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**Research Article**

# Clinicoetiological profile and risk assessment of newborn with respiratory distress in a tertiary care centre in South India

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## ABSTRACT

**Background:** Respiratory distress is one of the common manifestation for which newborn seeks admission into NICU. As preterm care is increasing more use of surfactant, CPAP, mechanical ventilation has been seen in managing respiratory distress in newborn. This study has been undertaken to evaluate the various etiological factors, various maternal and neonatal risk factors associated with the development of severe respiratory distress, need for surfactant, CPAP and mechanical ventilation in newborns with respiratory distress and finally to assess the immediate clinical outcome of respiratory distress in newborns in our NICU.
**Methods:** The present study was conducted in the department of Pediatrics at Alluri Sitarama Raju academy of medical sciences hospital, Eluru, between August 2012 and August 2014 (over a period of 24 months). It is a prospective study.
**Results:** Out of 100 newborns admitted with respiratory distress, 90% were of respiratory origin. Most common cause was TTNB (32%) but severe distress was contributed maximum by HMD (44.82% of severe distress).
**Conclusions:** Transient tachypnoea of newborn is the most common cause among newborns with respiratory distress. Majority of newborns develop severe distress immediately after birth. Newborns with gestational age between 28-30 weeks are more prone to develop severe respiratory distress. Newborns weighing <1.5 kg are more prone for development of severe distress. Newborns with one minute APGAR score of <7 are more prone to develop severe distress.

**Keywords:** Respiratory distress syndrome, Hyaline membrane disease, Meconium aspiration syndrome, Transient tachypnoea of newborn

## INTRODUCTION

First breath is the most vital parameter in the beginning of a new life. Respiratory distress (RD) is among the most common symptom complexes seen in newborn infants. A variety of respiratory and non-respiratory disorders manifest clinically as respiratory distress.

This study was undertaken with the aim to know the most common etiological factors responsible for neonatal respiratory distress and effect of modern advancements like bubble CPAP and mechanical ventilation on the outcome of newborns with severe distress because the information available in our area till date is insufficient to prognosticate the outcome of severe respiratory distress.

### *Aims and objective*

The objectives of the study were as follows.

1) To study the various etiological factors responsible for development of respiratory distress.
2) To study the maternal and neonatal risk factors associated with the development of severe respiratory distress.
3) To study the need for CPAP and mechanical ventilation in newborn's with respiratory distress.
4) To study need for surfactant therapy in cases with respiratory distress
5) To assess the immediate clinical outcome of respiratory distress in newborn's.

## METHODS

The present study was conducted in the department of Pediatrics at Alluri Sitarama Raju academy of medical sciences hospital, Eluru, between August 2012 and August 2014 (over a period of 24 months). This study was approved by institutional ethics committee.

### *Inclusion criteria*

Newborns with respiratory distress who were admitted in NICU within 72 hours of life.

### *Exclusion criteria*

- Newborns with respiratory distress who were admitted in NICU after 72 hours of life.
- Newborns with associated significant congenital anomalies.

### *Method of study*

100 neonates with respiratory distress who were admitted in NICU were studied by clinical examination and relevant investigations. The severity of distress was assessed by Silverman-Anderson scoring for preterm neonates and Downe's scoring for term neonates. The association of variable risk factors both maternal and neonatal were studied for the development of severe respiratory distress. They were assessed for the development of distress against time of onset, etiology, requirement of surfactant, CPAP, mechanical ventilation and immediate outcome.

### *Method of collection of data*

Data was collected for all newborns included in the study with respiratory distress. General information, socioeconomic status, history and clinical examination findings of mother and newborn was documented. Newborns with respiratory distress were shifted to NICU for further management. Time of onset of distress was documented and the severity of the distress was documented, the severity was assessed by using Silverman & Anderson clinical scoring. Serial X-rays were done at 1 hour and 6 hours. Depending on the clinical diagnosis of respiratory distress, relevant investigations were sent and newborns were managed as per protocols. Interventions done in the form of CPAP / mechanical ventilation / surfactant therapy / treatment and mortality was documented to assess the clinical outcome against the final diagnosis.

