

FEATURES OF THE COURSE OF THE NEONATAL PERIOD IN NEWBORNS BORN TO MOTHERS WHO UNDERWENT COVID-19 DURING PREGNANCY

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Abstract. *The purpose of the study. To study the peculiarities of the course of the neonatal period in newborns born to mothers who underwent COVID-19 during pregnancy.*

Materials and methods. 70 premature babies were examined: The 1st main group consisted of 40 children born to mothers who suffered COVID-19 of varying severity during pregnancy, the 2nd group consisted of 30 premature babies whose mothers did not suffer from this infection. Clinical, anamnestic and statistical studies were conducted.

Results. Among premature babies born from mothers who suffered severe COVID-19 during pregnancy, deeply premature and moderately premature babies are significantly more likely to be born than from mothers who suffered mild COVID-19. In children born from mothers who suffered from coronavirus infection, especially to a severe form, there was a tendency for body weight gain to lag in the neonatal period compared with children whose mothers did not suffer from COVID-19 during pregnancy.

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

The emergence of SARS-CoV-2 disease (Severe Acute Respiratory Syndrome, Coronavirus-2) as a new infection has created unprecedented problems for the healthcare system around the world – doctors of various specialties found themselves facing an unknown, in some cases fatal disease [4,10,12]. For perinatal medicine specialists, pregnant women infected with SARS-CoV-2, women in labor and their newborns were also no exception, and maintaining a mother–child pair presented serious difficulties [2,10].

Since the spread of infection caused by the SARS-CoV-2 virus worldwide, scientists continue to conduct research on all aspects of the infectious process. Most of the studies conducted are devoted to the adult population, information on the incidence and course of the disease in the child population is practically absent. This situation is caused by rare cases of infection of young patients, especially newborn children, or mild manifestations of infection. According to some data, the prevalence of COVID-19 in children of various ages varies from 1 to 5% [3,5]. According to the World Health Organization, the proportion of children infected with COVID-19 is 7% of the total number of all reported cases of the disease [12].

Taking into account the experience of leading scientists, the obtained data indicate that the most likely way to infect a newborn is through contact, which may be the reason for isolating newborns from their mothers from the moment of birth until the mother stops releasing the virus [1,7,8]. There is no convincing evidence of vertical transmission of infection from mother to fetus. Available data indicate that the incubation period of COVID – 19 in newborns is usually 3-7 days, the shortest is 1 day, and the longest is 14 days [1,8]. The clinical course in newborns may be asymptomatic, mild or severe, however, in comparison with adult populations, mild and moderate manifestations of the disease are most common [5, 10,11].

The clinical data are not specific, especially in premature infants. The newborn's body temperature may be elevated, lowered, or normal. Symptoms of infectious toxicosis may be present: sluggish sucking, regurgitation, tachypnea, noisy breathing, participation of auxiliary muscles in breathing, apnea, unproductive cough, tachycardia, symptoms of damage to the gastrointestinal tract [6,8].

Respiratory tract lesions range from mild respiratory infection to pneumonia complicated by severe acute respiratory distress syndrome, multiple organ failure and death [1,7,8,13]. In very rare cases, newborns develop a multisystem inflammatory syndrome associated with a COVID infection-19 [7, 8, 9]. In a series of observations and individual descriptions, various clinical manifestations are indicated – from thrombosis to disorders of atrioventricular conduction [8].

Recovery in infants with COVID-19 is more likely to occur within 15-20 days. In the statistics of the pandemic, fatal cases of the disease in newborns are registered in rare cases, and they are associated with the presence of concomitant pathology [5].

At the same time, given the few and contradictory data on the health status of newborns born from mothers who suffered COVID-19 during pregnancy, it seems advisable to conduct further research.

The purpose of the study. To study the peculiarities of the course of the neonatal period in newborns born from mothers who underwent COVID-19 during pregnancy.

Materials and methods. Our research was conducted at the City Children's Hospital No. 5, and the City Perinatal Center. 70 premature newborns were examined. Of these, the main 1st group consisted of 40 premature newborns born from mothers who had suffered COVID-19. The comparison group consisted of 30 premature newborns, whose mothers did not suffer from COVID-19 and were in the NICU. The children of the main 1st group (n-40) were divided into two subgroups: 1a – n-21, newborns who were born from mothers who suffered a mild course of COVID-19 in the form of acute respiratory virus infection, 1b-n-19, newborns whose mothers suffered a severe course of COVID-19 in the form of coronavirus pneumonia.

