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Original Research Article

Clinical Profile of Neonates with Respiratory Distress in Tertiary Care Centre: A Cross Sectional Study

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Abstract:

Background: Approximately 3% of all babies worldwide have experienced respiratory distress, which can take many different forms, including respiratory and non- respiratory illnesses.

Objective: To determine the various etiology of the respiratory distress in neonates and to study the spectrum of initial clinical presentation, progression and recovery of the respiratory distress with respect to scoring system.

Methods: This cross-sectional study was conducted in all neonates with respiratory distress admitted to Neonatal intensive care unit at Rohilkhand medical college and hospital, Bareilly, Uttar Pradesh Duration of study was 1st November 2022 – 31st October 2023.

Results: Among 144 neonates, males were predominant at 68.75% (90 babies), while females were 31.25% (54 babies). The majority of the neonates (62.5%) weighed between 1500-2500 grams. Out of 144 neonates, a significant portion (65.97%) was preterm (born before 37 weeks). For neonates with respiratory distress, the survival rate was 56.94% (82 out of 144), while the mortality rate was 13.88% (20 out of 144), underscoring the serious impact of respiratory conditions. Respiratory distress syndrome was a major cause with 74.07% survival (40 out of 54). The severity of respiratory distress in preterm neonates showed 54.73% (52 out of 95) had moderate distress, and 31.57% (30 out of 95) severe, indicating a substantial need for targeted medical interventions. A majority of neonates showed mild distress (61.22% or 30 out of 49), with 14.28% (7 out of 49) exhibiting severe distress, providing insight into the variability of distress severity. Neonates with an APGAR score greater than 7 had a high survival rate of 93.75% (90 out of 96), reinforcing the APGAR score's predictive value for neonatal survival.

Conclusions: Using the Silvermann Anderson and Downe scoring systems, the study effectively categorized the severity of respiratory distress, aiding in the customization of treatment plans. The outcomes data underscored a high rate of neonate discharges but also a concerning mortality rate, highlighting the need for ongoing enhancements in neonatal care.

Keywords: Clinical Profile, Neonates, Respiratory Distress.

Introduction

The most important factor in a new life's commencement is the first breath. Among the most prevalent symptom complexes in neonates, respiratory distress is responsible for half of all neonatal deaths.[1] Approximately 3% of all babies worldwide have experienced respiratory distress, which can take many different forms, including respiratory and non- respiratory illnesses.[2]

Neonatal mortality has dramatically decreased in developed nations as a result of expanded pediatric and neonatal specializations, better diagnosis and treatment made possible by technological breakthroughs. The area of neonatology for respiratory problems is revolutionizing itself with the introduction of advanced neonatal ventilation such as ECMO and HFO.[3] Infants with respiratory distress who get early respiratory support typically recover and are released from the hospital. Three babies passed away during the study period; these were extramural babies with severe respiratory distress syndrome who were sent to the NICU late in the course of their illness and did not receive proper respiratory support prior to transfer.

In order to reduce newborn mortality, it is crucial to identify the cause of respiratory distress and plan to provide services for these babies. There is incredibly limited research on the causes of respiratory distress in term newborns available in India. The

outcomes of these investigations vary amongst other centers as well. The Downe scoring method, which takes into account factors including respiratory rate, cyanosis, retractions, grunting, and air admission in both lungs,[4] can be used to determine the degree of respiratory distress. Pneumothorax and air leaks, transitory tachypnea, pneumonia, aspiration syndromes, pulmonary edema, pleural effusion, and pulmonary bleeding are the most common causes of respiratory distress.[5]

Hyaline membrane disease, also known as respiratory distress syndrome, is a condition that mostly affects preterm babies. Its incidence is inversely correlated with both birth weight and gestational age. It happens in 60–80% of babies under 28 weeks of gestation, in 15–30% of babies between 32 and 36 weeks, and infrequently in babies older than 37 weeks. Syndrome of meconium aspiration: Meconium-stained amniotic fluid (MSAF) is the cause of meconium aspiration syndrome.

