

## DIFFERENTIAL AND THERAPEUTIC ASPECTS OF RESPIRATORY DISORDERS IN THE NEWBORN

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*Jenyfer da Costa Andrade*

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/2234029687504013>

*Laise Andrade Oliveira*

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/1908492080665499>

*Zuleide Barros Luna Gomes*

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/7931917708204756>

*Gabrielle Barbosa Lima de Andrade*

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/0597655590159730>

*Mylenne Bomfim Souza*

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/1481564329417300>

*Anelise Marques Feitosa de Souza*

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/1020645842053237>

*Lara Letycia Araujo Costa*

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/8734919331174914>

*Millena Mesquita Costa Vasconcelos*

Universidade Federal de Sergipe, Aracaju

<http://lattes.cnpq.br/0756667049145431>

*Malu Rissi*

Universidade Tiradentes, Aracaju

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**Lara Victória Menezes Elias Mota**

Universidade Tiradentes, Aracaju

**Andreane Meneses Andrade**

Universidade Federal de Sergipe, Aracaju

**Summer Santana Linhares**

Universidade Tiradentes, Aracaju

**Abstract: Introduction:** Respiratory problems are the most common cause of admission to neonatal intensive care units (NICU). In this scenario, medical accuracy in recognizing differential aspects of respiratory disorders in newborns is extremely important, mainly because they present, among themselves, different degrees of morbidity and mortality and demand specific therapies. This article, therefore, aims to clarify these aspects in order to encourage the most appropriate diagnosis and treatment for this age group. **Methodology:** This article is a bibliographic review with a descriptive character. Data collection was carried out from January to May 2022, where scientific articles from the SCIELO, Google Scholar and LILACS system were searched. In all, 12 articles were fully sufficient to elucidate the topic. **Results:** The etiopathogenesis, clinical picture, diagnosis, differential diagnosis and therapy were discussed regarding meconium aspiration syndrome, transient tachypnea of the newborn and neonatal sepsis. **Conclusions:** For transient tachypnea, identification of hilar congestion and cisural fluid may be helpful. For RDS and neonatal sepsis, however, the reticulogranular infiltrate is common to both. In this case, the blood count and systemic manifestations are useful for differentiation. Therefore, the greatest strategy is linked to the clinical history - identifying important points in the history, such as maternal and gestational health status, in addition to gestational age -, and to the physical examination - since some disorders manifest themselves in a milder way than others.

**Keywords:** Respiratory disorders in the newborn. Respiratory distress syndrome. Meconium aspiration syndrome. Transient tachypnea of the newborn. Neonatal sepsis.

## **INTRODUCTION**

Respiratory problems are the most common cause of admission to neonatal intensive care units (NICU). Many factors, including prematurity, gender, mode of delivery and genetic predisposition, are involved in the etiology of this problem. The causes of respiratory disorders result from the inability of the neonatal lung to adapt to the new environment. The last weeks of pregnancy prepare the fetus for the transition to extrauterine life. Thus, the immaturity of the pulmonary structure present before term may be associated with delayed intrapulmonary fluid absorption, surfactant insufficiency and gas exchange deficiency. In addition, during the last six weeks of pregnancy, the fetus begins to develop synchrony and control over breathing, leading to an increased risk of apnea of prematurity at birth before this maturation (PEREIRA et al, 2020).

Preterm birth is characterized by the birth of the conceptus with a gestational age of less than 37 weeks and corresponds to approximately 20 million births worldwide. Currently, improvements and advances in care for high-risk pregnant women and in neonatal treatment have reduced the mortality of high-risk preterm infants, especially those with low birth weight, especially due to the use of exogenous substances similar to those produced by the human body, mechanical ventilation and the development and professional improvement of lung stimulation techniques, which are important in increasing the survival rates of those with respiratory deficiency (PRIGENZI et al., 2008; ANDREANI, CUSTODIO & CREPALDI, 2006).

In this scenario, medical accuracy in recognizing differential aspects of respiratory disorders in newborns is extremely important, mainly because they present, among themselves, different degrees of morbidity and mortality and demand

specific therapies. This article, therefore, aims to clarify these aspects in order to encourage the most appropriate diagnosis and treatment for this age group.

## **METHODOLOGY**

This article is a bibliographic review with a descriptive character. Data collection was carried out from January to May 2022, where scientific articles from the SCIELO, Google Scholar and LILACS system were searched. The following descriptors were used for the research: respiratory disorders in the newborn, respiratory distress syndrome, meconium aspiration syndrome, transient tachypnea of the newborn, neonatal sepsis. For the choice of this theme, some inclusion and exclusion criteria were established. Inclusion criteria were articles published between the years 2019 to 2022, where the full text was available, without language determination. Articles published before the year 2000 and those that did not contribute to differential diagnosis and/or treatment were used as exclusion criteria. In all, 12 articles were fully sufficient to elucidate the topic.

