

## STRUCTURE OF PATHOLOGICAL CONDITIONS IN PREMATURE NEWBORN CHILDREN BORN TO MOTHERS WHO HAVE COVID-19 DURING PREGNANCY

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**Abstract.** *This article is devoted to studying the structure of pathogenesis in premature newborns born from a mother who suffered COVID-19 during pregnancy. The authors examined 70 premature babies born to mothers who had COVID-19 of varying severity during pregnancy.*

**Keywords:** *COVID-19, coronavirus infection, newborn, premature babies.*

Relevance. Currently, one of the most pressing global problems is the infection caused by the new coronavirus SARS-CoV-2, which today is acquiring not only medical, but also social significance. March 11, 2020 The World Health Organization declared a pandemic of a new coronavirus infection. One of the most important issues of concern to the global community is the potential contribution of this infection to the health of offspring [3,9,10].

A large-scale meta-analysis conducted in 2021, including 128,176 non-pregnant women and 10,000 pregnant women with confirmed cases of COVID-19, showed that pregnant patients exhibited the same clinical manifestations of COVID-19 as non-pregnant women. The most frequently diagnosed symptom (89% of cases) in pregnant women was pneumonia. Particular attention should be paid to the higher rates of vital disorders and mortality in the group of pregnant women compared to non-pregnant women [1].

Initial data indicated that there was no increase in the incidence of congenital malformations in the fetus and pregnancy complications in women who had COVID-19 in the first trimester [7], while at the same time, in those who were ill in later stages of gestation, the incidence of premature rupture of membranes and premature birth increased perinatal losses [5,12].

Studies conducted in 18 countries by the University of Oxford also prove the influence of coronavirus infection in the perinatal period on the development of severe complications in the mother and fetus [4,6]. The death rate also more than doubles in pregnant women with COVID-19 compared to non-pregnant women. The percentage of operative delivery in pregnant women with coronavirus infection is much higher than in healthy patients, and is close to 50% [6].

According to a systematic review of studies (100 thousand subjects), transmission of the virus to the fetus was recorded in 5.4% of cases (5.4 thousand); also in the group of pregnant women with SARS-CoV-2 there was a significantly higher percentage of premature babies (up to 25%) and children born with low body weight (fetal growth retardation syndrome up to 25%); Fetal distress syndrome occurred in 26.5–30.0%, neonatal asphyxia in 1.4%, neonatal intensive care unit admission was required in 43% of cases, and perinatal mortality was 0.35–2.2% [9].

Russian scientists Zhukovets I.V. et al. (2022) found that 14.4% of newborns from mothers with SARS-CoV-2 were born prematurely, 3.6% with moderate asphyxia. Vertical transmission was not recorded in any case. In 33% of children infected in the neonatal period, SARS-CoV-2 was of moderate severity, and in 67% it was of mild severity. Only every third pregnant woman is

vaccinated. Of these, at the stage of preconception preparation - 77%, during pregnancy – 23% [11].

Clinical experience gained in providing care to newborns from mothers with COVID-19 shows that there were features of the course of adaptation in the early neonatal period: a high frequency of respiratory disorders requiring respiratory therapy; early hemodynamic disorders; tendency to thrombohemorrhagic complications; a significant proportion of children had signs of infectious diseases specific to the perinatal period. Children born to mothers with severe COVID-19 are at high risk of being born with asphyxia. Adverse neonatal outcomes in newborns born to mothers who have had COVID-19, such as deaths, were predominantly associated with extreme prematurity or the presence of concomitant diseases [5,8,9].

At the same time, given the limited and contradictory data on the health of newborns born to mothers who have had COVID-19 during pregnancy, it seems appropriate to conduct further research.

Purpose of the study. To study the structure of pathological conditions in premature newborns born to mothers who had COVID-19 during pregnancy.

Materials and methods. We observed 70 premature newborns. The first main group consisted of 40 premature newborns born to mothers who had suffered COVID-19 of varying severity during pregnancy, of which subgroup 1a consisted of 21 newborns who were born to mothers who had had a mild course of COVID-19 in the form of ARVI, in 1b the subgroup included 19 newborns whose mothers suffered a severe course of COVID-19 in the form of coronavirus pneumonia.

