



A Study on the Clinical Profile and Outcome in Term Neonates with Respiratory Distress Within 72 Hrs of Life.

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Abstract

Background: Neonatal respiratory distress (NRD) poses a significant threat to newborns, contributing substantially to global neonatal mortality rates, especially in developing nations. Despite advancements in neonatal care, there is a notable gap in literature regarding the clinical profile and outcomes of term neonates experiencing respiratory distress within the first 72 hours of life. This study aims to bridge this gap by providing a comprehensive analysis of term infants with respiratory distress admitted to a tertiary care hospital's Neonatal Intensive Care Unit (NICU) in Salem, Tamil Nadu.

Aims and Objectives: The primary objective of this prospective observational study is to offer an understanding of the clinical profile and short-term outcomes in term neonates with respiratory distress within the initial 72 hours of life. Specific aims include examining varied manifestations, associated factors, and elucidating the short-term consequences and prognosis. The study intends to inform better clinical practice and enhance healthcare strategies for improved outcomes in this vulnerable neonatal group.

Materials and Methods: The study was conducted at the NICU of VMKV Medical College and Hospital, the study spanned over a duration of 1 year. The sample comprised of 100 term neonates with respiratory distress admitted within 72 hours of birth. Data collection involved standardized proformas, including demographic and clinical information of neonates and mothers. Ethical approval was obtained, and data were analysed using descriptive and inferential statistics.

Results: Transient tachypnea of newborn (55%) and meconium aspiration syndrome (32%) emerged as the two most frequent causes of respiratory distress, while respiratory distress syndrome (7%), acyanotic congenital heart disease (3%), and congenital diaphragmatic hernia (3%) were less common. Nearly 17% of neonates required mechanical ventilation, and 15% needed Continuous Positive Airway Pressure (CPAP). All term neonates with respiratory distress were treated successfully, with no reported deaths in the study cohort.

Conclusion: This study significantly advances our understanding of the clinical dynamics and short-term outcomes for term neonates experiencing early respiratory distress. The absence of reported deaths in the cohort indicates the effectiveness of the care provided. Improved newborn care, including vigilant monitoring, prompt interventions, and specialized treatments such as mechanical ventilation, played a pivotal role in achieving favourable outcomes and a commendable survival rate.

The findings prompt considerations for broader population-based studies to validate and extend these insights. Additionally, the emphasis on follow-up care post-discharge could



unveil the long-term implications of respiratory distress in neonates. Recommendations for enhanced prenatal care and the establishment of well-equipped Neonatal Intensive Care Units (NICUs) reinforce the need for a comprehensive and proactive approach to neonatal respiratory care, with a potential impact on global neonatal health outcomes.

Introduction:

In the initial four weeks of life, four million newborns worldwide succumb annually ⁽¹⁾, with the neonatal period posing the highest vulnerability, especially for preterm and low birth weight infants. Approximately 98 % of these fatalities occur primarily in the developing nations⁽²⁾. Neonatal mortality accounts for two-thirds of infant deaths and one-third of deaths in children under five. One-fourth to one-half of neonatal deaths occur within the first 24 hours, with 75 % occurring within the initial week, emphasizing the critical nature of the first 48 hours for infant survival ⁽³⁾.

Neonatal respiratory distress (NRD) stands as a prevalent concern in the early days of a newborn's life, characterized by symptoms such as tachypnea, intercostal retractions, grunting, nasal flaring, and cyanosis ⁽⁴⁾. The prevalence of NRD varies between 2.2 and 7.6 percent in developed nations and 0.7 to 8.3 percent in India, with risk factors including prematurity, caesarean delivery, meconium-stained amniotic fluid, gestational diabetes, preeclampsia, multiple pregnancies, chorioamnionitis, oligohydramnios, and structural lung disorders ^(5,6).

Contrary to severe conditions like infections, encephalopathy or congenital defects, NRD can arise from benign conditions like Transient Tachypnea of the Newborn (TTN). Various factors contribute to the complexity of NRD etiologies, including Respiratory Distress Syndrome (RDS), TTN, Meconium Aspiration Syndrome (MAS), sepsis, pneumonia, early asphyxia, congenital heart disease (CHD), and pulmonary anomalies. ^(7,8)

Clinical signs of respiratory distress includes difficulty in breathing, rapid or slow/shallow breathing, and grunting. Timely identification and intervention are crucial, as respiratory distress can progress to apnea, respiratory failure, cardiopulmonary collapse, and eventual mortality. ⁽⁹⁾

Efficient investigation of the prevalent causes in local settings allows targeted formulation of hospital policies^(10,11). Adequate prenatal care is emphasized, as insufficient care may lead to smaller infants with an increased likelihood of NICU admission.⁽¹²⁾ Antenatal corticosteroid use between 24 and 34 weeks gestation significantly reduces the incidence and severity of respiratory distress in threatening preterm deliveries⁽¹³⁾. Globally, addressing respiratory distress requires broader access to basic interventions like oxygen and Continuous Positive Airway Pressure (CPAP). Identifying and addressing local causes provides a foundation for tailored interventions and recognizing varying frequencies of etiologies.

