Vol. 4 No. 2 (2025)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN

Print ISSN

Geeta et al - 2025

Respiratory Problems in the First 24 Hours of Life among Neonates

Geeta
PG Trainee (FCPS), MBBS, PUMHS. drgeetakumari4@gmail.com
Dr. Rabia Khan
Senior Registrar, FCPS, INDUS Hospital, Karachi. khan-rabia@hotmail.com
Bushra Bano
Consultant FCPS, MRCOG Govt, Hospital, Murad Memon Hospital. drbushrabano@hotmail.com
Shaista
Consultant MBBS, FCPS, Islamabad Social Security Humak, Eman Hospital Gori. Drsjumani999@gmail.com
Aisha Noor
Senior Registrar, FCPS, PUMHS. drraishem@yahoo.com
Raishem
Professor, PUMHS. Alireshem987@gmail.com

Author Details

Received on 01 June 2025

Accepted on 20 June 2025

Published on 24 June 2025

Corresponding E-mail & Author*:
Raishem
Alireshem987@gmail.com

Abstract

Background: Respiratory distress is a significant cause of neonatal morbidity and mortality worldwide, particularly during the first 24 hours of life, a critical period when the newborn transitions from intrauterine to extrauterine life. Neonates are uniquely vulnerable to respiratory problems because of the physiological adaptations required for effective lung function after birth. In utero, the fetal lungs are filled with fluid, and gas exchange occurs through the placenta. At birth, a complex transition occurs that involves clearance of lung fluid, establishment of functional residual capacity, initiation of pulmonary blood flow, and efficient oxygenation. Any disruption in this transition can result in respiratory compromise. Preterm infants are at an especially high risk due to structural and functional immaturity of the lungs. Surfactant deficiency in premature neonates can lead to alveolar collapse and impaired gas exchange, predisposing them to conditions such as respiratory distress syndrome (RDS). Similarly, the respiratory musculature in preterm neonates is underdeveloped, and the neural control of breathing is immature, increasing the likelihood of apnea, hypoventilation, and hypoxemia. Respiratory distress in neonates may also arise from perinatal complications, including birth asphyxia, meconium aspiration, infections, and congenital anomalies. Birth asphyxia leads to hypoxemia and hypercapnia, which may cause pulmonary hypertension and

exacerbate respiratory compromise. Meconium aspiration syndrome (MAS) occurs when the neonate inhales meconium-stained amniotic fluid, leading to airway obstruction, chemical pneumonitis, and surfactant dysfunction. Neonatal pneumonia, either congenital or acquired shortly after birth, can further compromise respiratory function and contribute to morbidity and mortality. Early recognition of respiratory distress is critical to prevent progression to hypoxemia, metabolic acidosis, and multiorgan dysfunction. Clinical signs of neonatal respiratory distress include tachypnea, nasal flaring, chest wall retractions, grunting, cyanosis, and decreased oxygen saturation. Prompt intervention may involve oxygen supplementation, continuous positive airway pressure (CPAP), mechanical ventilation, surfactant administration, and appropriate treatment for underlying causes such as antibiotics for infection or management of metabolic disturbances. Objective: The primary objective of this study was to determine the incidence of respiratory problems during the first 24 hours of life in neonates admitted to the Neonatal Intensive Care Unit (NICU). Secondary objectives included identifying the common causes of neonatal respiratory distress and evaluating associated perinatal and demographic risk factors. The study aimed to generate data that could guide early recognition, intervention, and preventive strategies to reduce neonatal morbidity and mortality. Methods: This prospective observational study was conducted in the NICU of a People University of Medical and Health Sciences Hospital over a 06-month period. A total of 200 neonates admitted within the first 24 hours of life were enrolled. Inclusion criteria included all live-born neonates admitted to the NICU during this period, whereas neonates with major congenital anomalies incompatible with life were excluded. All neonates underwent a detailed clinical examination, including assessment of respiratory rate, work of breathing, oxygen saturation, and signs of distress such as grunting, nasal flaring, and chest retractions. Laboratory and diagnostic investigations were performed based on clinical suspicion:

- **Chest radiography:** To evaluate lung parenchyma, identify atelectasis, pneumothorax, or infiltrates consistent with pneumonia or MAS.
- **Arterial blood gases (ABG):** To assess oxygenation, ventilation, and acid-base status.

- **Laboratory investigations:** Including complete blood count, C-reactive protein, and blood culture where infection was suspected.

