

## Original Research Article

# ETIOLOGY AND CLINICAL SPECTRUM OF RESPIRATORY DISTRESS IN NEONATES IN A TERTIARY CARE NICU IN WESTERN INDIA

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**ABSTRACT**

Respiratory distress in neonates is a leading cause of neonatal morbidity and mortality, necessitating prompt diagnosis and intervention. This prospective observational study, conducted at a tertiary care NICU, examined 250 neonates with respiratory distress over two years. The most common etiologies included respiratory distress syndrome (32.8%), transient tachypnea of the newborn (27.2%), meconium aspiration syndrome (14.8%), and pneumonia (18%). Preterm neonates exhibited a higher incidence of RDS, while TTN and MAS were predominant in term neonates. Severity assessment using Downe's and Silverman-Anderson scores revealed 27.6% with severe distress. Treatment modalities included CPAP (68%), mechanical ventilation (23.6%), and surfactant therapy. The study emphasizes the role of antenatal corticosteroids, maternal infection screening, and evidence-based respiratory management in improving neonatal outcomes. Future research should focus on optimizing ventilation strategies and long-term follow-up to reduce morbidity and mortality associated with neonatal respiratory distress.

**Keywords:** neonates, respiratory distress

**INTRODUCTION**

Respiratory distress in neonates is a significant cause of neonatal morbidity and mortality, often leading to extended hospital stays and intensive medical intervention. It is characterized by symptoms such as tachypnea, nasal flaring, grunting, and chest retractions, which indicate inadequate gas exchange and potential respiratory failure. Neonatal respiratory distress can result from various etiologies, including respiratory distress syndrome (RDS), transient tachypnea of the newborn (TTN), meconium aspiration syndrome (MAS), pneumonia, congenital anomalies, and metabolic disorders.<sup>[1]</sup> Understanding the underlying causes and implementing timely, evidence-based management strategies are essential to reducing mortality and morbidity associated with this condition. Advances in neonatal care, including surfactant therapy, non-invasive ventilation, and

improved maternal interventions, have significantly improved neonatal outcomes.<sup>[2]</sup>

**MATERIALS AND METHODS**

This prospective observational and analytical study was conducted in the Neonatal Intensive Care Unit (NICU) of MGM Hospital, Kalamboli, from December 2017 to November 2019. A total of 250 neonates presenting with respiratory distress were included in the study based on predefined inclusion criteria. The inclusion criteria comprised neonates with a respiratory rate exceeding 60 breaths per minute, subcostal and intercostal retractions, nasal flaring, expiratory grunting, and cyanosis.<sup>[3]</sup> Exclusion criteria included neonates with congenital malformations incompatible with life or those referred after initial treatment at another facility. Data collection involved a thorough maternal history, including the presence of risk factors such

as gestational diabetes, preeclampsia, prolonged rupture of membranes, mode of delivery, and signs of intrauterine infection.<sup>[4]</sup> Neonatal parameters such as birth weight, Apgar score, gestational age, and the need for resuscitation at birth were also recorded. Clinical examination and diagnostic investigations, including arterial blood gas analysis, chest radiography, and blood cultures were performed to determine the cause and severity of respiratory distress. The severity of respiratory distress was assessed using Downe's Score for term infants and Silverman-Anderson Retraction Score for preterm infants.<sup>[5]</sup> Treatment modalities included oxygen therapy, continuous positive airway pressure (CPAP), mechanical ventilation, and surfactant therapy.<sup>[6]</sup>

## RESULTS

A total of 250 patients formed the study cohort. A higher proportion of male neonates (58.4%) were

affected compared to females (41.6%). The majority of cases (92.8%) presented within the first seven days of life, with 79.6% exhibiting symptoms on the first day. Regarding the mode of delivery, 53.6% were delivered vaginally, 45.6% via cesarean section, and 0.8% through vacuum-assisted delivery. Adverse maternal factors were identified in 116 mothers, including eclampsia (8.8%), chorioamnionitis (3.2%), oligohydramnios (3.6%), multiple PV examinations (>4 times in 19.6%), and fever (11.2%). Preterm birth was significant, with 52% of neonates born before 37 weeks of gestation.

### Severity and Etiology of Respiratory Distress

Using Downe's Score and Silverman Anderson Retraction Score, 27.6% of neonates had severe distress, 64.8% moderate distress, and 7.6% mild distress. Severity was significantly associated with lower gestational age ( $p=0.002$ ). The leading causes of respiratory distress in our study along with their frequencies have been elaborated in table 1.

**Table 1: Causes Of Respiratory Distress**

Etiology	Number of Cases (n=250)	Percentage (%)
Respiratory Distress Syndrome (RDS)	82	32.8
Transient Tachypnea of the Newborn (TTN)	68	27.2
Meconium Aspiration Syndrome (MAS)	37	14.8
Pneumonia	45	18.0
Hypoxic-Ischemic Encephalopathy (HIE)	8	3.2
Congenital Heart Disease (CHD)	6	2.4
Persistent Pulmonary Hypertension (PPHN)	2	0.8
Tracheoesophageal Fistula (TEF)	2	0.8

RDS was exclusively observed in preterm neonates, while MAS was predominantly found in term infants (97.3%). Pneumonia affected both preterm (55.5%) and term neonates (44.5%).

### Treatment and Outcome

Oxygen therapy was administered to 8.4% of neonates, while 68% required CPAP support. Mechanical ventilation was necessary for 23.6% of cases, primarily those with severe RDS, MAS, or pneumonia.