In infants who are premature, the incidence of MSAF is quite low. Meconium aspiration syndrome affects about 5% of newborns born during MSAF, and about 50% of these babies [5] need mechanical breathing newborn tachypnea: Following a term cesarean delivery, newborn tachypnea is most frequently observed. It is characterized by the early beginning of expiratory grunting or retractions in addition to tachypnea, which is sometimes eased by little oxygen augmentation (<40%) Pneumonias cause 50% of neonatal respiratory distress in underdeveloped countries.[4]

It is very important to determine the profile of the disease which helps Pediatrician in planning the treatment and anticipating the requirement of higher modalities of treatment like surfactant therapy and ventilatory support. It also helps to estimate the cost of the treatment, duration of stay in hospital and counseling the patient regarding the prognosis of the disease.

Materials and Methods

This cross-sectional study was conducted in all neonates with respiratory distress admitted to Neonatal intensive care unit at Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh Duration of study was 1st November 2022 – 31st October 2023.

Sample Size: 144

Sampling Technique: sampling was done to obtain the required sample size.

Inclusion Criteria:

1. Neonates with respiratory distress who were admitted in NICU within 28 days of life.
2. Neonates whose parents are willing to give consent

Exclusion Criteria:

1. Neonates born with chromosomal disorders admitted to NICU.
2. Neonates born with inborn metabolic disorders admitted to NICU.

Methodology

Neonates were classified as term, pre- and post-term, enrolled as cases with respiratory distress on the basis of clinical profile. A detailed case Record form including name, age, sex, and residence will be obtained. Neonatal data was recorded includes weight of the baby, gestational age, mode of delivery, APGAR score, Downe's score, Silverman Anderson score.

Downe's score was used for term and post-term neonates. If score noted ≥4, was labeled as respiratory distress. Silverman Anderson scoring was done for preterm neonates and scoring from 0-3 was labeled as mild respiratory distress. Downe's and Silverman scoring was done on daily basis by NICU posted doctor.

During study if any patient clinically deteriorates, it shall be immediately informed to parent treating unit. Factors related to labor and deliveries was assessed including type of delivery normal vaginal or C-section, Elective or emergency, place of delivery, any associated complications like; prolonged rupture of the membrane more than 18 hours, prolonged labor, meconium stained liquor, antepartum hemorrhage and others. Maternal information was recorded including age, parity and any systemic diseases [10].

Following scoring system was used to assess clinical profile of neonates with respiratory distress:

Downe's Score

	0	1	2
Respiratory Rate	<60MIN	60-80/ minutes	>80/minutes
Retractions	No retractions	Mild retraction	Severe retraction
Cyanosis	No cyanosis	Cyanosis relieved by O2	Cyanosis on O2
Grunting	No grunting	Audible by stethoscope	Audible with ear
Air Entry	Good bilateral air entry	Mild decrease in air entry	No air entry

Interpretation of Score: <4 = No respiratory distress 4-7 = respiratory distress >7 = impending respiratory failure

Silverman Anderson Score

Feature	Score 0	Score 1	Score 2
Chest Movement	Equal	Respiratory Lag	Seasaw Respiration
Intercostal Retraction	None	Minimal	Marked
Xiphoid Retraction	None	Minimal	Marked
Nasal Flaring	None	Minimal	Marked
Expiratory Grunt	None	Audible With Stethoscope	Audible

Interpretation of Score:

- 0-3 = mild respiratory distress
- 4-6 = moderate respiratory distress
- >6 = impending respiratory distress 10 = severe respiratory distress

Statistical Analysis: The statistical analysis was conducted using the statistical software SPSS version 25.0, after importing the data into a Microsoft Excel spreadsheet. Numerical data was displayed using the mean and standard deviation, while categorical data was shown using the frequency and percentage of each category. The mean values of the two groups were compared using the student t-test, while the chi-square test was used to analyze the frequency differences between the two groups. A p- value below 0.05 indicates statistical significance.