Chi square test was used to analyze the data. SPSS 11.5 was used to analyze the data.

## RESULTS

It was seen that 90% of the distress cases are of respiratory in origin, while 6% are of cardiac in origin and 4% are others like congenital diaphragmatic hernia, sepsis, birth asphyxia etc. (Table 1).

**Table 1: Distribution based on etiology of distress.**

| Etiology | Frequency |
|---|---|
| Respiratory | 90 |
| Cardiac | 06 |
| Others | 04 |

52% of newborns of gestational age of 37 & >37 weeks developed respiratory distress when compared to 26%, 14%, 8% of newborns developed respiratory distress with age between 34-36, 31-33, 28-30 weeks respectively.

**Table 2: Age distribution.**

| Gestational age | Frequency (n=100) |
|---|---|
| 28-30 | 8 |
| 31-33 | 14 |
| 34-36 | 26 |
| >37 | 52 |

51% of male infants developed distress when compared to 49% of females (Table 3).

**Table 3: Sex distribution.**

| Sex of the newborn | Frequency (n=100) |
|---|---|
| Male | 51 |
| Female | 49 |

**Table 4: Distribution based on severity of distress.**

| Grading of respiratory distress | S-A score | Downe's score | Frequency (n=100) |
|---|---|---|---|
| Mild | <3 | <3 | 23 |
| Moderate | 3-7 | 3-7 | 50 |
| Severe | >7 | >7 | 27 |

Majority of the newborns had moderate respiratory distress (50%), while 27% of newborns had severe distress and 23% had mild respiratory distress (Table 4).

87.5% of newborns of gestational age 28-30 weeks developed severe distress and 12.5% developed moderate distress. 50% of newborns of gestational age of 31-33 weeks developed moderate distress and 42.8% developed developed severe distress and 7.1% developed mild distress. 53.2% of newborns of gestational age of 34-36 weeks developed moderate distress and 26.9% developed mild distress and 19.2% developed severe distress. 53.8% of newborns of gestational age of 37 & >37 weeks developed moderate distress 28.8% developed mild distress and 15.3% developed severe distress (Table 5).

**Table 5: Age vs. severity of the distress.**

| Gestational age | Mild | Moderate | Severe | Total cases |
|---|---|---|---|---|
| 28-30 weeks | 0 | 1 | 7 | 8 |
| 31-33 weeks | 1 | 7 | 6 | 14 |
| 34-36 weeks | 7 | 14 | 5 | 26 |
| 37 & >37 weeks | 15 | 28 | 9 | 52 |

49% of male infants developed moderate distress and 29.4% developed mild distress and 21.5% developed severe distress. 51% of female infants developed moderate distress and 32.6% developed severe distress and 16.3% developed mild distress (Table 6).

**Table 6: Sex versus severity of the distress.**

| Sex of the newborn | Total No. of cases | Mild | Moderate | Severity |
|---|---|---|---|---|
| Male | 51 | 15 | 25 | 11 |
| Female | 49 | 8 | 25 | 16 |

53.1% of newborns with TTNB developed mild distress and 37.5% developed moderate distress and 9.3% developed severe distress. 51.7% of newborns with HMD developed moderate distress and 44.8% developed severe distress and 3.4% developed mild distress. 55.5% of newborns with MAS developed moderate distress and 33.3% developed severe distress and 11.1% of newborns developed mild distress (Table 7).

**Table 7: Respiratory etiology versus severity of the distress.**

| Etiology | Total cases (n=90) | Mild | Moderate | Severe |
|---|---|---|---|---|
| TTNB | 32 | 17 | 12 | 3 |
| HMD | 29 | 1 | 15 | 13 |
| MAS | 18 | 2 | 10 | 6 |
| CONG Pneumonia | 11 | 1 | 8 | 2 |

72.2% of newborns with congenital pneumonia developed moderate distress 18.1% developed severe distress and 9% developed mild distress (Table 7).

