm 15.8%. Among the study population, 68.9% were delivered through LSCS and 31.1% were delivered through NVD.

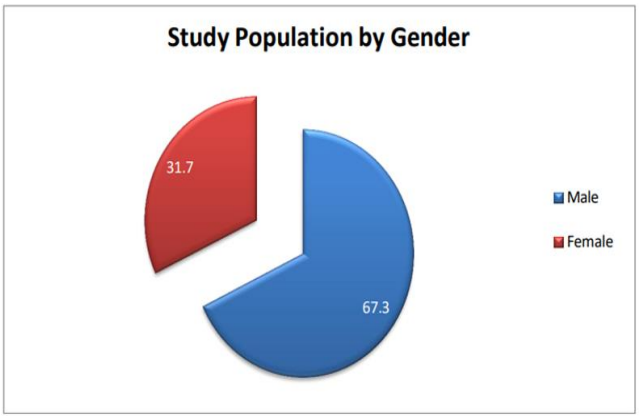

Fig 1 Pie Chart Showing Study Population by Gender

Out of 177 newborns who developed respiratory distress, 68.3% were males and 31.7% were females.

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IV. DISCUSSION

Respiratory distress is the leading cause of admission to the NICU. It also contributes to significant morbidity and mortality in newborns. Respiratory distress is not a disease itself but is a common presentation of various respiratory and non-respiratory etiology. Various factors such as antenatal, postnatal, maternal, and fetal risk factors influence the occurrence of respiratory distress. Very few studies have identified the incidence of respiratory distress in settings similar to ours and the common causes of respiratory distress have not been reported.

During the study period, a total of 461 newborns were admitted to the NICU out of which 177 developed respiratory distress making the incidence rate 38.3%. A study done by Haquea et al revealed the incidence of respiratory distress to be 34% which was similar to our study.[18] Another study done by Wadi et al revealed the incidence of respiratory distress as 50% which was slightly higher than our study.[15] A study done by Abderlrahman et al had an incidence rate of 56.6% which is also higher compared to our case.[16] These findings could suggest that there were a variety of different cases admitted in our NICU as compared with other studies.

In this study, the commonest cause of respiratory distress was found to be TTN which was calculated to be 46.8%. Multiple studies have also found TTN to be the most common cause of respiratory distress in the NICU. The incidence of TTN in a study conducted by Haquea et al was 43.2%, Shah et al was 46%, Swarnakar et al was 40.7% and Wadi et al was 44.9%.[4-20,15] All these studies have similar findings to this study suggesting that across different studies TTN has been the commonest cause of respiratory distress in neonates with similar incidence. Studies done by Swarnakar et al, Dutta et al and Abderlraham et al also had TTN as the most common cause however these studies have a lower incidence of 36.9%, 32.3%, and 28% respectively.[20,10,16] On the contrary, a study done by Rijal et al established MAS to be the most common cause and TTN to be the second most common cause with an incidence of 21.1% and 15.5% respectively. [8] Another study by Mehta et al revealed sepsis with pneumonia as the commonest cause of respiratory distress in neonates.[12] The increasing number of LSCS in developing countries could justify TTN as the most common cause of respiratory distress requiring NICU admission. However several other risk factors like male gender, term deliveries, and the practice of observing all cases with respiratory distress at delivery could also add to the reason for TTN being the most common cause.

In this study, 68.7% of babies with respiratory distress were delivered through LSCS and 31.7% were delivered through NVD. Similarly, a study done by Swarnkar et al had 67.6% of babies delivered through LSCS and 32.4% through NVD.[20] Haquea et al had 84% of newborns delivered through LSCS and 16% through NVD.[18] Swarnakar et al had 67.6% of newborns delivered through LSCS and 32.4% through NVD.20 All these studies, have TTN as the commonest cause of respiratory distress and also have a higher incidence of LSCS as compared to NVD. Similarly, a study done by Rijal et al, which had MAS as the commonest cause of respiratory distress has a higher incidence of NVD (59.6%) as compared to LSCS (30.9%).[8] In addition to this, among all the cases of TTN in this study, 78% were delivered through LSCS highly suggesting that LSCS is the one of the risk factors for TTN.

