HEALTHY LIFESTYLE. PREVENTION

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PHYSICAL DEVELOPMENT AND PHYSICAL FITNESS OF 7-8-YEAR-OLD GIRLS WITH PECULIARITIES OF PERINATAL DEVELOPMENT PERIOD

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ABSTRACT

Aim. The purpose of the research is to study the characteristics of the physical development of 7-8-year-old girls with non-physiological perinatal period.

Materials and methods. 236 girls of 7-8-year-old girls from Kirov (Russia) were divided into groups: group I - control (n = 60, physiological perinatal period), group II (n = 58, late gestational hypertension in the anamnesis), group III (n = 61, placental insufficiency in the anamnesis), group IV (n = 57, maternal anemia in the anamnesis). We measured their physiometric characteristics (heart rate, blood pressure, vital capacity of lungs, flexion muscle strength of the right and left hand, maximum oxygen consumption) and anthropometric ones (length, body weight, chest circumference, its excursion). Then the corresponding indices and coefficients were calculated.

Results. Girls with late gestational hypertension have lower mass-growth index, the Quetelet index and dynamometry indicators; girls with placental insufficiency have higher systolic blood pressure and lower work power; girls with maternal anemia in the anamnesis have low mass-growth index, the Quetelet index and the power of work.

Conclusion. It is shown that the studied perinatal pathologies have a similar remote effect on physical development: gestational hypertension and anemia of a mother during pregnancy affect the mass-growth index and the Quetelet index, placental insufficiency and anemia influence the work power. Thus, we consider these indicators of 7-7-year-old girls (mass-growth index, the Quetelet index and work power) to be the most sensitive to pathologies of the perinatal period.

Keywords: physical development, perinatal period pathologies, gestational hypertension, placental insufficiency, pregnancy anemia.

Introduction. A number of studies have shown that complications of the perinatal period negatively affect the morphophenotype and adaptation of newborns [4], and the sexual development of adolescents [5]. The increase in the period of gestation is connected with an increase in body mass and its index in adulthood, especially among girls [7].

According to research, gestational hypertension in the anamnesis affects the physical development of children. Children with a gestational hypertension (n = 343) have a higher body mass index and a greater circumference of the chest than those with a physiological perinatal period [6]. The research [22], which aimed to identify the relationship between gestational hypertension of mother and obesity in 4-7-year-old children (n = 88406), showed that mother's increase in pressure by 10 mmHg during pregnancy increases the risk of children's obesity.

In addition, gestational hypertension in the anamnesis affects the state of the cardiovascular system (CVS). A study [16] showed that in 979 children (median age of 7 years) children with gestational hypertension of mother had a higher systolic blood pressure. Also, Tenhola S and co-authors [19] write about higher systolic and diastolic blood pressure of 12-year-old children with a mother's gestational hypertension in the anamnesis, the cause of it may be the elevated concentration of adrenaline in children's blood. In addition to high systolic blood pressure, children with gestational hypertension have a higher level of triglycerides in the blood plasma, which confirms the presence of a metabolic syndrome [17]. According to Alsnes I.V. et al. [6], all children with a mother's gestational hypertension are at risk for cardiovascular disease.

In addition to gestational hypertension, placental insufficiency has a distant influence on the state of children's CVS. It causes an increase in blood pressure [20] and has a long-term effect on the CVS status [14]. Moreover, placental insufficiency remotely reduces memory [10] (when a child is 12).

In addition to the above pathologies, the mother's anemia during pregnancy has a remote negative impact on the health of children. A study of 78,923 women showed that if a mother had anemia (hemoglobin concentration in the blood was 70-99 g/l), then the risk of anemia of 3-5-year-old children increased [21]. Mother's anemia during pregnancy affects the motor abilities of 1-year-old children [9]. In addition, it has an inverse correlation with the Tiffno-Pinelli index of 8-9-year-old children, i.e. they have a smaller airway patency [18] up to 10 years old [13].

The **purpose** of our study is to study the characteristics of the physical development of 7-8-year-old girls with non-physiological perinatal period.

Materials and methods of the research. In retrospect, according to the data of the registration form No. 112-U "The history of the development of the child" and 026/u "Medical card of the child" we studied the perinatal period development of 236 first-year schoolgirls in the city of Kirov (Kirov region, Russia). Girls were divided into 4 groups: I - control (n = 60, physiological perinatal period), II (n = 58, late gestational hypertension), III (n = 61, placental insufficiency), IV (n = 57, maternal anemia in the anamnesis). Groups II-IV included children with only one of these pathologies. To measure the physical development of girls, physiometric and anthropometric indicators were measured logically: at the beginning of the first grade (1st measure in October), in the middle (2d measure in January), at the end (3d measure in May) and at the beginning of the second grade (4th measure in September). Anthropometric indicators included measurements of length, body weight, chest circumference, its excursions and the calculation of weight-growth indices: mass-growth, Rohrer, Pignet, Quetelet [8]. According to anthropometric indicators, we compared the increase between measurements 1 and 2 (October-January), 2 and 3 (January-May), 3 and 4 (May-September).

