International Journal of
Health Systems and Medical Sciences

ISSN: 2833-7433
Volume 2 | No 6 | Jun -2023

Features of Interferon Status in Children Born to Mothers Infected With Covid-19

Sadullayeva Iroda Kurbanovna [1], Karomatova Fazolat Abdiqahhorovna [2]

[1] Bukhara State Medical Institute named after Abu Ali ibn Sino

Abstract: Relevance: The COVID-19 pandemic caused by the coronavirus (SARS-CoV-2) has grown from a global outbreak to a global pandemic in just a few months. To date, hundreds of pediatric cases have been documented, including neonatal infection. This situation has drawn public attention to neonatal infection.

Keywords: Newborns born from mothers with COVID-19, SARS-CoV-2, COVID-19, interferon, newborns.

The study of immunity in newborns born to mothers with a proven new coronavirus infection COVD-19 is a little-studied issue at present. The study of the immunity of newborns born to mothers of COVID-19 coronavirus infections is of great interest due to the ongoing pandemic caused by COVID-19.

The purpose of the study: to study the interferon status of newborns born to mothers with COVID-19 coronavirus infection.

Materials and methods: To study the features of interferon newborns born from mothers with COVID-19, 60 newborns were examined on the basis of the Kagan "COVID Hospital" in the Bukhara region. The survey was conducted during the months of July-November 2021. In the blood taken from the umbilical cord, IFN-α, Ab to IFN-α and IFN-γ were determined. The control group included 60 healthy newborn babies from mothers with physiologically occurring pregnancy.

Results of the study: The results of the study of the interferon status of newborns selected for the study showed a statistically significant decrease in the level of IFN-α in group 2 newborns by 4.0 times compared to the data of the healthy group-33.32± 0.91pkg/ml ($p<0.05$).

The analysis of the level of antibodies to IFN-α also showed a significant increase in their level to 156.54± 15.8 pkg/ml In group 2 patients, the ratio of the values of group 1 was 92.43± 7.58 pkg/ml ($p<0.05$).

An increase in the level of IFN-γ by 2.9 times was found in newborns of group 2 ($p<0.05$), in relation to the indicators of the healthy group -23.8± 0.6 pkg/ml.

Conclusion: Thus, as a result of our scientific research, it was found that an imbalance in the interferon synthesis system occurs in children born to mothers infected with COVD-19 infection

Relevance: The COVID-19 pandemic caused by the severe acute respiratory syndrome-2 coronavirus (SARS-CoV-2) has grown from a global outbreak to a global pandemic in just a few months. To date, hundreds of pediatric cases have been documented, including neonatal infection. This situation has attracted public attention to neonatal infection [3].

Many retrospective studies have been conducted to analyze the effects of COVID-19 in pregnant women on their newborns [9]. It is known that vertical transmission of SARS-CoV-2 is possible, but apparently occurs in a minority of cases of maternal coronavirus disease in the third trimester [5,6].

Children from the first days of life are more and more in contact with the external environment in all its diversity, and their metabolic processes are very active. Naturally, newborns form very early mechanisms of protection against everything genetically alien.

From birth to the end of puberty, step by step, the structure and functions of the immune system are formed. The newborn period is characterized by a weak immune response to antigens due to the immaturity of T- and B-lymphocytes. and also in connection with the functional weakness of phagocytosis. Natural killer cells (EC cells) are not yet sufficiently developed. This, in particular, explains the low level of gamma interferon.

Interferons are a group of low-molecular biologically active peptides, proteins, of which more than 20 are currently known. There are four types of interferons (α, β, γ, ω), differing in origin, some chemical and biological properties.

They are combined into two types: type I - alpha, beta and omega interferons, type 2 - gamma interferon. α-interferon-(leukocyte) is produced by lymphocytes, macrophages, and some epithelial cells after induction by various antigens (interferon inducers). The latter include viruses, to a lesser extent rickettsias, bacteria, protein polymers, synthetic anions.

Interferon-α inhibits the growth of viruses and other intracellular parasites. It inhibits the connection of viral RNA with the ribosomes of the cell, which makes it difficult or completely excludes the possibility of reproduction of the virus in the cell, and also inhibits the proliferation of normal cells-fibroblasts, hematopoietic cells (antiproliferative, tumoricidal effect)[8]

γ- interferon (immune) - it is mainly produced by various subclasses of lymphocytes. Its secretion is observed only after stimulation of cells by antigens or mitogens. It enhances the antiviral and antiproliferative effects of interferons-α and interferons-β. In addition, it is the most important immunoregulator.

The study of immunity in newborns born to mothers with a proven new coronavirus infection COVD-19 is a little-studied issue at present. The study of the immunity of newborns born to mothers of COVID-19 coronavirus infections is of great interest due to the ongoing pandemic caused by COVID-19. There are only isolated works devoted to this issue in foreign literature. The data presented by the authors regarding the immunity of newborns to the new coronavirus infection COVID-19 are isolated, and the results of observations require further in-depth study and analysis.