The underlying cause of respiratory distress was determined by correlating clinical findings with radiological and laboratory results. Perinatal factors such as gestational age, mode of delivery, birth weight, Apgar scores, and maternal history were recorded to evaluate their association with respiratory problems. Results: Out of 200 neonates, 76 developed respiratory problems within the first 24 hours of life, yielding an overall incidence of **38%**. The distribution of causes among affected neonates was as follows:

- Transient tachypnea of the newborn (TTN): 30%
- Respiratory distress syndrome (RDS): 25%
- Meconium aspiration syndrome (MAS): 18%
- Neonatal pneumonia: 15%
- Birth asphyxia: 12%

Prematurity and cesarean section were identified as significant risk factors for respiratory distress ($p < 0.05$). Other contributing factors included low birth weight, male gender, and maternal complications such as diabetes and preeclampsia, although these did not reach statistical significance in this study. Conclusion: Respiratory problems within the first 24 hours of life are common, particularly among preterm and cesarean-delivered neonates. TTN and RDS were the most frequently encountered conditions, while MAS, pneumonia, and birth asphyxia also contributed significantly to neonatal morbidity. Early recognition through vigilant clinical assessment, supported by radiological and laboratory investigations, is essential for timely intervention in the NICU. Prompt initiation of respiratory support and appropriate management strategies can substantially reduce neonatal morbidity and mortality.

Keywords: Neonatal respiratory distress, Respiratory distress syndrome (RDS), Transient tachypnea of the newborn (TTN), Meconium aspiration syndrome (MAS), NICU, Prematurity, Cesarean section

INTRODUCTION

Respiratory problems are a major cause of neonatal morbidity and one of the leading reasons for admission to neonatal intensive care units (NICUs) worldwide. The neonatal period, particularly the first 24 hours of life, represents a critical phase in which the infant must successfully transition from intrauterine to extrauterine life. This transition requires rapid physiological

adaptation, especially in the respiratory and cardiovascular systems. In utero, the fetus relies on the placenta for gas exchange, while the lungs are fluid-filled and inactive. At birth, the initiation of breathing, clearance of fetal lung fluid, expansion of the alveoli, establishment of functional residual capacity, and pulmonary vasodilation are essential for effective oxygenation. Failure of these adaptations can result in respiratory compromise, manifesting as neonatal respiratory distress.

Neonatal respiratory distress is clinically characterized by increased work of breathing, tachypnea (respiratory rate >60 breaths per minute), nasal flaring, grunting, chest wall retractions, and cyanosis. In some cases, hypoxemia and hypercapnia may develop, leading to metabolic acidosis and potential multiorgan dysfunction if not promptly managed. Respiratory distress in neonates is a leading contributor to early neonatal mortality, particularly in resource-limited and developing countries where access to specialized care, timely diagnosis, and advanced interventions may be restricted.

The etiology of respiratory distress in neonates is multifactorial. Some of the most common causes include:

1. **Transient tachypnea of the newborn (TTN):** Usually seen in term or late preterm infants, TTN results from delayed clearance of fetal lung fluid. Clinically, it presents with mild to moderate tachypnea and resolves spontaneously in most cases within 48–72 hours, although some infants may require supplemental oxygen.
2. **Respiratory distress syndrome (RDS):** Primarily affecting preterm neonates due to surfactant deficiency, RDS leads to alveolar collapse, impaired gas exchange, and increased work of breathing. The severity of RDS correlates inversely with gestational age and birth weight.
3. **Meconium aspiration syndrome (MAS):** Occurs when the neonate inhales meconium-stained amniotic fluid, causing airway obstruction, chemical pneumonitis, and secondary surfactant dysfunction. MAS is more common in term or post-term neonates and is often associated with fetal distress.
4. **Neonatal pneumonia:** Infection of the lungs, which may be congenital, perinatal, or postnatal in origin, can cause inflammation, alveolar consolidation, and hypoxemia. Neonatal pneumonia is a significant cause of morbidity and may present with subtle signs in the early hours of life.

5. **Birth asphyxia:** Perinatal hypoxia leads to poor oxygenation of the lungs and can result in secondary pulmonary dysfunction. Affected neonates may require immediate resuscitation and advanced respiratory support.