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

Results and discussion. At the first stage of our study, we analyzed the gestational age of premature newborns, depending on the severity of the coronavirus infection suffered by the mother (Chart 1).

Chart 1. The gestational age of premature newborns, depending on the severity of the coronavirus infection suffered by the mother

Gestational age	1a subgroup, n-21 % , (abs)	1b subgroup, n-19 % , (abs)	2-comparison group, n-30 % , (abs)
Less than 28 weeks	4,8±4,6 (1)	0	3,3±3,2(1)
28-31 weeks	4,8±3,0 (1)	15,8±4,4 (3) *	6,7±5,2 (2)
32-33 weeks	28,5±9,9(6)	52,6±8,5 (10) *	26,7±8,1(8) ^
34-36 weeks	62,0± 9,6 (13)	31,5±9,1 (6) *	63,4±8,8(19) ^

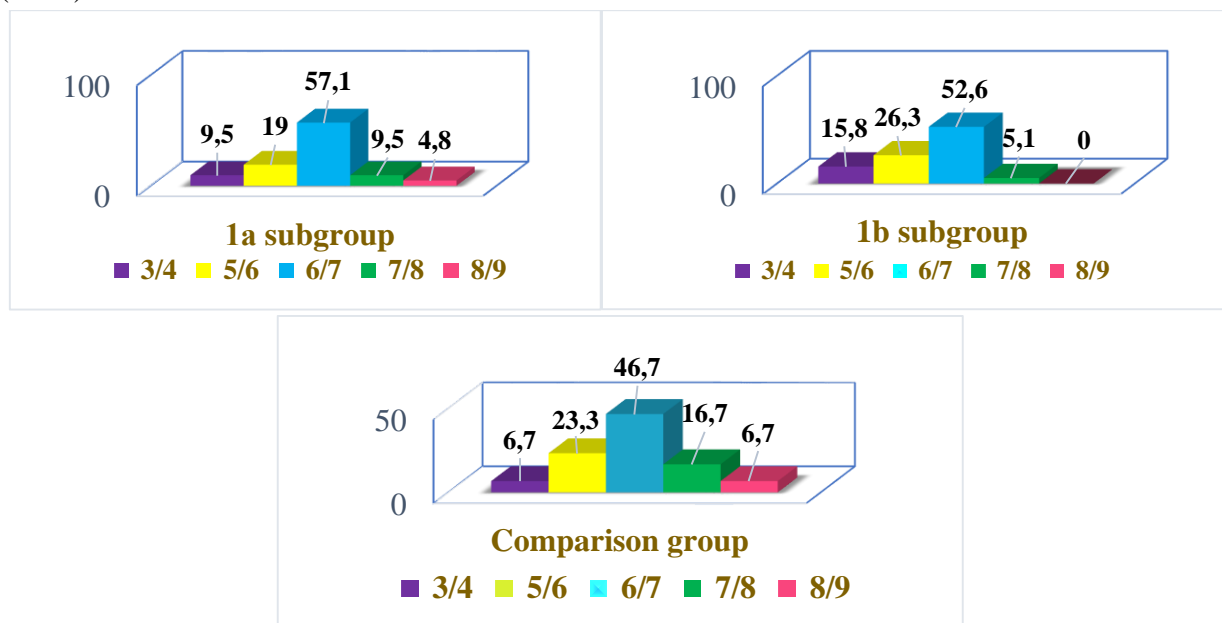
Note: *- $P < 0.001$ – the reliability of the differences between groups 1a and 1b.

^ - $P < 0.001$ – the reliability of the differences between 1b and the comparison group.

The obtained data showed that in mothers who underwent COVID-19 in mild form (subgroup 1a), a significant part of the children - $62.0 \pm 10.6\%$ - were late premature and they were born with a gestational age of 34-36 weeks. The same picture was among the children of the comparison group - $63.4 \pm 8.8\%$.