## DISCUSSIONS

Neonatal respiratory distress is a multifactorial condition that requires timely diagnosis and intervention. The study findings indicate that preterm neonates are at higher risk for RDS due to lung immaturity and surfactant deficiency.<sup>[7]</sup> The prevalence of RDS in preterm neonates in this study (32.8%) underscores the importance of antenatal corticosteroid administration to promote fetal lung maturation.<sup>[8]</sup> Surfactant replacement therapy has been a cornerstone in managing RDS, significantly reducing mortality and the need for prolonged mechanical ventilation. However, despite these advancements, RDS remains a major contributor to neonatal morbidity, necessitating continuous evaluation of treatment protocols. The study also highlights the significant impact of mode of delivery on neonatal respiratory distress,

with cesarean deliveries contributing to an increased incidence of TTN due to delayed clearance of fetal lung fluid. TTN was diagnosed in 27.2% of neonates, with cesarean section delivery being a major predisposing factor. This aligns with previous studies indicating that elective cesarean sections performed before 39 weeks of gestation are associated with a higher risk of neonatal respiratory distress.<sup>[9]</sup> The transient nature of this condition often results in favorable outcomes with minimal intervention, typically resolving within 48 to 72 hours.<sup>[10]</sup> However, cases with prolonged respiratory distress may require additional oxygen support and close monitoring for potential complications such as pulmonary hypertension.

Meconium aspiration syndrome (MAS), affecting 14.8% of neonates, was strongly associated with meconium-stained amniotic fluid and fetal distress. This finding emphasizes the importance of close intrapartum monitoring, timely detection of fetal distress, and prompt resuscitative efforts at birth to prevent aspiration and its complications.<sup>[11]</sup> Despite advances in delivery room management, including intrapartum suctioning and early respiratory support, MAS remains a challenging condition, often requiring prolonged respiratory support and surfactant administration in severe cases. Prevention strategies, such as avoiding post-term deliveries and ensuring adequate fetal monitoring during labor,

play a crucial role in reducing the incidence of MAS.

Pneumonia was observed in 18% of neonates, reinforcing the role of maternal infection screening and early antibiotic initiation in improving neonatal prognosis. Neonatal pneumonia is often linked to maternal infections, including chorioamnionitis, prolonged rupture of membranes, and perinatal bacterial colonization. The high incidence of pneumonia in this study supports the need for routine maternal screening for infections and strict adherence to intrapartum antibiotic prophylaxis guidelines. Early diagnosis through blood cultures, chest radiographs, and inflammatory markers is crucial in differentiating pneumonia from other causes of respiratory distress, ensuring timely and appropriate antimicrobial therapy.<sup>[12]</sup>

Treatment strategies varied according to the severity of respiratory distress. Oxygen supplementation and CPAP were the primary modes of respiratory support, with 68% of neonates requiring CPAP. This non-invasive ventilation strategy has been widely recognized for its effectiveness in preventing the need for mechanical ventilation in preterm neonates with mild to moderate RDS. The study further supports the role of CPAP in improving lung compliance, reducing work of breathing, and lowering the incidence of ventilator-associated complications. However, neonates with severe RDS, MAS, or pneumonia often require escalation to invasive mechanical ventilation. In this study, 23.6% of neonates required mechanical ventilation, highlighting the need for continuous monitoring and timely intervention to prevent respiratory failure.<sup>[13]</sup>

The mortality rate was significantly high with RDS and pneumonia, indicating the severity of these conditions and the importance of prompt, evidence-based interventions. The findings suggest that despite improvements in neonatal intensive care, respiratory distress remains a significant cause of morbidity and mortality. This underscores the need for further research into optimizing ventilation strategies, surfactant therapy protocols, and early identification of high-risk neonates. The integration of newer therapies, such as high-frequency oscillatory ventilation and inhaled nitric oxide, may provide additional benefits in managing severe cases and improving overall neonatal outcomes.<sup>[14]</sup>

Another crucial aspect highlighted by this study is the role of maternal and antenatal factors in neonatal respiratory distress. Risk factors such as gestational diabetes, preeclampsia, and maternal infections significantly influence neonatal lung development and overall respiratory health. Addressing these maternal conditions through adequate prenatal care, optimizing maternal glycemic control, and timely administration of antenatal corticosteroids can substantially reduce the incidence of neonatal respiratory distress. Additionally, delayed cord clamping and early initiation of skin-to-skin contact have been suggested to enhance neonatal adaptation

to extrauterine life, potentially reducing respiratory complications.<sup>[15]</sup>

Long-term outcomes of neonates who experience respiratory distress at birth also warrant attention. While many cases resolve without significant complications, neonates with severe RDS or pneumonia are at risk of developing chronic lung disease, bronchopulmonary dysplasia (BPD), and neurodevelopmental impairments. This highlights the importance of structured follow-up programs focusing on respiratory health, growth, and neurodevelopmental assessment. Strategies such as optimizing nutrition, minimizing oxygen toxicity, and ensuring appropriate respiratory support can help mitigate long-term sequelae.<sup>[16]</sup>

## CONCLUSION

The findings from this study emphasize the complex interplay of perinatal, maternal, and neonatal factors contributing to respiratory distress in neonates. RDS remains the leading cause in preterm neonates, whereas TTN and MAS are predominant in term infants. Early diagnosis, stratified treatment, and antenatal interventions such as corticosteroids significantly improve neonatal outcomes. Continued efforts in optimizing neonatal respiratory management, enhancing maternal care, and adopting evidence-based treatment protocols are essential in reducing neonatal morbidity and mortality. Further studies are warranted to explore novel therapeutic approaches and preventive measures, ensuring better survival and quality of life for affected neonates.

**Conflict of Interest:** None.

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