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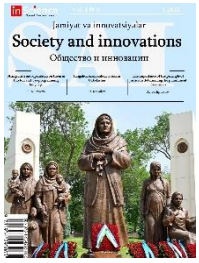

Respiratory and cardiac function markers in youth with vegetative dysfunctions

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ABSTRACT

This study examines the cardiovascular and respiratory systems in adolescents with SVD (syndrome of vegetative dystonia), focusing on the influence of perinatal pathology and gender differences. A total of 243 adolescents aged 12-18 with clinically and laboratory-instrumentally confirmed autonomic nervous system dysfunction were assessed. The findings revealed that cardiac abnormalities were more frequently observed in adolescents with SVD who had a history of perinatal pathology, particularly in males. Additionally, an increased risk of bronchial permeability disorders was identified in adolescents with SVD and history of perinatal pathology, predominantly in females.

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Vegetativ disfunktsiyali yoshlarda nafas olish va yurak funktsiyasi belgilari

Kalit so‘zlar:
o‘smirlar,
vegetativ kasalliklar,
perinatal patologiya.

ANNOTATSIYA

Ushbu tadqiqot SVD (vegetativ distoni sindromi) bo‘lgan o‘smirlarning yurak-qon tomir va nafas olish tizimlarini o‘rganib, perinatal patologiyaning ta’siri va gender farqlariga e’tibor qaratadi. Klinik va laboratoriya-instrumental tasdiqlangan avtonom nerv tizimining disfunktsiyasi bo‘lgan 12-18 yoshdagi jami 243 nafar o‘smir baholandi. Natijalar shuni ko‘rsatdiki, yurak anomaliyalari SVD bilan og‘rigan o‘smirlarda, ayniqsa, erkaklarda perinatal patologiyasi bo‘lgan o‘smirlarda ko‘proq kuzatilgan. Bundan tashqari, SVD va perinatal patologiya tarixi bo‘lgan o‘smirlarda, asosan, ayollarda bronxial o‘tkazuvchanlik buzilishi xavfi ortishi aniqlandi.

Маркеры функции дыхания и сердца у юношей с вегетативными дисфункциями

Ключевые слова:
подростки,
вегетативные
расстройства,
перинатальная патология.

АННОТАЦИЯ

В данном исследовании изучается состояние сердечно-сосудистой и дыхательной систем у подростков с СВД (синдромом вегетативной дистонии) с акцентом на влияние перинатальной патологии и гендерного различия. Обследовано 243 подростка в возрасте 12-18 лет с клинически и лабораторно-инструментально подтвержденной дисфункцией вегетативной нервной системы. Полученные данные показали, что нарушения со стороны сердца чаще наблюдались у подростков с СВД, имевших в анамнезе перинатальную патологию, особенно у лиц мужского пола. Кроме того, выявлен повышенный риск развития нарушений бронхиальной проходимости у подростков с СВД и перинатальной патологией в анамнезе, преимущественно у лиц женского пола.

Relevance: Vegetative system disorders in children are present in 25-80% of cases, with 17-20% progressing into conditions such as ischemic heart disease, hypo- and hypertension, bronchial asthma, and gastric or duodenal ulcers [3]. The prevalence of this pathology among noncommunicable diseases in childhood and adolescence ranges from 29.1 to 75% of cases [4]. The autonomic nervous system's leading role in the development of cardiovascular system pathologies in children has been established, and autonomic nervous system dysfunction is regarded as an adaptation disorder, involving a breakdown in neuroendocrine autonomic regulation of the heart and blood vessels [2]. When the acting factor surpasses the adaptive capabilities of the cardiovascular system, a pathological process involving both functional and structural disorders arises. Due to their “indicator” advantages, the cardiovascular and respiratory systems are prioritized in evaluating the adaptive capacities of the entire organism [1,5].

The purpose of the research is to determine the specific aspects of respiratory and cardiac activity in children with vegetative dysfunctions, depending on gender.

Material and methods of the research: The research is grounded in the findings of clinical and functional evaluations of the cardiovascular and respiratory systems in adolescents with SVD, taking into account the presence of perinatal pathology. The study involved 243 adolescents aged 12-18 who had clinically and laboratory-instrumentally confirmed autonomic nervous system dysfunction, specifically vegetative dystonia syndrome (VDS). The average age of SVD clinical manifestation in girls was 12.2±1.8 years old, while in boys it was 13.5±2.1 years old.