About a third of children in 1a subgroup ($28.5 \pm 9.9\%$) were born moderately premature with a gestational age of 32-33 weeks. In subgroup 1b of children whose mothers suffered severe coronavirus infection, more than half of the children ($52.6 \pm 8.5\%$) were born moderately premature, with a gestation period of 32-33 weeks, which was significantly more than in children whose mothers suffered mild COVID-19 ($28.5 \pm 9.9\%$) and then in children of the comparison group ($26.7 \pm 8.1\%$). Deeply premature babies with a gestational age of 28-31 weeks in group 1b were born significantly more often than in subgroup 1a and 2.4 times more often than in the comparison group.

Next, we conducted a thorough analysis of Apgar scores at birth in the observed groups (Pic.1).



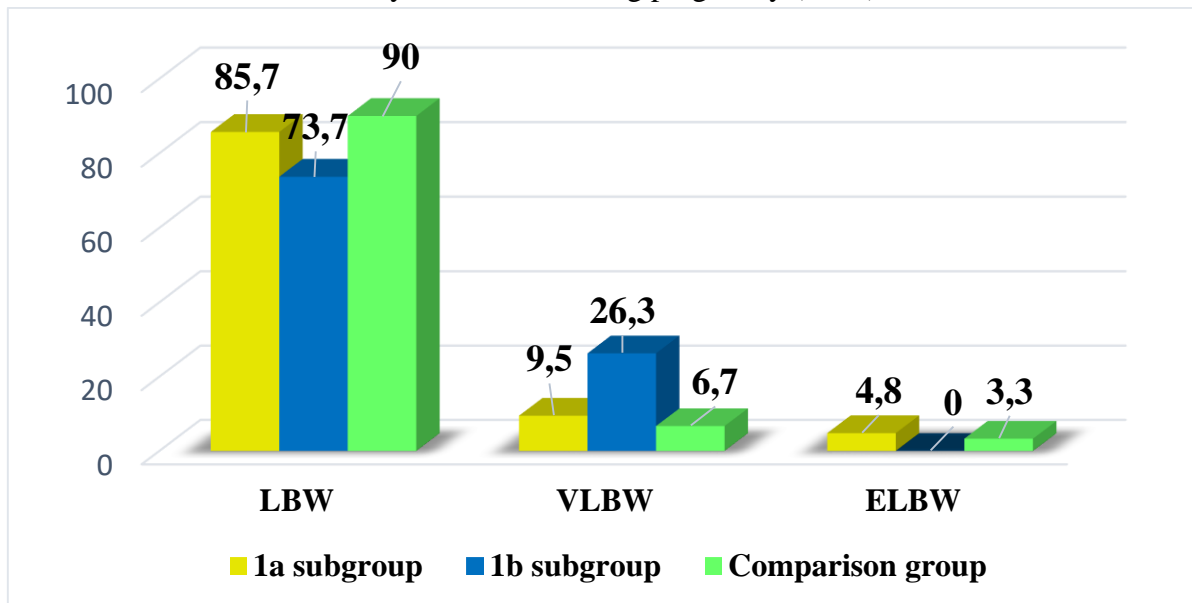
Pic.1. Assessment of newborns on the Apgar scale at birth, depending on the severity of the COVID-19 suffered by the mother

The obtained data showed that all premature infants, including children of the comparison group, are mostly born with Apgar scores of 6/7 points. It should be noted that in the comparison group, the number of children with the highest Apgar scores of 7/8 points was the highest and exceeded that by 3.3 times than in children of group 1b, i.e., those born from mothers who had suffered a severe course of coronavirus infection.

The children of group 1b, whose mothers suffered severe COVID-19, were born with the lowest scores on the Apgar scale of 3/4 and 5/6 points. Thus, the number of children whose mothers suffered severe COVID-19, with low grades at the 1st and 5th minutes, are born 2.4 times more often than among children of the comparison group, and 1.7 times more often than among children whose mothers had mild COVID-19.

At the next stage of our study, we studied the physical development of premature infants, depending on the severity of the coronavirus infection suffered by the mother. We analyzed the

distribution of examined premature newborns by birth weight, depending on the severity of the coronavirus infection suffered by the mother during pregnancy (Pic.2).



Pic.2. Distribution of examined premature newborns (%) by birth weight, depending on the severity of COVID-19 suffered by the mother.