Results: The study aimed to examine the Clinical Profile of Neonates with Respiratory Distress. Out of 144 babies, 90 (68.75) were males and 54 (31.25) were females. Out of the 144 newborns examined, most (62.5%) had a weight ranging from 1500 to 2500 grammes, which is considered a good weight range. In contrast, a smaller percentage of infants were classified into lower weight categories: 8.33% had a weight of less than 1000 grammes, and 17.36% fell within the range of 1000 to 1500 grammes.

These findings indicate a notable number of infants with low birth weight. In addition, 11.80% of infants had a weight ranging from 2500 to 3500 grammes. Out of the 144 newborns examined, the majority (65.97%) were born prematurely, which is defined as being born before 37 weeks of gestation. In contrast, 27.77% of the individuals were born inside the normal gestational period of 37 to 42 weeks, while a lesser proportion (6.25%) were born after the expected 42 weeks of gestation. The results emphasize the frequency of premature births in the examined population, which may be linked to a range of maternal and fetal health concerns.

Table 1: Distribution according to cause of respiratory distress

Cause of respiratory distress	No of babies survived	No of babies died	Total	p-value
Respiratory	82 (56.94)	20 (13.88)	102 (70.83)	0.333
Cardiac	04 (2.77)	01 (0.69)	05 (3.47)	
CNS	18 (12.5)	04 (2.77)	22 (15.27)	
Surgical	09 (6.25)	06 (4.16)	15 (10.41)	

This p-value is not small enough to reject the null hypothesis at common significance levels (e.g., 0.05 or 0.01). Therefore, there is no statistically significant association between the cause of respiratory distress and survival outcomes based on this data. Among the 102 infants that had respiratory distress, 82 managed to survive, accounting for a survival rate of 56.94%.

Conversely, 20 infants did not survive, resulting in a mortality rate of 13.88%. Out of a group of 5 infants experiencing cardiac- related distress, 4 managed to survive, accounting for a survival rate of 2.77%. Unfortunately, 1 of the infants did not survive, resulting in a mortality rate of 0.69%. Out of the 22 children who had discomfort connected to their central nervous system, 18 were able to survive, which accounts for 12.5% of the total.

Unfortunately, 4 newborns did not survive, representing a mortality rate of 2.77%. Out of a group of 15 babies, 9 (6.25%) survived after experiencing surgical discomfort, whereas 6 (4.16%) unfortunately died.

Table: 2 Distribution according Etiology of Respiratory Distress in Neonates

Etiology	No of babies survived	No of deaths	Total	p-value
Respiratory distress syndrome	40 (74.07)	14 (25.92)	54 (37.5)	0.081
Transient tachypnea of newborn	25 (100)	0 (0)	25 (17.36)	
Congenital Pneumonia	17 (85)	03 (15)	20 (13.88)	
Birth asphyxia	05 (62.5)	03 (15)	08 (5.55)	
Meconium aspiration syndrome	12 (80)	3 (20)	15(10.41)	
Congenital Heart Disease	4 (66.66)	2 (33.33)	06 (4.16)	
Tracheo- oesophageal fistula	4 (66.66)	2 (33.33)	06 (4.16)	

Diaphragmatic Hernia	1 (333.33)	2 (66.66)	03 (2.08)	
Others	5 (71.42)	2 (1.38)	07 (4.86)	

This p-value indicates that there is no statistically significant association between the etiology of illness and the survival outcomes at the common significance level of 0.05.

