AETIOLOGY OF RESPIRATORY DISTRESS AND RISK FACTORS ASSOCIATED WITH DEVELOPMENT OF RESPIRATORY DISTRESS IN TERM NEWBORNS

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ABSTRACT

BACKGROUND
Respiratory distress is a common problem encountered within the first 48-72 hours of life. It is one of the commonest cause of admission to NICU. So, it is very important to know the aetiology and risk factors associated with development of respiratory distress to provide better management.

The aim of the study is to study the aetiology of respiratory distress and the risk factors associated with development of respiratory distress in term newborns.

MATERIALS AND METHODS
Prospective study of 100 term newborns admitted in our NICU with respiratory distress. General information, history and clinical examination findings of mother and newborn were documented. Time of onset of respiratory distress and the severity of the distress were documented. Severity was assessed using Downe’s clinical scoring. X-ray was done at 6 hours in all newborns. Various aetiologies and risk factors associated with respiratory distress were assessed.

RESULTS
In our study, the most common cause of respiratory distress was transient tachypnoea of newborn seen in 59% cases followed by early onset sepsis 20% cases and meconium aspiration syndrome 17% cases. Majority of newborn had severe distress (42%) followed by moderate distress (35%) and mild distress (23%). The risk factors associated with development of respiratory distress were low socioeconomic status, more than four per vaginal examinations, meconium-stained liquor, caesarean section, low birth weight and male sex of the baby.

CONCLUSION
Transient tachypnoea of newborn is the most common cause of respiratory distress in term newborns and the risk factors for development of respiratory distress are low socioeconomic status, more than four per vaginal examinations, meconium-stained liquor, caesarean section, low birth weight and male sex of the baby. Early diagnosis and management of respiratory distress in newborn is needed to decrease the severity of the disease and to reduce the mortality.

KEYWORDS
Term Newborn, Respiratory Distress, Maternal Risk Factors, Foetal Risk Factors.


BACKGROUND
Respiratory distress is among the most common symptom complexes seen in the newborn. Respiratory distress results from heterogenous group of illness with varying incidence, underlying aetiology, clinical course and outcome. The clinical presentation of respiratory distress in the newborn includes tachypnoea (more than 60 breaths per minute), apnoea, cyanosis, grunting, inspiratory stridor, nasal flaring and poor feeding. There may also be retractions in the intercostal, subcostal or supracostal spaces.

Respiratory distress is one of the commonest problems encountered within the first 48-72 hours of live births and is responsible for about 20% of neonatal mortality.¹ There has been a tremendous advances in the management of respiratory distress...
distress such as ventilator therapy with different modes such as CPAP, conventional mechanical ventilation, ultra high frequency jet ventilation, liquid ventilation, surfactant replacement therapy, sophisticated monitoring and extracorporeal membrane oxygenation all of which have improved the outcome among the babies with respiratory distress. Continued efforts in prevention of premature birth, early recognition of foetal distress, maternal risk factors for neonatal sepsis and in diagnosis of diseases in utero will lead to further improvements in neonatal outcome.

Nonetheless, the continued high incidence of maternal risk factors and newborn receiving poor antenatal care continues to test the abilities of the neonatologist. Early recognition and appropriate therapy of neonatal respiratory diseases has impressive results. Continued efforts in prevention of premature birth, early recognition of foetal distress, maternal risk factors for neonatal sepsis and in diagnosis of diseases in utero will lead to further improvements in neonatal outcome.

AIMS AND OBJECTIVES
1. To study the aetiology of respiratory distress in term newborns.
2. To study the risk factors associated with development of respiratory distress in term newborns.

MATERIALS AND METHODS
Design
Prospective study of 100 term newborns born with respiratory distress in Konaseema Institute of Medical Sciences (KIMS), Amalapuram, during a period of 1 year from December 1, 2014, to December 1, 2015.

Sources of Data
Term newborns admitted in NICU of Konaseema Institute of Medical Sciences, Amalapuram, due to respiratory distress fulfilling Downe’s criteria.

Method of Collection of Data
Sample Size- 100 term neonates.
Sampling Method- Simple random sample method.

Inclusion Criteria
Newborns with term gestation delivered in Konaseema Institute of Medical Sciences, Amalapuram, and admitted in NICU with respiratory distress within 72 hours of birth.