It follows from this figure that the number of children with low body weight prevailed in all groups. However, the smallest number of children with LBW was among children born from mothers who had suffered severe COVID-19 - $73.7 \pm 11.4\%$.

Among children born to mothers who had a mild course of coronavirus infection, newborns with LBW were slightly higher - $85.7 \pm 9.9\%$, although no significant differences were found. The largest number of children with LBW was in the comparison group - $90.0 \pm 8.8\%$.

It is important to note that in the group of children born to mothers with severe infection, more than a quarter of newborns were born with VLBW - $26.3 \pm 5.1\%$, which was significantly more than in children born to mothers with mild COVID-19 and then in children of the comparison group ($P < 0.001$).

Next, we evaluated the average physical development of premature infants, depending on the severity of the coronavirus infection suffered by the mother (Chart 2).

Chart 2. Average indicators of physical development of premature infants at birth, depending on the severity of the mother's COVID-19

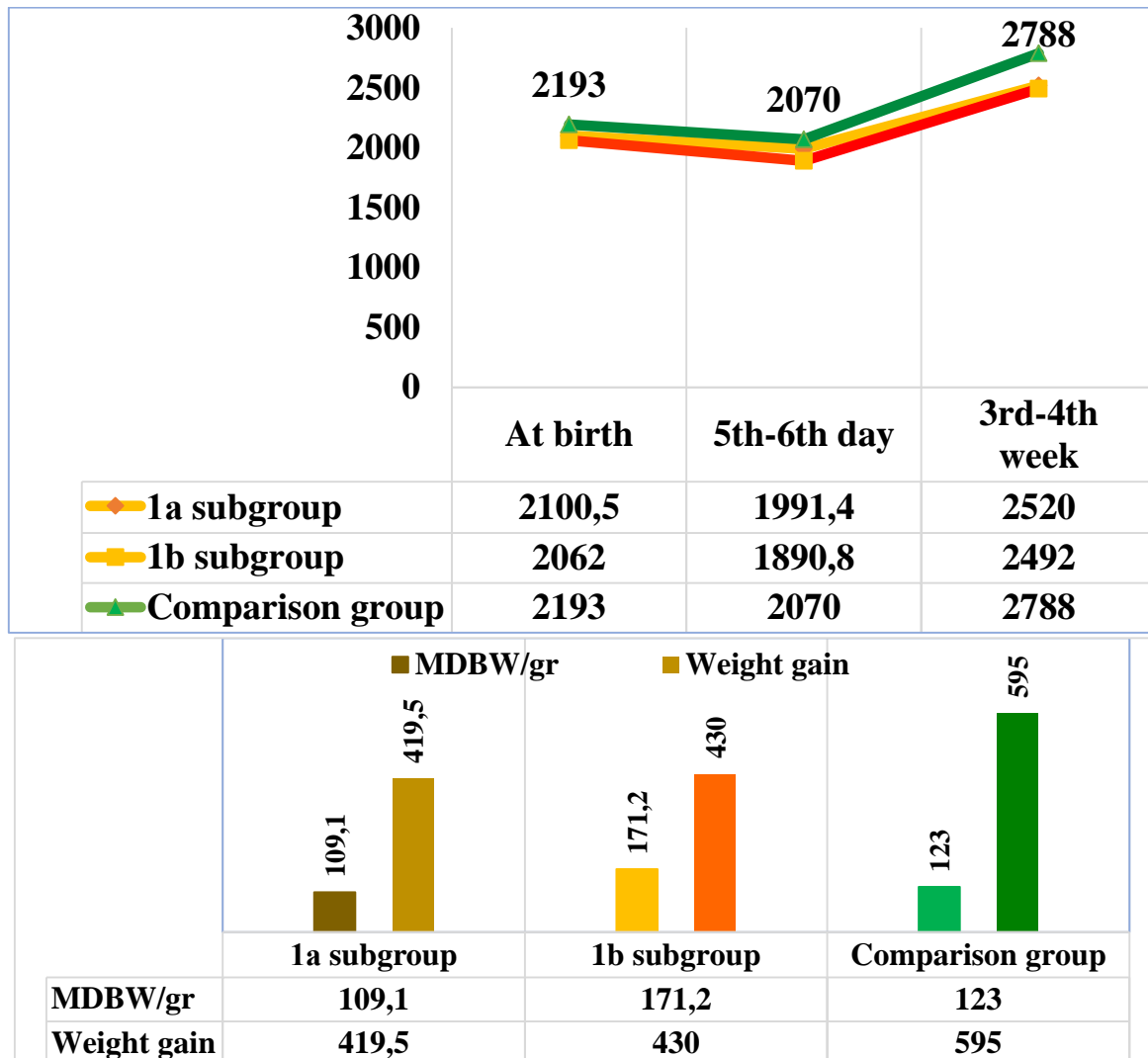
Indicators	1st main group, n-40		2 nd comparison group, n-30
	1a subgroup, n-21	1b subgroup, n-19	
Body weight, gr	$2100,5 \pm 101,6$	$2062,0 \pm 114,1$	$2193,0 \pm 81,2$
Body length, cm	$44,2 \pm 0,8$	$43,8 \pm 0,8$	$44,1 \pm 1,3$
Head circumference, cm	$29,9 \pm 0,3$	$30,8 \pm 0,5$	$30,9 \pm 0,4$
Chest circumference, cm	$27 \pm 0,7$	$28,9 \pm 0,7$	$29,0 \pm 0,5$

