DOI: 10.7860/IJNMR/2016/22669.2189

Original Article

Paediatrics Section

# Pattern of Respiratory Problems in Neonates in a Level III Neonatal Care Unit with Special Reference to Pneumonia

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## ABSTRACT

**Introduction:** Respiratory distress constitutes one of the commonest cause of morbidity and mortality in the neonatal period. It is more commonly encountered within the first 48-72 hours of life.

**Aim:** To find out the incidence, causes and outcome of respiratory distress in inborn newborn babies and also to determine the common organisms of pneumonia.

**Settings and Design:** A hospital based prospective study was carried out for a period of 7 months (October 2015 to April 2016) in the NICU (Neonatal Intensive Care Unit) of AMCH (Assam Medical College and Hospital) .

**Materials and Methods:** All inborn newborn babies admitted to NICU of AMCH who developed respiratory symptoms were included in the study. Maternal and baby details were filled up in a predesigned structured proforma.

**Statistical Analysis:** Data were entered in SPSS (Software package for statistical analysis), version 16 and the frequencies were analyzed.

**Results:** Of all the inborn deliveries during our study period, 5.3% developed respiratory distress. It constituted 22.4% of all NICU admission, 61.5% were males and 38.5% were females. TTNB was the most common cause (42.8%) of respiratory distress followed by pneumonia (29.6%), sepsis (8.9%), MAS (8.2%) and RDS (5.9%). TTNB was more in term babies (54.6%), RDS among preterm babies (94.4%) and MAS was found exclusively in the term babies.

Of the 90 Pneumonia cases, sepsis screen was positive in 87.8% cases and blood culture was positive in 14.4% cases. The most common organism was CONS (coagulase negative staphylococcus) which was found in four cases (4.4%), followed by acinetobacter in three cases (3.33%) and klebsiella in two cases (2.2%). In the pneumonia cases, predisposing factors like PROM was detected in 25.6%, maternal fever in 16.6% and foul smelling liquor in 11.1%. The overall case fatality rate is 23%. Mortality is highest (77.8%) in RDS.

**Conclusion:** Respiratory distress is a common cause of NICU admission, TTNB being the commonest cause, followed by pneumonia. The burden of neonatal pneumonia is high in our NICU.

**Keywords:** Blood culture, Newborn, Respiratory distress.

## INTRODUCTION

Respiratory distress constitutes one of the commonest causes of morbidity and mortality in the neonatal period. It is more commonly encountered within the first 48-72 hours of life. In developed countries the incidence of respiratory distress ranges from 2.2% to 7.6%, whereas in India it ranges from 0.7% to 8.3% [1]. Respiratory pathology is the commonest (32-54%) autopsy finding among early neonatal deaths [2-4]. The spectrum of respiratory distress in neonates includes transient tachypnoea of newborn (TTNB), pneumonia, Respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), sepsis, congenital heart disease(CHD), some surgical pathology of the lungs, oesophagus and diaphragm and other miscellaneous causes. Neonatal pneumonia accounts for a substantial proportion of these. Frequencies of 1 to 35% has been reported for neonatal pneumonia [5]. Worldwide, between 750000 and 1.2 million neonatal deaths are due to pneumonia. Of the global childhood mortality, upto 10% is accounted by neonatal pneumonia with the highest mortality being reported from developing countries [6,7]. According to National Neonatal and Perinatal database [8], Pneumonia constitutes 2.5% of neonatal deaths.Although many studies are there on respiratory distress in newborn, but very few studies have focused on neonatal pneumonia. Hence, the present study was designed to know the incidence of respiratory distress

among the inborn neonates along with the aetiology and outcome of babies with respiratory distress with a special reference to pneumonia.

## AIMS AND OBJECTIVES

### Primary

1. To find out the incidence of respiratory distress in inborn newborns.

2. To find out the causes of respiratory distress in newborn.

### Secondary

1. To determine the common causative organisms of pneumonia.

2. To find out the outcome of the respiratory distress in newborn.

## MATERIALS AND METHODS

A hospital based prospective study was carried out for a period of seven months (October 2015 to April 2016) in the Neonatal Unit, Department of Pediatrics, Assam Medical College and Hospital (AMCH), Dibrugarh, Assam, India.

### Inclusion Criteria

All inborn newborn babies admitted to NICU of AMCH who developed respiratory symptoms were included in the study.

### Exclusion Criteria

Babies with multiple congenital malformations were excluded from the study.