The comparison group consisted of 30 premature newborns whose mothers did not have COVID-19 and were in the preterm care unit. Our studies were carried out at City Children's Hospital No. 5 and the City Perinatal Center.

Clinical, laboratory and instrumental research methods were carried out. Statistical processing of the obtained data was carried out using Microsoft Excel 2010, Statistics 6.1 software packages. Differences were considered statistically significant at a level of  $P < 0.05$ .

Results and discussion. Considering that our study included exclusively premature children, during the process of nursing and treatment they were kept in an incubator, tube feeding and on parenteral nutrition (Table 1).

**Table 1.**  
**Features of care for premature babies depending on the severity of COVID-19 suffered by the mother**

Indicators	1st main group, n-40		2nd control group, n-30, %, (abs)
	1a subgroup, n-21, %, (abs)	1b subgroup, n-19, %, (abs),	
Incubator content	29.5±11.1 (5)	38.9±11.5 (7)	19.2±7.8 (5)
Tube feeding	66.7±11.2 (12)	68.4±10.6 (13)	76.9±8.3 (20)
Parenteral nutrition	100.0 (18)	100.0	100.0

Most of the children in incubation were from subgroup 1b – 38.9±11.5%. In subgroup 1a there were slightly fewer such newborns – 29.5±11.1%, and in the comparison group there were the fewest of them – 19.2±7.8%. The number of newborns receiving tube feeding and parenteral

nutrition in the observed groups did not differ significantly. The children were on parenteral nutrition and then switched to tube feeding.

Premature babies also required respiratory therapy. The overwhelming majority of them received humidified oxygen through a mask, and the number of such children did not differ significantly between groups (Table 2). Thus, in subgroup 1a there were 80.9±8.6% of such children, in subgroup 1b -78.9±9.4%, and in the comparison group -83.3±6.8%.

**Table 2.**

**Characteristics of respiratory therapy in observed newborns**

Respiratory therapy	1st main group, n-40		2nd control group, n-30, %, (abs)
	1a subgroup, n-21, %, (abs)	1b subgroup, n-19, %, (abs),	
Humidified O2	80.9±8.6 (17)	78.9±9.4 (15)	83.3±6.8 (25)
CPAP	14.2±7.6 (3)	15.8±8.4 (3)	13.4±6.2 (4)
mechanical ventilation	4.7±4.6 (1)	5.2±5.1 (1)	3.3±3.2 (1)

The number of children on CPAP was also approximately the same in all observed groups. Thus, in subgroup 1a of children on CPAP there were 14.2±7.6%, in subgroup 1b – 15.8±8.4%, and in the comparison group –13.4±6.2%.

There was one child on mechanical ventilation in each group, which amounted to 4.7±4.6% in subgroup 1a, -5.2±5.1% in subgroup 1b and -3.3±3.2% in the comparison group. The duration of stay of children on CPAP in children of subgroup 1a was 3.0 days, in children of subgroup 1b 3.6 days, and in the comparison group – 2.5 days.

When children were admitted to the department, in the early neonatal period, the general condition of newborn children was assessed (Table 3).

**Table 3.**

**General condition of premature infants in observation groups in the early neonatal period**

General state	subgroup 1a, n-21 %, (abs)	subgroup 1b, n-19 %, (abs)	2nd control group, n-30 %, (abs)
Extremely severe	4.8±4.6 (1)	15.8±8.4 (3)	6.7±4.6 (2)
Heavy	71.4±9.9 (15)	57.8±11.4 (11)	63.4±7.8 (19)
Moderate	23.8±10.3 (5)	26.3±7.4 (5)	30.0±6.4 (9)

At the same time, it was revealed that among the children of the comparison group, a significant part of the children were in a serious condition – 63.4±7.8%, a third of all children were in a condition of moderate severity – 30.0±6.4%, the smallest part of the children was in extremely serious condition – 6.7±4.6%.

