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POINT OF VIEW

M.S. Savvina, T.I. Nelunova, T.E. Burtseva, T.M. Klimova, V.B. Egorova, V.G. Chasnyk

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THE ROLE OF SOCIAL FACTORS IN THE FORMATION OF CONGENITAL HEART DISEASE IN THE REPUBLIC OF SAKHA (YAKUTIA)

The article presents the results of the study of the association of some socio-demographic factors with risk of congenital heart disease in children in the Republic of Sakha (Yakutia). The analysis was carried out on the basis of the Perinatal Center of the Republican Hospital No.1-NCM). The study includes all cases of congenital defects among newborns born alive in two time periods – from 2001-2003 and 2011-2013. In the first period, 697 cases were registered, in the second period there were 1127 cases of congenital heart disease.

The first group included newborns with persistent fetal communications without signs of heart failure, without expansion of the heart cavities and without hemodynamic disorders. The second group was represented by newborns with congenital heart disease with signs of heart failure and functional class of various degrees. This group was divided by severity of heart failure and functional class stages into two subgroups which were 2A and 2B respectively.

The factors such as the education of parents, the number of births in the history, the presence of a full and incomplete family, were analyzed.

The compared groups were not statistically significantly different by age of the parents. The median values of the mothers' age at the time of birth of a child with congenital heart disease were 27 years in the first group, 26 years in the 2A group, and 28 years in the 2B group. The median age of the father in all groups was 29 years.

The structure of categories of social status is represented mainly by employees, non-workers, workers and students. An analysis of the parents of the education factor as a possible predictor of the birth of a child with congenital heart disease was also conducted.

According to the results of the study, social factors affecting the risk of birth of children with congenital heart defects were an incomplete family without a sign of marriage (registered and unregistered marriage), the level of education of the mother in the case of simple heart defects, the number of births and the social status of the mother in complex diseases.

Keywords: congenital heart disease, social factors, parents, statistical analysis.

SAVVINA Maya Semyonovna – PhD, senior researcher of the laboratory Monitoring of the state of children's health, Yakut Scientific Center of Complex Medical Problems, e-mail: maya_savvina@mail.ru; **NELUNOVA Tuyara Ivanovna** – cardiologist of the Perinatal Center of the Yakutsk Republican Clinical Hospital, PhD student, St. Petersburg State Pediatric Medical University; **BURTSEVA Tatiana Egorovna** – MD, Professor, Department of Pediatrics and Pediatric Surgery, Medical Institute, M.K. Ammosov North-Eastern Federal University, Head of the Child Health Monitoring Laboratory, Yakut Scientific Center of Complex Medical Problems, e-mail: bourtsevat@yandex.ru; **KLIMOVA Tatiana Mikhailovna** – PhD in Medical Sciences, Associate Professor, Department of Pharmacology and Pharmacy, Medical Institute, M.K. Ammosov North-Eastern Federal University, Associate Professor, Senior Research Specialist, Yakut Scientific Center of Complex Medical Problems, e-mail: biomedykt@mail.ru; **EGOROVA Vera Borisovna** – PhD in Medical Sciences, Associate Professor, Department of Pediatrics and Pediatric Surgery, Medical Institute, M.K. Ammosov North-Eastern Federal University; **CHASNYK Vyacheslav Grigorievich** – MD, Professor, head of the Department of Hospital Pediatrics, FSBEI HE St. Petersburg State Pediatric Medical University.

Introduction. Children's health is formed under the influence of the interaction of endogenous and external factors. The leading place among the endogenous are genetic factors, parents' health, the course of antenatal and perinatal periods. The external environmental factors also can increase the likelihood of disease [1,9,14].

Congenital heart disease is one of the global problems of modern neonatology and pediatrics. Most of the risk factors influencing the formation of CHD in the fetus can be managed, as evidenced by numerous multicenter studies, which reinforces the importance of preventive measures aimed at preventing further growth of CHD prevalence [2, 7].

The etiology of congenital heart disease is still unclear. In addition to genetic or chromosomal abnormalities, maternal factors such as drug intake during pregnancy, viral infections in the first trimester of pregnancy, smoking, alcohol abuse, and others can contribute to CHD development [4, 5, 6, 8, 13]. There is an evidence of an increased risk of heart defects in children of mothers with diabetes

mellitus or obesity [10, 11]. Some studies have shown that family socio-economic status, age of parents are risk factors for the development of congenital heart disease [4, 8, 12].

