Causes and outcome of infants admitted with respiratory distress in a tertiary care neonatal unit: A five year review

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ABSTRACT

Background: Respiratory distress is a common cause for admission of infants to a neonatal unit. The aim of this study was to analyze the causes of respiratory distress leading to admission in a neonatal unit.

Method: This is a 5 year retrospective review of neonates admitted initially with diagnosis of respiratory distress in the neonatal unit of a tertiary care hospital from November 2017 to October 2022. Cases were identified and analyzed using electronic database maintained in the neonatal unit and were cross checked with electronic discharge summaries where necessary.

Results: Respiratory distress was found to be the most common cause for admission to the neonatal unit almost comprising of 46% of total admissions. The commonest cause for respiratory distress on admission was found to be transient tachypnoea of newborn (TTN) in term infants and surfactant deficiency respiratory distress syndrome (RDS) in preterm infants. As compared to babies with TTN, who were all discharged home, 18.4% of those with RDS did not survive. The overall mortality of infants presenting initially as respiratory distress was 9.1%. Other common causes for respiratory distress on admission were sepsis, birth asphyxia, shock, congenital heart disease, seizure and polycythemia.

Conclusion: Respiratory distress is a common cause for admission to a neonatal unit in both term and preterm infants. Although TTN in term and RDS in preterm are common causes for respiratory distress in newborns, the underlying cause for respiratory distress is diverse and not just limited to the lungs and heart.

Keywords: Respiratory distress, Newborn, preterm

INTRODUCTION:

Respiratory distress is a common presenting problem in infants encountered within first 72 hours of life with prevalence of 4.24% in neonates[1]. 15% of term infants and 29% of late preterm infants admitted to a neonatal intensive care unit develop significant respiratory morbidity, with incidence even higher for babies born before 34 weeks of gestation[2]. A study done in India showed incidence of respiratory distress for preterm babies was 30%, followed by 20.9% in post-term infants and 4.2% in term babies[3]. Respiratory distress in neonates can present as grunting, nasal flaring, cyanosis, tachypnea, apnea or chest retractions. A variety of disorders including respiratory and non-respiratory (cardiac, neurological , infectious, metabolic disorders and congenital anomalies) causes such as transient tachypnea of newborn (TTN), surfactant deficiency respiratory distress syndrome (RDS), birth asphyxia, pneumonia, meconium aspiration syndrome and other miscellaneous causes can lead to respiratory distress in newborns[4].

Regardless of the cause, if not recognized and managed promptly, respiratory disease can lead to respiratory failure. So, it is imperative that any health care provider caring for newborns can readily recognize the signs and symptoms of respiratory distress, differentiate various causes and initiate management strategies specific to the cause in order to prevent complications.

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There are limited studies done in Nepal to establish the cause for respiratory distress in newborns. This study would help the clinicians working in our country in similar settings for better understanding of the various etiologies that might initially present as respiratory distress in infants.

METHOD:

This is a 5 year retrospective view of neonates admitted with respiratory distress in the neonatal unit of a tertiary care hospital between November 2017 and October 2022. The patients were identified from an electronic database maintained in the neonatal unit. Patients who were admitted with respiratory distress as a primary cause for admission were selected. This included patients who were admitted due to tachypnoea, defined as respiratory rate of more than 60 breathes per minute, grunting, nasal flaring, chest retractions, cyanosis or hypoxia. The cause of respiratory distress at the time of admission was also extracted from the electronic database and was cross checked with electronic discharge summaries, where necessary. Data were analyzed using Microsoft Excel.

RESULTS:

There were 1615 admissions in the neonatal unit of Nepal Mediciti Hospital between 1st November 2017 and 31st October 2022. Out of them, 96 patients were excluded, 82 were >28 days of age on admission and 14 had incomplete data set. A total of 702 patients out of remaining 1519 patients were admitted due to respiratory distress as the primary cause for admission. This comprised of 46.2% of total neonatal admissions. Among the 702 patients, 372(53%) were preterm and 330(47%) were term born (≥37 weeks of gestational age).

The single most important cause for respiratory distress at the time of admission and their outcome are tabulated in table 1.

