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# EFFECT OF ENVIRONMENTAL POLLUTION ON INDICATORS OF HUMORAL IMMUNITY IN PATIENTS WITH NEONATAL SEPSIS

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## Abstract

The problem of an unfavorable impact of environmental factors on the population's health is becoming significantly important every year and is being actively discussed by leading experts around the world. Therefore, the aim of the study was to determine the indicators of humoral immunity in 260 newborns with neonatal sepsis under different conditions of environmental pollution of their parents' residence. There was a bigger part of prematurely born children among patients with neonatal sepsis living in polluted areas. The level of immunoglobulins A, M, G in the blood serum of a group of children whose parents lived in polluted areas were established to be significantly lower than in newborns whose parents lived in clean areas. Patients with neonatal sepsis whose parents lived in polluted areas of the city had significantly lower indicators of immunoglobulin levels in blood serum than children whose parents lived in rural areas.

**Keywords: immunoglobulins A, M, G; newborns; sepsis; environmental risk coefficient.**

**Introduction.** More than 5 million children die every year in the world from the impact of the unfavorable environment [1]. Due to this, the problem of the unfavorable impact of environmental factors on the population health is becoming crucially important every year and is actively being discussed by leading experts all over the world [2, 8, 11, 12]. The influence of environmental factors on the state and development of a fetus, newborn and child plays an important role in the future, since in the period of early ontogenesis they have high selectivity, and the development tempo of various organs and functional systems are characterized by the highest rate [3]. It should be noted that many disorders of the child's health are formed already in the perinatal period and are mainly associated with the course of pregnancy, the influence of a mother's body on the fetus in a polluted environment [4, 13]. The placenta of women living in polluted conditions is found to have different signs of oppression of compensatory-adaptive mechanisms that are recently interpreted by researchers as environmentally induced failure [8]. The current problem in neonatology is sepsis, especially among premature infants [2-4], in the basis of which a violation of the mechanisms of the immune protection of the macroorganism can be found. Given the importance of this issue, the study of changes in humoral immunity is relevant.

**The aim of the study** was to determine the indicators of humoral immunity in 260 newborns, patients with neonatal sepsis under different conditions of environmental pollution of their parents' residence.

**Materials and methods.** Being treated in Chernivtsi and Khmelnitsky regions, 260 patients with neonatal sepsis were under observation. Newborns were divided into two groups: the I group of children (141) was from parents who permanently lived in polluted areas; the II one (119) - newborns whose parents lived in clean areas. The characteristic of patients is given in Figure 1.

Premature infants dominated in both groups. By the place of residence, the mothers of newborn children with neonatal sepsis lived in rural areas more often: 65.95± 3.99 % in group I and 73.95± 4.04% in group II.

According to statistical yearbooks [9, 10] in Chernivtsi and Khmelnytsky regions the formula of environmental risk coefficient was created (CER): CEP Soil + 2 CEP water+ 3 CEP air/ 3, where CER is a coefficient of environmental pollution was defined as the ratio of local indicators to the regional ones. Taking into account these factors, the value of CER <2 was considered as a favorable one, and ≥2 as the one that had a risk of unfavorable factors on the body.

