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# THE IMPORTANCE OF GESTATIONAL AGE IN THE COURSE OF RESPIRATORY DISTRESS SYNDROME IN NEWBORNS

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## Abstract

The article examines the influence of gestational age on the clinical course of respiratory distress syndrome (RDS) in newborns. A comparative analysis of the frequency, severity and outcomes of RDS in children born at different gestational ages is conducted. A pronounced relationship between the level of lung maturity and the nature of the disease is established, which emphasizes the need for an individual approach to providing neonatal care.

**Keywords:** respiratory distress syndrome, newborns, gestational age, prematurity, pulmonary maturity, surfactant, respiratory failure.

## Introduction

Respiratory distress syndrome (RDS) is one of the most common and severe conditions in newborns, especially premature babies. The main pathogenetic mechanism of RDS is considered to be a deficiency of surfactant, a complex of lipoproteins produced by type II alveolocytes and ensuring the stability of the alveoli during the respiratory cycle. When it is insufficient, the alveoli collapse, which leads to impaired gas exchange, hypoxia and acidosis[1].

The highest incidence of RDS is observed in children born at a gestation period of less than 34 weeks, since it is during this period that active maturation of lung



tissue and formation of the surfactant system occurs. At the same time, even full-term newborns can suffer from RDS in the presence of intrauterine hypoxia, cesarean section without labor stimulation, diabetes mellitus in the mother and other risk factors[2].

Early recognition of RDS symptoms such as tachypnea, grunting exhalation, chest retractions, cyanosis is critical for timely initiation of therapy. The leading methods of treating RDS are: exogenous surfactant therapy, respiratory support (CPAP, mechanical ventilation), thermoregulation, and infection prevention[5].

Given the high prevalence of RDS among premature infants and the severity of its course, especially in conditions of low gestational age, it is important to determine a clear relationship between the gestational age and clinical manifestations of the disease. This will optimize approaches to the prevention, early diagnosis and treatment of RDS in newborns[3,4].

The aim of this study is to assess the role of gestational age in the development, clinical course and outcomes of respiratory distress syndrome in newborns[6,8].

## **Materials and Methods**

This prospective clinical study was conducted at the neonatal intensive care unit of the Republican Specialized Scientific and Practical Medical Center of Pediatrics from January 2022 to December 2024. The main objective of the study was to investigate the effect of gestational age on the course of respiratory distress syndrome (RDS) in newborns.

The study included 90 newborns with clinically and radiologically confirmed diagnosis of RDS, born without congenital malformations, genetic syndromes and severe intrauterine infections. Patients were divided into three groups depending on gestational age:

- **Group I - very premature** (28–31 weeks of gestation) – 30 newborns
- **Group II - moderately premature** (32–36 weeks of gestation) – 30 newborns
- **Group III - full-term newborns** ( $\geq 37$  weeks of gestation) - 30 newborns

The diagnosis of RDS was established on the basis of clinical symptoms (tachypnea, expiratory groan, chest retractions, cyanosis), laboratory data



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(hypoxemia, respiratory acidosis) and radiological signs (“ground glass”, hypoaeration, decreased pneumatization).

A standardized assessment was performed for all patients:

- 1) Time of onset of RDS symptoms after birth
- 2) The need and frequency of administration of exogenous surfactant
- 3) Type and duration of respiratory support (CPAP, mechanical ventilation)
- 4) Length of stay in intensive care unit
- 5) Disease outcome (recovery, complications, mortality)
- 6) Associated conditions: perinatal hypoxia, infectious complications, hypoglycemia, etc.

Additionally, perinatal factors were assessed: method of delivery, presence of premature rupture of membranes, antenatal prophylaxis (administration of glucocorticoids), birth weight, and Apgar score.

Statistical data processing was performed using SPSS 26.0 software. Descriptive statistics methods (mean value, standard deviation) were used to analyze quantitative data, and Student's t-test and  $\chi^2$  were used to compare groups. Differences were considered statistically significant at  $p < 0.05$ .