## **RESULTS**

### **HYALINE MEMBRANE DISEASE OR RESPIRATORY DISTRESS SYNDROME**

Respiratory Distress Syndrome (RDS) in newborns is a respiratory disorder caused by a decrease in the concentration of alveolar surfactant (a lipoprotein mixture produced by cells in the wall of the alveoli from 24 weeks onwards), which leads to an increase in surface tension in the alveolar air-liquid interface, causing less stability of the alveolus, with conclusion in its collapse at the end of expiration.

This causes progressive atelectasis with consequent hypoxemia and pulmonary hypoperfusion, triggering injury to the alveolar

epithelium, increased capillary permeability, interstitial edema and transudation of plasma or blood into the alveolar spaces, resulting in the so-called hyaline membrane (MULLER et al, 2000).

For differential diagnosis, it is important to identify prematurity (surfactant reaches sufficient values from 34 weeks on average), sex (male children tend to have greater pulmonary immaturity at the same gestational age as female children), maternal comorbidities (cortisol and insulin in maternal diabetes interfere with fetal lung maturity), among others.

In addition, the child will be clinically tachypneic (respiratory rate equal to or greater than 60 breaths per minute) and with signs of respiratory distress (such as chest indrawing, suprasternal beat and/or nasal fins). The radiograph (figure 1) is nonspecific and may show a pattern common to other

respiratory disorders. Radiographic findings, when present, are related to a diffuse ground-glass reticulogranular pattern and reduced lung volume. Among the complications, there may be air leaks, pulmonary infection, pulmonary hemorrhage, intracranial hemorrhage, bronchopulmonary dysplasia and/or retinopathy of prematurity.

The therapy, therefore, is in charge of oxygen support for alveolar stabilization, usually with maintenance of positive pressure by CPAP. Intubation with mechanical ventilation and surfactant administration is an option in children who are refractory to conservative treatment or at higher risk. Antibiotic therapy is reserved for cases of higher infectious risk, and ampicillin and gentamicin are good initial options. Corticosteroid administration, in this case, has prophylactic utility, and must be indicated in the antenatal period in the prediction of

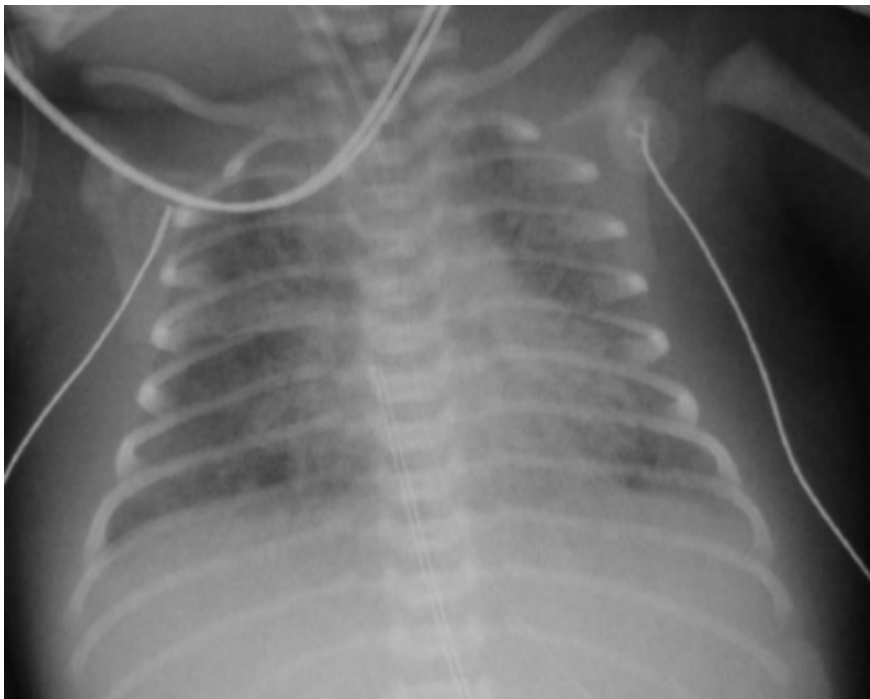


Figure 1. Newborn chest X-ray showing diffuse reticulogranular pattern, air bronchograms, decreased lung volume, “ground glass” or “ground glass” image.

Source: Sanarmed (2020).

preterm labor to accelerate fetal respiratory maturation.

### PNEUMONIA OR NEONATAL SEPSIS

Sepsis is one of the main causes of morbidity and mortality in the neonatal period. The incidence varies from 1 to 8 cases per 1,000 live births, and in preterm newborns weighing less than 1,500 grams, the incidence of sepsis confirmed by positive culture is between 11% and 25% (PROCIANOY, 2011).