In our study, 68.2% were males and 31.8% were females. In a study done by Haquea et al, 64% were male and 36% were female.[18] Similarly, another study by Wadi et al showed 61.6% were males and 38.3% were females.[15] In a research conducted by Abderlrahman et al 54% were male and 46% were female.83 These findings could suggest that the male gender could be a risk factor for TTN. However, a study done by Rijal et al which had MAS as the commonest cause of respiratory distress also revealed 61.4% were males and 38.6% were females.[8] This could suggest that the overall admission rate of male neonates in NICU is higher and that male gender is a risk factor for TTN could just be a confounding variable. Studies conducted by Shrestha et al and Mittal et al have revealed male babies are admitted more than female babies in the NICU.[17, 18]

In this study, 31.3% had one or more risk factors such as meconium-stained liquor, prematurity, GDM, PROM, maternal UTI, and polyhydramnios. Out of them meconium stained liquor was present in 24.8% followed by prematurity in 15.8%, GDM in 15.3% and PROM in 6.2%. Similarly, a study by Swarnakar et al had meconium-stained liquor in 62%, PROM in 12.7% and GDM in 4.4%.[20] Wadi et al had meconium-stained liquor in 19.8% and PROM in 11.4% of cases.[15] In a study by Rijal et al there were 28% cases with PROM, 24% cases with meconium-stained liquor, 5% cases with maternal fever, and 1% cases with GDM.[8] These findings suggest that there were a myriad of risk factors for respiratory distress in neonates who were admitted to NICU and not just one specific cause.

Based on gestational age, 15.9% were preterm and the remaining 84.1% were term babies in this study. According to a study done by Harshini et al out of total newborns who developed respiratory distress 82.2% of babies were term and 17.8% were preterm.[19] These findings are consistent with our study as well. Another study done by Rao et al on respiratory distress in neonates had 32% preterm babies. These findings are consistent with the pre-established risk factor for TTN, being term or late preterm babies. On the contrary, in a study done by Lamichhane et al, there were 40.5% term babies and 59.4% pre-term babies which were different than our study.[21] Their study also revealed TTN to be the most common cause. In another study done by Brahmaiah et al, there were 59% of preterm babies.[11] Since TTN is also present in late preterm, the findings of these studies require more elaboration on the basis of gestational age.

In this study, 15.9% of babies had low birth weight and 84.9% had normal birth weight. In the study done by

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Harshini et al, 60% of babies had normal birth weights and 40% of babies with low birth weights.[19] These findings which were similar to our study could suggest that since the majority of the babies were term, the likelihood of them having normal weight will also be higher.

In this study, 94.9% of neonates with respiratory distress improved and there was only 1 (0.6%) mortality. In the study done by Haquea et al, there was 16.7% mortality which is exponentially higher than our study.18 There was 9% mortality in a study done by Wadi et al and 36% mortality in a study done by Abderlrahman et al.[15], [16] Overall outcome was better in our study as compared to other studies. This could be due to the less severe nature of the cases admitted in our NICU presence of leave against medical advice, better quality of care, and antenatal care for preterm babies like giving Inj. Dexamethasone and IV antibiotics, immediate intervention for cases like meconium-stained liquor. However, these are topics that could belong to a separate entity requiring detailed investigations in itself.

V. CONCLUSION

Respiratory distress is one of the most common causes of newborn admission to NICU. There are multiple causes of respiratory distress in newborns. In our study, we listed out all the multiple causes of respiratory distress and we found TTN to be the commonest cause of respiratory distress in neonates followed by MAS and congenital pneumonia. The causes of respiratory distress also depended on a myriad of risk factors. These risk factors include male gender, prematurity, LSCS, especially in full-term babies, meconium-stained amniotic fluid, and certain maternal factors like GDM, prolonged rupture of membrane, and so on. In addition, these risk factors can also be kept into consideration while admitting patients to NICU for further management and care and especially while counseling about the possible outcome and prognosis.

We also concluded that most of the babies with respiratory distress had good outcomes. However, the good outcome can also be due to the less severe nature of the respiratory distress present in our study and can also be due to the presence of leave against medical advice. Whatever the cause, as clinicians we can be proud that these babies had conditions treatable in clinical settings like ours and were provided ample care to achieve a good health outcome.

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