Despite advancements in neonatal care, a notable gap exists in the literature concerning the clinical profile and outcomes of term neonates experiencing respiratory distress within the first 72 hours of life. This study aims to bridge this gap by providing a meticulous understanding of the clinical characteristics and short-term outcomes in this specific population. Our research intends to offer valuable insights for clinicians, facilitating informed decision-making and targeted interventions for term neonates with early respiratory distress, potentially improving outcomes for this vulnerable group.

This study aims to provide a concise description of the clinical profile and outcomes in term neonates experiencing respiratory distress within the initial 72 hours of life. By examining various manifestations and associated factors, we seek to offer insights into the presentation of respiratory distress in this population. Simultaneously, we aim to elucidate short-term consequences and prognosis, addressing existing gaps in the literature. This research seeks to inform clinical practice and enhance healthcare strategies for better outcomes in this vulnerable neonatal group.

Methodology

In this prospective observational study, conducted at the neonatal intensive care unit (NICU) of VMKV Medical College and Hospital in Salem, Tamil Nadu, term neonates with respiratory distress admitted within 72 hours of birth were investigated over a duration of 1 year.

Sample size

The study population comprised of all term neonates with respiratory distress admitted to the NICU during the specified period. The sample size was determined based on a previous study, with a calculated minimum of 94; however, 100 samples were collected.

Inclusion criteria

We included all term inborn neonates with respiratory distress admitted to NICU within 72 hours of birth.

Exclusion criteria

Babies born <36 weeks, babies born with a birth weight of weighing less than 1000 grams, babies with syndromic presentation and neonates with surgical etiology as a cause for respiratory distress.

Sampling method



The first 100 neonates with respiratory distress admitted to the NICU were included using a systematic sampling method.

Data collection

Data collection involved Institutional Ethical Committee-approved proformas containing National Neonatology Forum standard definitions. Information on neonates included age at admission, delivery method, gender, birth weight, APGAR score, reason for admission, investigations, and NICU outcomes. Maternal data included age at conception, parity, hypertension, diabetes, number of pregnancies, antepartum hemorrhage, fetal infection, preeclampsia, mode of delivery, and length of labor.

Operational definitions were established for neonatal respiratory distress, transient tachypnea of the newborn (TTN), meconium aspiration syndrome (MAS), and birth asphyxia (BA). Diagnosis of sepsis and meningitis was based on clinical findings, C-reactive protein (CRP), complete blood count (CBC), positive blood culture, and cerebrospinal fluid (CSF) analysis.

Ethical approval was obtained, and data were analysed using Microsoft Excel and SPSS 23.0 software. Descriptive statistics, including frequency and percentage analysis for discrete variables, and mean, median, and standard deviation for continuous variables, were employed. Inferential statistics, specifically the Independent T test, were used to compare continuous variables between groups, considering a significance level of 0.05. Ethical considerations were adhered to throughout the study.

Result

In this extensive study involving 100 neonates, gender distribution highlighted a slight majority of females (59%) compared to males (41%). Noteworthy findings included 15% of infants diagnosed as Large for Gestational Age and 17% as Small for Gestational Age. The predominant mode of delivery emerged as emergency Lower Segment Caesarean Section (LSCS) at 47%, with normal vaginal delivery following closely at 33%.

Examining the general characteristics of newborns, 18% exhibited cyanosis, 15% displayed lethargy, and 29% demonstrated hypotonia. Maternal demographics revealed that 48% of mothers fell within the 21 to 30 age group, with 43% belonging to socio-economic class 2, 36% to class 3 and 21% to class 4. Unbooked cases constituted 31%, while booked cases accounted for 69% of study participants. Maternal health indicators reported a prevalence of 28% for fever, 1% for urinary tract infections (UTI), 14% for pregnancy-induced hypertension (PIH), 15% for gestational diabetes mellitus (GDM), 76% for anemia, and 15% for bleeding per vagina. Additionally, 17% of mothers experienced either artificial rupture of membranes (ARM) or premature rupture of membranes (PROM).

Among the neonates, 29% did not cry after birth, 56% underwent oropharyngeal suctioning, and 15% underwent endotracheal suctioning. Notably, 18% of infants displayed respiratory distress immediately after birth, with 79% developing respiratory distress within 24 hours. Moreover, 20% faced impending respiratory failure, and 66% displayed clinical distress. Radiological abnormalities were identified in 37% of cases, and 20% of neonates experienced respiratory distress beyond 24 hours.