The purpose of the research is to assess the association of some socio-demographic factors with the risk of congenital heart disease development in children in the Republic of Sakha (Yakutia).

Material and methods of the study. The retrospective study was conducted at the Perinatal Center of the Republican Hospital No.1 National Center of Medicine (PC RH No.1-NCM). All cases of CHD among newborns born alive in the periods 2001-2003 (period A) and 2011-2013 were included in the analysis. (period B). In period A there were 697 cases, in period B there were 1127 cases of CHD.

The first (1) group (n=1008) involved newborns with persistent fetal communications without signs of heart failure (HF), without dilated heart cavities and without hemodynamic abnormalities (small atrial septal discharge (ASD) without a functioning open arterial duct (OAP) or in combination with OAP with small blood discharge). The second (2) group was represented by newborns with CHD with signs of CHD and functional class (FC) of different degrees. This group was divided by severity of CH and FC stages into two subgroups: 2A and 2B. The subgroup 2A (n=183) consisted of newborn infants with CHD, with no or minimal manifestations of CH, i.e., with signs of CH 1, FC 1. This group included the patients with an average TMB discharge, without or in combination with a functional AVP less than 0.2 cm in diameter. Subgroup 2B (n=625) consisted of newborn infants with CHD and features of CH 1-3, class 2 or more. This group included: 1) moderate discharge on the IAP in combination with an OAP with a diameter of 0.2 cm or more, large discharge on the IAP (0.56 cm -1.0 cm) without or in combination with a functioning OAP of any size, atrial septal defect (ASD) of any size without or in combination with an OAP of any size; 2) complex CHD, without or in combination with a functioning OAP. In all patients of Group 2B the diagnosis was verified by X-ray contrast methods.

To assess the medical and social characteristics of the patients' families, a retrospective analysis of the primary documentation- statistical cards of an inpatient (form №066/-02) and inpatient registers (form №010u) was performed.

Statistical calculations were performed using IBM SPSS Statistics 22 software. Pearson and Kruskal-Wallis criteria were used to compare groups. Logistic regression method was used to assess the contribution of risk factors. The critical value of the significance level for testing statistical hypotheses was assumed to be 5%.

Results and discussion. The compared groups did not differ statistically significantly by parental age. The median maternal age at the time of birth of a child with CHD was 27 years in Group 1 (n=1008), 26 years in Group 2A (n=183), and 28 years in Group 2B (n=625) (p=0.252). The median values of the father's age in all groups (n=862, n=154, n=561) were - 29 years (p=0.915).

The structure of parents' social status categories among the entire sample population and Group 2B was analyzed further (Table 1). The structure of categories of social status of parents was represented mainly by employees, unemployed, workers, students of universities and colleges. In dynamics, over the 10 years of observation, the structure of social categories among mothers remains the same: in the first place - "employees", in the second place - "unemployed", in the third place - "workers". Analysis of the dynamics of the structure of social categories among mothers in periods A (n=147) and B (n=479) among Group 2B CHDs showed an increase in the proportion of unemployed from 19.7% to 27%. In period B, there was a decrease in the proportion of employees from 54.2% to 48.5% and of college students from 6.3% to 3.5%.

The social categories of fathers were slightly different from the structure presented above. Among the fathers in the total sample, A (n=697) and B (n=1127), the proportion of employees was approximately equal to that of workers, at 35%. Furthermore, among fathers, in the total sample population, A (n=697) and B (n=1127), the nonworking category was 11.2% and 13.2%. Students of higher education accounted for 3.0% and 4.2% and students of secondary education accounted for 3.6% and 1.4%.

The structure of social categories among fathers has remained the same over the 10 years of observation: the first place is held by employees and workers, the second one is occupied by unemployed men, and the third place is held by students of universities and colleges. There is no clear difference between the indicators of the general sample and Group 2B, as well as between periods A and B (Table 1).

The analysis of the parental education factor as a possible predictor of birth of a child with CHD was performed (Table 2). The education of both fathers and mothers in the general population was evenly distributed among the three CHD groups, with the exception of incomplete higher education. The second period had a higher proportion of persons with a college degree, but the differences between the total sample and the 2B group of CHDs did not exceed 10% of the total population for each category.