Out of a total of 54 cases, 40 infants managed to survive the illness, accounting for a survival rate of 74.07%. On the other hand, 14 infants unfortunately did not survive, representing a mortality rate of 25.92%. All 25 newborns diagnosed with Transient Tachypnea of the Newborn (TTN) survived, resulting in a 100% survival rate, and no deaths were documented. Out of a total of 20 cases of Congenital Pneumonia, 17 infants successfully survived, accounting for 85% of the cases, while 3 infants unfortunately succumbed to the illness, representing 15% of the cases. There were 8 occurrences of birth asphyxia, with 5 infants surviving (62.5%) and 3 not surviving (15%). Meconium aspiration syndrome (MAS) Out of the total of 15 cases, 12 infants managed to survive, accounting for 80% of the cases, while the remaining 3 infants unfortunately did not survive, representing 20% of the cases. Among babies with Congenital Heart Disease (CHD), the survival rate is 66.66%, with 4 out of 6 babies surviving, while 2 did not, representing a mortality rate of 33.33%. Trachea- esophageal fistula is a disorder where there is an abnormal connection between the trachea and the esophagus. In a study, 4 out of 6 newborns with this condition lived, which is a survival rate of 66.66%. The remaining 2 infants did not survive, accounting for a mortality rate of 33.33%.

Diaphragmatic hernia resulted in a survival rate of 33.33% for babies, with only 1 out of 3 surviving, while the remaining 2 infants unfortunately died, accounting for a mortality rate of 66.66%. In the Others category, out of a total of 7 instances, 5 babies survived, representing a survival rate of 71.42%, while 2 babies unfortunately passed away, accounting for a mortality rate of 1.38%.

Table 3: Grading Of Respiratory Distress in preterm neonates as per Silvermann Anderson Score

Grading	Silvermann Anderson Score	No of babies (n=95)	Percentage
Mild	<3	13	13.68
Moderate	4-6	52	54.73
Severe	≥7	30	31.57

Anderson's scoring system is used to categories newborn neonates based on the severity of their respiratory distress, which can be classified as mild, moderate, or severe. Moderate with a score of less than 3, Out of a total of 95 infants, 13 of them, which is equivalent to 13.68%, had a score below 3, suggesting minor respiratory distress. Among the majority of babies, 52 (54.73%) were classified as Moderate 4-6, indicating that their scores fell between 4 and 6. Out of the total of 30 newborns, which accounts for 31.57% of the sample, all of them scored 7 or above, suggesting a severe level of respiratory distress. This data offers valuable information regarding the intensity of respiratory distress observed in the evaluated babies. The data indicates that a considerable number of infants encountered moderate respiratory distress, but a lower percentage displayed either mild or severe distress.

Table 4: Grading Of Respiratory Distress in term neonates as per Downe Score

Grading	Downe Score	No of babies (n=49)	Percentage
Mild	<3	30	61.22
Moderate	4-6	12	24.48
Severe	≥7	07	14.28

The table displays statistics regarding the Downe scores of newborn infants, classified according to the severity of discomfort into mild, moderate, or severe levels. Out of the 49 newborns, a significant majority (30, 61.22%) had scores below 3, which indicates mild distress. A total of 12 infants, accounting for 24.48% of the sample, were classified in the moderate category, with scores ranging from 4 to 6. Out of the total number of newborns, 7 of them, which accounts for 14.28%, obtained a score of 7 or above, indicating a significant level of discomfort. Among the total number of births analyzed, 78 infants (54.16%) were born through a normal vaginal delivery. A total of 60 infants, accounting for 41.66% of all births, were delivered through Caesarean section, showing a notable proportion of deliveries necessitated surgical intervention. Only a small fraction of births, specifically 6 newborns (4.16%), were facilitated with the use of hoover extraction. Of the 144 infants in total, the majority, specifically 113 (92.36%), were released from the medical facility. Regrettably, a death rate of 21.52% was observed among 31 infants. The most common risk factor was meconium-stained amniotic fluid, observed in 16 participants (11.11%), indicating potential fetal distress or hy-

poxia. Foul-smelling liquor, likely indicative of infection, was noted in 7 participants (4.86%).