## **Results**

Analysis of the obtained data demonstrated a pronounced relationship between the gestational age of newborns and the severity of respiratory distress syndrome (RDS).

Group I - very premature (28-31 weeks).

- All patients (100%) developed RDS symptoms within the first hour of life.
- Intubation and administration of exogenous surfactant were required in 100% of cases. In 63% of children, surfactant was administered repeatedly.
- The duration of artificial ventilation (ALV) averaged  $7.2 \pm 2.1$  days.
- Average length of stay in the ICU is  $17.5 \pm 3.4$  days.
- Mortality was 30% (9 out of 30 newborns), mainly due to severe respiratory failure and sepsis.

Group II - moderately preterm (32-36 weeks)

- Symptoms of RDS appeared within the first 3-6 hours of life in 87% of children.



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- Surfactant was administered in 73% of cases, with only 18% requiring a second administration.
  - Mechanical ventilation was performed in 60% of patients, for an average of  $3.8 \pm 1.9$  days; the rest were given CPAP.
  - The average duration of hospitalization in the ICU is  $11.3 \pm 2.7$  days.
  - Mortality rate: 10% (3 out of 30), causes: complicated RDS, pneumonia.
- Group III - full-term ( $\geq 37$  weeks)
- In 30% of children, symptoms appeared in the first 12–24 hours of life, mostly in a mild form.
  - CPAP was used in 30%, surfactant administration was required in only 20% of cases.
  - Mechanical ventilation was required in only 3 (10%) newborns, lasting no more than 2 days.
  - Average duration of hospitalization is  $5.6 \pm 1.4$  days.
  - No fatalities were recorded.

#### **Comparative analysis**

- The average level of oxygen saturation during therapy reached normal values more quickly in groups II and III ( $p < 0.01$ ).
- The number of days on respiratory support statistically significantly decreased with increasing gestational age ( $p < 0.001$ ).
- The level of complications (pneumothorax, bronchopulmonary dysplasia) was highest in group I (40%), compared with group II (13%) and III (0%) ( $p < 0.05$ ).

#### **Discussion**

The obtained results demonstrate a pronounced dependence of the severity of the respiratory distress syndrome (RDS) on the gestational age of the newborn. The most severe clinical course, high need for respiratory support and surfactant therapy, as well as the highest mortality rate were noted among very premature infants (28–31 weeks). This corresponds to modern concepts of the immaturity of the surfactant system of the lungs in newborns with low gestational age[7].

The data are consistent with studies from leading neonatology centers, which emphasize that birth before 32 weeks of gestation is accompanied by a 70–100%



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risk of developing RDS, especially in the absence of antenatal glucocorticoid prophylaxis (Van Marter et al., 2020; Sweet et al., 2022). At the same time, the effectiveness of exogenous surfactant therapy and ventilation support is closely related to the rate of maturation of lung tissue[9].

In the moderately preterm group (32–36 weeks), the clinical course of RDS was less severe, which may be due to the partial formation of the surfactant system. However, these children still have a high risk of complications, especially in the presence of perinatal risk factors such as hypoxia, cesarean section, and diabetes mellitus in the mother[10].

In full-term infants ( $\geq 37$  weeks), the course of RDS is often transient. In these infants, RDS is often associated with "wet lung syndrome" (transient tachypnea of the newborn - TTN), maladaptation, or late resorption of fluid from the alveoli. The need for intensive care is significantly lower, and the prognosis is usually favorable.

Thus, gestational age can be considered not only as a risk factor for the development of RDS, but also as an important prognostic criterion for choosing patient management tactics. The study emphasizes the need for antenatal prophylaxis in women at risk of premature birth, timely diagnosis and early initiation of therapy in premature infants. In addition, the data obtained can be used to individualize neonatal care depending on the maturity of the newborn.

## **Conclusion**

The lower the gestational age, the higher the risk of developing severe RDS. Gestational age determines the strategy for managing the newborn and the choice of respiratory support methods. The prognosis of the disease directly depends on the degree of maturity of the lung tissue. An individualized approach to the treatment of RDS helps to reduce mortality and improve outcomes.

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