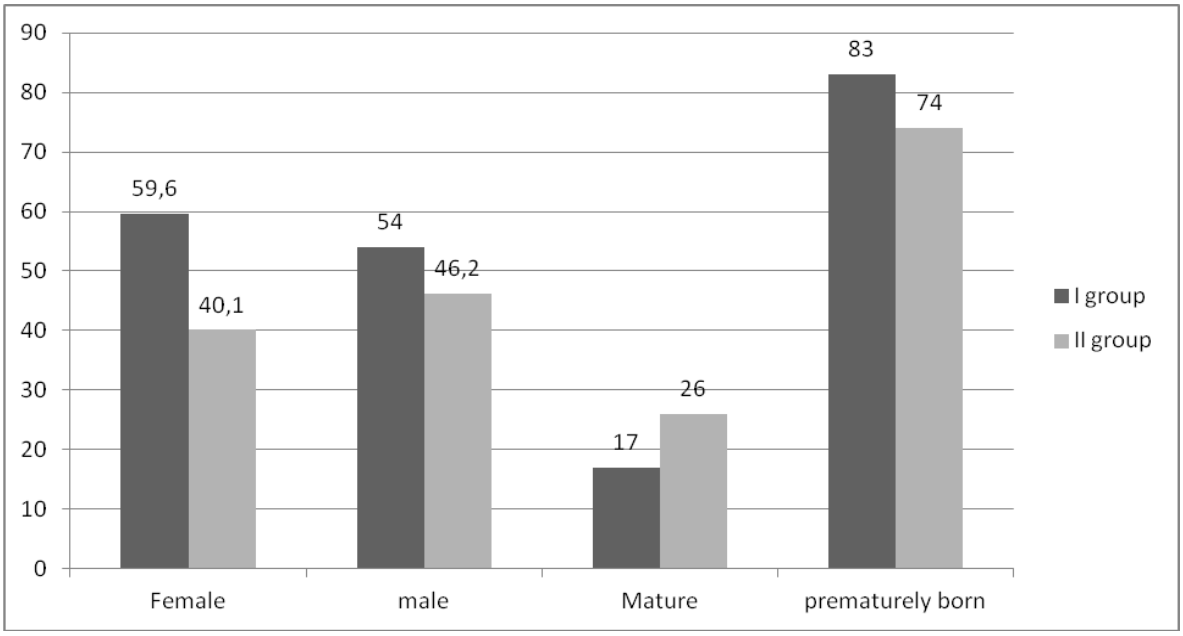


Figure 1 - The characteristic of newborns with neonatal sepsis (%)

A detailed collection of obstetric history, assessment of risk factors, a clinical and paraclinical examination of children with neonatal sepsis were carried out. The diagnosis was made according to the concept of "Sepsis -3"[5, 6, 7]. The level of immunoglobulins A, M, G (g\l) in blood serum was determined on the very first day of the illness by the method of immunoenzyme analysis on Stat Fax 303/Plus (USA).

The obtained data were analyzed by biostatistics methods using the principles of clinical epidemiology as well as with the help of computer packages “STATISTICA” StatSoft Inc. and Excel XP for Windows on a personal computer. The study was carried out according to the principles of the Helsinki Declaration. The Protocol of the study was agreed with the local Ethical Committee of all institutions. The agreement of the childrens' parents or their guardians was obtained for the studies.

**The results of the research**. Figure 2 presents the levels of immunoglobulins (Ig ) A, M, G in blood serum of patients with neonatal sepsis, provided that parents live in areas with different environmental characteristics.

It should be noted that under the condition of parents' permanent residence in polluted areas in patients with neonatal sepsis, there was a significant decrease in the levels of Ig A, M, G in blood serum compared with patients who lived in clean areas.