During the research, groups of adolescents with SVD were formed depending on gender and perinatal lesions of the nervous system ("PLNS"), Group 1 consisted of 53 (21.8%) adolescent boys with PLNS, Group 2 consisted of 34 (14.0%) adolescent boys without PLNS, Group 3 consisted of 107 (44.0%) adolescent girls with PLNS and Group 4 consisted of 49 (20.2%) adolescent girls without PLNS. (Table 1)

Table 1.

Distribution of patients with SVD into groups on the basis of a medical anamnesis of PLNS.

Groups		**n**	**%**
Group I	adolescent boys with PLNS	53	21,81%
Group II	adolescent boys without PLNS	34	13,99%
Group III	adolescent girls with PLNS	107	44,03%
Group IV	adolescent girls without PLNS	49	20,16%
Total		**243**	**100,00%**

Note: SVD- vegetative dystonia syndrome.
PLNS-perinatal lesions of the nervous system.

Electrocardiogram (ECG) was recorded on 6-TEC-3 (2003) in 12 standard leads, at a paper speed of 50 mm/sec, at rest, in the supine position.

Assessment of external respiratory function was carried out on the hardware-software complex "Valenta". The following parameters were investigated:

– Vital capacity of the lungs (VCL) consists of the reserve volume of inhalation, reserve volume of exhalation, and respiratory volume, in liters.

– Forced vital capacity (FVC) is the amount of air that can be exhaled during forced exhalation per 1 second after the maximum exhalation, in percent. – FEV1 – the volume of forced exhalation in one second – the volume of air exhaled in one second of forced exhalation

– Tifno index – the volume of forced exhalation in 1s in percentage to the proper value of VCL. (Vital Capacity of the Lungs)

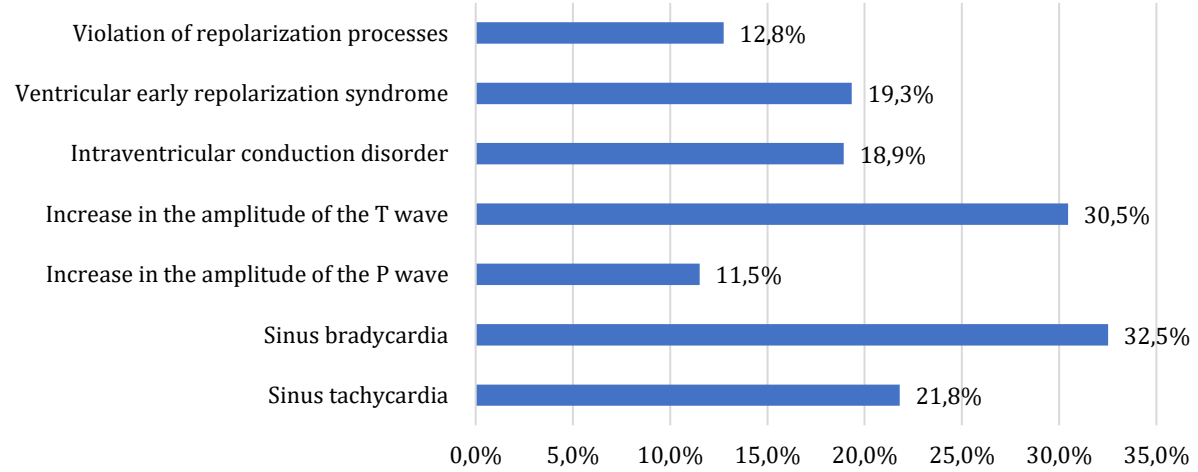
Statistical data were processed using the STATISTICA 6.0 software package (Stat Soft Inc., USA).

The following parameters were defined for the studied parameters: mean (M), standard error of the mean (m), median (Me), and interquartile range (25% percentile and 75% percentile) of the trait, if necessary. We used the nonparametric method – Mann-Whitney U-criterion calculation, for 3 or more groups – Kruskal-Wallis ANOVA

method to compare the quantitative characteristics of two independent groups. Qualitative parameters were assessed in absolute and relative values (%), χ2 criterion was used to compare qualitative signs in two independent groups, Fisher exact test for small samples, and Cochran Q-criterion for multiple comparisons. Differences with a 95% ($p<0.05$) level of significance were considered statistically significant.

Results of the research. Electrocardiographic parameters in adolescents with SVD were studied in order to study the state of cardiac activity in children with vegetative disorders. Sinus bradycardia was detected in 79 (32.5%) adolescents out of the total number of examined adolescents, the second most common was T-wave elevation – in 30.5% of cases.

