

# Risk Factors Of Pulmonary Respiratory Disorder Syndrome In Newborns

**Ozoda A. Mirzabekova;**  
Advanced training of doctors  
Senior Lecturer of the Department, Ph.D.  
Tashkent, Uzbekistan  
mail: [mirzabekovao76@gmail.com](mailto:mirzabekovao76@gmail.com)

## Resume

In this article, the frequency and differences of risk factors for respiratory distress syndrome developing in the lungs of premature and full-term newborns were studied. As material, during the period 2017-2021, in the Department of Pediatric Pathology of the Republican Specialized Scientific and Practical Medical Center of Pediatric Anatomy, risk factors were studied according to the clinical and anamnestic analysis of the mother in cases of autopsy and detection of hyaline membrane in the lungs. The results showed that in most cases, asphyxia is a risk factor for the development of hyaline membranes in the lungs of premature infants - 74.5%, aspiration of amniotic fluid - 43.6%, and acute labor - 45.5%. As the main risk factor for the formation of hyaline membranes in the lungs of full-term newborns, the incidence of infection in the fetus during the prenatal period was 69.6%, and diabetes mellitus 59.3%. In full-term newborns, the following risk factors were identified: acute labor (43.7%), congenital heart defects (40.6%), pulmonary hypertension (34.3%).

**Keywords:** newborn, premature birth, full birth, lungs, pulmonary respiratory disorder, hyaline membrane, risk factors.

**Relevance of the problem.** The terms "respiratory disorder syndrome," "respiratory distress syndrome," and "hyaline membrane disease" are synonyms (1, 2). Clinically and morphologically, these syndromes manifest as primary atelectasis of newborns, hyaline membranes, aspiration syndrome, edematous-hemorrhagic syndrome, and their clinical differential diagnosis is a very difficult task. The frequency of these respiratory disorders depends on the gestational age of the newborns. The shorter the gestational age, the higher the risk of developing these diseases. Modern technologies of IVL in neonatology and the use of exogenous surfactant have reduced the infant mortality rate. Nevertheless, respiratory disorders remain the main cause of early neonatal mortality. One manifestation of respiratory distress syndrome is hyaline membranes, which develop due to underdevelopment of the lungs, insufficiency of surfactant in the alveoli (3, 4). In the pathogenesis of GM - acidosis and hypoxia narrow the pulmonary arteries, swell the walls of the alveoli, inhibit, and even stop the synthesis of surfactant. Arterial spasm increases blood pressure in the pulmonary vessels, blood begins to flow from right to left, as a result of which the walls of the pulmonary capillaries are hypoxemically damaged, blood and plasma are released into the tissue, fibrin precipitates, and HM appears. Under the influence of chronic hypoxia of the fetus or newborn, the differentiation of surfactant-synthesizing II-pneumocytes slows down and the formation of GM accelerates (5, 6, 7). With hypertension in pregnant women, fetal growth slows down, as a result of which the lungs remain immature, surfactant is produced less, and GM appears. In fact, surfactant begins to be synthesized in the ventricle at 23 weeks of life and reaches its maximum by 36 weeks. The appearance of the hyaline membrane is also associated with the inflammation of lung tissue, i.e., the appearance of HM limits the inflammatory process. The later the infection enters the lung tissue, the more likely it is to cause GM production due to disruption of surfactant production when alveolocytes are desquamated.

**Materials and methods.** As material, the autopsy report, medical history, and lung tissue of children examined in the Department of Pediatric and Maternal Pathology of the Republican Specialized Scientific and Practical Medical Center of the Ministry of Health of the Republic of Uzbekistan for the last 5 years were studied. A total of 87 cases of infant death were examined, of which 32 were full-term and 55 were premature. In each case, clinical and anamnestic data from the mother's medical history were studied, and risk factors contributing to the development of atelectasis in the child were analyzed.

**Research results and their discussion.** In the study of risk factors for the development of hyaline membranes, we analyzed 2 groups in our material separately, i.e., the group of premature and full-term infants. The number of premature infants was 55, of which asphyxia of various types was identified as the main risk factor in 41.5% of cases. Subsequently, hyaline was a risk factor of the membranes, with amniotic fluid aspiration accounting for 43.6%, and the intensive labor process for 45.5%. As a result of aspiration of amniotic fluid, the formation of hyaline membranes is observed due to the entry of various protein substances into the respiratory tract and alveolar cavity and the development of asphyxia in the alveolar tissue. As a result of diabetes mellitus in the mother's body, metabolic disorders also occur in the fetus's body, including hyaline membrane formation due to high plasma protein content in surfactant produced in the alveolar cavity. In our material, maternal diabetes mellitus was identified as a risk factor in 41.8% of cases.

