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Scenario of Neonatal Respiratory Distress in Tertiary Hospital

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ABSTRACT

Background: Respiratory distress is one of the most common reasons for admission in Neonatal Intensive Care Unit. However, studies of newborn admitted with respiratory distress in our setup are limited. This study aims to look for incidence of neonatal respiratory distress in our setup, to analyze the common causes of respiratory distress and to determine possible strategic plan needed for better clinical outcome.

Methods: A cross sectional study was conducted from March 2013 to December 2014 in Nepal Medical College and Teaching Hospital. Data of all the neonates with respiratory distress admitted during this period were analyzed.

Results: Total 317 (13.4%) neonates were admitted to Neonatal Intensive Care Unit during the study period.109 neonates developed respiratory distress comprising 34.3% of all Neonatal Intensive Care Unit admissions. Incidence of neonatal respiratory distress was 4.6%. The common causes of respiratory distress in our study were meconium aspiration syndrome in 21.1%, septicemia in 16.5%, transient tachypnea of newborn in 15.5%, pneumonia in 14.6%, birth asphyxia and hyaline membrane disease were in each 11.9% of the neonates. Caesarean section was the most common predisposing factor associated with the development of transient tachypnea of newborn in 82.3% newborns (p=.001). The overall mortality rate due to respiratory distress was 12.8%.

Conclusions: Meconium aspiration syndrome, septicemia and hyaline membrane disease are the most important causes of respiratory distress in our setup. Good obstetric care, proper training of health care personnel in neonatal resuscitation and early recognition of potential risk factors of respiratory distress will be helpful.

Keywords: Meconium aspiration syndrome; neonatal period; respiratory distress

INTRODUCTION

Respiratory distress is one of the most common reasons for admission in Neonatal Intensive Care Unit (NICU).[1] 15.0% of term babies, 29.0% of late preterm and even a higher proportion of newborns born prior to 34 weeks of gestation develop significant respiratory morbidity.[2] The most common causes of respiratory distress include Transient Tachypnea of the Newborn (TTN), Hyaline Membrane Disease (HMD), Birth asphyxia, Pneumonia and Meconium Aspiration Syndrome (MAS).[3] Risk factors for neonatal respiratory distress include: prematurity, meconium-stained amniotic fluid (MSAF), caesarean section, gestational diabetes, maternal chorioamnionitis and factors such as oligohydramnios or structural lung abnormalities. Case fatality for newborns with hyaline membrane disease is 20.0-40.0% in developed countries and 50.0-75.0% in India. It ranges from 14.3% to 37.0% for meconium aspiration related respiratory distress deaths.[4] Most of the causes of neonatal morbidity and mortality are preventable.[5] Regardless of the cause, if not recognized early, respiratory distress can escalate to respiratory failure and cardiopulmonary arrest.

Studies from Nepal on neonates admitted with respiratory distress in NICU are very limited. Study reports have found an incidence of respiratory distress in 3.9% to 8.0% ofpatients admitted in NICU with respiratory distress.[6,7] However, studies on possible causes and outcomes of respiratory distress in neonates in our setup is limited. We did this study to find out the incidence of respiratory distress in our NICU, to analyze the common causes of respiratory distress, and to determine the strategic plan needed to improve outcome of these cases.

METHODS

This was a cross sectional study, carried out from March 2013 to December 2014 at Nepal Medical College and Teaching hospital (NMCTH). The study included all the neonates admitted to NICU with respiratory distress

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during this period. Simple convenient non probability sampling method was used for data collection.The cases 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.[8] They were also assessed by scoring systems using Silvermen Anderson Scoring system for preterm babies and Downe's Scoring system for term babies. The study excluded neonates whose parents/guardians refused to participate in the study or if any information required for data collection could not be obtained.

Using both an interviewer-administered questionnaire and hospital records, data were collected for each patient. Neonatal data included: body weight, gestational age, single or multiple births, Apgar score if available, need for resuscitation after birth and days of hospitalization. Factors related to labor and deliveries were assessed including: type of delivery, place of delivery, and complications (prolonged rupture of membranes (PROM)>18 hrs, prolonged labor, meconium staining of liquor and antepartum hemorrhage). Maternal information recorded was: age, parity, any medical disease, antenatal care attendance (if present or not), history of any sign of infection before labor, and maternal education. Chest x-ray, complete blood count, C-reactive protein, blood culture and sensitivity were sent for all patients. The duration of hospitalization and outcome were obtained.

