

Frequency, causes and outcome of neonates with respiratory distress admitted to Neonatal Intensive Care Unit, National Institute of Child Health, Karachi

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Abstract

Objectives: To determine the frequency, aetiology and outcome of respiratory distress in neonates in intensive care unit.

Methods: The descriptive cross-sectional study was conducted at the Neonatal Intensive Care Unit, National Institute of Child Health, Karachi, from October 2009 to March 2010. It comprised neonates aged day 0 to 28 who were admitted to Neonatal Intensive Care Unit. The neonates were screened first for respiratory distress and presence of one or more signs and symptoms. History, examination and investigations were carried out to find out various aetiologies of respiratory distress. Outcome was measured in terms of discharge and death. Data was analysed using SPSS12.

Results: Of the 205 neonates in the study, 120(58.6%) were boys and 85(41.4%) were girls. The overall mean age was 70.58±110.02 hours and the mean gestational age was 36.32±2.72 weeks while the mean weight was 2.41±2.4kg. Respiratory rate ≥ 60 /min was found in all (100%) the neonates. In terms of signs and symptoms, 125(60.9%) had grunting, 205(100%) had subcostal retractions and nasal flaring, and 81(40%) had cyanosis. The aetiologies observed were birth asphyxia, sepsis, transient tachypnoea of the newborn, pneumonia, meconium aspiration syndrome and respiratory distress syndrome in 22(10.75%), 37(18.05%), 29(14.1%), 36(17.6%), 34(16.7%) and 47(23.0%) neonates respectively. The incidence of neonates with respiratory distress was 68(33.3%).

Conclusion: The frequency of respiratory distress among the neonates was high, while mortality was high in neonates with respiratory distress, especially in pre-term and low birthweight neonates. Early diagnosis and management is important for better outcome.

Keywords: Causes, Outcome, Neonates, Respiratory distress. (JPMA 65: 771; 2015)

Introduction

Respiratory distress is one of the most common problems presented within the first few days of life.^{1,2} Respiratory distress in the newborn may present as apnoea, cyanosis, grunting, inspiratory stridor, nasal flaring, poor feeding, tachypnoea (more than 60 breaths per minute) and intercostal, subcostal or supracostal recessions.³ It occurs in about 7% neonates. Decreased gestational age predisposes to respiratory distress. There are three times more chances to develop respiratory distress at 37 weeks of gestation than at 39-40 weeks.⁴ Other risk factors include increasing number of Caesarean section, meconium-stained amniotic fluid, gestational diabetes, maternal chorioamnionitis, or prenatal ultrasonographic findings, such as oligohydramnios or structural lung abnormalities.⁵ Fifteen percent of term infants and 29% of late pre-term infants admitted to the neonatal intensive care unit (NICU) develop significant respiratory morbidity; this is even higher for infants born before 34 weeks' gestation.⁶ In newborn infants, it may have either

pulmonary or extra-pulmonary causes.⁷ The principles of care are the same, irrespective of the cause of the respiratory distress. So, it is important to recognise and manage it quickly, otherwise it may lead to respiratory failure and cardiopulmonary arrest.

Respiratory distress being a symptom complex represents a heterogeneous group of illness with varying incidence, aetiology, clinical causes and outcome.⁸ A wide variety of pathologic lesions may be responsible for respiratory disturbances, including pneumonia (22.5%), hyaline membrane disease (HMD), respiratory distress syndrome (RDS) (20.8%), meconium aspiration syndrome (MAS) (16.7%), sepsis (12.5%), transient tachypnoea of newborn (TTN) (11.7%), birth asphyxia (BA) (7.5%), congenital heart disease (CHD) (4.3%) and others.⁹ While knowing the frequency of various aetiologies, investigations can be minimised by investigating first the most common cause of respiratory distress in our local settings, and hospital policies can be made according to most common aetiologies and their outcomes. To evaluate the causes of respiratory distress it is important to take detailed history, including prenatal, natal and postnatal history along with a thorough physical examination and laboratory and radiological investigations. A chest radiograph should be