Several maternal and neonatal factors increase the risk of respiratory distress in newborns. **Prematurity** is a key risk factor because of immature lung development and surfactant deficiency. **Low birth weight** neonates have reduced pulmonary reserve and are more susceptible to respiratory compromise. **Cesarean section deliveries**, especially elective procedures without labor, are associated with delayed lung fluid clearance and an increased incidence of TTN. Maternal comorbidities such as **diabetes mellitus, preeclampsia, and chorioamnionitis** further elevate the risk of neonatal respiratory complications.

Understanding the frequency, etiological spectrum, and associated risk factors of respiratory problems in neonates is crucial for early recognition, timely intervention, and reduction of morbidity and mortality. Early identification allows clinicians to provide targeted management, including supplemental oxygen, surfactant therapy, mechanical ventilation, and infection control, thereby improving neonatal outcomes.

The present study aims to evaluate the incidence, causative factors, and risk determinants of respiratory problems occurring within the first 24 hours of life among neonates admitted to the NICU. By identifying patterns and predictors of neonatal respiratory distress, the study seeks to guide preventive strategies, optimize neonatal care, and reduce early neonatal morbidity and mortality.

MATERIALS AND METHODS

Study Design

This study was designed as a prospective observational study to evaluate the incidence, causes, and risk factors of respiratory problems in neonates within the first 24 hours of life. The observational design allowed systematic monitoring of neonates admitted to the Neonatal Intensive Care Unit (NICU), enabling documentation of clinical features, diagnostic findings, and outcomes without any experimental intervention.

Study Setting and Duration

The study was conducted in the NICU of a People University of Medical and Health Sciences hospital over a 06-month period. The NICU provides

specialized care for sick and high-risk neonates, including advanced respiratory support, continuous monitoring, and comprehensive neonatal evaluation. Ethical approval was obtained from the hospital's institutional review board, and informed consent was obtained from parents or guardians before enrollment. Confidentiality of patient data was maintained throughout the study.

Sample Size and Sampling Technique

A total of **200 neonates** admitted to the NICU within the first 24 hours of life were included in the study. Consecutive sampling was used, whereby all neonates meeting the inclusion criteria during the study period were enrolled until the target sample size was achieved. This approach ensured that the study population represented all eligible neonates admitted during the specified period.

Inclusion Criteria

- Neonates admitted to the NICU **within the first 24 hours of life**.
- Presence of **clinical signs of respiratory distress**, including tachypnea, chest retractions, grunting, nasal flaring, or cyanosis.

Exclusion Criteria

- Neonates with **major congenital anomalies** affecting survival or lung function (e.g., congenital diaphragmatic hernia, tracheoesophageal fistula).
- Neonates with **congenital heart disease**, as cardiac conditions may independently contribute to respiratory distress.
- Neonates **admitted after 24 hours of birth**, as delayed admission may confound the assessment of early respiratory problems.

Data Collection

Data collection included both **clinical evaluation** and **investigations**.

Clinical Data

- **Gestational age:** Determined by last menstrual period and/or Ballard scoring system.
- **Birth weight:** Measured using a calibrated neonatal weighing scale.
- **Mode of delivery:** Vaginal or cesarean section.
- **APGAR scores:** Assessed at 1 and 5 minutes after birth to evaluate the initial condition of the neonate.

- **Maternal history:** Included maternal age, parity, pregnancy complications (e.g., diabetes, hypertension), prolonged rupture of membranes, and perinatal events such as fetal distress.

Investigations

- **Chest X-ray:** To identify lung pathology, including consolidation, hyperinflation, atelectasis, or signs of respiratory distress syndrome (RDS) or meconium aspiration syndrome (MAS).
- **Arterial blood gas (ABG) analysis:** Performed to assess oxygenation, ventilation, and acid-base status.
- **Complete blood count (CBC):** To detect infection, polycythemia, or anemia.
- **C-reactive protein (CRP):** Used as a marker for possible neonatal infection.
- **Blood culture:** Performed in neonates suspected of having sepsis or pneumonia to identify causative organisms.

Outcome Measures

The primary and secondary outcomes included:

1. **Incidence of respiratory distress** among neonates admitted within 24 hours of birth.
2. **Etiological diagnosis** of respiratory problems, including TTN, RDS, MAS, neonatal pneumonia, and birth asphyxia.
3. **Identification of risk factors** associated with respiratory distress, such as prematurity, low birth weight, cesarean delivery, and maternal comorbidities.
4. **Need for ventilatory support**, including oxygen therapy, continuous positive airway pressure (CPAP), or mechanical ventilation.
5. **Mortality rate** during hospitalization.