The prevalence of respiratory distress varies with gestational age: 30.0% among preterm, 20.0% among post terms to 4.0% in term babies. Assuming prevalence of respiratory distress as 7.5%[6-8] and level of significance of 5.0 %, sample size was calculated using formula $N= z^2pq/d^2$ where, p= prevalence of respiratory distress in newborns. q = 1-p, N= sample size, z=1.96, d= maximum tolerable error. Estimated sample size was 106. Demographic and clinical data of all the patients were entered and analyzed using SPSS version 20. Categorical data are expressed as frequencyand percentage. Continuous data are expressed with mean and standard deviation. Chi-square test was used to compare two categorical data. A two tailed P value <0.05 was considered to be statistically significant. Ethical approval was taken from Institutional Review Board in Nepal Medical College and Teaching Hospital.

RESULTS

Out of 2364 live deliveries during the study period, 317 (13.4%) neonates were admitted to NICU.109 neonates developed respiratory distress comprising of 34.3% of all NICU admissions and with an incidence of 4.6% in the total live deliveries. In this study, 67 (61.4%) neonates were male and 42 (38.6%) were female with male to female ratio 1.3:1. There were 26 (23.8%) pre-term babies, 80 (73.3%) term and 3 (2.7%) post-term neonates who were admitted with respiratory distress. It was also found that 59.6% vaginally delivered babies and 39.4% LSCS babies had respiratory distress. The commonest cause of respiratory distress in our study was Meconium Aspiration Syndrome (MAS) in 23 (21.1%) patients (Table 1). Most cases of MAS were full term with mean gestational age of 37.2 weeks±1 week and mean birth weight was 2995 gm±230 gm.In HMD, 80.0% of cases were of <32 wks with mean birth weight of 1240 grams ±140 gm. In most of the cases, antenatal steroid was not given as they presented late in the hospital. Maternal risk factors like PROM, maternal fever, foul smelling liquor, hypertension, and diabetes mellitus were present in MAS, septicemia, TTN, pneumonia, and HMD(Table 2). TTN(p=.001) and HMD (p=.02)were observed significantly more in a cesarean section than MAS (p=.27), birth asphyxia(p=.17), pneumonia (p=.80) and sepsis(p=.80). Congenital heart disease was the cause for respiratory distress in 6.4% cases (Table 1).Of all clinical signs and symptoms tachypnea, was the most common finding for the diagnosis of neonatal respiratory distress found in 87.1% neonates. Overall, 87.2% of neonates survived and 12.8% died. Most common causes of death were septic shock, respiratory failure and sudden cardiopulmonary arrest.

Table 1. Etiology of neonatal respiratory distress and relation to mode of delivery.

Diagnosis	Number %	Vaginal no	Caesarean no	P value
TTN	17(15.5%)	3	14	.001
HMD	13(11.9%)	4	9	.02
MAS	23(21.1%)	16	7	.27
Pneumonia	16 (14.6%)	10	6	.80
Birth Asphyxia	13 (11.9%)	10	3	.17
Pneumothorax	2 (1.83%)	2		
Septicemia	18(16.5%)	14	4	.08
Congenital Heart disease	7 (6.4%)	6	1	.14
Total	109 (100%)	65 (59.6%)	44 (30.9%)	

*TTN- Transient tachypnea of newborn, HMD- Hyaline membrane disease, MAS- Meconium aspiration syndrome

Table 2. Neonatal and maternal characteristics of commonest causes of neonatal respiratory distress.

Neonatal /Maternal Characteristics	TTN		HMD	Birth Asphyxia	MAS	Septicemia	Pneumonia
Gestational age(wks range)	34-42	25 -32	32-36	30-42	37-42	28-42	28-42
Number in each group (%)	17(15.5%)	11(10.09)	2(1.83%)	13(11.9%)	23(21.1%)	18 (16.5%)	16 (14.6%)
Weight (gm)Range	2040-4400	700-1750	1800-2100	2150-4400	2500-4550	1250-4400	1800-4500
Mean±SD	3570±325	1240±140	1940±75	3750±280	2995±230	3650±470	3400±310
Mode of delivery:							
CS	14	08	01	03	07	04	06
VD	03	03	01	10	16	14	10
Maternal risk factors							
PROM†	04	02	01	02		10	09
Hypertension	02	03	01	01	02		
Diabetes mellitus		01					
Stained Liquor				06	17	01	
Foul smell liquor						03	04
Maternal fever		02				02	01

*CS-caesarean section, VD- vaginal delivery, †Premature rupture of membranes

DISCUSSION

The causes of respiratory distress in neonates despite of its prevalence, morbidity and mortality have not been studied in context of Nepal. Very few studies have identified the incidence of respiratory distress in our setting and the common causes of respiratory distress have not been reported. The incidence of respiratory distress was found to be 4.6% in our study. Previous studies from Nepal have reported incidence from 3.9% to 8.0%.[6] However, these studies have just been limited to an overview of the NICU admissions and the causes of the respiratory distress has not been discussed. In our study, we found the common causes of respiratory distress in neonates were MAS in 21.1% followed by septicemia in 16.5% out of which 33.3% were culture proven sepsis, TTN in 15.5%, pneumonia in 14.6%, birth asphyxia in 11.9%, hyaline membrane disease in 11.9%, and congenital heart disease in 6.4%. However, Nagendra et al. showed that the commonest cause for respiratory distress in neonates was respiratory distress syndrome in 18.8% neonates followed by TTN in 14.0% and MAS in 12.5% of neonates.[8] The difference might be due to more number of term babies in our study.