It is believed that the vertical transmission path of the new COVID-19 coronavirus infection from mother to child is extremely unlikely [1]. Only a few rather controversial cases of possible vertical transmission of the virus have been described in China [2,7] and in Peru [4]. According to the current WHO guidelines, tests for COVID-19 coronavirus should be performed using reverse transcription polymerase chain reaction (RT-PCR) as the most accurate and reliable method of diagnosing viral infection [5].

The presence of interferons in newborns allows us to judge the presence of innate immunity and is of a prognostic nature. Modern literature says that the immune system in the neonatal period and in the postnatal period is in a state of physiological suppression. The biological meaning of suppressing immune reactions in newborns and in the postnatal period is to prevent the risk of developing severe immunopathological reactions with massive contact of the child with environmental antigens[12].

It has been established that the human immune system is inextricably linked with the interferon system. Interferons-α and -γ affect the activity of natural killers. Also, one of the important properties of interferons is the ability to interfere with intracellular replication of viruses, activating the cell's response to viral infection.

Interferon triggers a cascade of biochemical reactions in cells that lead to suppression of the synthesis of viral proteins, as well as to suppression of the assembly and release of viral particles and activation of the process of apoptosis of an infected cell[10].

The purpose of the study: to study the interferon status of newborns born to mothers with COVID-19 coronavirus infection.

Materials and methods: To study the features of interferon newborns born from mothers with COVID-19, 60 newborns were examined on the basis of the Kagan "COVID Hospital" in the Bukhara region. In all pregnant women, the PCR test for SARS-CoV 2 was positive. The survey was conducted during the months of July-November 2021. All newborns are full-term at 38-42 weeks gestation. In the blood taken from the umbilical cord, IFN-α, Ab to IFN-α and IFN-γ were determined. The control group included 60 healthy newborn babies from mothers with physiologically occurring pregnancy.

Immunological studies of the blood of sick children were carried out in the laboratory of Immunomorphology of the Institute of Human Immunology and Genomics of the Academy of Sciences of the Republic of Uzbekistan. The indicators of cytokine (IFN-α, AT to IFN-α and INF-γ) status in the blood were studied. Blood tests in the early (1 day of life) neonatal period of adaptation by the ELISA method. The test system was used by the manufacturer JSC "Vector Best" (St. Petersburg). The cytokine level was determined according to the attached instructions. The principle of operation of the kit according to the attached instructions. The kit uses a "sandwich"-a variant of solid-phase enzyme immunoassay. To implement this option, two monoclonal antibodies with different epitope specificity to the studied cytokines were used.

Results of the study: Out of 60 children on the Apgar scale, 51 children were born with 7-8 points, 9 children with 6-7 points.

The results of the study of the interferon status of newborns selected for the study showed a statistically significant decrease in the level of IFN-α in group 2 newborns by 4.0 times compared to the data of the healthy group-33.32± 0.91pkg/ml ($p<0.05$), (Fig.1.)