31.81% of newborns (14 out of 44) born of normal vaginal delivery developed severe distress compare to 23.21% (13 out of 56) newborns born out of section lower segment caesarean section (Table 8).

**Table 8: Mode of delivery versus severity.**

| Mode of delivery | Frequency (n=100%) | Severe distress (n=27%) | Without severe distress |
|---|---|---|---|
| NVD | 44 | 14 (31.81%) | 30 (68.1) |
| LSCS | 56 | 13 (23.21%) | 43 (76.7%) |

$X^2$ - 0.925; p value - 0.336, not significant

87.5% of newborns (7 out of 8) of gestational age 28-30 weeks developed severe distress, when compared to 42.85% (6 out of 14), 19.23% (5 out of 26), 17.30% (9 out of 52%) newborns of gestational age 31-33 weeks, 34-36 weeks, 37 & >37 weeks respectively (Table 9).

**Table 9: Gestational age of child in weeks versus severity.**

| Gestation in weeks | Frequency (n=100) | Severe distress (n=27) | Without severe distress |
|---|---|---|---|
| 28-30 | 8 | 7 (87.5%) | 1 (12.5%) |
| 31-33 | 14 | 6 (42.85%) | 8 (57.1%) |
| 34-36 | 26 | 5 (19.23%) | 21 (80.7%) |
| 37 & >37 | 52 | 9 (17.30%) | 43 (82.6%) |

$X^2$ - 19.9; p value <0.001, highly significant

70% of newborns weighing below 1.5 kg developed severe distress when compared to 18.96% (11 out of 58) and 16% (4 out of 25) newborns developed severe distress weighing >2 kg and 1.5-1.99 kg respectively.

**Table 10: Birth weight of the newborn versus severity of distress.**

| Birth weight of newborn | Frequency (n=100) | Severe distress (n=27) | Without severe distress |
|---|---|---|---|
| >2 kg | 58 | 11 (18.96%) | 47 (81%) |
| 1.5-1.99 kg | 25 | 4 (16%) | 21 (84%) |
| <1.5 kg | 17 | 12 (70.58%) | 5 (29.4%) |

$X^2$ - 19.8; p value <0.001, highly significant

34.84% of newborns (23 out of 66) developed severe distress at birth when compared to 14.81% (4 out of 27) and 0% (0 out of 7) newborns developed severe distress at 0-6 hours and >6 hours respectively (Table 11).

**Table 11: Age of onset versus severity of distress.**

| Onset | Frequency (n=100%) | Severe distress (n=27%) | Without severe distress |
|---|---|---|---|
| At birth | 66 | 23 (34.84%) | 43 (65.1%) |
| 0-6 hours | 27 | 4 (14.81%) | 23 (85.1) |
| >6 hours | 7 | 0 | 7 (100%) |

$X^2$ - 6.69; p value - 0.035, significant

57.1% (8 out of 14) of newborns with APGAR score at one minute <7 developed severe distress compared to 54.1% (13 out of 24) and 9.6% (6 out of 62) of newborns with APGAR score at one minute of 7-8 and >9 respectively developed severe distress (Table 12).

**Table 12: APGAR score at 1 minute versus severity.**

| APGAR score at 1 minute | Frequency (n=100%) | Severe distress (n=27%) | Without severe distress |
|---|---|---|---|
| <7 | 14 | 8 (57.1%) | 6 (42.8%) |
| 7-8 | 24 | 13 (54.1%) | 11 (45.8%) |
| 9-10 | 62 | 6 (9.6%) | 56 (90.3%) |

$X^2$ - 24.9; p value<0.001, highly significant

**Table 13: Need for CPAP vs. mechanical ventilation in cases with respiratory distress.**

| Total cases with respiratory distress | Need for CPAP & its percentage | Need for mech. ventilation and its percentage |
|---|---|---|
| 90 | 65 (72.22%) | 49 (54.44%) |

72.22% of cases with respiratory distress needed use of CPAP for further management. And 54.44% of cases with respiratory distress needed use of mechanical ventilation for further management (Table 13).