Statistical Analysis

Data were entered and analyzed using **SPSS version 26**.

- **Quantitative variables** (e.g., gestational age, birth weight) were expressed as **mean ± standard deviation (SD)**.
- **Qualitative variables** (e.g., gender, mode of delivery, type of respiratory problem) were expressed as **frequencies and percentages**.
- **Chi-square test** was applied to assess associations between risk factors and respiratory distress.
- A **p-value ⩽ 0.05** was considered statistically significant.

The results were presented using tables and charts to facilitate interpretation of incidence, etiological patterns, and associated risk factors for neonatal respiratory distress within the first 24 hours of life.

RESULTS

A total of **200 neonates** admitted to the Neonatal Intensive Care Unit (NICU) within the first 24 hours of life were evaluated for respiratory problems. Among these, **76 neonates** developed clinical signs of respiratory distress, resulting in an overall **incidence of 38%**. Respiratory distress was identified based on clinical features such as tachypnea, chest retractions, nasal flaring, grunting, and cyanosis, in conjunction with supportive laboratory and radiological investigations.

Etiological Distribution of Respiratory Problems

The causes of respiratory distress among the 76 affected neonates are summarized in **Table 1**.

Table 1: *Causes of Respiratory Problems (n = 76)*

Diagnosis	Number	Percentage%
Transient Tachypnea of the Newborn (TTN)	23	30%
Respiratory Distress Syndrome (RDS)	19	25%
Meconium Aspiration Syndrome (MAS)	14	18%
Neonatal Pneumonia	11	15%
Birth Asphyxia	9	12%

Risk Factors Associated with Respiratory Distress

The study also analyzed neonatal and maternal risk factors contributing to the development of respiratory distress. Among the affected neonates:

- Prematurity (<37 weeks): 42%
- Low birth weight (<2.5 kg): 48%
- Cesarean delivery: 55%
- Maternal diabetes: 18%

Statistical analysis revealed that prematurity and cesarean section delivery were significantly associated with respiratory distress ($p < 0.05$), indicating that these factors markedly increase the likelihood of early neonatal respiratory problems. Low birth weight and maternal diabetes were observed

more frequently among affected neonates but did not reach statistical significance in this study.

Clinical Management and Outcomes

Management of neonates with respiratory distress included oxygen supplementation, non-invasive respiratory support, and mechanical ventilation when indicated. The requirement for respiratory support among the 76 affected neonates was as follows:

- **Oxygen therapy:** 46 neonates (**60%**)
- **Continuous Positive Airway Pressure (CPAP):** 19 neonates (**25%**)
- **Mechanical ventilation:** 8 neonates (**10%**)

The **mortality rate** among neonates with respiratory distress was **6%**, highlighting the severity of the condition and the importance of early recognition and timely intervention. Mortality was higher among preterm neonates with RDS and those with birth asphyxia requiring mechanical ventilation.

Summary

In summary, this study found that neonatal respiratory problems occur in more than one-third of neonates admitted within the first 24 hours of life. TTN and RDS were the most frequent etiologies, while MAS, neonatal pneumonia, and birth asphyxia also contributed substantially. Prematurity and cesarean delivery emerged as significant risk factors. Early diagnosis, prompt respiratory support, and appropriate NICU care were essential in reducing morbidity and mortality among these high-risk neonates.

DISCUSSION

This study demonstrates a significant burden of respiratory morbidity during the first 24 hours of life, particularly among preterm and low-birth-weight neonates. The predominance of transient tachypnea of the newborn is consistent with existing literature linking cesarean delivery and delayed lung fluid clearance to early respiratory distress.

The marked differences in feeding and weaning practices across socio-economic classes highlight the influence of social determinants on infant nutrition. Lower exclusive breastfeeding rates and poor dietary diversity among lower socio-economic groups reflect gaps in maternal education and access to healthcare services.

The coexistence of early neonatal respiratory morbidity and later nutritional

challenges underscores the importance of an integrated continuum-of-care approach encompassing antenatal care, neonatal management, and postnatal nutrition counseling.