The average body weight of premature newborns at birth was lowest in children of subgroup 1b who were born from mothers who had suffered severe coronavirus infection, although no significant differences were found relative to other groups. Thus, the body weight of newborns

of subgroup 1a averaged 2100.5 ± 101.6 g, in subgroup 1b - 2062.0 ± 114.1 g, in the comparison group - 2193.0 ± 81.2 g. Body length, head circumference and chest circumference in almost all observed children had no significant differences among themselves.

The study analyzed the dynamics of body weight in the observed newborn children (Pic.3). It was found that in children born to mothers who had suffered a mild course of coronavirus infection, the maximum decrease in body weight practically did not differ from that in children of the comparison group.

However, in children born to mothers who had severe coronavirus infection, the maximum loss of body weight was greater than in children of the comparison group and than in children from mothers with mild COVID-19.



Pic.3. Comparative analysis of body weight dynamics in preterm newborn infants observed.

Upon admission to the department on the 5th-6th day of life, newborns whose mothers had suffered a severe infection had a body weight of -1890.8 ± 73.0 g less than in children of subgroup 1a - 1991.4 ± 111.8 g and the comparison group -2070.0 ± 75.6 g, although there were no significant differences.

Body weight gain during the period of stay in the hospital before discharge, on average, at the 3rd week in newborns of the main group was less than in children of the comparison group.

Upon admission of children to the department, in the early neonatal period, an assessment of the general condition of newborn children was carried out. At the same time, it was revealed

that in the comparison group, a significant part of the children were in severe condition - $63.4 \pm 7.8\%$, $30.0 \pm 6.4\%$ of children were in moderate severity, and $6.7 \pm 4.6\%$ were in extremely severe condition. Children of subgroup 1a born from mothers who had suffered a mild course of COVID-19 were overwhelmingly in severe condition - $71.4 \pm 9.9\%$, $23.8 \pm 10.3\%$ were in moderate condition, and $4.8 \pm 4.6\%$ of newborns were in extremely severe condition. In subgroup 1b, $15.8 \pm 8.4\%$ of children were born in extremely severe condition, which was 3.3 times more than among children of subgroup 1a and 2.4 times more than among children of 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 of the children were in moderate severity - $26.3 \pm 7.4\%$.

Thus, our studies have shown that among premature newborns born to mothers who suffered severe COVID-19 during pregnancy, deeply premature and moderately premature babies are significantly more likely to be born than mothers who suffered mild COVID-19, and mothers who suffered mild COVID-19 are significantly more likely to be born late premature babies are more often born. Premature babies whose mothers have suffered severe COVID-19 are 1.7 times more likely to be born with lower Apgar scores than children from mothers with mild coronavirus infection.

In children born to mothers who had severe coronavirus infection, the maximum loss of body weight was greater than in children of the comparison group and then in children from mothers with mild COVID-19. Body weight gain by the 3rd week of life in premature newborns born to mothers who had a coronavirus infection during pregnancy lags behind compared to children whose mothers did not have COVID-19 during pregnancy.

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