The physiometric parameters were studied in February-March, measuring the heart rate, blood pressure [15], vital capacity of the lungs [11], the flexion muscular strength of the right and left hand [12]. We calculated life and strength index, pulse pressure, coefficient of efficiency of blood circulation, coefficient of endurance [3]. The level of general endurance was assessed by the maximum oxygen consumption (MOC), using the method of indirect calculation of the MOC for power and heart rate during the performance of the test step (climbing the bench at a height of 0.35 m for 4 minutes with a frequency of 20 cycles per minute) [1]. Using the MOC, the level of physical working capacity was assessed according to Apanasenko [2]. The results of the research were subjected to statistical processing using parametric statistics methods in the Microsoft Excel software package on an Intel Pentium computer.

Then the arithmetic mean (M) and the standard error of the mean (m) were calculated. The differences were assessed by the Student's criterion (t) for independent samples, and they were considered reliable at p<0,05 (in text it is indicated as «*»).

Results and discussion. When compared with the group I (control) for girls from the group II (late gestational hypertension), lower values of weight-growth indices and dynamometry indicators were revealed (Table 1).

The obtained data contradict the literature data on the higher body weight among children with a mother's gestational hypertension in the anamnesis [6, 22]. We have not confirmed the data on the influence of gestational hypertension on the cardiovascular system [16, 17, 19]. For the first time the effect of gestational hypertension on dynamometry was established.

When comparing groups I (control) and III (placental insufficiency), no differences in anthropometric parameters were revealed, but differences in cardiovascular parameters were established (Table 2). The group III has higher systolic blood pressure and lower exercise power.

We have confirmed the literature data on the increase of blood pressure of children with placental insufficiency [14, 20]. For the first time, it has been established that placental insufficiency has a negative effect on the power of the work.

Comparison of the group I (control) and IV (maternal anemia) has revealed differences in three indices (Table 3). The group IV has the lower mass-growth index, the Quetelet index and the work power.

We have not confirmed the literature data on the negative impact of the maternal anemia in the anamnesis on the state of the child's airways [13,18] - differences in the magnitude of the vital capacity of the lungs, the vital index, the Stange and Gentcha tests between groups I and IV.

For the first time it has been established that anemia has a negative effect on the power of work, the mass-growth index and the Quetelet index, which are the calculation units and indirectly indicate the amount of body weight.

Conclusion. While studying 236 girls, we have established a relationship between the features of physical development of 7-8-year-old girls and non-physiological perinatal period. Statistically significant differences were revealed in six parameters, including both anthropo- and physiometric indicators. Regardless of the type of perinatal pathology (gestational hypertension, placental insufficiency, anemia), girls are more likely to have differences in the Quetelet index, mass-growth index and work power. All three indicators are calculated and determined taking into account the body weight. Consequently, perinatal period pathologies remotely affect the body weight, reducing its value in comparison with the control at 7-8 years. It should be noted that two pathologies of the perinatal period (gestational hypertension and anemia) affect the mass-growth index and Quetelet index, while placental insufficiency and anemia affect the work power. Thus, we consider these indicators (the mass-growth index, Quetelet index and work power) in 7-8-year-old girls to be most sensitive to perinatal period pathologies.

Table 1

Indicators of physical development of the group I (control) and the group II (late gestational hypertension)

Indicators	Measurement №	Control		Late gestational hypertension		p
		M	m	M	m	
Mass-growth index. g / cm	2	206.57	6.02	189.76	3.52	<0.05
Quetelet index. kg / m2	2	15.77	0.38	14.67	0.22	<0.05
Dynamometry of the right hand. kg	4	14.20	0.44	12.68	0.63	<0.05
Dynamometry of the left hand. kg	4	13.34	0.48	11.59	0.59	<0.05

Table 2

Indicators of physical development of the group I (control) and the group III (placental insufficiency)

Indicators	Measurement №	Control		Placental insufficiency		p
		M	m	M	m	
Systolic blood pressure. mmHg	-	95.45	1.32	99.81	1.71	<0.05
Working power. kg * m / min	-	227.52	13.31	192.10	5.74	<0.05

Table 3

Indicators of physical development of the group I (control) and the group IV (maternal anemia)