Permission from institutional ethics committee was sought. Proper consent from parents were taken before enrollment in the study. Maternal and baby details were filled up in a pre-designed structured proforma. Babies were nursed under Servo Control open care system.

Respiratory rate was counted for one minute when the baby was in a quiet state. Respiratory distress was diagnosed clinically by the presence of two of the following criteria, namely RR ≥60/min, chest indrawing (subcostal, intercostals and suprasternal), expiratory grunt and cyanosis at room air. They were then assessed by Downe's scoring system [9]. Vitals were recorded and respiratory, cardiovascular and nervous system were examined in detail. History of maternal fever >38°C, foul smelling liquor, meconium stained amniotic fluid, prolonged rupture of membrane (PROM)>24 hours were taken. Continuous monitoring of oxygen saturation, heart rate was done by pulse oxymeter or multichannel monitor. Blood glucose was monitored regularly using the dextrostix. Sepsis work up was done at 8 to 12 hours when clinically indicated. First line antibiotics (Ciprofloxacin and Amikacin - which are used in our NICU as based on culture sensitivity report of last 6 months) were started in the neonates if there were associated risk factors or non-resolution of symptoms within 24 hours. Blood cultures were taken before starting antibiotics. Oxygen was supplied from an oxygen concentrator. ABG analyses were done in unstable babies as indicated and with changes in ventilator settings. Non-invasive ventilation (CPAP-continuous positive airway pressure and NIMV-Nasal intermittent mandatory ventilation) was given based on Downe's Score. CPAP/NIMV was given for score >4 and mechanical ventilation (SIMV-synchronized Intermittent Mechanical Ventilation) for score > 6. The initial settings of the ventilator depended on the underlying disease and ABG analysis and clinical decision. The neonates were regularly monitored. The end point of the study was neonates with stable vitals, accepting feeds, fit to be shifted out of NICU or when baby died.

The diagnosis of cause of respiratory distress was based on guidelines recommended by the National Neonatology Forum [8].

Chest X-Ray was done in all babies. X-ray chest was interpreted as per suggested criteria [10].

Sepsis screen was considered positive if at least two of the following were positive

(i) Leucopenia (TLC <5000/cu mm).

(ii) ANC (Absolute Neutrophil Count)- read in Manroe's charts or Mouzinho's charts depending on whether it is term or preterm baby respectively [11,12].

(iii) Immature neutrophil to total neutrophil (I/T) ratio>0.2.

(iv) Micro ESR (in mm in first hour) > "3+ age in days" in the first week of life or >10 thereafter is considered positive.

(v) Positive CRP - in our laboratory >0.5mg/dl is considered positive.

Data were entered in SPSS (Software package for statistical analysis), version 16 and the frequencies were analyzed.

## RESULTS

During our study period of seven months 5743 were delivered, out of which 304 newborns (5.3%) developed features of respiratory distress. It constituted 22.4% of all NICU admission (1370) during this period. Among these, there were 187 (61.5%) males and 117 (38.5%) were females. Transient Tachypnoea of the Newborn (TTNB) was the most common cause (42.8%) of respiratory distress followed by pneumonia (29.6%), sepsis (8.9%), Meconium Aspiration Syndrome (MAS) (8.2%) and Respiratory Distress Syndrome (RAS) (5.9%). Of these, 14 cases (4.6%) had pneumonia with sepsis [Table/Fig-1]. TTNB was more in term babies (54.6%) as compared to preterm babies (45.4%) but it was not significant (p=0.9). RDS was seen mostly among preterm babies (94.4%), of which 61.6% occurred in babies below 34 weeks

| Causes | No of cases (n) | Percentage (%) |
|---|---|---|
| TTNB | 130 | 42.8 |
| Pneumonia | 90 | 29.6 |
| Sepsis | 27 | 8.9 |
| MAS | 25 | 8.2 |
| RDS | 18 | 5.9 |
| BA | 16 | 5.3 |
| CHD | 9 | 3 |
| Surgical | 3 | 0.98 |

**[Table/Fig-1]:** Etiology and incidence of Respiratory Distress
- 14 babies had Pneumonia associated with sepsis.
- Surgical causes: Congenital diaphragmatic hernia-2, Esophageal atresia with Tracheo-esophageal fistula-1

[Table/Fig-2,3]. MAS was found exclusively in the term babies.160 babies (52.6%) responded to only headbox oxygen, 58 babies (19.1%) required CPAP, 14 babies required NIMV (4.6%), and 72 babies (23.7%) babies had to be managed by mechanical ventilation (SIMV).

