Original Research Article

Clinical profile of respiratory distress in neonates admitted in NICU in a tertiary care hospital

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Abstract

Background: Respiratory distress in neonates is a common reason for admission to the Neonatal Intensive Care Unit; morbidity is significant if early diagnosis and treatment are not sought. Respiratory distress is diagnosed clinically by the presence of at least two of the following criteria namely, respiratory rate of >60/minute, retractions (Subcostal, Xiphoid And Suprasternal Recession), flaring of the alaenasi, expiratory grunt and cyanosis at room air on two consecutive examinations at least hour apart The incidence varies from 30% among preterms, 20% among post-terms to 4% in term babies. The goal of this research is to study the clinical profile of neonates with respiratory distress in a tertiary care hospital. **Methodology**: This prospective observational study was conducted during period of 18 months. Patients satisfying inclusion criteria were enrolled in the study. **Results:** Respiratory system involvement was the most common cause for respiratory distress in neonates(77.36%) followed by central nervous system involvement(17.36%). Respiratory distress syndrome was the most common cause of respiratory distress(27.36%)followed by transient tachypnea of newborn(19.47%).Congenital pneumonia was the third most common cause. Most of the neonates were weighing between 1500-2500gms(48.94%).Preterm babies were more in number. Inborn neonates(n=146) were more than outborn neonates(n=44).Majority of the preterm babies had moderate respiratory distress and majority of term neonates had mild respiratory distress.Oxygen Therapy by continuous positive airway pressure(CPAP) was needed in 41.06%, surfactant therapy needed by 7.89% and mechanical ventilation by 23.16%. Survival being 81.58% with early detection of respiratory distress and appropriate management. **Conclusion:** To ensure accurate diagnosis and appropriate treatment for all neonates presenting with respiratory distress, thorough clinical assessment and appropriate investigation is required.

Key words: Respiratory distress; Tachchypnea; Respiratory Distress Syndrome; Surfactant Therapy, Hyaline Membrane Disease

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INTRODUCTION

Preterm babies have a greater newborn mortality rate than those born at term, according to research and expert opinion.[1,2] In Western countries, the prevalence of newborn respiratory distress [RD] ranges from 2.2 % to 7.6 %, but in India, it ranges from 0.7 % to 8.3 %. Respiratory distress in newborns can be caused by a variety of medical or surgical conditions.[3] Transient tachypnea, infections [pneumonia, sepsis, or meningitis], meconium aspiration, and hyaline membrane disease (HMD) are all causes of neonatal RD. Diaphragmatic hernia, tracheo-oesophageal fistula, and choanal atresia are surgical reasons. Respiratory distress is associated with a variety of predisposing factors such as gestational age, body weight, maternal risk factors.[4] Prematurity, malpresentation, irregular delivery, premature rupture of membranes, foetal distress, multiple pregnancy, male sex, and a low apgar

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score at birth are all significant predictors of neonatal respiratory distress. Respiratory discomfort, regardless of the reason, can swiftly progress to respiratory failure and cardiopulmonary arrest if not diagnosed and treated. As a result, any health care provider caring for newborn infants must be able to recognise the signs and symptoms of respiratory distress, differentiate between the numerous causes, and implement management methods to avoid serious complications or death.[5] In India, the case fatality rate for respiratory distress is 30%. Newborns with Hyaline Membrane Disease had the greatest case fatality rate (20-40 % in developed countries and 50-75 % in India). Meconium aspiration-related RD fatalities range from 14.3 % to 30.37 %. Some of the most prevalent underlying reasons have been thoroughly researched, and when implemented, can help to minimise disease burden.[6] Improved prenatal care, early detection and referral of high-risk pregnancies, closer connectivity between referral hospitals and health centres, close monitoring of labour to detect foetal distress, and early intervention where warranted can all help to minimise respiratory distress incidence and infant mortality. In the event of respiratory distress, sufficient and prompt resuscitation, oxygen supplementation, temperature maintenance, and time referral if the respiratory distress lasts more than two hours will all help to prevent death. Appropriate ventilatory assistance and surfactant therapy will reduce mortality in cases of hyaline membrane disease and meconium aspiration.[7] Short- and long-term problems, such as chronic lung disease, respiratory failure, and even death, can result from failing to diagnose and treat the underlying cause of respiratory distress in newborns.[8] Ventillatory therapy with various modes such as CPAP, conventional mechanical ventilation, surfactant replacement therapy and extracorporeal membrane oxygenation have all improved the outcome among babies with respiratory distress. Despite recent advances in clinching diagnosis and care, clinical trials on newborn respiratory distress have been scarce in our nation. As a result, it's critical to understand the etiological variables and outcomes of neonates with respiratory distress. Several research have looked into the epidemiology of RD in developed countries. However, only a few Indian experts have looked into the full range of respiratory disorders.[9,10] Physiological changes occur in all body systems at the time of birth.[11] Adaptation of the lungs is important for survival.[12] The lungs are filled with fluid released by the respiratory epithelium for lung development.[13] Fetal lung fluid is absorbed eventually.[14,15] Appropriate alveolar development occurs until 32 weeks of gestation and surfactant production is complete by 34 weeks of gestation.[16]