It can manifest early (first 48 hours of life) or late (after the first week). In the first case, there is a relationship with ascending or intrapartum infections, such as bacterial aspiration of the birth canal. Therefore, germs of the female genital tract are considered as the main causes, among them: group B and Gram negative enteric streptococci, such as *Escherichia coli*. In the second, it is usually a community-acquired infection

after discharge, or nosocomial during hospitalization. Among the germs, the most found are various staphylococci, Gram negative and fungi (in more specific cases of prolonged hospitalization and with invasive devices).

For differential diagnosis, reports of prolonged rupture of membranes (greater than 18 hours), maternal colonization by pathogenic germs, prematurity and/or chorioamnionitis (maternal fever, maternal or fetal tachycardia, uterine pain and foul-smelling amniotic fluid) must be sought.

In addition, the clinical picture may have an asymptomatic onset. Unlike RDS, respiratory distress is more insidious and can take days to appear. On the other hand, it is also associated with systemic manifestations, such as changes in alertness, pulse/perfusion, inappetence, vomiting, abdominal cramps, fever or hypothermia. The radiograph (Figure 2) is also nonspecific and very similar to RDS

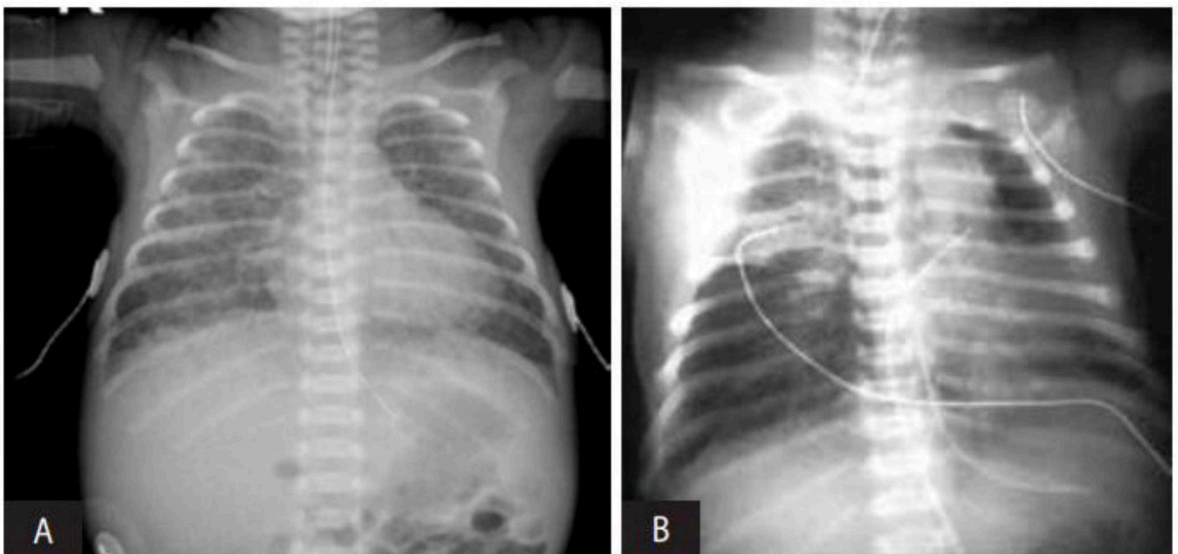


Figure 2. Radiograph A of a premature newborn with respiratory failure and a history of chorioamnionitis with infiltrates and signs of pulmonary consolidation. B-radiography of late preterm NB with acute septic condition presenting with lobar consolidations.

Source: Newborn Health Care (Ministry of Health).

in the presence of a reticulogranular infiltrate. Due to the presence of systemic disease, neutropenia may present with immature neutrophils on the blood count, in addition to positive cultures in late infections. The Rodwell hematological score must also be applied and the assessment of C-reactive protein must be taken into account.

The treatment, therefore, is more specific. It requires the use of antibiotic therapy, with ampicillin with gentamicin being a first option in early cases and, in late cases, the best indication will depend on the profile of local antimicrobial resistance – usually guided by culture with a sensitivity test.

### **TRANSIENT TACHYPNEA OF THE NEWBORN OR WET LUNG SYNDROME**

Wet lung syndrome is a newborn's difficulty in breathing for a certain time due to the large amount of fluid in the lungs. This condition leads to low blood oxygenation,

whose organic response is the mechanism of tachypnea. This condition usually has a benign evolution as the body absorbs this pulmonary fluid.

For differential diagnosis, a history of elective cesarean section, absence of labor, preterm newborn or, unlike most other respiratory conditions, full-term newborn can be identified.