Exclusion Criteria
1. Newborns admitted in NICU with onset of respiratory distress after 72 hrs. after birth.
2. Outside born newborns admitted with respiratory distress.
3. Babies less than 37 weeks gestation (preterm).

Method of Collection of Data
Data was collected for all newborns included in the study with respiratory distress. General information, history and clinical examination findings of mother and newborn were documented. Newborns with respiratory distress were shifted to NICU for further management. Time of onset of respiratory distress was documented and the severity of the distress was documented and the severity was assessed using Downe’s clinical scoring. X-ray was done at 6 hours in all newborns and abnormal findings were reported by the radiologist. Depending on the clinical diagnosis of respiratory distress, relevant investigations were sent and newborns were managed as per guidelines of NICU, KIMS.

RESULTS
Out of 100 babies, 74 babies were males and 26 were females. Majority of mothers (61%) were in age group of 22-30 years and belonged to upper lower socioeconomic class. 58% were primipara and 76% of babies were delivered through caesarean section. 33% of babies were born through meconium-stained liquor and 76% of babies born with birth weight between 2.6-3.5 kg.

In our study, the most common cause of respiratory distress was transient tachypnoea of newborn (59 cases) followed by early onset sepsis (20 cases) and meconium aspiration syndrome (17 cases). Majority of newborn has severe distress (42%) followed by moderate distress (35%) and mild distress (23%). 100% of newborn with CDH and TEF developed severe distress, whereas 82.3% of newborn with meconium aspiration syndrome developed severe distress and 40% of newborn with early onset sepsis developed severe distress (Table 1).

<table>
<thead>
<tr>
<th>Final Diagnosis</th>
<th>Frequency (n=100)</th>
<th>Severe Distress (n=42)</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyanotic congenital heart diseases</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Congenital diaphragmatic hernia</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Early onset sepsis</td>
<td>20</td>
<td>8</td>
<td>40%</td>
</tr>
<tr>
<td>Meconium aspiration syndrome</td>
<td>17</td>
<td>14</td>
<td>82.3%</td>
</tr>
<tr>
<td>Tracheoesophageal fistula</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Transient tachypnoea of newborn</td>
<td>59</td>
<td>18</td>
<td>30.5%</td>
</tr>
</tbody>
</table>

| Table 1. Final Diagnosis Versus Severity of Respiratory Distress |

There were 3 neonatal deaths during the period of study of which 2 babies died from complications of meconium aspiration syndrome and 1 baby from early onset sepsis.

Duration of Respiratory Distress
64.9% of newborn (24 out of 37) with respiratory distress more than 24 hours developed severe respiratory distress
when compared to 28.6% of newborns (18 out of 63) with distress less than 24 hours \((p=0.000385)\).

**Risk Factors for Development of Severe Respiratory Distress**

In the present study, a significant association was between certain risk factors and severity of respiratory distress. The risk factors, which were found to be statistically significant \((p<0.05)\) are socioeconomic status, per vaginal examinations, liquor, mode of delivery, birth weight and sex of the baby (Table 2).

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Frequency((n=100))</th>
<th>Severe Distress((n=42))</th>
<th>(p) value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age of Mother (Yrs.)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤21</td>
<td>26</td>
<td>9</td>
<td>0.094 617</td>
</tr>
<tr>
<td>22-30</td>
<td>61</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>≥30</td>
<td>13</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Socioeconomic Status</strong></td>
<td></td>
<td></td>
<td>0.001 773</td>
</tr>
<tr>
<td>Upper middle</td>
<td>9</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Lower middle</td>
<td>39</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Upper lower</td>
<td>52</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
<td>0.199 244</td>
</tr>
<tr>
<td>Primigravida</td>
<td>58</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Gravida 2 to 3</td>
<td>34</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Multigravida</td>
<td>8</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Per Vaginal Examinations</strong></td>
<td></td>
<td></td>
<td>0.000 506</td>
</tr>
<tr>
<td>&lt;4</td>
<td>49</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>&gt;4</td>
<td>51</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Liquor</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Clear</td>
<td>67</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Meconium stained</td>
<td>33</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td><strong>Mode of Delivery</strong></td>
<td></td>
<td></td>
<td>0.042 92</td>
</tr>
<tr>
<td>Cesarean</td>
<td>76</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td>24</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Birth Weight (kg)</strong></td>
<td></td>
<td></td>
<td>0.03</td>
</tr>
<tr>
<td>≤2.5</td>
<td>25</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2.6-3.5</td>
<td>71</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>≥3.6</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td>0.029</td>
</tr>
<tr>
<td>Male</td>
<td>74</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Risk Factors for Development Severe Respiratory Distress**