Of the 90 Pneumonia cases, sepsis screen was positive in 79 ( 87.8%) cases and blood culture was positive in 13 (14.4%) cases [Table/Fig-4].The most common organism was CoNS (Coagulase negative Staphylococcus) which was found in four cases (4.4%), three of them were preterm. This was followed by acinetobacter in three cases (3.33%) and Klebsiella in two cases (2.2%) [Table/Fig-5]. In the pneumonia cases, predisposing factors like PROM was detected in 25.6%, maternal fever in 16.6% and foul smelling liquor in 11.1%. The overall case fatality

| Cause | <37 wks | | >37wks | | Total |
|---|---|---|---|---|---|
| | n | % | n | % | |
| TTNB | 59 | 45.4 | 71 | 54.6 | 130 |
| Pneumonia | 43 | 47.8 | 47 | 52.2 | 90 |
| MAS | 0 | 0 | 25 | 100 | 25 |
| RDS | 17 | 94.4 | 1 | 5.6 | 18 |

**[Table/Fig-2]:** Gestational age wise distribution of cases.

| Cause | <34 wks | | 34-<37wks | | 37-42wks | | Total |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | |
| TTNB | 14 | 10.8 | 45 | 34.6 | 71 | 54.6 | 130 |
| Pneumonia | 12 | 13.3 | 32 | 35.6 | 46 | 51.1 | 90 |
| MAS | 0 | 0 | 0 | 0 | 25 | 100 | 25 |
| RDS | 11 | 61.1 | 6 | 33.3 | 1 | 5.6 | 18 |

**[Table/Fig-3]:** Gestational age wise distribution of cases.

| Blood Culture | n | (%) |
|---|---|---|
| Sterile | 76 | ( 84.4) |
| Positive | 13 | (14.4) |
| Contaminated | 1 | (1.11) |
| Total | 90 | |

**[Table/Fig-4]:** Blood culture in pneumonia.

| Organism | N (%) |
|---|---|
| CoNS | 4 (4.4) |
| *Acinetobacter* | 3 (3.33) |
| *Klebsiella* | 2 (2.2) |
| *Pseudomonas* | 2 (2.2) |
| *S. viridans* | 1 (1.11) |
| Gram negative Bacilli | 1 (1.11) |
| Total | 13 (14.45) |

**[Table/Fig-5]:** Spectrum of organisms in blood culture positive Pneumonia cases.

| Outcome | n | % |
|---|---|---|
| Survived | 233 | 76.6 |
| Died | 70 | 23.0 |
| DAMA | 1 | 0.3 |
| Total | 304 | 100 |

**[Table/Fig-6]:** Outcome od Respiratory Distress.

rate is 23% [Table/Fig-6]. Mortality is highest (77.8%) in RDS. The mortality in neonates due to pneumonia was

| Causes | Survived | Died | DAMA | Case fatality rate (%) | Total |
|---|---|---|---|---|---|
| TTNB | 129 | 0 | 1 | 0 | 130 |
| Pneumonia | 68 | 22 | 0 | 24.4 | 90 |
| Sepsis | 16 | 11 | 0 | 40.7 | 27 |
| MAS | 14 | 11 | 0 | 44 | 25 |
| RDS | 4 | 14 | 1 | 77.8 | 18 |
| BA | 7 | 9 | 0 | 56.3 | 16 |
| CHD | 3 | 6 | 0 | 66.7 | 9 |
| Surgical | 0 | 3 | 0 | 100 | 3 |

**[Table/Fig-7]:** Cause wise mortality.

found to be 24.4% [Table/Fig-7].

## DISCUSSION

In the present study, the overall incidence of respiratory distress was found to be 5.3%. A near about incidence of 6.7% was found by Kumar A et al., [1] 22.4% of all NICU admission had respiratory distress. Swarnkar K et al., [13] found that 16.37% of NICU admission had respiratory distress. Santosh S et al., found an incidence of 13.7% [14]. Haque A et al., [15] found a very high incidence of 34.1% among the admitted babies.

There was a male predominance (61.5%). Afroza et al.,[15] also found similar high incidence in males.

While evaluating the causes of respiratory distress, TTNB was the most common cause (42.8%). TTNB was also found to be common cause in many studies [1,13,15]. Kumar A and Bhat BV [16] found an incidence of 42.7% which is similar to our study. Swarnkar K et al., [13] found it to be 40.7%.