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initially ordered in newborns presenting with respiratory distress. Other helpful laboratory studies include Serum glucose assessment, arterial blood gas (ABG) concentrations, complete blood count (CBC) with differential count, and blood culture.⁷ Common respiratory diseases of the newborn such as MAS, pneumonia, RDS, and congenital diaphragmatic hernia (CDH) may lead to respiratory failure and/or persistent pulmonary hypertension in newborns. Respiratory failure is a leading cause of neonatal mortality and is responsible for nearly 200 newborn deaths each year (1 in 1,100 live births), including preterm newborns, representing 15% of total national neonatal mortality.¹⁰ The lungs fully develop by the age of 2 to 5 years as alveolar septation and microvascular maturation keeps on going even after birth.¹¹ Therefore, developmental lung disease can also occur after birth like broncho pulmonary dysplasia (BPD), in which there is arrested alveolarisation in developing lungs exposed to mechanical ventilation, oxygen, and other inflammatory mediators before completion of normal development. BPD affects up to 32% of premature infants and 50% of very low birth-weight (VLBW) infants.¹² Failure to readily recognise symptoms and treat the underlying cause of respiratory distress in the newborn can lead to short and long-term complications, including chronic lung disease, respiratory failure and even death.

The aim of this study was to assess the causes of respiratory distress in neonates admitted to an intensive care unit at NICH and their hospital outcome. It is important to have an idea of the common causes of respiratory distress that we encounter in a particular unit. It will help in future planning for better management of such patients.

Patients and Methods

The descriptive Cross-sectional study was conducted at the NICU of the National Institute of Child Health (NICH), Karachi, from October 2009 to March 2010, and comprised neonates selected through consecutive sampling. All neonates from birth to 28 days of life belonging to either gender and admitted to the NICU with gestational age >28 wks and weight >1000gm were included. Neonates developing respiratory distress postoperatively, syndromic neonates and neonates with congenital anomalies were excluded.

All neonates referred in the NICU were seen and a written informed consent was taken from the parents concerned. Finally, neonates were screened for respiratory distress which was defined as presence of one or more of following clinical features: respiratory rate >60

breaths/minute, chest wall retraction, grunting, nasal flaring and cyanosis. Outcome was measured in terms of discharged i.e. fully recovered in terms of improvement in signs and symptoms, and the presence of all of the following: No sign of respiratory distress, oxygen (O₂) saturation >95% on room air, and taking mother feed more than 4 times per day. The other outcome was death.

History, examination and investigations were carried out to find out various aetiologies of respiratory distress. The neonates were labelled as RDS if they developed respiratory distress within six hours and chest X-ray showed one or more of the following; poor expansion with air bronchogram, reticulogranular pattern and ground glass opacity. Neonates developing respiratory distress immediately after birth and chest X-Ray showing one or more of following; hyperinflation, prominent perihilar marking and interlobar fissure oedema, were labelled as TTN. MAS was labelled when neonates had meconium staining of one or more of the following: Liquor, nails, umbilical cord and skin, with X-Ray chest showing emphysematous changes and bilateral patchy infiltrates with atelectasis.

Neonates having history of lethargy or poor feeding and complete blood count (CBC) showing total leukocyte count (TLC) either >30,000 or <5000 per μ l were labelled as Sepsis. Pneumonia was labelled to those neonates who developed respiratory distress at any age during neonatal period with chest X-ray showing bilateral patchy opacities. Neonates having history of delayed cry, low Apgar score <3 for 5 minutes and ABGs showing acidosis with PH <7.0 were labelled as having birth asphyxia.

Standard care with frequent monitoring and, if required, ventilatory support were given to all neonates. Patients were discharged when they had no sign of respiratory distress, O₂ saturation >95% on room air and taking mother feed more than 4 times per day.

The principal investigator examined selected cases of respiratory distress on a regular basis up to day 28, and outcome in terms of either Discharge or Death were noted. Data entries were made into a specially designed proforma.

Data was analysed through SPSS 12. Frequencies and percentages were calculated for all qualitative/categorical variables including gender, Apgarscore, outcomes (Discharge or Death) and aetiologies (Sepsis, RDS, Pneumonia, MAS, TTN, and Birth asphyxia). Mean values were computed for age, weight, age of onset of respiratory distress and gestational age. Stratification was done by age, gender and gestational age to see the

impact of these variables on outcome.