Indicators	Measurement №	Control		Anemia		p
		M	m	M	m	
Mass-growth index. g / cm	3	206.57	6.02	189.63	5.25	<0.05
Quetelet index. kg / m2	3	15.77	0.38	14.66	0.30	<0.05
Working power. kg * m / min	-	227.52	13.31	194.17	7.22	<0.05

References

1. Avdeeva M.S. Tulyakova O.V. Vliianie perinatalnykh faktorov na razvitie dvigatelnykh funktsii pervoklassnikov [Influence of perinatal history upon development of motor functions in first graders] Pediatria, 2012, Vol. 91, №2, p. 132-135. http://pediatriajournal.ru/files/upload/mags/321/2012_2_3364.pdf
2. Apanasenko G.L. Popova L.A. Meditsinskaia valeologiia [Medical Valeology] Rostov-na-Donu: Feniks, Zdorovye, 2000. – 248 p.
3. Dubrovskii V.I. Sportivnaia meditsina [Sport Medicine]. – 2-nd Ed., Moscow: Vlados, 2001. – 512 p.
4. Dzhamali M.I. Yailenko M.I. Ivanyan A.N. Gribko T.V. Morfofenotip i adaptatsiia novorozhdennykh v zavisimosti ot stepeni narusheniia krovotoka v sisteme "mat-platsenta-plod" [Morphophenotype and adaptation of newborns depending on the stages of circulatory disturbances in "maternal-placental-fetal" system] Clinical Practice in Pediatrics, 2008, Vol 3, № 6, p. 33-37.
5. Mirlas E.M. Zaritskaya E.N. Shulzhenko E.V. Sostoianie ploda i perinatalnye iskhody u materei s khronicheskoi platsentarnoi nedostatochnostiu [Fetus state and perinatal outcomes in mothers with chronic placental insufficiency] Bulletin Physiology and Pathology of Respiration, 2008, № 30, p. 68-72. https://cfpd.amursu.ru/attachments/article/80/N30.pdf
6. Hypertension in Pregnancy and Offspring Cardiovascular Risk in Young Adulthood: Prospective and Sibling Studies in the HUNT Study (Nord-Trøndelag Health Study) in Norway / I.V. Alsnes, L.J. Vatten, A. Fraser [et al.] // Hypertension. – 2017. – Vol. 69, Is. 4. – P. 591-598. doi: 10.1161/HYPERTENSIONAHA.116.08414.
7. Body Mass Index, Overweight, and Obesity in Swedish Women Born Post□term / J., M. Lundgren, W.S. Cutfield [et al.] // Paediatric and Perinatal Epidemiology. – 2016. – Vol. 30, Is. 4. – P. 320–324. https://doi.org/10.1111/ppe.12292
8. Marfell-Jones M.J. International standards for anthropometric assessment / M.J. Marfell-Jones, A.D. Stewart, J.H. de Ridder. – Wellington, New Zealand: International Society for the Advancement of Kinanthropometry. 2012.

– 131 p. http://www.ceap.br/material/MAT17032011184632.pdf

9. Prenatal Hemoglobin Levels and Early Cognitive and Motor Functions of One-Year-Old Children / M.O. Mireku, L.L. Davidson, G.K. Koura [et al.] // Pediatrics. – 2015. – Vol. 136, Is. 1: e76-83. doi: 10.1542/peds.2015-0491.

10. Fetal umbilical artery Doppler pulsatility index and childhood neurocognitive outcome at 12 years / F. Mone, B. McConnell, A. Thompson [et al.] // BMJ Open. – 2016. – Vol. 6, Is. 6: e008916. doi: 10.1136/bmjopen-2015-008916.

11. Moore V.C. Spirometry: step by step / V.C. Moore // Breathe. – 2012. – Is. 8. – P. 232-240. doi: 10.1183/20734735.0021711

12. Muscle Strength Procedures Manual. – National Health and Nutrition Examination Survey, 2011. – 55 p. https://wwwn.cdc.gov/nchs/data/nhanes/2011-2012/manuals/muscle_strength_proc_manual.pdf

13. An exploratory study of the associations between maternal iron status in pregnancy and childhood wheeze and atopy / B.I. Nwaru, H. Hayes, L. Gambling et. al. // British Journal of Nutrition. – 2014. – Vol. 112, Is. 12. – P. 2018-2027. doi: 10.1017/S0007114514003122.

14. Paauw N.D. Pregnancy as a critical window for blood pressure regulation in mother and child: programming and reprogramming / N.D. Paauw, B.B. van Rijn, A.T. Lely, J.A. Joles // Acta physiologica (Oxford, England). – 2017. – Vol. 219, Is. 1. – P. 241-259. doi: 10.1111/apha.12702. Epub 2016 May 26.