35.5% of cases (32 out of 90) with respiratory distress needed use of surfactant for further management.

**Table 14: Need for surfactant in cases with respiratory distress.**

| Cases with respiratory distress | Need for use of Surfactant | Need for use of Surfactant |
|---|---|---|
| 90 | 32 | 32 |

44.8% of newborns diagnosed with hyaline membrane disease developed severe distress, where as 33.3% of newborns diagnosed with meconium aspiration syndrome developed severe distress, 18.18% of newborns with congenital pneumonia and 9.37% of newborns with TTNB developed severe distress. Whereas 33% of patients with cardiac conditions like (Acyanotic congenital cardiac disease, VSD, ASD, moderate PAH, Heart failure) developed severe distress and 25% of patients other condition like diaphragmatic hernia etc. developed severe distress (Table 15).

**Table 15: Final diagnosis versus severe distress.**

| Final diagnosis | Frequency (n=100) | Severe distress (n=27) | Percentage |
|---|---|---|---|
| Transient tachypnoea of newborn | 32 | 3 | 9.37% |
| Hyaline membrane disease | 29 | 13 | 44.82% |
| Meconium aspiration syndrome | 18 | 6 | 33.33% |
| Congenital pneumonia | 11 | 2 | 18.18% |
| Cardiac | 6 | 2 | 33.33% |
| Others | 4 | 1 | 25% |

**Table 16: Etiology versus treatment intervention.**

| Respiratory etIology | Frequency | Requirement of surfactant and its percentage | Requirement of CPAP and its percentage | Requirement of mechanical ventilation and its percentage |
|---|---|---|---|---|
| Hyaline membrane disesase | 29 | 24 (82.75%) | 27 (93.10) | 20 (68.96%) |
| Transient tachypnoea of newborn | 32 | 0 (0%) | 15 (46.87%) | 6 (18.75%) |
| Meconium aspiration syndrome | 18 | 8 (44.44%) | 14 (77.77%) | 9 (50%) |
| Congenital pneumonia | 11 | 0 (0%) | 7 (63.6%) | 7 (63.6%) |

82.75% of newborns with HMD required surfactant use and 93.10% and 68.96% of newborns with HMD required use of CPAP and mechanical ventilation respectively. None of newborns with TTNB required used of surfactant and 46.87% and 18.75% of newborns with TTNB rewuired use of CPAP and mechanical ventilation. 44.44% of newborns with MAS required use of surfactant and 77.77% and 50% of newborns with MAS required

use of CPAP and mechanical ventilation respectively. None of newborns with congenital pneumonia required use of surfactant while 63.6% of newborns required both CPAP and mechanical ventilation (Table 16).

88.8% (80) cases recovered out of 90 and death occurred in 11.1% (10) cases (Table 17).

75.86% of newborns with HMD recovered compared to death of 24.13% of newborns 100% of newborns with TTNB recovered completely. 88.88% of newborns with MAS recovered completely compared to death in 11.11% of newborns. 90.9% of newborns with congenital pneumonia recovered completely when compared to death in 9.09% of newborns (Table 18).