Diabetes mellitus, a significant concern due to its implications on fetal growth and the risk of complications, was present in 5 participants (3.47%). Polyhydramnios and oligohydramnios, conditions related to abnormal amniotic fluid volumes, were reported in 3 (2.08%) and 5 (3.47%) participants, respectively.

Table 5: Distribution of study participants as per APGAR at 5 min

APGAR at 5 min	Survived	Died	Total	p-value
0-3	02 (25)	06 (75)	08 (5.55)	
4-6	28 (70)	12 (30)	40 (27.77)	
>7	90 (93.75)	06 (6.25)	96 (66.66)	0.001

This very small p-value indicates that there is a statistically significant association between APGAR scores and survival outcomes. Out of the 8 newborns with Apgar scores ranging from 0 to 3, 2 (25%) survived while 6 (75%) died. Out of a total of 40 newborns with Apgar scores ranging from 4 to 6, 28 (70%) survived whereas 12 (30%) did not survive. Among a cohort of 96 infants with Apgar scores over 7, the majority, specifically 90 (93.75%) infants, survived, whereas 6 (6.25%) infants did not survive. This data demonstrates a positive correlation between Apgar scores and survival outcomes, indicating that higher Apgar scores (>7) are linked to better odds of survival.

Continuous Positive Airway Pressure (CPAP) was the most commonly used treatment, administered to 112 neonates, which represents 77.78% of the cases. Mechanical ventilation was required for 76 neonates, accounting for 52.78% of the sample, indicating a significant need for invasive respiratory support. Oxygen therapy was used in 65 cases, or 45.14% of the neonates, reflecting its role as a fundamental supportive treatment for less severe respiratory distress.

Discussion:

The present study aimed to examine the Clinical Profile of Neonates with Respiratory Distress. Out of 144 babies, 90 (68.75) were males and 54 (31.25) were females. In the study done by Haquea et al.[6], Sirageldin MK Abderlrahman et al.[7], incidence of respiratory distress were 34%, 56.5 % % respectively.

Our study shows that most newborns (62.5%) have a good weight range of 1500-2500 grammes, while 8.33% and 17.36% have low birth weights. 11.80% have a weight between 2500-3500 grammes. The studies conducted by Lureti M et al.[8] and Miller H et al.[9] also mentioned that low birth weight is a risk factor for respiratory distress among newborn baby. They also reported respiratory distress was more in male babies as compared to females.

Present study found that 56.94% of infants with respiratory distress survived, while 20 did not, resulting in 13.88% mortality. Cardiac-related distress had 2.77% survival, while central nervous system discomfort had 12.5% survival. Surgical discomfort had 6.25% survival, while 4.16% died. These statistics highlight the importance of respiratory distress in neonates and highlight the need for targeted intervention techniques to reduce mortality rates.

Survival rates of various neonatal conditions, including Transient Tachypnea of the Newborn (TTN), Congenital Pneumonia, birth asphyxia, Meconium aspiration syndrome (MAS), Congenital Heart Disease (CHD), Tracheo- oesophageal fistula, Diaphragmatic hernia, and Others. Out of 54 cases, 40 infants survived, with a survival rate of 74.07%. The mortality rate was 25.92%. All 25 newborns diagnosed with TTN survived, while 17 survived in Congenital Pneumonia cases. Birth asphyxia occurred in 8 cases, with 5 infants surviving (62.5%) and 3 not surviving (15%). The survival rate for Tracheo- oesophageal fistula was 66.66%, while Diaphragmatic hernia had a survival rate of 33.33%. The report emphasizes the need for focused interventions and medical treatment to improve outcomes. Haquea et al. [6] shows 43.2 % TTN, 25% BA, 10% CHD. Sirageldin MK Abderlrahman et al. [7] shows 28% TTN, 9% CHD.