According to the data presented in Table 2, the structure of the educational categories of parents is represented by secondary school, secondary specialized, higher, and incomplete higher education. In period A, among the mothers and fathers in the total sample (n=697), secondary school, secondary specialized, and higher education were relatively evenly distributed, accounting for about 30% (29.5% to 32%.), and incomplete higher education accounted for 8.2% to 9.5%. In period B, there was a decrease in the proportion of mothers and fathers in the total sample (n=1127) with specialized secondary education (23.1% for mothers, 27.7% for fathers). The proportion of mothers with higher education increased (37.7%). Among the sample of mothers with newborns in group 2B, when comparing the two periods, (period A (n=147), period B (n=479)), there was a persistence of a higher proportion of persons with higher education in relation to the proportion of persons with secondary school and secondary special education. There was no such a tendency among fathers.

During the studied periods, there was a decrease in the proportion of individuals with specialized secondary education (23.1% - mothers, 27.7% - fathers) and an increase in the proportion of mothers with higher education of 37.7%. In the sample of CHD group 2B, mothers have a higher share of persons with higher education in relation to the share of individuals with secondary school and secondary vocational education. Among fathers, the share of individuals with higher education decreased.

The social categories of father and mother proved to be statistically significant predictors of CHD development (Table 3). In the first period of the study, the logistic regression data (comparison category - employees) revealed that the risk of having children with simple CHD was higher in mothers, categorized as "college students" (OR = 5.94, p=0.03) and was lower for fathers categorized as "civil servants" (OR = 0.07, p=0.027), "unemployed" (OR = 0.16, p=0.018) and "college students" (OR = 0.0374, p=0.037). Analysis by group showed that the low-

Table 1

Social categories of father and mother in periods A and B. total and among Group 2B CHD cases. n (%)

Category	Mother				Father			
	Period A		Period B		Period A		Period B	
	Total (n=697)	CHD in the 2B group (n=147)	Total (n=1127)	CHD in the 2B group (n=479)	Total (n=697)	CHD in the 2B group (n=147)	Total (n=1127)	CHD in the 2B group (n=479)
Employees	48.0	54.2	49.9	48.5	35.2	40.0	30.5	31.1
Civil servants	2.2	0	0.9	1.1	5.9	0.8	1.6	2.0
Workers	13.8	11.3	11.2	11.7	32.7	33.3	32.5	29.1
Peasants	1.6	2.8	0.2	0.2	0.5	0	1.2	1.5
Unemployed	22.7	19.7	25.9	27.0	11.2	12.5	13.2	11.5
College students	4.1	6.3	3.5	3.2	3.6	2.5	1.4	1.2
Entrepreneurs	0.3	0	1.1	0.9	3.7	1.7	9.3	11.2
Soldiers	0	0	0	0	0.7	0.8	0.9	1.2
Employees of the Ministry of Internal Affairs	0.7	0	1.1	0.6	3.4	2.5	4.8	5.1
School students	0.6	0.7	0.7	0.6	0.2	0.8	0.1	0.2
Church workers	0	0	0	0	0	0	0.1	0.2
People with disabilities	0.1	0	0.4	0.6	0	0	0.2	0.5
University students	5.7	4.9	5.2	5.5	3.0	5.0	4.2	5.1

Table 2

The level of education of fathers and mothers in periods A and B in the total sample and among Group 2B CHD cases, n (%)

The level of education	Mother				Father			
	Period A		Period B		Period A		Period B	
	Total (n=697)	CHD in the 2B group (n=147)	Total (n=1127)	CHD in the 2B group (n=479)	Total (n=697)	CHD in the 2B group (n=147)	Total (n=1127)	CHD in the 2B group (n=479)
secondary school	29.5	21.3	31.1	32.7	30.7	29.1	34.0	35.5
secondary specialized	31.0	28.3	23.1	19.8	31.8	28.2	27.7	28.1
Incomplete higher	9.5	9.4	8.2	9.4	5.3	6.4	6.1	6.1
Higher	30.0	40.9	37.7	38.1	32.2	36.4	32.1	30.3

er risk of having group 2A children was characterized by fathers categorized as "employees" (OR = 0.03, p=0.043) and "non-workers" (OR = 0.01, p=0.017). The lowest risk of having group 2B children was found in fathers classified as "civil servants" (OR = 0.03, p=0.037).

In the second period of the study, a lower risk of having children with simple CHD was typical for fathers from the "worker" category (OR = 0.48, p=0.006), compared to the "employee" category. The lower risk of having children with complex CHD was statistically significantly higher for mothers from the "workers" category (OR = 3.71, p=0.025) and the " entrepreneurs" category (OR = 10.65, p=0.01).