METHODOLOGY

Study design: This prospective observational study was conducted during period of 18 months. Patients satisfying inclusion criteria were enrolled in the study.

Place of study: Tertiary care government teaching hospital

Study population: All neonates with respiratory distress during study period

Inclusion criteria: Both in born and out born neonate admitted in NICU with respiratory distress

Exclusion criteria: Babies less than 28 weeks of age, Babies more than 28 days, Multiple congenital malformation

DATA COLLECTION

Parents/ grandparents/ relatives of neonates were informed and counselled about the study and enrolled after taking informed consent. Data was collected using pre designed proformas fulfilling objectives of study. The cases were disgnosed clinically by presence of at least 2 of the following criteria, RR 60/min or more, subcostal indrawing, flaring of Alaenasi, expiratory grunt and cyanosis at room temperature. To assess respiratory distress Silverman Anderson score and Downes score was used. The neonates were examined in detail with emphasis on gestational age, sex, weight, respiratory, cardiovascular and nervous system will be examined in detail. They were kept under constant supervision till discharge or death and treatment for specific indication was given. Mothers significant antenatal history was taken by retrospective study. Careful scrutiny of history, clinical and radiological findings was done to diagnose clinical conditions producing respiratory distress. Using pulse oximetry continuous monitoring of oxygen saturation was done. In unstable babies and with changes in ventilator settings ABG analysis was done. When clinically indicated sepsis workup was done, When septicaemia or pneumonia was suspected endotracheal tube and blood culture sensitivity was ordered. By nasal prongs or hood oxygen was supplied. Those requiring ventilatory support ventilator was started. With underlying disease and ABG analysis the settings of the ventilator were varied and aim was to use minimal possible fractional inspired oxygen (FiO2) and maintain normal blood gases. All babies were monitored for complications like air leak, congestive cardiac failure and sepsis. During and after ventilation chest physiotherapy was given. When clinical and radiological improvements were seen and normal blood gases were obtained, babies were weaned off the ventilator. Prior to expected extubation dexamethasone (0.2 to 0.4 mg/kg) was given 24 hours before. Baby succumbing to treatment or hemodynamically stable baby accepting feeds shifted out of NICU was endpoint of study.

RESULTS

In the present study, total 190 neonates with respiratory distress have been studied.

Distribution according to gender of neonates

In admissions males outnumber females. Males were 104(54.73%) and females 86(45.26%)

Table 1: Distribution according to gender of neonates according to weight

Sex	N	%
Males	104	54.73%
Female	86	45.27%

Distribution according to weight

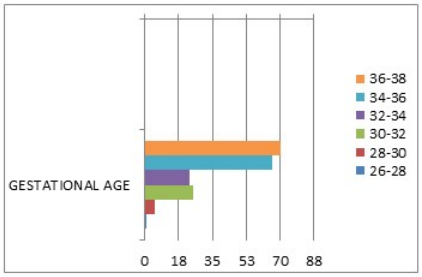
Most of the neonates were weighing between 1500-2500 gms.(N=119, 62.63%).Mean birth weight being 1.97kg, median – 1.9, minimum – 0.6, maximum – 3.3

Table 2: Distribution according to weight

Weight	N	%
<1000 gms	7	3.70%
1000 – 1500 gms	38	20%
1500- 2500 gms	93	48.94%
2500-3500 gms	52	27.36%

Distribution according to gestational age

Preterm neonates(n=120,63.15%) outnumber term neonates(n=70,36.84%), maximum being between 34-36 wks (34.74%) p value 0.0006, being statistically significant.