Etiologies of respiratory distress primarily involved respiratory factors (94%), cardiac factors (3%) and congenital diaphragmatic hernia (3%) accounting for a smaller percentage. Ventilatory support included hood ventilation (68%), high-flow oxygen (17%), and continuous positive airway pressure (CPAP) (15%). Mechanical ventilation was required in 17% of cases. Final diagnoses consist of transient tachypnea of the newborn (55%), meconium aspiration syndrome (32%), respiratory distress syndrome (7%), congenital diaphragmatic hernia (3%), and acyanotic congenital heart disease (3%). This study provides insights into the clinical and demographic profiles of neonates experiencing respiratory distress, emphasizing the need for further investigation and targeted interventions in this population.

Table 1. Distribution of the study participants according to the aetiology of respiratory distress (n = 100)

Aetiology of respiratory distress	Frequency	Percent(%)
Cardiac	3	3.0
Congenital Diaphragmatic Hernia	3	3.0
Respiratory	94	94.0
Total	100	100.0

Table 2. Distribution of the study participants according to their final diagnosis (n = 100)

Final diagnosis	Frequency	Percent(%)
Acyanotic congenital heart disease	3	3.0
Congenital diaphragmatic hernia	3	3.0
Meconium aspiration syndrome	32	32.0
Respiratory distress syndrome	7	7.0



Transient tachypnoea of newborn	55	55.0
Total	100	100.0

Discussion

One of the most prevalent issues in the first few days of neonatal life is neonatal respiratory distress (NRD). Since knowing the common causes of respiratory distress in a specific unit is important to better treating NRD in future planning, the current study was set out to determine the frequency of the causes and outcomes of respiratory distress in neonates hospitalised in the NICU of VMKV medical college and hospital, Salem.

About 33% of the neonates in the current study who had respiratory distress were delivered by normal vaginal delivery, while 47% required emergency LSCS. The mothers of the study participants had a 28% prevalence of fever. Among the mothers of the study participants, the prevalence of UTI, PIH, and GDM was 1%, 14%, and 15%, respectively. The mothers of the study subjects had an anaemia prevalence of 76%. The prevalence of bleeding per vagina and oligohydramnios among the mothers of the study participants was 15 percent and 3 percent respectively. Nearly 17% of the neonates with respiratory distress required mechanical ventilation.

According to a cross-sectional study by Sabzehei et al. in Iran, 60.2% of newborns with respiratory distress were delivered via emergency LSCS, compared to 39.8% delivered vaginally under normal circumstances. GDM, PIH, and PROM were all prevalent in mothers of study participants at rates of 2.2%, 4.3%, and 15.1%, respectively. Neonatal patients in respiratory distress needed mechanical ventilation in close to 26.9% of cases.⁽⁴⁾

In a prospective observational study conducted by Sathenahalli et al. in newborns hospitalised in the NICU of a tertiary care hospital in central India, observed that 27% of the newborns with respiratory distress were delivered by emergency LSCS, while 51% were delivered by normal vaginal delivery. The prevalence of PROM, PV bleeding in mothers, and oligohydramnios was 1%, 11%, and 8% respectively among the mothers of study participants. 19% of the neonates with respiratory distress needed mechanical ventilation⁽¹⁴⁾.

Transient tachypnea of newborn (55%) and meconium aspiration syndrome (32%) were the two most frequent causes of respiratory distress in the term neonates admitted to the NICU in this study. Respiratory distress syndrome was observed in about 7% of term newborns (RDS), whereas Acyanotic congenital heart disease (3%) and congenital diaphragmatic hernia (3%) were observed equally.

A descriptive cross-sectional hospital-based study conducted in NICU of Omdurman Maternity Hospital supported the findings of our study. According to Abdelrahman et al., the most frequent causes were

transient tachypnea of the newborn (TTN) accounting for 28%, followed by sepsis and hyaline membrane disease (HMD) which occurred in 24% and 15% of neonates respectively⁽¹⁵⁾.

The descriptive study by Zaman et al. in Saudi Arabia found that transient tachypnea in newborns (TTN) was the most important cause of respiratory distress (RD), accounting for 35.7% of cases, followed by hyaline membrane disease (HMD) in 25%, meconium aspiration syndrome (MAS) in 17.9%, congenital pneumonia in 7.1% and other congenital anomalies in 14.3%.⁽⁶⁾

TTN in 160 neonates (40%) and respiratory distress syndrome in 107 neonates (26.75%) were found to be the two most frequent causes of newborn respiratory distress in Kommawar et al's cross-sectional investigation in India. Birth asphyxia was the third factor (12.25 percent)⁽¹⁶⁾.