We found MAS in 21.1% neonates which was the most common cause for respiratory distress but the incidence of MAS in developed countries is on the decline possibly due to improved obstetric care and adequate training for health care personnel on neonatal resuscitation. Hence, this suggests we have to improve our obstetric care (antenatal and natal) with emphasis in training health care personnel to prevent MAS.[9]

Sepsis was the second most common cause of respiratory distress found in 16.5% with similar incidence as reported by other studies. Haque et al. found an incidence of 16.1% and Kumar et al. found an incidence of 17.0%.[10,11] The incidence of pneumonia with radiological evidence was 14.6% in our unit. Similarly, Dutta et al. reported pneumonia to be the second most common cause of respiratory distress with an incidence of 24.3%.[12] But, Mathuret al. found pneumonia was the most common cause of respiratory distress in newborns with a very high incidence of 68.7%.[13] We found that in septicemia and pneumonia, predisposing factors like PROM were detected in 55.5% and 56.2%, foul smelling liquor in 16.6% and 25.0%, and maternal fever in 11.1% and 6.2%. Hence, presence of maternal risk factors like PROM, fever and foul smelling liquor are likely to predispose to neonatal septicemia and pneumonia. Early recognition and prophylactic antibiotics to the mother might be beneficial in its prevention.

HMD constituted 11.9% of the total respiratory distress cases in our study. However, very high incidence of 31.5% was found in the study by Santosh et al.[14] We observed that 84.6% respiratory distress syndrome among preterm babies were below 34 weeks period of gestation. Zaazou et al. found that 75.0% of respiratory distress occurred in

those with gestational age ranging from 26-32 weeks and 25.0% in those with gestational age ranging from 32-36 weeks.[15] Therefore, preterm delivery should be avoided as much as feasible by providing good obstetric care, using tocolytic agent and antenatal steroids for fetal lung maturity.

A study done by Prakash showed that the causes of respiratory distress in the neonates were HMD in 23.0% and birth asphyxia in 10.7%.[16] Whereas, our data shows 11.9% neonates with respiratory distress had birth asphyxia. The incidence of birth asphyxia is similar to our study. Respiratory distress due to congenital heart disease was similar to other studies. Adebami et al. found respiratory distress due to congenital heart disease in 6.1% of the study participants.[17] In our study, congenital heart disease was the cause for respiratory distress in 6.4% of neonates.

The importance of respiratory distress in neonates can be realized from the fact that the neonates with respiratory distress are 2-4 times more likely to die than those without respiratory distress.[18] Present study observed that male sex is a risk factor for respiratory distress (RD) with an incidence of 61.4%. Similarly, Miller et al. showed that the incidence of severe respiratory distress was almost three times higher among males than females.[19] We found that 59.6% vaginally delivered babies had respiratory distress more when compared to 39.4% LSCS babies which is similar to the study done by Sabzehei et al.[20] In this study, 82.3% babies with TTN were delivered by caesarean section and the risk of TTN was found to be more in babies born via caesarean section (p=.001). Tudehop et al. also showed that TTN was more common in babies born by caesarean section.[21] TTN (p=.001) and HMD (p=.02) were found to be more common with caesarean section. HMD were common in caesarean possibly because of early termination of pregnancy via caesarean section (elective/emergency) lowering the period of gestation of the newborn. No significant differences were seen between these two modes of deliveries in MAS (p=.27), birth asphyxia(p=.17), sepsis (p=.08), and pneumonia (p=.80).

We acknowledge some limitations of our study. Our results may have been different because of our small sample size and less number of preterm deliveries as compared to the other studies. Only patients admitted to NICU were included in the study however a significant number of patients whose respiratory distress settled within an hour of observation have not been included. This is a hospital based study done in a limited time frame so large population based studies will be needed to corroborate our findings. Nevertheless, this study gives a good overview of common causes of respiratory distress in a tertiary care NICU in Kathmandu valley and will be a strong basis for larger epidemiological studies.

CONCLUSIONS

Respiratory distress comprised of 4.6% of all total live deliveries. MAS was the most common cause of respiratory distress observed in our study. Septicemia, TTN, and pneumonia were the other significant causes of admissions in NICU with respiratory distress in our setup. Good obstetric care, proper training of health care personnel in neonatal resuscitation and early recognition of potential risk factors for respiratory distress will be helpful in decreasing its morbidity and mortality.

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