Graph 1: Distribution according to gestational age

Distribution according to cause of respiratory distress

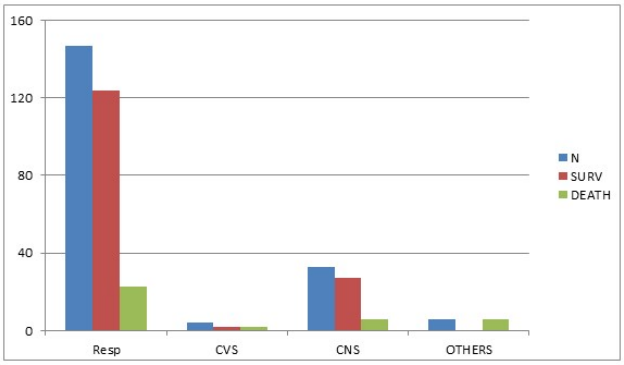
77.36%(n=147) of respiratory distress in neonates was respiratory in origin. Respiratory distress syndrome is the most common cause, followed by transient tachypnea of newborn followed by congenital pneumonia.

Cause of respiratory distress	N	%	Survival	%	Death	%
Respiratory	147	77.36%	124	85.35%	23	15.65%
Cardiac	4	2.10%	2	50%	2	50%
Central nervous system	33	17.36%	27	81.81%	6	18.19%
Surgical	6	3.15%	0	0%	6	100%

Table 3: Etiology Of Respiratory Distress in Neonates

Cause of respiratory distress	N	%	Survival	%	Death	%
Respiratory distress syndrome	52	27.36%	39	75%	13	25%
Transient tachypnea of newborn	37	19.47%	37	100%	0	0%
Congenital Pneumonia	35	18.42%	31	88.57%	4	11.43%
Birth asphyxia	33	17.36%	27	81.81%	6	18.19%
Meconium Aspiration Syndrome	14	7.36%	12	85.71%	2	14.29%
Congenital Heart Disease	4	2.10%	2	50%	2	50%
Tracheo-oesophageal fistula	4	2.10%	0	0%	4	100%
Diaphragmatic Hernia	2	1.05%	0	0%	2	100%
Others (pulmonary hemorrhage,	9	4.73%	5	55.55%	4	44.45%

	PPHN, laryngomalacia



Graph 2: Distribution according to system involved in neonatal respiratory distress

DISTRIBUTION ACCORDING TO SEVERITY OF RESPIRATORY DISTRESS IN PRETERMS

Majority of preterms had moderate respiratory distress(n= 56, 29.47%)

Table 4: Grading Of Respiratory Distress in preterm neonates

Grading of respiratory distress	Silvermann Anderson Score	N	%
Mild	≤3	16	8.42%
Moderate	4-6	56	29.47%
Severe	≥7	33	17.36%

DISTRIBUTION ACCORDING TO SEVERITY OF RESPIRATORY DISTRESS IN TERMS

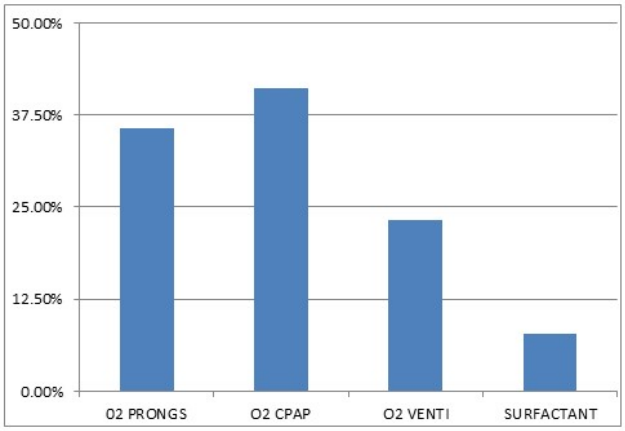
Majority of terms had mild respiratory distress(n=51, 26.84%)