15. Pulse and Blood Pressure Procedures for Household Interviewers. – National Health and Nutrition Examination Survey 1993. – 50 p. https://wwwn.cdc.gov/nchs/data/nhanes3/manuals/pressure.pdf

16. Pregnancy-Associated Hypertension and Offspring Cardiometabolic Health / M.M. Rice, M.B. Landon, M.W. Varner [et al.] // Obstetrics & Gynecology. – 2018. – Vol. 131, Is. 2. – P. 313-321. doi: 10.1097/AOG.0000000000002433.

17. Seppä S. Markers of Insulin Sensitivity in 12-Year-Old Children Born from Preeclamptic Pregnancies / S. Seppä, R. Voutilainen, S. Tenhola // Pediatrics. – 2015. – Vol. 167, Is. 1. – P. 125-130. doi: 10.1016/j.jpeds.2015.04.015.

18. Shaheen S.O. Haemoglobin concentrations in pregnancy and respiratory and allergic outcomes in childhood: Birth cohort study / S.O. Shaheen, C. Macdonald-Wallis, D.A. Lawlor, A.J. Henderson // Clinical and Experimental Allergy. – 2017. – Vol. 47, Is. 12. – P. 1615-1624. doi: 10.1111/cea.13034. Epub 2017 Oct 16.

19. Blood pressure, serum lipids, fasting insulin, and adrenal hormones in 12-year-old children born with maternal preeclampsia / S. Tenhola, E. Rahiala, A. Martikainen [et al.] // Journal of Clinical Endocrinology & Metabolism. – 2003. – Vol. 88. Is. 3. - P. 1217–1222. https://doi.org/10.1210/jc.2002-020903

20. Association between placental morphology and childhood systolic blood pressure / X. Wen, E.W. Triche, J.W. Hogan [et al.] // Hypertension. – 2011. – Vol. 57, Is. 1. – P.48-55. doi: 10.1161/HYPERTENSIONAHA.110.162792.

21. Maternal haemoglobin concentrations before and during pregnancy as determinants of the concentrations of children at 3-5 years of age: A large follow-up study / Y. Zhang, L. Jin, J.M. Liu [et al.] // European Journal of Clinical Nutrition. – 2018. – Aug 17. doi: 10.1038/s41430-018-0284-x. [Epub ahead of print].

22. Maternal Blood Pressure Rise During Pregnancy and Offspring Obesity Risk at 4 to 7 Years Old: The Jiaxing Birth Cohort / J.S. Zheng, H. Liu, K.K. Ong [et al]. // Journal of Clinical Endocrinology & Metabolism. – 2017. – Vol. 102, Is. 11. – P. 4315-4322. doi: 10.1210/jc.2017-01500.

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OPINION OF YOUNG PEOPLE ON THE POTENTIAL RISK OF THE BIRTH OF DEAF CHILD

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ABSTRACT

In Yakutia, the contribution of *GJB2* mutations to the etiology of hereditary deafness is 48.8% and is one of the highest in Asia, due to a significant accumulation of the mutation of the splice site c.-23+1G>A in the *GJB2* gene due to the founder effect in the Yakut population ("age" of mutation ~ 800 years). The results of scientific research in the field of genetic forms of deafness are actively introduced into practice in the form of various test systems of routine DNA diagnostics. However, the bioethical, social and psychological problems arising from the application of these genetic technologies are less well understood than the molecular genetic aspects of deafness. We conducted a questionnaire and a selection of buccal epithelium of 241 people, whose mean age is 21, in order to analyze their opinion on the potential risk of a deaf child's birth and conduct genetic testing for the presence of the mutation c.-23+1G>A in the *GJB2* gene. The frequency of heterozygous carriage of the mutation c.-23+1G>A of the *GJB2* gene among hearing young people (n = 241) in the Yakut population was 10.8%, which is comparable to the previously obtained data. Analysis of data from the questionnaire with genotypes shows that there are no statistically significant differences in the respondents' responses ($p>0.05$). As a result of the questionnaire, it is shown that most young hearing people think that deafness can be a hereditary disease (62.6%). Most young people assume the possibility of birth of a deaf child from hearing parents (81.33%), but only 2.49% of respondents agree with this risk. Such an answer can be explained by the protective internals of the psyche, when a person assumes the existence of the same risk of the birth of a deaf child in all people, but denies such a possibility in himself.

Keywords: opinion of young people, *GJB2* gene, c.-23+1G>A mutation, frequency of heterozygous carrier.

Introduction. In recent years, in connection with the expansion of the possibilities of DNA testing, much attention has been paid to the molecular genetic causes of hereditary forms of deafness. However, at the same time, in many regions of the world, the bioethical and social aspects of this disease remain insufficiently studied. At present, genetic technologies are ahead of the informa-

* - Equivalent contribution of authors