According to Tudehope et al., TTN accounts for 41% of the causes of RD. He also demonstrated that TTN was more likely after a caesarean section, with the justification that it would not have happened in the absence of labour⁽¹⁷⁾. In his research Kumar A, the most frequent (42.7%) cause of RD was discovered to be transient tachypnea of the newborn (TTN), which was followed by infections (17.0%), meconium aspiration syndrome (10.7%), hyaline membrane disease (9.3%), and birth asphyxia (3.3 percent)⁽¹⁸⁾.

Contrary to our study's findings, a study conducted by Bahwal et al found that the most common underlying cause of RD in children was RDS in 44% of cases, followed by TTN in 18.8%, birth asphyxia in 14%, MAS in 12%, and others (11.2%), CHD in 4%, sepsis in 3.2%, congenital pneumonia in 2.4%, and congenital anomalies in 1.6%.⁽¹⁹⁾

In a study by Verma et al. in India, respiratory distress syndrome was found to be the primary cause of RD in neonates in 30% of cases; transient tachypnea in newborns caused respiratory distress in 22% of cases; meconium aspiration syndrome caused respiratory distress in 18% of cases; and congenital pneumonia caused respiratory distress in 15% of cases. 25% of respiratory discomfort was caused by other factors.⁽³⁾

This wide range in the percentage of causes of respiratory distress across studies may be related to antenatal care in that community, availability of obstetricians, including trained birth attendants, use of preventive measures during the antenatal period, percentage of term and preterm deliveries, non-uniform inclusion criteria, and various other factors, such as the status of the community and the type of facilities in the institution.

In the current study, all term neonates who had respiratory distress were treated and discharged from



the hospital. Fewer studies have documented neonatal deaths among those with respiratory distress. According to a study by Bahwal et al, 40.4% of neonates were discharged with complete recovery, 10.4% of neonates were discharged with problems, and death occurred in 49.2% of neonates⁽¹⁹⁾. Neonatal death was observed in 11% in a study carried out in India by Verma et al⁽³⁾.

Abdelrahman et al. conducted a cross-sectional hospital-based study in which complete recovery was observed in 56% of neonates, neonatal death in 36% and 8% were discharged with problems⁽¹⁵⁾.

In Iran, a cross-sectional study by Sabzehei et al. found that while 19.4% of neonates with respiratory distress did not survive, 80.6% of them were successfully treated⁽⁴⁾.

In an Indian cross-sectional study, Kommawar et al. found that out of 400 neonates with respiratory distress admitted to the NICU, 314 (78.5%) were discharged, while 86(21.5%) died. Compared to inborn neonates with respiratory distress (21.35 percent), the death rate (21.9 percent) was slightly higher in the outborn neonates⁽¹⁶⁾.

A neonatal intensive care unit's mortality rate depends on various factors such as the baby's clinical condition, the facility's infrastructure, staffing levels, and the level of training of those working there. As a result, fatality rate reports in various research from various regions vary greatly.

One of the most common illnesses in the first 48 to 72 hours of life is respiratory distress. About 0.96 to 12% of live babies experience respiratory distress, and it accounts for 20% of neonatal deaths. In early neonatal fatalities, respiratory pathology is the most common (32–54%) autopsy finding. It is not always possible to determine which newborns may develop symptoms even before birth.

Respiratory distress can quickly worsen into respiratory failure and cardiopulmonary arrest if it is not identified and treated. In order to prevent serious complications or death, it is crucial for all healthcare professionals caring for newborn babies to be able to quickly identify the signs and symptoms of respiratory distress, distinguish between different causes, and implement the appropriate management techniques.

Conclusion

Transient tachypnea of the newborn and meconium aspiration syndrome were the two most frequent causes of respiratory distress among the term neonates admitted in NICU. After being treated, all the neonates were discharged from the hospital. In conclusion, it was inferred that improved newborn care necessitates early recognition, appropriate resuscitative measures and mechanical ventilation for better results and a lower neonatal mortality rate.

Limitation

Since our study was carried out at a single tertiary care facility, it might be challenging to apply our findings to the general community. Therefore, to corroborate these findings in the broader population, a sizable population-based multicentre cohort research is required. If this study were to be carried out on a larger scale, the findings might be more accurate. To determine the long-term implications of the respiratory distress in newborns, follow-up care of the neonates after discharge maybe useful.

Recommendations

A comprehensive approach to neonatal respiratory distress involves early detection and intervention of risk factors, alongside thorough prenatal care. Equipped NICUs and trained healthcare providers offer vital respiratory support, while strict infection control measures prevent sepsis, ensuring optimal outcomes for newborns.

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