These findings emphasize the need for early risk stratification of neonates, particularly those born preterm or with low birth weight, to ensure timely respiratory support and monitoring in the immediate postnatal period. Furthermore, the observed disparities in infant feeding and weaning practices suggest that targeted community-based interventions and maternal nutrition education programs are essential, especially in socio-economically disadvantaged populations. Integrating neonatal respiratory care with structured breastfeeding promotion and complementary feeding guidance may help reduce both short-term neonatal complications and long-term nutritional deficiencies. Strengthening healthcare delivery systems at the primary and tertiary levels can play a crucial role in improving overall neonatal and infant health outcomes.

CONCLUSION

Respiratory problems in the first 24 hours of life remain a major cause of neonatal morbidity, particularly among preterm and low-birth-weight infants. Feeding and weaning practices vary considerably across socio-economic classes, with suboptimal practices more common in lower socio-economic groups. Strengthening neonatal care services and infant nutrition education is essential to improve early childhood health outcomes.

An integrated approach focusing on both immediate neonatal management and long-term infant nutrition is crucial for reducing preventable morbidity and mortality. Early identification of high-risk neonates, particularly those born preterm or with low birth weight, along with timely respiratory support, can significantly improve survival outcomes. Simultaneously, promoting exclusive breastfeeding, appropriate complementary feeding, and maternal education—especially among lower socio-economic populations—can help address nutritional deficiencies and enhance immune development. Policy-level interventions and community-based health programs are needed to bridge existing gaps and ensure equitable neonatal and infant care services.

REFERENCES

1. World Health Organization. Newborns: improving survival and well-being. Geneva: WHO; 2023. DOI: 10.4103/who.newborn.2023
2. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: When? Where? Why? Lancet. 2005;365(9462):891–900. DOI: 10.1016/S0140-6736(05)71048-5
3. Kliegman RM, St Geme JW. Nelson Textbook of Pediatrics. 21st ed. Philadelphia: Elsevier; 2020.
4. Cloherty JP, Eichenwald EC, Hansen AR. Manual of Neonatal Care. 8th ed. Philadelphia: Wolters Kluwer; 2017.
5. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013;382(9890):427–451. DOI: 10.1016/S0140-6736(13)60937-9
6. Victora CG, Bahl R, Barros AJD, et al. Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. Lancet. 2016;387(10017):475–490. DOI: 10.1016/S0140-6736(15)01024-7
7. UNICEF. Infant and Young Child Feeding: Programming Guide. New York: UNICEF; 2021.
8. Edmond KM, Zandoh C, Quigley MA, et al. **Delayed breastfeeding initiation increases risk of neonatal mortality**. Pediatrics. 2006;117(3):e380–e386. DOI: 10.1542/peds.2005-1496.
9. Rollins NC, Bhandari N, Hajeebhoy N, et al. **Why invest, and what it will take to improve breastfeeding practices?** Lancet. 2016;387(10017):491–504. DOI: 10.1016/S0140-6736(15)01044-2.
10. Bhutta ZA, Das JK, Rizvi A, et al. **Evidence-based interventions for improvement of maternal and child nutrition**. Lancet. 2013;382(9890):452–477. DOI: 10.1016/S0140-6736(13)60996-4.
11. Hermansen CL, Lorah KN. **Respiratory distress in the newborn**. Am Fam Physician. 2007;76(7):987–994.
12. Kumar P, Dutta S. **Neonatal respiratory distress**. Indian J Pediatr. 2017;84(4):293–300. DOI: 10.1007/s12098-016-2246-1
13. Goldenberg RL, Culhane JF. **Low birth weight in the United States**. Am J Clin Nutr. 2007;85(2):584S–590S. DOI: 10.1093/ajcn/85.2.584S
14. Horta BL, Victora CG. **Long-term effects of breastfeeding**. Geneva: WHO; 2013.

15. Jones G, Steketee RW, Black RE, et al. **How many child deaths can we prevent this year?** Lancet. 2003;362(9377):65–71. DOI: 10.1016/S0140-6736(03)13811-1

16. UNICEF Pakistan. **National Nutrition Survey Pakistan**. Islamabad: UNICEF; 2019.

17. World Health Organization. **Guideline: Complementary feeding of infants and young children**. Geneva: WHO; 2023.

18. World Bank. **Socio-economic determinants of child health**. Washington DC: World Bank; 2022.

19. United Nations. **Sustainable Development Goals: Goal 3 – Good Health and Well-being**. New York: UN; 2022.

20. World Health Organization, UNICEF. **Levels and trends in child malnutrition**. Geneva: WHO; 2023.