**Table 17: Immediate clinical outcome of respiratory distress.**

| Cases with respiratory etiology | Recovered | Death |
|---|---|---|
| 90 | 80 (88.8%) | 10 (11.1%) |

**Table 18: Etiology of distress versus clinical outcome.**

| Respiratory etiology | Frequency (n=90) | Cases recovered (n=80) | Death cases (n=10) | Percentage of recovery (R) and death (D) |
|---|---|---|---|---|
| Hyaline membrane disease | 29 | 22 | 7 | R = 75.86%, D = 24.13% |
| Transient tachypnoea of newborn | 32 | 32 | 0 | R =100%, D = 0% |
| Meconium aspiration syndrome | 18 | 16 | 2 | R = 88.88%, D = 11.11% |
| Congenital pneumonia | 11 | 10 | 1 | R = 90.9%, D = 9.09% |

## DISCUSSION

In the present study, out of 100 cases identified with distress 90% were respiratory in origin. Among whom 27% had severe respiratory distress, while 60% had moderate and 23% had mild respiratory distress, the common cause of respiratory distress is transient tachypnoea of newborn 35.5% followed by hyaline membrane disease 32.2% and meconium aspiration syndrome 20% and congenital pneumonia 12.2 %. There were 6 cases with cardiac etiology and 4 cases in other conditions which include pneumothorax, congenital diaphragmatic hernia, congenital lobar emphysema, Sepsis, Birth asphyxia etc.

Similar results were seen in a study done by Guyon G[1] where the commonest cause for respiratory distress was TTNB (72%). However in a study done by Alok Kumar.[2] HMD was found to be the commonest (42.7%) followed by TTNB (17%).

In the present study it was found that 34.84% of newborns developed severe distress at birth where as 14.81% developed severe distress with in first 6 hours of life. In contrast to a study done by Derek C[3] where 47.8% (34 neonates out of 71) with duration of respiratory distress of more than 24 hours developed severe distress.

In the present study 87.5% of newborns (7 out of 8) of gestational age 28-30 weeks developed severe distress, when compared to 42.85% (6 out of 14), 19.23% (5 out of 26), 17.30% (9 out of 52%) newborns of gestational age 31-33 weeks, 34-36 weeks, 37 & >37 weeks respectively.

In the present study 70% of newborns weighing below 1.5 kg developed severe distress when compared to 18.96% and 16% of newborns who developed severe distress weighing >2 kg and between 1.5-1.99 kg respectively. In the study done by M. Lureti[4] it was seen that the risk of neonatal respiratory distress markedly increased with decreasing birth weight compared to babies weighing more than 2500 g at birth. The fourth group of neonates with birth weight 1001-1500 grams had survival rate of 96% with only few cases of BPD and ROP. In the present study 32.65% of female children developed severe distress when compared to 21.56% among male children.

In contrast to this M. Lureti[4] shows that the frequency of neonatal respiratory distress is higher in males than females. Similarly Herbert C. Miller[5] shows that the incidence of severe respiratory distress was almost 3 times higher among males than females. However in the study done by Dani,[6] it was observed that there was no significant association between respiratory distress and sex of the baby. Similar observations were made by

Nagendra K[7] who also concluded that there was no significant difference in neonatal respiratory distress among male and female infants. Male sex was regarded as a significant risk factor for the development of respiratory distress by Ingemarsson[8] and Rawlings JS.[9]

In our study the possible risk factors which are responsible for the development of respiratory distress are evaluated and tabulated as follows:

**Table 19: The possible risk factors which are responsible for the development of respiratory distress.**

| Neonatal risk factors | Subdivisions | Severe distress present | Severe distress absent | p value |
|---|---|---|---|---|
| Gestational age | 28-30 weeks | 7 (87.5%) | 1 (12.5%) | <0.001 |
| | 31-33 weeks | 6 (42.8%) | 8 (57.1%) | |
| | 34-36 weeks | 5 (19.2%) | 21 (80.7%) | |
| | 37 & >37 weeks | 9 (17.3%) | 43 (82.6%) | |
| Sex | Male | 11 (21.5%) | 40 (78.4%) | <0.212 |
| | Female | 16 (32.6%) | 33 (67.3%) | |
| Birth weight | >2 kg | 11 (18.9%) | 47 (81.1%) | <0.001 |
| | 1.5-1.99 kg | 4 (16%) | 21 (84%) | |
| | <1.5 kg | 12 (70.5%) | 5 (29.4%) | |
| Age of onset | At birth | 23 (34.8%) | 43 (65.1%) | <0.035 |
| | 0-6 hours | 4 (14.8%) | 23 (85.1%) | |
| | >6 hours | 0 | 7 (100%) | |
| APGAR score | <7 | 8 (57.1%) | 6 (42.8%) | <0.001 |
| | 7-8 | 13 (54.1%) | 11 (45.8%) | |
| | 9-10 | 6 (9.6%) | 56 (19.3%) | |
| Maternal risk factors | NVD | 14 (31.8%) | 30 (68.1%) | <0.0336 |
| | LSCS | 13 (23.2%) | 43 (76.7%) | |