A comparative analysis of the general condition of newborn children born to mothers who had coronavirus infection showed that children of subgroup 1a were overwhelmingly in serious condition – 71.4±9.9%, less than a quarter of children were in moderate condition – 23.8±10.3%, and one child was born in extremely serious condition – 4.8 ±4.6%. In subgroup 1b 15.8±8.4% of children were born in an extremely serious condition, which was 3.3 times more than among children in subgroup 1a and 2,4 times more than among children in the comparison group. More

than half of the children in group 1b were in severe condition –  $57.8 \pm 11.4\%$  and more than a quarter were in moderate condition –  $26.3 \pm 7.4\%$ .

At the next stage of our study, we studied the structure of pathological conditions in premature newborns born to mothers who had mild and severe coronavirus infection and in children in control group, whose mothers did not have COVID-19 during pregnancy (Table 4).

**Table 4.**

***The structure of pathological conditions in observed premature infants in the neonatal period***

Pathological conditions	1st main group, n-40		2nd control group, n-30, %, (abs)
	subgroup 1a, n-21, %, (abs)	subgroup 1b, n-19, %, (abs),	
RDS	62.0±10.6 (13)	78.9±9.4 (15)	73.4±8.1 (22)
Congenital pneumonia	76.1±9.3 (16)	89.5±7.1 (17)	76.7±7.8 (23)
Atelectasis of the lungs	47.6±10.9 (10)	57.8±11.4 (11)	33.3±8.6 (10)
Asphyxia	57.1±10.8 (12)	68.5±10.6 (13)	53.4±9.1 (16)
MFI	80.9±8.6 (17)	84.2±8.4 (16)	70.0±8.4 (21)
IUGR	19.0±8.6 (4)	26.3±7.4 (5)	26.4±8.1 (8)
HIE	90.4±6.5 (19)	94.7±5.2 (18)	86.7±6.2 (26)
IVH	47.6±10.9 (9)	52.6±11.4 (10)	30.0±6.4 (9)
Anemia	100 (21)	100 (19)	100 (30)
Neonatal jaundice	62.0±8.6 (13)	84.2±8.4 (16)	76.7 ±7.7 (23)
Sepsis	0	15.8±8.4 (3)	6.7±4.5 (2)

Our studies have shown that in newborns of subgroup 1a, RDS occurred in  $62.0 \pm 10.6\%$  of cases, and in subgroup 1b, in children whose mothers suffered a severe course of coronavirus infection, it was slightly higher - in  $78.9 \pm 9.4\%$  cases. Our studies also showed that congenital pneumonia developed more often in children whose mothers suffered a severe course of COVID-19 - in  $89.5 \pm 7.1\%$  of cases, and among children of subgroup 1a - in  $76.1 \pm 9.3\%$  of children. Atelectasis in the lungs of newborn children of subgroup 1a occurred in  $47.6 \pm 9.3\%$  of cases, and in subgroup 1b more often - in  $57.8 \pm 11.4\%$  of cases. It is important to note that a significant number of children in subgroup 1b were born with asphyxia –  $68.5 \pm 10.6\%$ , in subgroup 1a also more than half of the children were born with asphyxia -  $57.1 \pm 10.8\%$ .

Considering that all observed children were premature, the vast majority of them in both groups showed signs of morphofunctional immaturity: in subgroup 1a - in  $80.9 \pm 8.6\%$  of children, and in subgroup 1b - in  $84.2 \pm 8.4\%$  of children. HIE was also slightly more common in children of subgroup 1b –  $94.7 \pm 5.2\%$  than in children of subgroup 1a –  $90.4 \pm 6.5\%$ . IVH were also more common in children of subgroup 1b than in children of subgroup 1a and the comparison group. Anemia was observed in 100% of children in both groups. It is also important that in children of subgroup 1b, sepsis developed in  $15.8 \pm 8.4\%$  of cases. Sepsis in children whose mothers suffered severe COVID-19 is 2.4 times more common than among premature babies whose mothers did not have coronavirus infection.

Thus, in newborns whose mothers suffered COVID-19 during pregnancy, the most common pathological conditions in the structure are anemia, hypoxic-ischemic encephalopathy, intraventricular hemorrhage, congenital pneumonia, respiratory distress syndrome, pulmonary atelectasis, asphyxia, morphofunctional immaturity, neonatal jaundice. At the same time, a significant predominance of these pathological conditions was noted in children born to mothers who had suffered a severe course of coronavirus infection, although no significant differences were identified.

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