**DISCUSSION**

Respiratory distress is one of the commonest problems encountered within the first 48-72 hours of life. It occurs in approximately 7-8% of livebirths and is responsible for about 20% of neonatal mortality.\(^1\) In study by Santosh S. et al, the incidence of respiratory distress among term newborns was 7.6%.\(^2\,3\)

**Aetiology and Diagnosis**

In the present study, out of 100 term newborns identified with respiratory distress, the commonest cause for respiratory distress was transient tachypnoea of newborn (59%) followed by early onset sepsis (20%), meconium aspiration syndrome (17%) and acyanotic congenital heart disease 2%, congenital diaphragmatric hernia (1%) and tracheoesophageal fistula (1%). Similar result was seen in the study done by Gouyon JB where the commonest cause for respiratory distress in newborns was TTNB (72%) followed by MAS (61%) and RDS (38%).\(^4\) However, in a study done by Alok Kumar, it was seen that the RDS was found to be the commonest (42.7%) cause of respiratory distress followed by TTNB (17.0%), MAS (10.7%), sepsis (9.3%) and birth asphyxia (3.3%).\(^5\)

**Severity of Respiratory Distress**

In the present study, it was seen that 42% of newborns had severe respiratory distress followed by 35% with moderate respiratory distress and 23% with mild respiratory distress. In present study, 64.9% of newborn had respiratory distress more than 24 hours developed severe respiratory distress as compared to 28.6% of newborns with respiratory distress less than 24 hours. Similar results were observed in the study done by Derek C where neonates (34 out of 71) with the duration of respiratory distress of more than 24 hours developed severe respiratory distress.\(^6\)

**Risk Factors**

**Maternal Factors**

Socioeconomic status- In present study, 57.69% of newborn from upper lower socioeconomic class developed severe respiratory distress as compared to 44.44% of upper middle class and 20.51% of lower middle class who developed severe distress. Similar results were seen by Rajavarupu Chandrasekhar where 93% of newborns (26 out of 28) from lower middle class developed severe respiratory distress compared to 58.3% (7 out of 12) and 25% (15 out of 60) newborn from upper middle and upper lower class, respectively.\(^7\)

Maternal Age- In present study, 69.23% of newborns born to mothers with age ≥30 years developed severe respiratory distress as compared to 39.34% of newborns born to mothers with age between 22-30 and 34.61% of newborns born to mothers with age ≤21. Similar results were observed in the study done by C. Dani\(^8\) where it was observed that mothers >32 years of age were at a higher risk of delivering babies with respiratory distress. In present study though the severity of respiratory distress varied with varying maternal age, the variation was statistically insignificant.

Parity- In the present study, 52.94% of newborns born to 2\(^{nd}\) and 3\(^{rd}\) gravida mothers developed severe respiratory distress as compared to 50% of newborns born to multigravida and 34.48% of newborns born to primigravida mothers. These variations in severity were not significant statistical. Similar results were observed by M. Lureti\(^9\) that there is no significant association between multiparity and the respiratory distress. However, in a
study by C. Dani,\textsuperscript{8} it was seen that the incidence of respiratory distress was more in the first pregnancy and after the fourth pregnancy. However, N.B. Mathur\textsuperscript{10} has shown that multigravida was a risk factor for developing respiratory distress in newborns.

PV examination- In the present study, 58.82% of newborns born to mothers who had more than 4 per vaginal examinations developed severe respiratory distress as compared to 24.49% of newborns born to mothers who had less than 4 per vaginal examinations. C. Dani, M.F. Reali and G. Bertini\textsuperscript{8} has shown that the number of PV examination above 4 was significantly associated with respiratory distress. Similar results were observed in the study done by Kwang Sun Lee et al\textsuperscript{11} where per vaginal examination done more than 5 before the delivery time was more associated with respiratory distress.