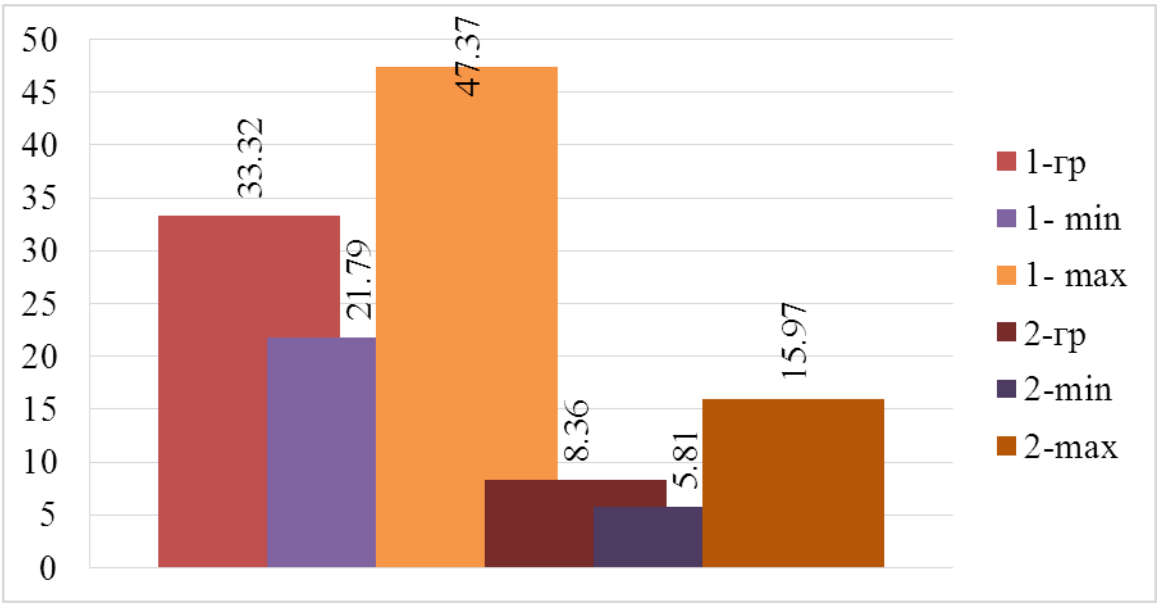

Figure 1. Comparative evaluation of IFN-α synthesis in newborns in the first days of life

The analysis of the level of antibodies to IFN-α also showed a significant increase in their level to 156.54± 15.8 pkg/ml in group 2 patients with respect to the values of group 1-92.43± 7.58 pkg/ml ($p<0.05$), Fig.2.

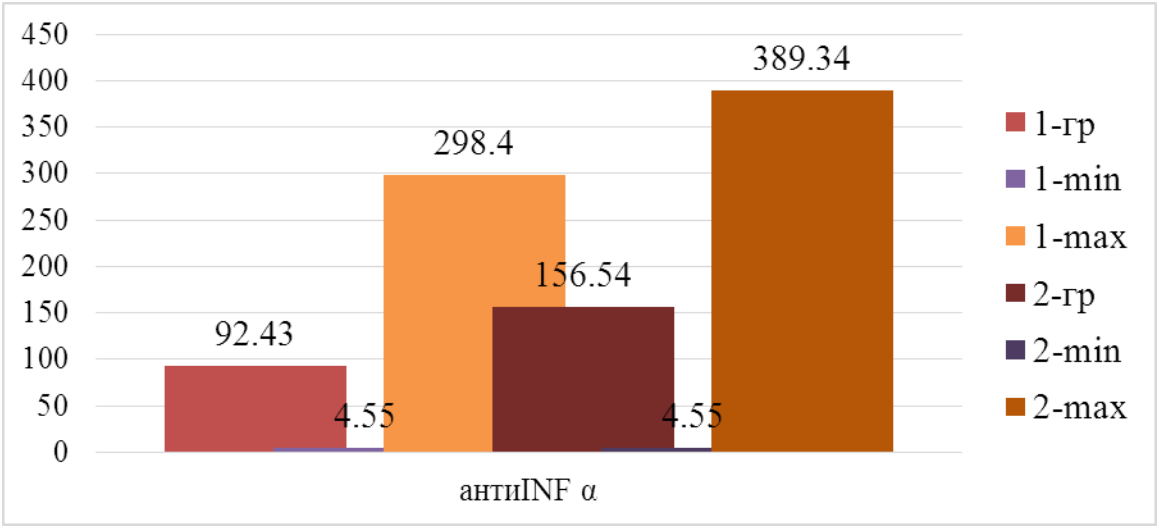

Figure 2. Comparative evaluation of the synthesis of antibodies to IFN-α in newborns in the first days of life

The obtained results of the analysis show activation of the synthesis of antibodies to IFN-α in newborns exposed to the coronavirus infection of the mother during pregnancy. At the same time, an increase in the level of IFN-γ by 2.9 times was also found in newborns of group 2 ($p<0.05$), with respect to the indicators of the healthy group -23.8± 0.6 pkg/ml (Fig.3).