The second important cause of respiratory distress in this study was pneumonia, which was found to be 29.6%. Similarly, pneumonia was found to be the second cause of respiratory distress with an incidence of 24.35% by Dutta A et al., [17]. But Mathur NB et al., [18] in a study done in 2002, found Pneumonia to be the commonest cause of respiratory distress in newborns with a very high incidence of 68.7%.

We observed that out of the 90 cases of pneumonia, sepsis screen was positive in 79 cases (87.8%) and blood culture was positive in only 13 babies (14.4%).The most common organism was CoNS which was found in four babies (30.8%) three of which were preterm, followed by *Acinetobacter* in three babies (20.1%) and *Klebsiella* in two babies (15.4%). Mathur NB et al., [18] found sepsis screen to be positive in 56.3% and blood culture in 47.57% babies with pneumonia. Dutta et al., [17] found blood culture to be positive in 37.8% of babies. In both the studies the predominant organism was *Klebsiella*.

In the pneumonia cases, predisposing factors like PROM was detected in 25.6%, maternal fever in 16.6% and foul smelling liquor in 11.1%. Dutta A et al., [17] found PROM in 21.6% of pneumonia cases and chorioamnionitis in 5.4%. Mathur et al., [18] found a high incidence of PROM (33.98%). He found history of maternal fever in 20.3% and foul smelling liquor in 15.5% cases.

Sepsis as a cause of respiratory distress was found in 8.9% of cases. Haque A et al.,[15] found an incidence of 16.1% and Kumar A et al.,[16] found incidence of 17.0%.

We found MAS as the fourth important cause of respiratory distress with an incidence of 8.2%. The incidences were found to be 9.3%,10.7% and 13.5% by Swarnkar K et al., [13], Kumar A et al., [1] and Dutta A et al., [17] respectively. However, Mathur et al., [18], in their study found that MAS represented only 4% of the cases. All the cases of MAS were found in term babies only. Kumar A et al., [16] also found MAS among term and post term babies.

RDS constituted 5.9% of the total respiratory distress cases in our study. Incidence of RDS of 7.9% and 9.3% were found by Dutta A et al., [17] and Kumar A et al., [16] respectively. Very high incidences were found by Haque A et al., (30.2%) [15], Mohammed HZ et al., (31%) [19] and Santosh S et al., (31.5%) [14]. We found RDS mostly among preterm babies (94.4%), of which 61.6% were seen below 34 weeks. Mohammed HZ et al., [19] found that 75% of cases occurred in those with gestational age ranging from 26-32 weeks and 25% in those with gestational age ranging from 32-36 weeks. Dutta A et al., [17] found all the cases of respiratory distress below 34 weeks of gestation. Kumar A et al., [16] also found RDS mostly among preterms.

In our study surgical causes of respiratory distress were found to be congenital diaphragmatic hernia (in 2 babies) and oesophageal atresia with trachea-oesophageal fistula (in one baby). Dutta A et al., [17] also found similar surgical cause of respiratory distress with an equal incidence. Oesophageal atresia with or without trachea-oesophageal fistula have been observed as the commonest paediatric surgical condition leading to neonatal respiratory distress [20].

The overall case fatality rate is 23%. Mortality is highest (77.8%) in RDS. The mortality in neonates due to pneumonia was found to be 24.4%. Almost similar case fatality rate of 22.6% with maximum mortality of 62.5% was found by Swarnkar A et al., [13]. Kumar A et al., [1] found the overall case fatality rate to be 19%. But, Santosh S et al., [14] found a very low mortality rate of 7.6%.

## LIMITATIONS

We have seen that the mortality due to RDS was high. This may be due to the fact that there was no supply of surfactant in our hospital during that period. As most of the patients were from a low socio-economic background, most of them could not afford it. It could be given to only few. But now since it is available in our hospital, we hope to get a much lower mortality in the RDS babies.

## CONCLUSION

Respiratory distress constituted 22.4% of all NICU admission. The burden of neonatal pneumonia is high in our NICU, being the second important cause of respiratory distress. The mortality due to pneumonia was found to be 24.4%. Presence of maternal risk factors like PROM, fever and foul smelling liquor predispose to neonatal pneumonia and hence needs early intervention.

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**FINANCIAL OR OTHER COMPETING INTERESTS:**
None.

Date of Publishing: **Oct 01, 2016**