Table 5: Grading of Respiratory Distress in term neonates

Grading of respiratory distress	Downe Score	N	%
Mild	≤3	51	26.84%
Moderate	4-6	23	12.10%
Severe	≥7	11	5.78%

DISTRIBUTION ACCORDING TO TREATMENT INTERVENTION

Majority of the neonates required O2 by continuous positive airway pressure(CPAP)



Graph 3: Modality Of Oxygen Requirement in neonates with respiratory distress

DISTRIBUTION ACCORDING TO X-RAY FINDING

Most significant X-ray finding was of hyaline membrane disease(n=52, 27.36%), followed by infiltration and consolidation(n=31,16.31%). Normal X-ray was found in 61 neonates with respiratory distress(32.10%)

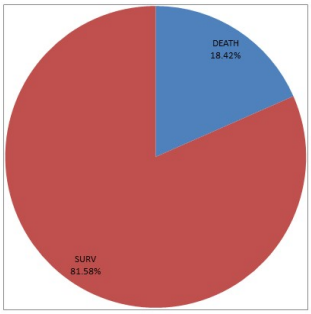
Table 6: Chest X-ray findings in neonatal respiratory distress

X-ray finding	N	%
Hyaline Membrane Disease	52	27.36%

Cardiomegaly	6	3.15%
Infiltration/consolidation	33	16.31%
Increased Perihilar Interstitial Markings	10	4.21%
Hyperinflation	8	3.15%
Decreased pulmonary vascularity	2	1.05%
Pneumothorax	2	1.05%
Coiling of tube	4	2.10%
Hypo plastic Bowel Loops	2	1.05%
Normal	71	32.10%

MORTALITY

Mortality was 18.42%(n=35)



Graph 4: Mortality in neonates with respiratory distress

DISCUSSION

77.36%(n=147) of respiratory distress in neonates was respiratory in origin. Respiratory distress syndrome is the most common cause, followed by transient tachypnea of newborn followed by congenital pneumonia. Present study had similar findings with studies like Guyon G *et al.*,[5] Rubaltella FF,[6] C Dani,[17] but studies by Nagendra K *et al.*,[18] T.S. Raghu Raman *et al.*,[19] Kumar *et al.*,[20] showed contrary findings. Leading cause of neonatal respiratory distress is transient tachypnea of newborn (42.7%) followed by infections (pneumonia, sepsis, meningitis) found in (17%),meconium aspiration syndrome(10.7%), hyaline membrane disease(9.3%),birth asphyxia (3.3%) as shown by Kumar A.[20] 41% of respiratory distress was due to transient tachypnea of newborn according to a study by Tudehope and Smith.[21] In a study by Rubaltelli. FF 208 died (14.6%). Incidence of respiratory distress syndrome 1.16%, case fatality rate 24%, incidence of transient tachypnea of newborn 0.93%, case fatality rate of 1.3%. Incidence of Meconium aspiration syndrome 0.06%, case fatality rate of 10.3%, incidence of persistent pulmonary hypertension 0.02%, case fatality rate 38.5%, incidence of pneumonia 0.07%, case fatality rate 21.7%.[6] Most common cause of respiratory distress was respiratory distress syndrome in both inborn and outborn neonates in a study by Rakholia *et al.*[22] In inborn neonates second most common cause was birth asphyxia (17%) and in outborn neonates sepsis. According to Malhotra A K hyaline membrane disease accounted for 88% mortality, birth asphyxia accounted for 66% mortality, sepsis and pneumonia for 50% mortality and all cases of transient tachypnea of newborn and meconium aspiration syndrome survived. Most number of deaths were below 2.5kgs. Respiratory distress accounted for 13.7% of all NICU admissions.[23] According to Hermansen CL *et al.* Transient Tachypnea of newborn is the most common cause of respiratory distress in neonates, constituting more than 40% of cases.[24] According to Sauparna C *et al.* sepsis(pneumonia) was the most common cause of respiratory distress in neonates(38.9%),followed by respiratory distress syndrome(23%),meconium aspiration syndrome(20.5%), transient tachypnea of newborn(10%), congenital heart disease(6%), congenital diaphragmatic hernia(1%) and pulmonary haemorrhage(1%).[25] According to Bajad M *et al.* and Adebami OJ *et al.* survival in term neonates and preterm neonates are 93.4% and 84.6%.[26,27] 81 babies were diagnosed with respiratory distress out of 200 babies studied by Bhutta ZA. Supplemental oxygen was required by these babies while in NICU.[4] With the advent of surfactant therapy mortality rate of respiratory distress syndrome decreased by 50% according to a study by Steven *et al.*[28] Singh N and Prasad V *et al.*[29] had mortality rate of 18.69% which is lower as compared to Das N et a study in Pakistan.[30] Mortality rate was 22.86% in study done by Keerti Swarnkar.[31] In neonatal respiratory distress to identify the usefulness of X-ray Ian Donald shows that , out of 89 cases observed, good aeration was seen in 34 cases, signs compatible with hyaline membrane disease was present in 26, pneumothorax was present in 2 , diaphragmatic hernia in 1, abnormal aeration was present in 21 in which specific diagnosis was not obtained.[32] In neonates with respiratory