Statistical analysis of the effect of parental education as a predictor of the risk of having a child with CHD was performed. The results are presented in Table 4. In period A, the risk factor for the birth of children with simple CHD (comparison with secondary education) was the mother's higher education (OR = 3.47, p=0.031); in group 2B, the risk of having a child with CHD was lower for mothers with a specialized secondary education (OR = 0.437, p=0.024). In period B, the risk of having children with simple CHD was lower in fathers with incomplete higher education (OR = 0.32, p=0.026) and higher education (OR = 0.486, p=0.006); the risk of having children with complex CHD was higher in mothers with incomplete higher education (OR = 7.06, p=0.013). The risk of birth of CHD in group 2A was lower in fathers with secondary education (OR = 0.41, p=0.03).

Next, the analysis of other factors with possible risk of having a child with CHD, such as the number of repeated births in the anamnesis, the presence of full and single-parent families, and marital status (registered and unregistered marriages) was performed. These factors were statistically significant (Table 5).

According to the data presented in Table 5, in period A, incomplete family (OR = 4.84, p=0.049) was a statistically significant risk factor for having children with simple CHD (compared with the presence of registered marriage). In Group 2B, the risk of CHD was lower in families with registered marriage (OR = 0.187, p=0.046). There was also evidence of an increased risk of complex CHD birth in period B in women with a history of repeated births (OR = 1.51, p=0.014).

Thus, according to the results of the study, in both periods, the highest risk of CHD birth was detected in the categories "single-parent family without paternal residence" and "number of births".

Table 3

Social category of parents and risk of having a child with CHD

Factor	Risk	Period	Odds ratio (OR)	p
Mother is a college student	Simple CHD	A	5.94	0.031
Father is a civil servant	Simple CHD	A	0.07	0.027
Father is unemployed	Simple CHD	A	0.16	0.018
Father is a college student	Simple CHD	A	0.038	0.037
Father is an employee	2A group	A	0.03	0.043
Father is unemployed	2A group	A	0.01	0.017
Father is a civil servant	2B group	A	0.03	0.037
Father is unemployed	2B group	A	0.06	0.044
Father is a college student	2B group	A	0.052	0.025
Father is a worker	Simple CHD	B	0.48	0.006
Mother is a worker	Complex CHD	B	3.71	0.025
Mother is an entrepreneur	Complex CHD	B	10.65	0.011

Table 4

Education of parents and the risk of having a child with CHD

Factor	Risk in groups	Period	Odds ratio (OR)	p
HE of mother	Simple CHD	A	3.47	0.031
SSE of mother	2B group	A	0.437	0.024
IHE of father	Simple CHD	B	0.32	0.026
HE of father	Simple CHD	B	0.486	0.006
IHE of mother	Complex CHD	B	7.06	0.013
SE of father	2A group	B	0.41	0.030
STE of father	2B group	B	1.61	0.053

Notes: HE - higher education; IHE - incomplete higher education; SE - secondary education; SSE - secondary specialized education; STE - secondary technical education; period A is 2001-2003; period B is 2011-2013.

Table 5

Other social factors and the risk of having a child with CHD

Factor	Risk of CHD	Period	OR	p
2)	Simple CHD	A	4.84	0.049
3)	2A group	A	0.026	0.039
4)	2A group	A	0.028	0.019
3)	2B group	A	0.187	0.046
2)	Simple CHD	B	3.09	0.020
1)	Complex CHD	B	1.51	0.014
3)	2B group	B	0.116	0.004
4)	2B group	B	0.108	0.004

Notes: period A is 2001-2003; period B is 2011-2013; 1) - number of births, 2) - single-parent family: father does not live in the family, 3) - families with registered marriage, 4) - families with unregistered marriage.

In both periods, one of the most important risk factors for the birth of children with CHD was the birth of a child in a single-parent family. A single-parent family was a factor with a low risk of having a child with CHD, and the absence of formal marriage had no significant effect. In Group 2A and 2B CHD samples, registered marriage and unregistered marriage were the factors with low risk of having a child with CHD. These data are consistent with those of other researchers [3].

The factors listed appeared to be multidirectional and do not fit into a single obvious concept. In general, the evidence on socioeconomic inequality and the risk of CHD is somewhat contradictory [8]. Education level, employment, socioeconomic status, behavior, and environmental factors are related. In this case, we can also assume that the social category indicated in the medical record is not directly related to the real socioeconomic status of the family.