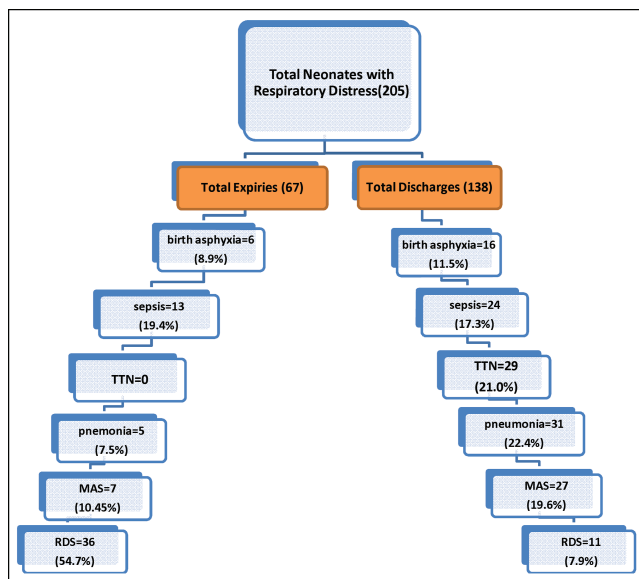
Results

Of the 615 patients screened, 205(33.3) met the inclusion criteria. Of the 205 neonates in the study, 120(58.6%) were boys and 85(41.4%) were girls. The mean age of the neonates was 70.58±110.02 hours, the mean gestational age was 36.32±2.72 weeks and the mean weight was 2.41±2.4kg. The mean age of onset was 50.42±101.30 hours. Age in hours for 176(85.8%) neonates was 3-131 hours, and the age of onset for 183(89.2%) was 1-120.79 hours. Besides, 63(30.7%) neonates had gestational age 37-38 weeks.

Respiratory rate ≥60/min was found in 205(100%) neonates, while 125(60.9%) had grunting, 205(100%) had subcostal retractions, nasal flaring was in 205(100%), while cyanosis was in 81(39.5%) (Table-1). Aetiologies observed were birth asphyxia, sepsis, TTN, pneumonia, MAS, RDS.

Table-1: Sign and Symptoms of Respiratory Distress (n=205).

Signs and Symptoms	Yes (n)	(%)
Respiratory rate ≥ 60 / min	205	100
Grunting	125	60.9
Subcostal retractions	205	100
Nasal flaring	205	100
Cyanosis	81	39.5



TTN: Transient tachypnoea of newborn
 MAS: Meconium aspiration syndrome
 RDS: Respiratory distress syndrome

Figure-1: Flow Diagram showing outcome with respect to frequencies and percentages.

Table-2: Respiratory Distress (n=205).

Causes of Respiratory distress	Yes (n)	(%)
Birth Asphyxia	22	10.75
Sepsis	37	18.05
TTN	29	14.1
Pneumonia	36	17.6
MAS	34	16.7
RDS	47	23.0

TTN: Transient tachypnoea of newborn.
 MAS: Meconium aspiration syndrome.
 RDS: Respiratory distress syndrome.

Table-3: Causes of respiratory distress according to age.

Diagnosis	Age = 0 - 24 hours	Age > 24 hours
Birth asphyxia	19 (9.2%)	3(1.5%)
Sepsis	02 (0.97%)	35(17.1%)
TTN	28 (13.7%)	01(0.48%)
Pneumonia	02 (0.97%)	34(16.5%)
MAS	33 (16.1%)	01(0.48%)
RDS	47 (23%)	00(0%)
Total	131(64%)	74(36%)

TTN: Transient tachypnoea of newborn.
 MAS: Meconium aspiration syndrome.
 RDS: Respiratory distress syndrome.

Table-4: Causes of respiratory distress according to weight.

Diagnosis	Weight <2.5 kg	Weight => 2.5 kg
Birth asphyxia	07 (3.4%)	15(7.3%)
Sepsis	19(9.2%)	18(8.7%)
TTN	11(5.3%)	18(8.7%)
Pneumonia	12(5.8%)	24(11.7%)
MAS	03(1.5%)	31(15%)
RDS	46(22.4%)	01(0.48%)
Total	98(48%)	107(52%)

TTN: Transient tachypnoea of newborn.
 MAS: Meconium aspiration syndrome.
 RDS: Respiratory distress syndrome.