distress, early during course of the disease the first chest radiograph had the greatest impact was shown in a study by Sangita Kurl.[33] In a study by Zaazou MH *et al.* 65.4% had characteristic radiological finding of linear streaking at hilum.[34] According to Jain L and Eaton DC *et al.* chest radiography is the diagnostic of transient tachypnea of newborn, engorgement of lymphatic system with retained lung fluids causes prominent peri hilar streaking.[35] In the present study Preterm neonates(n=120,63.15%) outnumber term neonates(n=70,36.84%), maximum being between 34-36 wks. The incidence of respiratory distress in gestational age between 34 to 36 weeks was less as compared to gestational age of less than 32 weeks was shown in a study by Kwang sun Lee *et al.*[36] Gestational age is associated with respiratory distress in newborn was shown by C. Dani.[17] In the present study most of the neonates were weighing between 1500-2500 gms.(N=119, 62.63%). Mean birth weight being 1.97kg, median – 1.9, minimum – 0.6, maximum – 3.3. In a study by Bhutta ZA, respiratory distress was documented in 81/200(41 percent), in babies weighing <1000 grams was highest (70%).[37] In a study by Kwang Sunlee *et al.* increased respiratory distress was observed with decrease in birth weight.[36] In the present study males outnumber females. Males were 104(54.73%) and females 86(45.26%) Among males the incidence of severe respiratory distress syndrome was three times higher than females as shown in a study by Herbert C Miller.[38] Sex of the baby and respiratory distress have no significant association was shown by C.Dani[17]. In Male and female neonates there is no significant difference in incidence of Respiratory Distress Syndrome was shown by Negendra K.[18] In a study by P. Brahmaiah in 20% preterm babies Anderson Score of >7 was observed. Score of 4-6 was observed in 50% of deaths in preterms,50% had score of >7, in 12.7% Downes Score of more than 7 was observed. MAS(44.4%) and Pneumonia(22.2%) are associated with a score of >7. Death in term babies was associated with Downe score >7.[39]

CONCLUSION

Respiratory distress is more common when antenatal risk factors are present. Risk variables for severe respiratory distress were meconium stained fluid, small for gestational age, 1 minute APGAR score less than 7, newborn weight less than 2.5 kg, male sex. Clinical assessment is necessary by Anderson silverman in preterm and Downes score in term newborns for determining clinical prognosis. The immediate period following delivery is critical for a neonate's adaption to life outside the womb. The newborn is vulnerable to a range of respiratory disorders all presenting with signs of respiratory distress. To ensure accurate diagnosis and correct treatment for all neonates presenting with respiratory distress, thorough clinical assessment and appropriate investigation is required. To improve outcomes prompt recognition of more serious underlying conditions is required. A variety of causes involving respiratory, cardiac, central nervous system can affect a baby, all of which show signs of respiratory distress. A complete clinical examination and proper investigation are essential to guarantee accurate diagnosis and therapy for all infants presenting with respiratory distress. To enhance outcomes, it is necessary to recognise more significant underlying diseases as soon as possible.

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