Figure 1: Frequency of ECG changes in adolescents with SVD (в %, n= 243)



Sinus bradycardia was more common in adolescents in groups I and III than in groups II and IV (22.6% and 25.2% compared with 14.7% and 18.4%, respectively).

At the same time, increased T-wave was observed in 22 (41.5%) adolescents in group I compared with 5 (14.7%) in group II; $p1<0.001$. Rhythm disturbances in the form of sinus tachycardia were observed in 27 (25.2%) in group III and in 12 (22.6%) patients in group I.

The highest percentage of patients with intraventricular conduction abnormalities was observed in group III – 28 (26.2%), in group II this sign was found in 17.0% of cases. Group III demonstrated prolongation of the PQ interval (grade I atrioventricular block), high and acute T waves.

Table 2.

Frequency of ECG changes in adolescents with SVD depending on sex and perinatal pathology in the anamnesis.

ECG parameters	Group I (n=53)		Group II (n=34)		Group III (n=107)		Group VI (n=49)	
	n	%	n	%	n	%	n	%
Sinus tachycardia	12	22,6%	5	14,7%	27	25,2%	9	18,4%
Sinus bradycardia	15	28,3%	7	20,6%	48	44,9%	9	18,4%
Increase in amplitude of the P wave	6	11,3%	8	23,5%	4	3,7%	10	20,4%
Increase in amplitude of the T wave	22	41,5%	5	14,7%	39	36,4%	8	16,3%
Intraventricular conduction disorder	9	17,0%	3	8,8%	28	26,2%	6	12,2%
Ventricular early repolarization syndrome	8	15,1%	2	5,9%	29	27,1%	8	16,3%
Violation of repolarization processes	7	13,2%	1	2,9%	22	20,6%	1	2,0%

Early ventricular repolarization syndrome, represented by a spade-shaped segment deformation with a slight shift of its relative isoline, was detected in 29 (27.1%) in group III and in 15.1% of cases in group I, which may indicate features of metabolic processes in the developing myocardium in this contingent of children. Ventricular repolarization disorder, represented by a shortened PQ interval, was detected in 20.6% of group III patients and in 13.2% of group I patients.

Assessment of external respiratory function was performed by spirograph. The bronchial permeability disorders were observed in group III, as indicated by such spirographic parameters as VC, FVC, FEV, and Tiffno index. These parameters were lowered and made up 63,7% and 61,4% respectively, which was 1,2 times lower than the findings in Group II (73,4% and 71,6% respectively); p1<0,01.

In group I the VC index (68,3%), although different from this index in group II (73,4%) (p1<0,01), was lower than in group IV (70,1%) (p<0,01). These abnormalities were reflected in the FEV 1 index, which was also the lowest in group III, 62.5%; p1<0.001, compared with group II, 72.7%. (Table 3).

Table 3.

Spirograph parameters in adolescents with SVD depending on sex. (Me [25q; 75q])

VFD indicators	Group I (n=53)	P 1-2 < -	Group II (n=34)	P 2-3 < -	Group III (n=107)	P 3-4 < -	Group IV (n=49)	P 4-1 < -	P 4-2 < -	P 3-1 < -
	1		2		3		4			
VC (%)	68,3 [68,0;69,3]	0,01	73,4 [72,1; 75,3]	0,001	63,7 [61,7;65,9]	0,001	70,1 [69,0;71,3]	0,01	0,01	0,001
FVC (%)	64,1 [64,0;65,1]	0,01	71,6 [70,0;73,1]	0,001	61,4 [60,8; 63,1]	0,01	65,9 [64,9;67,1]	0,01	0,01	0,01
FEV1 (%)	68,9 [67,2;69,3]	0,01	72,7 [71,7;73,9]	0,001	62,5 [61,3;63,6]	0,01	69,1 [68,6; 69,7]	0,01	0,01	0,01
Tiffno index (%)	81,8 [80,9;83,3]	0,01	85,3 [85,8;87,5]	0,01	70,7 [70,5;71,5]	0,001	81,2 [80,6;82,4]	0,01	0,01	0,001

Note: p – the statistical significance of the difference in the indicators.

The lowest Tiffno index, the ratio of air volume exhaled during the first second of maximal exhalation to vital capacity, was observed in group III patients (70.7%) compared to group II (85.3%) (p1<0.001) and in groups I and IV (81.8% and 81.2%) (p1<0.001).

Results: Cardiac abnormalities were found to be more commonly observed in adolescents with SVD who have a history of perinatal pathology, particularly in males. Additionally, a higher risk of bronchial patency issues was identified in adolescents with SVD who have a history of perinatal pathology, predominantly in females.

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