Summary. All studied groups did not differ statistically significantly by the age of parents at the time of birth of a child with CHD (p = 0.252). Social factors associated with the risk of birth of children with CHD were:

single-parent family, with no significant differences in marital status (registered and unregistered marriages);

in the sample of simple CHD - higher and incomplete higher education of the mother, study of the mother in a specialized secondary educational institution. In both studied periods, in the sample of simple CHD, the factors of higher education, incomplete higher education, and studies at a college were associated with a possible risk of CHD development; the same factors in fathers were associated with a low risk;

in the complex CHD sample, factors in the number of repeated births and the mother's social category of "worker" and "entrepreneur".

Conclusion. According to the research data, it can be assumed that the social category indicated in the medical records may not have been related to the real socioeconomic situation of the family. Among the social factors, in both time periods, the single-parent family category was the most high-risk.

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M.S. Kabbani, L.S. Shchegoleva, O.E. Filippova, O.E. Karyakina, M.A. Kunavin

ASSESSMENT OF THE IMMUNE STATUS IN MEN OF THE SUBRACTIC AND SEMI-ARID REGIONS USING FACTOR ANALYSIS

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Functional systems, including the immune system in humans, adapt depending on the influencing environmental factors. Factor analysis is considered an important method for identifying latent operating parameters and their contribution to the overall process. The aim of this work is to assess the immune status of men aged 20-60 years old living in the subarctic and semi-arid regions using factor analysis. After determining the concentration of leukocytes by standard methods, and the concentration of lymphoid subpopulations by the method of indirect immunoperoxidase reaction using monoclonal antibodies, factor analysis was carried out by the method of the main component with the determination of coefficient scores of indicators to calculate the contribution of different stages of the immune reaction in the formation of the immune response. The processes of lymphoproliferation and apoptosis play a controlling role over other processes, regardless of the place of residence. The activity of the phagocytosis process increases under semi-arid conditions. The activities of the processes of differentiation and the acquired cellular response are intensified in the subarctic region. At the same time, the balance between the processes of proliferation and apoptosis is disturbed to a greater extent in the subarctic region. Thus, the formation of an adaptive immune response in men of the subarctic region is accompanied by excessive use of the reserve capabilities of immune homeostasis. In men of the semi-arid region, the adaptive immune response is formed more fluently, which contributes to the preservation of reserve capabilities of immune homeostasis and is the most optimal (beneficial) for the body.

Keywords: immune system, factor analysis, phagocytosis, apoptosis, lymphoproliferation, subarctic region, semi-arid region.

Introduction: The impacts of living in different climatic, environmental and technogenic conditions can lead to adaptive functional and systematic changes, including the immune system, The body's reserve capabilities may subsequently be exhausted as a result, which may lead to the development of chronic pathology of a regional nature [1,6].

The air temperature, daylight and solar irradiation, UV index, and air quality index are all different in the subarctic and semi-arid regions. The average temperature in the subarctic region is 16°C lower than in the semi-arid region, and the semi-arid region has 3 hours more sunshine than the subarctic region. The UV index is 2.5 times higher on average in the semi-arid region. The air quality index in the subarctic region (AQI=23) is higher than in the semi-arid region (AQI=41), because the concentration of pollutants, particularly particulate matter (2.5 and 10 microns), is 25 times higher in the semi-arid region than in the subarctic region [9,12].

The evaluation of the functions of the human immune system is based on the development new methods and is important for determining the internal relationship of immunological parameters and the mechanisms of their functioning [11]. At present, the quantitative determination of immunocompetent cells, including cytotoxic, T-helper, B-lymphocytes and natural killers, by microscopic or flow cytometry method gives a good idea of the state of the body's immune homeostasis, normal ranges of cell content, and is also considered an important indicator in the norm. and in pathology [2,3].

Since these parameters are frequently involved in complex variable immu-

Federal State Budgetary Educational Institution, N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences RAS: **KABBANI Mohammad Sohib** – researcher; assistant of the Department of M.V. Lomonosov Northern (Arctic) Federal. Un-ty (NarFU), sohibmsk@hotmail.com, ORCID: 0000-0002-2330-7123; **SHCHEGOLEVA Lyubov Stanislavovna** – Doctor of Biology, Prof., Head. lab., ORCID: 0000-0003-4900-4021; **FILIPPOVA Oksana Evgenievna** – Ph.D., senior researcher, ORCID: 0000-0001-6117-0562. M. V. Lomonosov NArFU: **KARYAKINA Olga Evgenievna** – Ph.D., ORCID: 0000-0003-0781-0164; **KUNAVIN Mikhail Alekseevich** – PhD, ORCID: 0000-0001-7948-1043.