Table 1

Cause of respiratory distress	Number (%)	Mortality
Transient Tachypnea of Newborn (TTN)	276(39.31%)	0 (0%)
Respiratory distress syndrome (RDS)	255(36.32%)	47(18.4%)
Sepsis (Including pneumonia and meningitis)	77(10.96%)	3(3.9%)
Birth asphyxia/ Perinatal depression	24(3.41%)	1(4.2%)
Meconium aspiration syndrome (MAS)	23(3.27%)	1(4.3%)
Pulmonary arterial hypertension (PAH)	10(1.42%)	2(20%)
Congenital heart disease	7(0.99%)	3(42.9%)
Shock	6(0.85%)	2(33.33%)
Severe nasal congestion	3(0.42%)	0(0%)
Seizure	3(0.42%)	0(0%)
Polycythemia	3(0.42%)	0(0%)
Congenital diaphragmatic hernia	2(0.28%)	2(100%)
Tracheoesophageal fistula (TEF)	2(0.28%)	0(0%)
Suspected gastroesophageal reflux disease(GERD)	2(0.28%)	0(0%)
Amniotic fluid aspiration	1(0.14%)	0(0%)
Congenital surfactant deficiency (ABCA 3 gene mutation)	1(0.14%)	1(100%)
Covid Pneumonia	1(0.14%)	0(0%)
Hydrops fetalis	1(0.14%)	1(100%)
Hyper flexed neck causing airway obstruction	1(0.14%)	0(0%)
Lung collapse	1(0.14%)	0(0%)
Multiple congenital anomalies	1(0.14%)	0(0%)
Pulmonary hypoplasia (excluding those with congenital diaphragmatic hernia)	1(0.14%)	1(100%)
Vocal cord palsy (Bilateral abductor palsy)	1(0.14%)	0(0%)
TOTAL	**702**	**64(9.1%)**

DISCUSSION:

There are very few studies done in our country to identify the incidence of respiratory distress in infants admitted to a neonatal unit and to look for their outcomes. In addition to this,

the various causes for respiratory distress in these babies have not been well studied either. This study would hopefully fulfil this gap to a certain extent. Respiratory distress comprised of almost half of all the causes (46%) for total neonatal admissions in our study. The commonest cause for respiratory distress on admission was found to be TTN. TTN comprised of almost 40% of total admissions due to respiratory distress. Studies done by Sonawane et al and Kommawar A et al, also found TTN as the most common cause for respiratory distress[5,6]. Our finding is also similar to the findings obtained in the study done by Tudehope et al which showed the incidence of TTN to be 41%[7]. RDS was found to be the second most common cause of admission due to respiratory distress in our study almost comprising of 36% of total admissions. A study done by Santosh S et al showed the incidence of RDS to be almost same as in our study with incidence of 31.5%[8]. This might be due to the fact that almost 53% of the cases that were included in our study were premature infants and it is well established fact that RDS is very common in these infants. As opposed to term born babies with TTN, all of whom were discharged from the neonatal unit after short observation, 18.4 % of preterm infants with RDS died during hospital stay. However, the cause of death was not necessarily RDS in all of these infants. There were other significant contributing factors like sepsis and intraventricular hemorrhage in these cases.

The third commonest cause for respiratory distress was found to be sepsis with incidence of almost 11% which was less as compared to other studies conducted by Haque et al and Kumar et al which showed the incidence of 16% and 17% respectively[9,10]. Early recognition and prophylactic antibiotics in the mothers might have contributed to the lower incidence in our study. Among the 77 neonates who were diagnosed to have sepsis on admission, 31 had radiological evidence of pneumonia, out of whom 2 did not survive. 6 out of 77 babies had evidence of meningitis based on evaluation of cerebrospinal fluid. The rest of the 40 babies either had blood culture positive sepsis or culture negative sepsis with hematological and /or biochemical markers suggestive of sepsis, along with clinical features.

The incidence of respiratory distress due to birth asphyxia or perinatal depression and meconium aspiration syndrome was very less in our study as compared to the previous study done by Prashant et al which showed the incidence of MAS to be 21% and birth asphyxia to be 12%[11]. This difference might be due to improvement in antenatal care over the years, and also the presence of in-house paediatricians round the clock in our setting. This might have helped in better outcome of perinatal asphyxia. If the babies had echocardiographic evidence of moderate to severe pulmonary arterial hypertension requiring treatment, they were attributed to have respiratory distress due to persistent pulmonary hypertension of newborn(PPHN). Its incidence has been reported as 1.9 per 1000 live births with mortality rate ranging between 4-33%[12]. Another study conducted in tertiary care unit of eastern India showed mortality rate of 29.06%[13]. Out of 10 babies that were diagnosed to have PPHN in our study, 2 did not survive. So, even in the absence of high frequency oscillatory ventilation and inhaled nitric oxide in resources limited setting like ours, our survival rate is somewhat comparable to those studies even though the total number of cases is very low. The presence of paediatric cardiologists in our setting has definitely helped in early diagnosis of PPHN and appropriate timely intervention in these infants.

Among the 7 infants that were diagnosed to have congenital heart disease, 3 did not survive. The first infant had total anomalous pulmonary venous connection, second had congenital cardiomyopathy with anomalous coronary artery and the third had congenitally corrected transposition of great arteries.

Among the six infants who were noted to have respiratory distress due to shock on admission, had varied reasons for shock including mid- gut volvulus with gut necrosis, ileal atresia with malrotation , vein of Galen malformation , late onset sepsis and two with intraventricular hemorrhage.