The clinical picture is mild or moderate respiratory distress, hardly severe, with transient tachypnea that resolves quickly in less than 1 week. The radiograph (Figure 3) shows hilar congestion, increased vascular tissue, cisural fluid, effusion, cardiomegaly, hyperinflation, among others.

Treatment, like SDR, is supportive. Oxygen therapy at less than 40% FiO<sub>2</sub> may be helpful in maintaining adequate oxygenation. There is no need for diuretics or other specific treatments, as long as there is an accurate diagnosis and effective observational management.



Figure 3. Chest X-ray of a newborn showing increased vascular design, congested hilum, fluid in the fissure; sometimes pleural effusion.

Source: Sanarmed (2020).

## MECONIUM ASPIRATION SYNDROME

Meconium is a greenish material, composed of liquid, tissue residues and fetal hair, in addition to mucus and salts, and can be present in the amniotic fluid from the 10th week of gestation. Physiologically, the anal sphincter of the fetus during intrauterine life is contracted, preventing the elimination of meconium before birth. However, meconium can be released into the amniotic fluid by stress and, in some cases, the fetus can aspirate this substance (HERNANDEZ et al, 2013). This occurs even trachea during intrauterine life and even lung parenchyma during neonatal life. Meconium Aspiration Syndrome (MAS) is characterized by expiratory blockage and pneumonitis caused by this situation.

In this case, the differential diagnosis is more accurate. The newborn is usually born bathed in meconium amniotic fluid, in addition to corresponding to a history of fetal distress. It can also occur in term or even post-term newborns – see the relationship with fetal distress and sphincter relaxation.

The lack of prenatal or perinatal care increases the chances of deaths caused by MAS, with greater possibilities of occurring

in developing countries (RODRIGUES and BELHAM, 2017).

MAS can lead to respiratory failure and is considered a serious pathology with high levels of mortality. The clinical picture is one of severe respiratory distress – severe tachypnea with obvious signs of respiratory effort, as well as poor perfusion. Radiographs (Figure 4) usually reveal gross alveolar infiltrate, pneumothorax, and increased lung volume.

For treatment, ventilatory support is essential and usually occurs via mechanical ventilation. Antibiotic therapy can be associated in suspected superimposed bacterial infection, in addition to surfactant in specific cases. In some cases of depressed newborns in the delivery room shortly after birth, mouth and nostril suctioning may be sufficient.

## CONCLUSIONS

The differential and therapeutic aspects of respiratory disorders in newborns have an important impact on the morbidity and mortality of this group. After all, this is a syndrome often experienced by professionals, patients and family members in the hospital

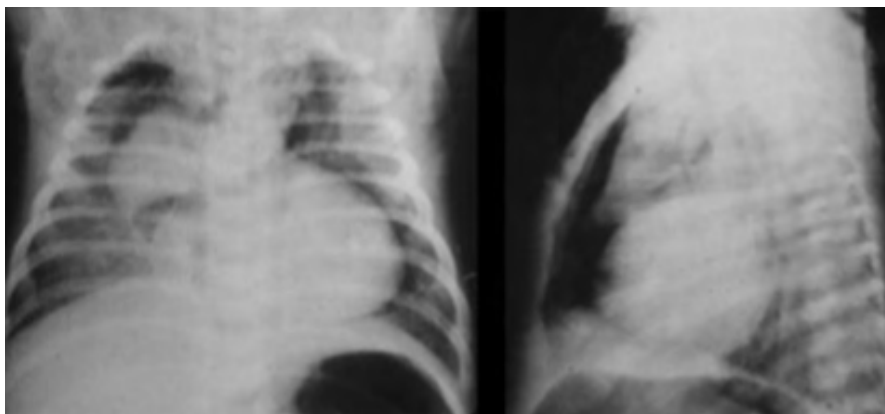


Figure 4. Two-view newborn chest X-ray showing hyperinflation, bilateral gross condensations.

Source: Sanarmed (2020).

system, both in the maternity ward and in the neonatal intensive care unit.

Among differential aspects, it is valid to recognize the nonspecificity of radiography in most cases. For transient tachypnea, identification of hilar congestion and cisural fluid may be helpful. For RDS and neonatal sepsis, however, the reticulogranular infiltrate is common to both. In this case, the blood count and systemic manifestations are useful for differentiation. Therefore, the greatest strategy is linked to the clinical history - identifying important points in the

history, such as maternal and gestational health status, in addition to gestational age -, and to the physical examination - since some disorders manifest themselves in a milder way than others.

Early diagnosis is the best tactic for initiating adequate and timely therapy to reduce morbidity and mortality in any health sector. In neonatology, this expertise reduces length of stay in Intensive Care Units and promotes more favorable outcomes for the discharge of these patients.

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