It is known that the state of arterial hypertension in the body of a pregnant woman slows down fetal growth, almost all internal organs, including the respiratory system, are underdeveloped, due to the fact that type II surfactant-producing alveolocytes cannot fully perform their function, surfactant is produced less, and due to the excessive release of plasma proteins in the alveolar lumen, GM is formed. In our material, arterial hypertension of the maternal organism was detected in 38.2% and was assessed as a risk factor for the formation of hyaline membranes. Infection of the fetus during pregnancy, especially under the influence of Gr+ infections, including mycoplasma, inhibits the production of surfactant, creating an environment of metabolic acidosis in lung tissue, resulting in plasminogen deficiency, fibrinolysis, and the formation of hyaline membranes in the incomplete structure of surfactant, together with phospholipids and plasma proteins. In our material, intrauterine infection of the fetus was assessed as a risk factor for hyaline membrane formation in 34.5% of cases.

Table 1

*Frequency of occurrence of risk factors of the hyaline membrane of the lungs in groups of premature and full-term newborns, in number and %*

No	Hazardous factors	Premature birth		Mature birth		total	
		number	%	number	%	number	%
1.	Asphyxia	41.	74.5*	12.	37.5*	53.	60.9
2.	Amniotic fluid aspiration	24.	43.6*	9.	28.1*	33.	37.9
3.	Pulmonary hypertension	21.	38.2*	11.	34.3*	33.	37.9
4.	Heart defects	17.	30.9*	13.	40.6***	30.	34.5
5.	Intense labour	25.	45.5**	14.	43.7***	39.	44.8
6.	Maternal diabetes mellitus	23.	41.8**	19.	59.3***	42.	48.2
7.	Infection during intrauterine period	19.	34.5**	21.	65.6***	40.	45.9
	Total	55.	100.	32.	100.	87.	100.

Appendix: \* -  $p \leq 0.05$ ; \*\* -  $p \leq 0.01$ ; \*\*\* -  $p \leq 0.001$

Our next analysis, when studying the risk factors leading to this "acute respiratory distress syndrome" in newborns who died after the appearance of hyaline membranes in their lungs, obtained the following data. Among the risk factors for the formation of hyaline membranes in premature infants, asphyxia, aspiration with amniotic fluid, intrauterine infection, and pulmonary hypertension were noted as high risk factors, while among the risk factors leading to the formation of hyaline membranes in full-term newborns, intrauterine infection, maternal diabetes mellitus, rapid labor, and heart defects had relatively high rates. Even if the newborn is born full-term and has been infected with a Gr+ infection during the prenatal period, the production of surfactant is inhibited, an environment of metabolic acidosis arises in the lung tissue, as a result of which plasminogen deficiency occurs, fibrinolysis occurs, and hyaline membranes combine with incomplete surfactant, phospholipids, and plasma proteins. In our material, the formation of hyaline membranes in full-term newborns, infection of the fetus during the prenatal period, was assessed as a risk factor for the formation of hyaline membranes in 69.6% of cases. The second place was taken by diabetes mellitus in the mother's body and amounted to 59.3%. The following places are occupied by acute labor (43.7%), congenital heart defects (40.6%), pulmonary hypertension (34.3%) (Table 1).

When combining the data of both groups in our material and analyzing the average indicators, the following results were obtained. The highest rate was occupied by the process of asphyxia, which averaged 60.9%. The next, relatively high indicator was diabetes mellitus in the mother's body (48.3%), infection during the prenatal period (45.9%), and intensive labor (44.8%) (Table 1). Amniotic fluid aspiration (37.9%), pulmonary hypertension (37.9%) and congenital heart defects in newborns (34.5%) had relatively low rates.

### **Conclusion**

It was established that asphyxia in 74.5%, aspiration of amniotic fluid in 43.6%, and intensive labor in 45.5% of cases are risk factors for the development of hyaline membranes in the lungs of premature infants.

As the main risk factor for the formation of hyaline membranes in the lungs of full-term newborns, the incidence of infection in the fetus during the prenatal period was 69.6%, diabetes mellitus 59.3%.

In full-term newborns, the following risk factors were identified: acute labor (43.7%), congenital heart defects (40.6%), pulmonary hypertension (34.3%).

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