There were other etiologies like seizure (mostly hypocalcemic), polycythemia, suspected gastroesophageal reflux disorder (GERD) that also manifested as respiratory distress initially at the time of admission. The diagnosis of GERD is based on clinical signs and symptoms only. Interestingly, there were 3 cases that presented as respiratory distress who were eventually found to have no other significant etiologies rather than severe nasal congestion. These patients did not require any intervention other than management of nasal congestion.

Some congenital anomalies like congenital diaphragmatic hernia (CDH) and tracheoesophageal fistula (TEF) also presented initially as respiratory distress. Both cases of TEF survived however neither of the infants with CDH could be saved. The management of babies with CDH is very challenging. Mortality still exceeds 30% despite vast improvement in health care. Overall survival is highly variable varying from 70-80% in developed countries and 38-72% in low and middle income countries[14].

The infant with congenital surfactant deficiency was a full term baby who required repeated mechanical ventilation and improved every time with the administration of surfactant was eventually diagnosed to have ABCA 3 gene mutation. The majority of infants with ABCA 3 mutation who do not undergo lung transplantation do not survive beyond three to six months of life[15]. One infant was eventually found to have bilateral abductor vocal cord palsy, was transferred from another centre with initial diagnosis of congenital pneumonia requiring multiple endotracheal intubations and mechanical ventilation, leading to stridor. The cause for respiratory distress and stridor was thought to be initially due to vocal cord edema and then due to laryngomalacia. However, was later diagnosed to have bilateral vocal cord palsy.

CONCLUSION

This study has shown that respiratory distress is an important cause for admission in a neonatal unit comprising almost half of total admissions. TTN was found to be the commonest cause of respiratory distress in term born infants. Similarly, RDS was the commonest cause of respiratory distress in preterm neonates. However there are many causes for respiratory distress in neonates beyond lungs and heart as demonstrated in this study.

REFERENCES

1. Zaman LCDS, Goheer L, Riaz H. Prevalence and etiology of respiratory distress in newborns. PAFMJ. 2013;63(1):22–5.
2. Edwards MO, Kotecha SJ, Kotecha S. Respiratory distress of the term newborn infant. Paediatric respiratory reviews. 2013;14(1):29–37.
3. Hibbard JU, Wilkins I, Sun L, Gregory K, Haberman S, Hoffman M, et al. Respiratory morbidity in late preterm births. JAMA: the journal of the American Medical Association. 2010;304(4):419.
4. Barkiya SM, Venugopal N, Kumari V. Clinico-Etiological profile and outcome of neonatal respiratory distress. International Journal of Scientific Study. 2016;3(11):189–92.
5. Sonawane R, Patil A, Sonawane S. Clinical profile of respiratory distress in newborn. MVP Journal of Medical Sciences. 2018;151–5.
6. Lakhkar B, Kommawar A, Borkar R, Vagha J, Meshram R, Taksandae A. Study of respiratory distress in newborn. 2017;
7. Tudehope DI, SMYTH MH. Is "transient tachypnoea of the newborn" always a benign disease? Report of 6 babies requiring mechanical ventilation. Journal of Paediatrics and Child Health. 1979;15(3):160–5.
8. Santosh S, Kumar K, Adarsha E. A clinical study of respiratory distress in newborn and its outcome. Indian J Neonatal Med Res. 2013;1(1):2–4.
9. Haque A, Baki Ma, Begum T, Akhter S, Begum S, Nahar N. Etiology of respiratory distress in newborn experience in BIRDEM. BIRDEM Medical Journal. 2013;3(1):19–22.
10. Kumar A, Vishnu Bhat B. Epidemiology of respiratory distress of newborns. The Indian Journal of Pediatrics. 1996;63(1):93–8.
11. Rijal P, Shrestha M. Scenario of neonatal respiratory distress in tertiary hospital. Birth. 2018;14(10):6.
12. Walsh-Sukys MC, Tyson JE, Wright LL, Bauer CR, Korones SB, Stevenson DK, et al. Persistent pulmonary hypertension of the newborn in the era before nitric oxide: practice variation and outcomes. Pediatrics. 2000;105(1):14–20.
13. Sardar S, Pal S, Mishra R. A retrospective study on the profile of persistent pulmonary hypertension of newborn in a tertiary care unit of Eastern India. Journal of Clinical Neonatology. 2020;9(1):18.
14. Sahoo T, Sivanandan S, Thomas D, Verma A, Thukral A, Sankar MJ, et al. Predictors of Mortality among Neonates with Congenital Diaphragmatic Hernia: Experience from an Inborn Unselected Cohort in India. Indian Pediatrics. 2019;56(12):1037–40.
15. Hayes D, Lloyd EA, Fitch JA, Bush A. ABCA3 Transporter Deficiency. Am J Respir Crit Care Med. 2012 Oct 15;186(8):807–807.