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STATISTICAL CORRELATIONS OF THE PEDIATRIC METABOLIC SYNDROME SCORE

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REZUMAT

CORELAȚII STATISTICE ALE SCORULUI PEDIATRIC AL SINDROMULUI METABOLIC

Introducere: În ceea ce privește cercetările noastre, prezentul studiu este primul în care scorul sindromului metabolic (SM) pediatric și corelațiile sale la copii sunt validate.

Scopul lucrării: studierea coeficientului de corelație a scorului pediatric al SM cu parametrii clinici și paraclinici la copiii cu SM.

Material și metode: Studiu analitic, observațional, de cohortă. Au fost incluși 145 de copii. Scorul pediatric al SM a fost calculat folosind formula generală: (2xCA/h) + (Glu/5.6) + (TG/1.7)) + (TAs/130) - (HDLc/1.02. Analiza statistică folosită - SPSS versiunea 20.

Rezultate: Au fost înregistrate scorurile (nu au fost incluși copii cu vârsta 16 - 18 ani, având în vedere numărul mic al acestora și necesitatea aplicării altor formule): L_0 (non-SM) – 2.20±0.05, L_1 (SM) – 2.58±0.11 (p>0.05). Scorul pediatric al SM cu parametrii clinici și paraclinici a înregistrat: o corelație statistic semnificativă, de intensitate puternică pozitivă cu TG (+0.9**, p<0.001), slabă, pozitivă cu talia, vârsta, greutatea, IMC, ASC, IA, TAs, TAd, LDLc (+0.3**, p<0.001), CF (+0.24**, p<0.001), Glu (+0.2**, p<0.05), durata obezității (+0.2*, p<0.05), PPVS (+0.23**, p<0.001), MMVS (+0.2*, p<0.05), negativă cu HDLc (- 0.6**, p<0.001), IAF (- 0.21*, p<0.05).

Concluzii: Rezultatele cercetării au demonstrat valabilitatea scorului pediatric al sindromului metabolic pentru prezicerea acestuia a fost înaltă. Scorul dat este simplu și practic, poate fi utilizat în practica clinică și de cercetare. Totodată, a fost înregistrată o asociere cu parametrii antropometrici și hemodinamici, ai profilului lipidic, glucidic, ecografici de tipul remodelare a miocardului ventriculului stâng și nu au fost consemnate corelații cu parametrii de tipul grăsime epicardică și remodelare vasculară.

Cuvinte-cheie: scorul pediatric al sindromului metabolic, copii.

Notă: CA – circumferință abdominală, h – înălțime, IMC – indice de masă corporală, IA – indice abdominal, ASC – aria suprafeței corporale, IAF – indice abdominofesier, CF – circumferință fesieră, HDLc – colesterol cu densitate înaltă, LDLc – colesterol cu densitate joasă, Glu – glucoză, TG – trigliceride, TAs/d – tensiune arterială sistolică/diastolică, PPVS – peretele posterior al ventriculului stâng, MMVS – masa miocardului ventriculului stâng.

РЕЗЮМЕ

СТАТИСТИЧЕСКОЕ СООТНОШЕНИЕ ПЕДИАТРИЧЕСКОЙ ОЦЕНКИ МЕТАБОЛИЧЕСКОГО СИНДРОМА

Введение: Наше исследование является первым, в котором оценка педиатрического метаболического синдрома (МС) и его взаимосвязей у детей была подтверждена.

Цель работы: Изучение коэффициента корреляции педиатрической оценки МС с клиническими и параклиническими показателями у детей с данным синдромом.

Материал и методы: Данное исследование является аналитическим, наблюдательным, когортным исследованием. Было включено 145 детей. Показатель метаболического синдрома у детей рассчитывали по общей формуле: (2xОТ)/рост) + (Гл)/5.6) + (ТГ)/1.7) + (САД)/130) - (ХС ЛПВП/1.02. Использованный статистический анализ - версия 20 SPSS.