Liquor- In the present study, 69.7% of newborns with meconium-stained liquor developed severe respiratory distress as compared to only 28.36% of newborns with clear liquor who developed severe distress. In a study by Rajavarapu Chandrasekhar,\textsuperscript{7} 68.4% of newborns (26 out of 38) born to mothers with meconium-stained liquor developed severe respiratory distress compared to 35.40% of the newborns (22 out of 62) born to mother with clear liquor. Similar observations were observed in the study done by Michael Rygal\textsuperscript{12} where meconium-stained liquor had more chances of developing respiratory distress 58.8% when compared to 21.14%.

Mode of delivery- In the present study, 47.37% of newborns born by caesarean section developed severe distress when compared to 25% of newborns born by vaginal delivery. Similar findings were observed in studies done by C. Dani,\textsuperscript{8} EJ Geller\textsuperscript{13} and Jean-Bernard Gouyon\textsuperscript{9} where it was noticed that LSCS delivered babies have more chances of neonatal respiratory distress when compared to normal vaginal delivery. In a study by NN Hameed et al,\textsuperscript{14} a product of elective LSCS delivery was a highly significant risk factor for respiratory distress. Caesarean section, especially when performed before the onset of labour (elective), incurs additional risk of neonatal respiratory complications.\textsuperscript{14}

\textbf{Foetal Risk Factors}

Birth weight- In present study, 80% of newborns with birth weight ≤2.5 developed severe distress as compared to 25% of newborns with birth weight ≥3.6 developed severe distress while only 29.58% of newborn with birth weight between 2.6-3.5 developed severe distress. In the study done by M. Lureti,\textsuperscript{8} 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. In a study by NN Hameed et al,\textsuperscript{14} low birth weight was not found to be a significant risk factor for respiratory distress in full-term newborns as supported by the fact that intrauterine stressful condition enhancing surfactant secretion and maturation of lung.\textsuperscript{15}

Sex- In present study, 51.35% of male newborns developed severe respiratory distress when compared to 15.38% of females who developed severe distress. In the study done by Herbert C Miller\textsuperscript{15} shows that the incidence of severe respiratory distress was almost three times higher among males than females. In a study by NN Hameed et al,\textsuperscript{14} male sex was regarded as significant risk factor for respiratory distress. However, in a study by C. Dani,\textsuperscript{8} it was observed that there is no significant association with respiratory distress and the sex of the baby. Similar observations were observed by Negendra K,\textsuperscript{16} who also concluded that there is no significant difference in neonatal respiratory distress in male and female neonates.

Mortality- There were 3 neonatal deaths in our study of 100 newborn with respiratory distress. Of these 3 deaths, 2 deaths are due to complications of meconium aspiration syndrome and 1 death is due to early onset sepsis. The congenital heart disease that was referred to a higher center could not be followed up. The presence of low incidence of mortality in our study is mainly because most of the cases were TTN who recovered within 48-72 hours. EOS was diagnosed early and were treated with empirical antibiotics, which is cause of low mortality. All the surgical cases were referred to higher centres and were operated and survived. S.P. Shrivastava studied 1000 babies and found the most common respiratory cause of neonatal death was due to birth asphyxia (44%), followed by RDS (4.4%), MAS (1.9%).\textsuperscript{17}

\textbf{CONCLUSION}

Respiratory distress is common in newborn with incidence of 7% of all delivered newborns. Transient tachypnoea of the newborn is the most common cause of respiratory distress in term babies according to this study. Almost, 50% of newborns with respiratory distress developed severe respiratory distress, which required intensive monitoring. Risk factors like low socioeconomic status, more than 4 per vaginal examinations, meconium-stained liquor, caesarean delivery and low birth weight and male sex of newborn were associated with severe respiratory distress in newborns. Regular antenatal checkups for mother and identification of maternal risk factors and early intervention are the key for prevention of respiratory distress in newborn. Early diagnosis and management of respiratory distress in newborn is needed to decrease the severity of the disease and to reduce the mortality. Immediate clinical outcome of neonatal respiratory distress in term of mortality rate is variable and depends on the cause. Prevention of elective caesarean section deliveries before 38 weeks gestation helps to prevent the onset of respiratory distress in newborn.

\textbf{REFERENCES}