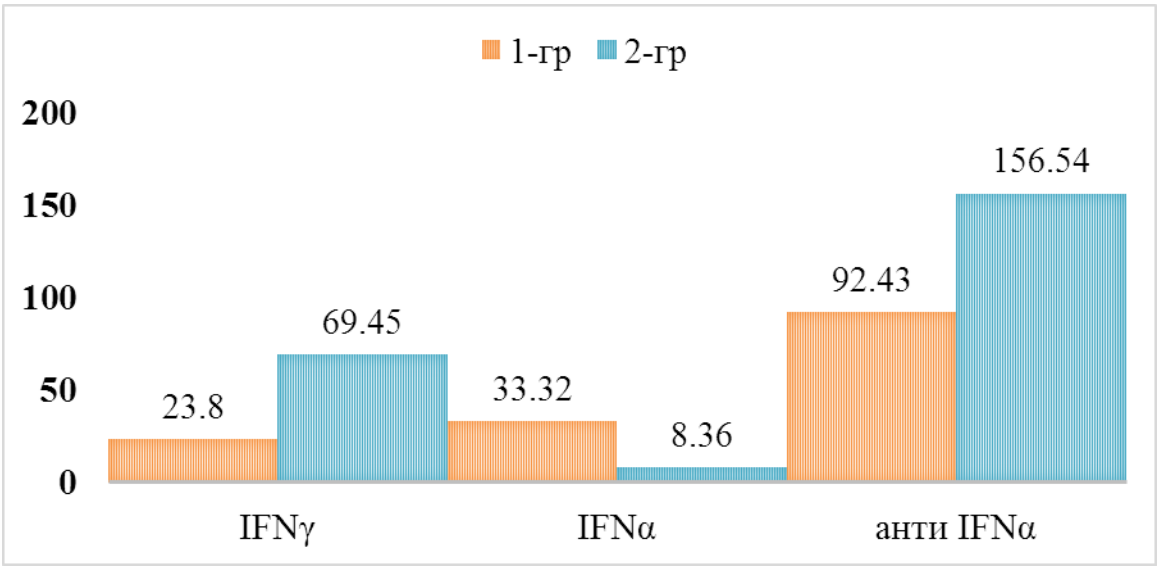

Figure 3. Interferon status of newborns.

Consequently, the obtained results of studying the interferon status of observed newborns on the first 5th day of life show an imbalance in the synthesis of interferons. Against the background of activation of IFN-γ synthesis by 2.9 times, anti-INF-α by 1.7 times in full-term newborns born to mothers with COVID-19, there is a 4-fold decrease in the synthesis of INF-α.

Conclusion: Thus, as a result of our scientific research, it was found that an imbalance in the interferon synthesis system occurs in children born to mothers infected with COVD-19 infection.

List of literature

1. Capobianco G., Saderi L., Aliberti S., Mondoni M., Piana A., Dessole F., et al. COVID-19 in pregnant women: A systematic review and meta-analysis [published online ahead of print, 2020 Jul 16]. Eur J Obstet Gynecol Reprod Biol. 2020; S0301-2115(20)30446-2. doi:10.1016/j.ejogrb.2020.07.006
2. Coronavirus (COVID-19) Infection in Pregnancy. Version 12: RCOG, 14.10.2020. 77 p.
3. COVID-19 Краткий технический обзор для служб охраны материнства UFPA 2020 май.

4. COVID-19 билан касалланган оналардан туғилган чакалокларнинг ахволини баҳолаш Хамидова Феруза Каримовна Эргашева Юлдуз Султоновна Абу Али Ибн Сино номидаги Бухоро Давлат Тиббиёт институти https://doi.org/10.5281/zenodo.7625499
5. Diriba K, Awulachew E, Getu E. The effect of coronavirus infection (SARS-CoV-2, MERS-CoV, and SARS-CoV) during pregnancy and the possibility of vertical maternal-fetal transmission: a systematic review and meta-analysis. Eur J Med Res. 2020 Sep 4;25(1):39. doi: 10.1186/s40001-020- 00439-w. PMID: 32887660; PMCID: PMC7471638.
6. Jafari M, Pormohammad A., Sheikh Neshin S.A., Ghorbani S., Bose D., Alimohammadi S., Basirjafari S., Mohammadi M., Rasmussen-Ivey C., Razizadeh M.H., Nouri-Vaskeh M., Zarei M.. Clinical characteristics and outcomes of pregnant women with COVID-19 and comparison with control patients: A systematic review and meta-analysis. Rev Med Virol. 2021 Jan 2:e2208. doi: 10.1002/rmv.2208. Epub ahead of print. PMID: 33387448.
7. Karomatova Fazolat Abdikaxhorovna Characteristics and Immunological Status of Chronic Jaundice in Infants Born to Mothers Who Passed Covid-19 Vol. 2 No. 4 (2022) ISSN: 2795-921X38 https://www.innovatus.es/index.php/ejmmp
8. Sa'dulloeva Iroda Qurbonovna, Karomatova Fazolat Abduqahhorovna "Bolalarda immun tizimi xususiyatlari va tekshiruv usullari" O'quv qo'llanma 2022 й
9. Schwartz DA. An Analysis of 38 Pregnant Women with COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes [published online ahead of print, 2020 Mar 17]. Arch Pathol Lab Med. .
10. Ершов, Ф.И. Интерфероны и их индукторы/Ф.И. Ершов, О.И. Иселев //Москва: ГЭОТАР, 2005.–368 с. Kushnareva, M. The use of intravenous immunoglobulins in premature newborn children in hardware lung ventilation / M. Kushnareva, E. Vetrova, G. Dementyeva // Int. J. Medical Science. –2014.–Vol. 5.–№2.–P. 23–25
11. Иммунный статус у детей, рожденных от матерей, инфицированных ковид-19 Volume: 03 Issue: 03 | May-Jun 2022 ISSN: 2660-4159 *www. cajmns.centralasianstudies.org/index.php*
12. Неонатология–национальное руководство / под ред. Академика РАМН проф. Н.Н. Володина. –М. ГЭОТАР-Медиа, 2008. –749 с].