***Treatment intervention***

In the present study 82.75% of newborns with HMD required surfactant therapy where as 44.4% of newborns with MAS and none of the newborns with TTNB and Congenital pneumonia required surfactant therapy. 93.1% of newborns with HMD required usage of CPAP, when compared to 77.7% with MAS, 63.6% with Congenital Pneumonia, 18.75% of newborns with TTNB, who required CPAP. 68.96% of newborns with HMD required mechanical ventilation when compared to 50% in MAS, 63.6% in Congenital Pneumonia and none in TTNB required mechanical ventilation.

Narendran et al.[10] describing infants with birth weight of 400-1000 g, found that intubation in the delivery room was required in 31.6% of cases. In a prospective study, in the present study 75.86% of newborns with HMD recovered when compared to 88.8 % with MAS, 90.9% with congenital pneumonia and 100% with TTNB.

## CONCLUSIONS

Following conclusions can be drawn from the above study.

- Transient tachypnoea of newborn is the most common cause among newborns with respiratory distress.
- Majority of newborns develop severe distress immediately after birth.
- Newborns with gestational age between 28-30 weeks are more prone to develop severe respiratory distress.
- Newborns weighing <1.5 kg are more prone for development of severe distress.
- Newborns with one minute APGAR score of <7 are more prone to develop severe distress.

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## REFERENCES

1. Gouyon JB, Ribakovsky C, Ferdynus C, Quantin C, Sagot P, Gouyon B, et al. Severe respiratory disorders in term neonates. Paediatr Perinat Epidemiol. 2008;22(1):22-30.
2. Kumar A, Bhatnagar V. Respiratory distress in neonates. Indian J Pediatr. 2005;72:425-8.
3. Angus DC, Linde-Zwirble WT, Clermont G, Griffin MF, Clark RH. Epidemiology of neonatal

respiratory failure in the United States. Am J Respir Crit Care Med. 2001;164:1154-60.
4. Lureti M, Parazzini F, Agarossi A, Bianchi C, Rocchetti M, Bevilacqua G. Risk factors for respiratory distress syndrome in the newborn: a multicentre Italian survey. Acta Obstet Gynecol Scand. 1993;72(5):359-64.
5. Herbert C. Miller. Respiratory distress syndrome of newborn infants: statistical evaluation of factors possibly affecting survival of premature infants. Pediatrics. 1998;31(4):573-9.
6. Dani C, Reali MF, Bertin GI, Wiechmann L, Spagnolo A, Tangucci M, et al. Risk factors for the development of respiratory distress syndrome and transient tachypnoea in newborn infants. Eur Respir J. 1999;14(1):155-9.
7. Nagendra K, Wilson CG, Ravichander B, Sood S, Singh SP. Incidence and etiology of respiratory distress in newborn. Med J Armed Forces India. 1999;55(4):331-3.
8. Ingemarrson I. Gender aspects of preterm birth. BJOG. 2003;110(Suppl 20):3408.
9. Rawlings JS, Smith FR. Transient tachypnoea of newborn - an analysis of neonatal and obstetric risk factors. Am J Dis Child. 1984;138(9):869-71.
10. Narendran V, Donovan FE. Early bubble CPAP and outcomes in ELBW preterm infants. J Perinatol. 2003;23(3):195-9.

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