Результаты: результаты были зарегистрированны (дети в возрасте 16-18 лет не были включены, учитывая их небольшое количество и необходимость применения других формул): L_0 (без-МС) – 2.20 ± 0.05, L_1 (МС) – 2.58 ± 0.11 (p>0.05). Оценка МС у детей с клиническими и параклиническими данными зарегистрировала: статистически значимую корреляцию, сильную положительную интенсивность с ТГ (+ 0.9**, p <0.001), слабо положительную с ростом, возрастом , весом, ИМТ, ППТ, САД, ДАД, ХС ЛПНП (+ 0.3**, p<0.001), ОБ (+ 0.24**, p<0.001), Гл (+ 0.2 **, p<0.05), продолжительность ожирения (+ 0.2*, p<0.05), ЗСЛЖ (+ 0.23**, p<0.001), ММВС (+ 0.2*, p<0.05), отрицательная с ХС ЛПВП (- 0.6**, p <0.001), ИТБ (-0.21*, p <0.05).

Выводы. Результаты исследования показали, что достоверность оценки метаболического синдрома в педиатрии для его прогнозирования была высокой.
Оценка педиатрического метаболического синдрома проста и практична, ее можно использовать в клинической и исследовательской практике.
В то же время была зарегистрирована связь с антропометрическими и гемодинамическими параметрами, с показателями липидного и углеводного обмена, с такими ультразвуковыми параметрами, как ремоделирование миокарда левого желудочка, и не было зарегистрировано никаких корреляций с такими параметрами, как эпикардиальный жир и ремоделирование сосудов.

Ключевые слова: педиатрическая оценка метаболического синдрома, дети.

Список сокращений: ОТ – окружность талии, ППТ – площадь поверхности тела, ИМТ – Индекс Массы Тела, ИТБ – индекс талия/бёдра, ОБ – окружность бедра, Гл – глюкоза, ТГ – триглицериды, САД/ДАД – систолическое/диастолическое артериальное давление, ХС ЛПВП – холестерол - липопротеины высокой плотности, ХС ЛПВП – холестерол - липопротеины низкой плотности ЗСЛЖ – задняя стенка левого желудочка, ММЛЖ – масса миокарда левого желудочка.

Introduction

The metabolic syndrome (MS) is a cluster of cardiometabolic risk factors including central obesity, insulin resistance, glucose intolerance, dyslipidemia, and raised blood pressure. The prevalence of MS is increasing worldwide due to the epidemic of overweight and obesity. Children with MS have an increased risk of adulthood MS, type 2 diabetes, and cardiovascular disease (CVD). MS also predicts type 2 diabetes, CVD, and CVD as well as all-cause mortality in adults [5].

The definition of MS is particularly controversial among children because there are no clear thresholds above which the cardiometabolic risk factors start to worsen [2].

MS has traditionally been classified based on dichotomous criteria that deny that MS-related risk likely exists as a spectrum. Pediatric MS score provides a way to track MS-related risk over time.

Also, minimal changes values of MS components are measurable and accounted for pediatric MS score, while the dichotomous approach to the syndrome is unable to account for these subtle changes. So far, no consensus exists in regards to the components of metabolic syndrome score and every researcher calculates score by his definition or experience. To overcome the issues of both dichotomous MS definition and unstandardized MS scores which are noncomparable, there is a need to develop a new, easy to calculate MS score, comparable across different studies and populations [3].

While considering the aforementioned arguments and the impact of childhood health on further adult health, we considered to choose the following research on pediatric MS score, that will contribute to the opening of new perspectives for identifying a single and effective approach, as well as for preventing cardiovascular complications of this syndrome, based on IDF criteria adapted for children, to reduce the morbidity and mortality rates at a young age.

MATERIAL AND METHODS

The purpose of the research: to study the correlation coefficient of the pediatric MS score with the clinical and paraclinical parameters in children with metabolic syndrome.

General design and study population. The study project was carried out within the IMPH IMC, at the Department of Pediatrics of the Pediatric Cardiology Clinic, to which 161 children were admitted, aged from 10 to 17 years 11 months and 29 days, from both urban and rural areas, the patients being selected electively during the 2016 – 2019 period. An observational analytical cohort study was planned to achieve the research purpose.

*The research comprised several stages***.** The 1st stage included 145 children (out of 161 participants, 16 ineligible), who were selected based on the inclusion/exclusion criteria, and made up the research group according to *the following criteria*: the age of 10-17 years 11 months and 29 days

(inclusive); with abdominal obesity (waist circumference (WC) ≥ 90percentile [6]); the child's parent or guardian consent, as well as children's assent (age ≥ 14 years) on research participation; being a citizen of the Republic of Moldova; ability to effectively communicate with the researcher; ability to understand and follow the study requirements; sufficient understanding in signing the informed agreement and written assent.