MAS and RDS in 22(10.75%), 37(18.05%), 29(14.1%), 36(17.6%), 34(16.7%) and 47(23.0%) neonates respectively (Table-2). In neonates less than 24 hours of age the most common cause of respiratory distress was RDS 47(23%) followed by MAS33(16%). In neonates who were more than 24 hours old, the most common cause was sepsis 35(17%) followed by pneumonia 34(16%) (Table-3). In neonates having weight less than 2.5kg the most common cause was RDS 46(22%) followed by sepsis 19(9%), while neonates weighing 2.5 kg and above were most commonly admitted with diagnosis of MAS 31(15%) followed by pneumonia 24(11%) (Table-4).

When gender was compared with respiratory distress, the higher proportion of birth asphyxia, TTN, pneumonia and RDS was found in boys, while the girls had predominantly sepsis and MAS. In total, 138(67.3%) neonates were discharged, while 67(32.7%) expired (Figure-1). When the outcome was compared, 82(68.3%) male neonates were discharged and 38(31.7%) expired. Similarly, 56(65.8%) female neonates were discharged and 29(34.2%) female neonates expired. The most common cause of mortality was RDS. Majority of the neonates were discharged whose gestational age was 37-38 weeks and above 39 weeks.

Discussion

The spectrum of causes of respiratory distress in neonates includes several clinical conditions. In the present study, sepsis and pneumonia were the most common causes of respiratory distress in the neonates (18% each). The frequency of neonatal sepsis and pneumonia was almost equal compared to earlier reports (18.7% and 25%).^{1,2,8} The difference may have been due to the unhygienic settings and deliveries by untrained persons or transportation from hospitals with inadequate hygienic precautions. Earlier studies of neonates with respiratory distress^{1,2,8,13} comprised neonates which were delivered in hospital by trained personnel and were provided with continuous care since birth. The importance of respiratory distress in the neonates can be realised from the fact that the neonates with respiratory distress are 2-4 times more likely to die than those without respiratory distress.¹ Especially while 40% of the global child deaths occur in the neonatal period, Low and middle income countries need effective and simple methods to improve hospital-based neonatal care.¹⁴

The knowledge of the causes of respiratory distress is important to plan facilities. The overall mortality rate in the present study was 33% which is lower than that reported from other centres.^{1,3} TTN, MAS and RDS were found to be 14%, 17%, 23% respectively while studies in developing countries show 12%, 16% and 18%. The difference is more likely to be due to proper facilities in hospitals.^{9,13,15}

The signs and symptoms of respiratory rate ≥ 60 /min were found in 205(100%) neonates, 125(60.9%) had grunting, 205(100%) had subcostal retractions, nasal flaring was found in 205 (100%) while cyanosis was in 81(39.5%). Results of earlier studies show 45.8% neonates had grunting, 88% had subcostal retractions, nasal flaring was found in 90% and cyanosis in 98.2%.¹⁶⁻²¹

Patients in the current study were at significant risk for mortality, pulmonary morbidity, and adverse signs and symptoms, all of which occurred at rates similar to those

reported for neonates being referred for higher levels of care.^{22,23} Much of the mortality and morbidity was in neonates with low gestational age and low birth weight. One study on large population found that cyanosis and grunting were in 70% and 67% neonates respectively.²⁴

The presenting complaints in a study showed that 83.4% neonates with pneumonia had rapid breathing, 81% poor feeding and 79.1% difficult breathing.²⁵ In primary neonatal care, rapid breathing, poor feeding and difficult breathing are useful symptoms suggestive of respiratory distress. Earlier studies on neonatal pneumonia have included neonates with only radiological findings and have not considered blood culture positivity in the diagnosis of neonatal pneumonia. One such study²⁶ reported neonatal pneumonia in 37.9% neonates with respiratory distress. Another study also had 35% neonates with respiratory distress, while in the current study it was found to be in 17.6%.

The limitation of the study is that not all the causes of respiratory distress were addressed like cardiac patients were referred to paediatric cardiology unit of a tertiary care cardiac hospital. So we could not know the outcome as they were not included in the study. Likewise, neonates with surgical causes of respiratory distress were referred to the surgical unit so they were also not included in the study. Another limitation is that cultural practices were not taken into consideration.

Conclusion

The most common causes for respiratory distress were RDS, pneumonia, MAS, birth asphyxia, TTN and sepsis. Most common cause of mortality was RDS because of associated factors like preterm and low birth weight, followed by sepsis. Every newborn with TTN got discharged. Further studies may be done individually on other causes for better understanding of management and outcome.

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