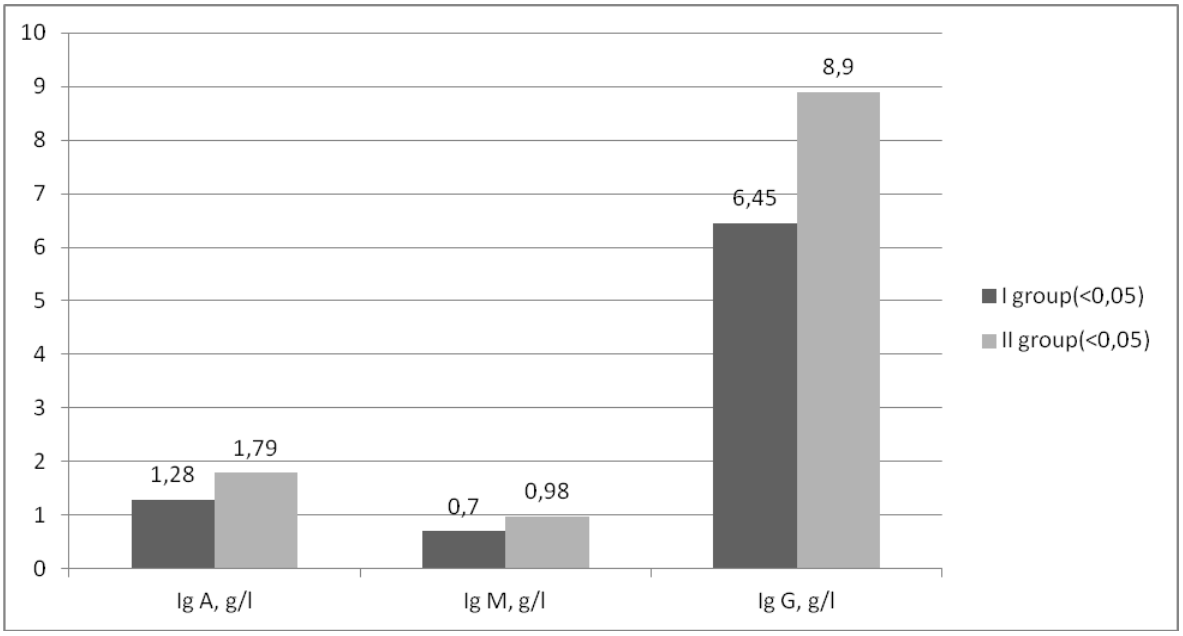


Figure 2 - Comparative characteristic of humoral immunity indicators in children with neonatal sepsis, under different environmental characteristics of their parents' residence

Table 1 presents a comparative characteristic of humoral immunity in patients with neonatal sepsis, depending on the place of residence.

Table 1 - Comparative characteristic of humoral immunity indicators in children with neonatal sepsis, depending on their parents' residence.

| Indica-tors | A level of immunoglobulins (g/l) in blood serum | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | city | | | | village | | | | P |
| Groups | N | A | M | G | N | A | M | G | |
| I | 48 | 0,82±0,11 | 0,63±0,08* | 4,27±0,45 | 91 | 1,53±0,13 | 0,74±0,04* | 7,68±0,05 | <0,05 |
| II | 31 | 1,54±0,23* | 0,79±0,11 | 6,67±0,77 | 85 | 1,9±0,12* | 1,06±0,07 | 9,72±0,47 | <0,05 |
| p | | <0,05 | >0,05 | <0,05 | | <0,05 | <0,05 | <0,05 | |

When comparing indicators with * p>0.05

According to the data obtained, children with neonatal sepsis whose parents lived in polluted streets of the city were found to have significantly lower levels of immunoglobulins in relation to the comparison group. The level of Ig A in the blood serum of newborns of I group was 0.82±0.11 g/l versus 1.54±0.23 g/l (p<0.05) of the comparison group. The level of Ig G in the blood serum of newborns whose parents lived in polluted areas was 4.27±0.45 g/l versus 6.67±0.77 g/l (p<0.05) of the comparison group. The decrease in Ig m content did not

have any significant differences but there was a tendency of its level decrease in I group. Children with neonatal sepsis whose parents lived in polluted rural areas were noted to have significantly lower levels of immunoglobulins in relation to the group of children whose mothers lived in clean areas The level of Ig A in the blood serum of newborns of I group was 1,53±0,13 g/l versus 1.89±0.12 g/l ($p<0.05$) of the comparison group. The level of Ig G in the blood serum of newborns whose parents lived in polluted areas 7.68±0.5 g/l versus 9.72±0.47 g/l ($p<0.05$) of the comparison group. The decrease in Ig M was 0.74±0.04 g/l in group I versus 1.06±0.07 g/l ($p<0.05$) in group II.

The data obtained while distributing patients with neonatal sepsis into groups of families who lived in rural areas and separately into those who lived in the city showed that in the city, which is likely to be a collector of various environmental risk factors, there is more inhibition of the synthesis of immunoglobulins A and G and a decrease in the level of immunoglobulins of group M with a tendency to greater depression in polluted areas where CEP ≥2.

**Conclusions.** 1. There were more prematurely born children among patients with neonatal sepsis, living in polluted areas.

2. The level of immunoglobulins A, M, G in the blood serum of a group of children with neonatal sepsis whose parents lived in areas with favorable environmental characteristics is significantly lower than in newborns whose parents lived in clean pollution zones.

3. Patients with neonatal sepsis whose parents lived in the city had significantly lower indicators of levels of of immunoglobulin in blood serum than children whose parents lived in rural areas.

The authors declare that they have no conflict of interest.

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