The *study exclusion criteria* for the patients were the following: secondary obesity: endocrine, genetic and neurological type, having a suggestive clinical examination, confirmed by specialized examinations; secondary high blood pressure: renal, endocrine, neurogenic, drug-induced, etc., patients having a suggestive clinical examination, confirmed by specialized examinations; acute conditions, whether or not accompanied by fever, whether or not undergoing treatment; chronic respiratory, cardiovascular, gastrointestinal, renal, neurological, endocrine, etc., disorders, whether or not undergoing treatment; the child's parents or legal representative disagreement, child's refusal to participate in the research, with a difficult ultrasound window, low compliance, patient's refusal to be included in the study.

The selected participants underwent a complex examination, which included: filling in a specific questionnaire (food and physical activity survey), the clinical examination on systems, laboratory testing for lipid status (total cholesterol (TCh), triglycerides (TG), high-density cholesterol (HDLc)), the glucose (Glu) spectrum (basal glucose, oral glucose tolerance test (OGTT) – selectively) and uric acid.

Following the clinical and paraclinical findings, the 2nd stage included the respondent's self-division into 2 groups, by using the criteria of MS according to the Consensus of the IDF adapted for children [1], namely: the research group (L_1) – 53 de children with MS (including 3 – 5 criteria) and control group (L_0) – 92 children without MS (including 1 – 2 criteria). The ratio of the study groups was 1:2. Subsequently, subjects from both groups were investigated by surface electrocardiography, transthoracic echocardiography, echocardiographic assessment of epicardial adipose tissue (EAT), and ultrasound measurement of carotid intima-media thickness (CIMT).

The 3rd stage included a comparative study of the two groups, in terms of lifestyle, symptoms, demographic, anamnestic and biochemical profile, cardiac function and morphology, values of the CIMT, EAT, the severity pediatric MS score, etc, as well as a statistical analysis of the obtained results. Practical conclusions and recommendations, based on the obtained results, were traced out at the 4th stage of the study.

All the participants were selected and informed about the research stages, being enrolled only by personal agreement, following a detailed explanation of the requirements and procedures of necessary investigations by discussing with each subject individually. All the procedures were performed, based on children's parent and legal representative consent, as well as on written assent of children ≥ 14 years old. They were not paid and have not suffered any financial costs for participation.

Ethical considerations. The study complied with the international standards of medical ethics, developed by the Declaration of Helsinki, regarding confidentiality and personal data protection of the participants. The research was approved by the Research Ethics Committee of State University of Medicine and Pharmacy "Nicolae Testemitanu" (report no. 59 of 03.06.2016). The resulting data were revealed only to the concerned participant, the personal data of each subject were not used and will not be used for any other purpose. The study applied the following research methods: historical, comparative, biostatistics ones, and others.

Metabolic syndrome. MS was defined according to the IDF consensus definition of metabolic syndrome in children and adolescents [1]: WC ≥ 90th percentile or adult cut-off if lower, plus any two of the following four factors: TG ≥ 1.7 mmol/l, HDLc < 1.03 mmol/l, BP systolic ≥ 130 and diastolic ≥ 85 mmHg, Glu ≥ 5.6 mmol/l (If ≥ 5.6 mmol/l (or known T2DM) recommend an OGTT) for age group 10 – <16 years, and use existing IDF criteria for adults: central obesity (defined as WC ≥ 94 cm for Europid men and ≥ 80cm for Europid women, with ethnicity - specific values for other groups*) plus any two of the following four factors: TG ≥ 1.7mmol/l or specific treatment for high TG, reduced HDLc: < 1.03mmol/l in males and < 1.29 mmol/l in females, or specific treatment for low HDLc, systolic BP ≥ 130 mmHg or diastolic BP ≥ 85 mmHg or treatment of previously diagnosed Arterial Hypertension, and Glu ≥ 5.6 mmol/l or known T2DM for age group > 16 years.