Anderson's scoring system categorizes newborn neonates into mild, moderate, or severe respiratory distress. Out of 95 infants, 13.68% had a score below 3, while 54.73% were moderate 4-6. Out of 30 newborns, 31.57% scored 7 or above, indicating severe respiratory distress. The data helps healthcare personnel tailor therapies and treatment strategies to meet the diverse needs of neonates with respiratory problems. The result is in alignment with the study done by Sauparna H. [10]

Downe scores in our study of 49 newborn infants, categorized into mild, moderate, or severe levels. The majority (60.212%) had scores below 3, indicating mild distress. A smaller percentage (24.48%) had moderate scores. Understanding these levels can help healthcare personnel tailor interventions for neonates with respiratory issues. Similar results were obtained by Palod PH. [11] Data on newborn infant delivery methods, with 78 infants (54.16%) born through normal vaginal delivery, 41.66% through Caesarean section, and 4.16% through hoover extraction, with a significant proportion requiring surgical intervention. Keerti Swarnakar et

al. [12] were 67.6% LSCS and 32.4% vaginal delivery which was contrast of our study. According to Kommawar A. [9] the most common mode of delivery is LSCS, which was seen in the present study too. 87.16% of them were delivered by LSCS. This can also explain the high incidence of antenatal steroid coverage as antenatal steroids are recommended not only for emergent preterm deliveries but also for elective caesarian section deliveries at term. A high discharge rate of 113 newborns (92.36%), with a 21.52% death rate among 31 infants. This highlights the alarming mortality rate among newborns and suggests the need for further examination and interventions to improve newborn care outcomes. Outcome from Santhosh et al. [13] was 7.8% death and 92.2% survival.

The study reveals that 11.11% of patients had meconium-stained amniotic fluid, indicating potential labor discomfort. 4.86% had amniotic fluid with a bad odor, indicating infection. 3.47% had diabetes mellitus. Assel Mohammed Wadi et al. [14] found 19.2% of maternal illness 11.4% rupture of membranes and 19.8% meconium- stained amniotic fluid.

A positive correlation between Apgar scores and survival outcomes for newborns. Out of 8 newborns with 0-3 Apgar scores, 2 survived, while 6 died. In 96 infants with 7-9 Apgar scores, 90% survived, indicating higher scores are linked to better survival. The study observed 27% newborn have had severe respiratory distress which was less as compared to study conducted by Derek C.[15] Study also revealed max, 57.14% newborn developed severe respiratory distress had low APGAR score. Similar findings have also been reported by Lureti M et al.[8] The present research shows that Continuous Positive Airway Pressure (CPAP) was the most commonly used treatment 77.78%, mechanical ventilation was required for 76 neonates, accounting for 52.78% of the sample, indicating a significant need for invasive respiratory support. Oxygen therapy was used in 65 cases, or 45.14% of the neonates.

Conclusion

The study identified a predominance of male neonates and highlighted a significant portion of infants with low birth weights and premature births. These findings stress the need for improved prenatal care and interventions aimed at reducing preterm labor, which is closely linked to neonatal complications.

Using the Silvermann Anderson and Downe scoring systems, the study effectively categorized the severity of respiratory distress, aiding in the customization of treatment plans. The data on delivery modes revealed a high prevalence of Cesarean sections, suggesting a potential overuse that could be addressed to optimize delivery practices. The outcomes data underscored a high rate of neonate discharges but also a concerning mortality rate, highlighting the need for ongoing enhancements in neonatal care. Additionally, maternal risk factors such as meconium-stained amniotic fluid and diabetes mellitus were significant predictors of adverse outcomes, emphasizing the importance of managing these conditions to improve neonatal health.

The study demonstrates the complexities of neonatal care for those with respiratory distress and underscores the importance of comprehensive strategies that include better prenatal monitoring, accurate diagnostics, and individualized medical interventions. Addressing these areas is essential for improving survival rates and reducing complications in newborns, ultimately ensuring a healthier start to life.

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