Pediatric MS score. Pediatric MS score was calculated by using the following formula = (2xWC/h) + (Glu (mmol/l)/5.6) + (TG (mmol/l)/1.7) + (sBP/130) - (HDLc (mmol/l)/1.02) [3].

Covariates. Apart from standard biochemical parameters to confirm the diagnosis of MS, uric acid level, and LDLc (TCh - HDLc - TG/5), were determined in every patient. All blood specimens were taken after overnight fasting. Additional clinical evaluation included medical history, lifestyle questionnaire, anthropometric measurements, physical examination, surface electrocardiography, transthoracic echocardiography, echocardiographic assessment of epicardial adipose tissue (EAT), and ultrasound measurement of carotid intima-media thickness (CIMT), etc.

Statistical analysis. The data collected from the primary material were introduced in the electronic database, whereas the statistical processing was performed using the Statistical Package for the Social Sciences (SPSS) version 20. Results are presented as mean±sd or count (%). Pearson correlation coefficient was used to assess the correlation between Pediatric MS score and other variables. All p values less than 0.05 were considered significant.

RESULTS

According to the inclusion and exclusion criteria, there were formed a general group, including 145 participants, of which 36.6% (53 pts) children with MS (research group) and 63.4 % (92 pts) children with non-MS (control group). Gender groups were divided into 55.9% boys (81 pts) and 44.1% girls (64 pts) of the total number of enrolled children. MS was present in 39.5% (32 pts) boys vs 32.8% (21 pts) girls, and non-MS in 60.5% (49 pts) boys vs 67.2% (43 pts) girls ($\chi 2 = 0.69$; $p>0.05$).

Also, there were selected *5 factors of MS* (according to the IDF consensus, adapted for children). The first factor (F1) - obesity, was recorded in 100% (145 pts) of cases in order of prevalence (it might be because children included in the study exhibited WC ≥ 90 percentile), the second factor (F2) found in 47.6% (69 pts) of cases, showed low values of HDLc and the third factor (F3), found in 25.5% (37 pts) of cases, which were defined by high TG was named the lipidic factor. The fourth factor (F4), recorded in 42.8% (62 pts) of cases with high BP values (BP systolic and/or BP diastolic), was called the blood pressure factor, and the fifth factor (F5), reported in 7.6% (11 pts) of cases with higher than normal blood Glu levels, was related to carbohydrate metabolism, is less prevalent.

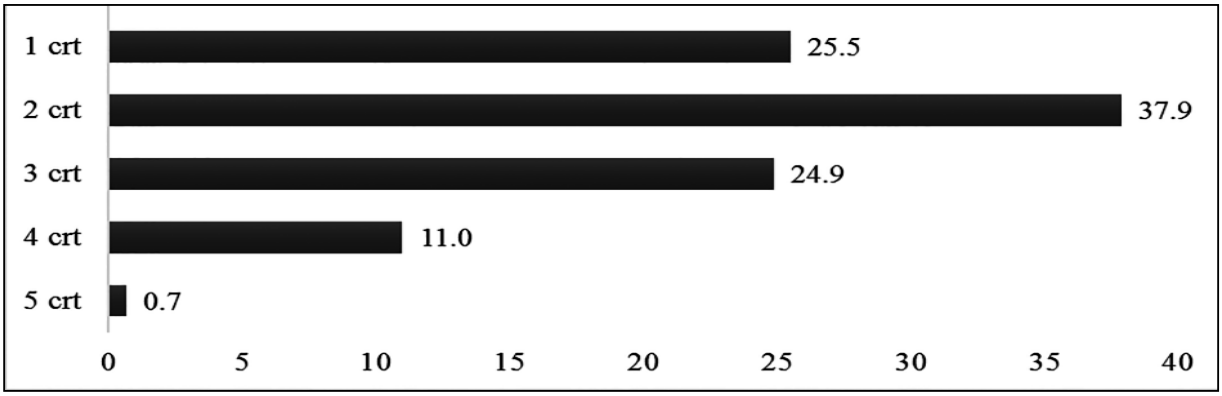

Figure 1. The participant distribution based on the number of criteria (crt) and IDF consensus for children (%), n=145.

According to *MS criteria* and based on the IDF agreement, 24.9% (35 pts) subjects presented 3 criteria, 11% (17 pts) – 4 criteria and 0.7% (1 pts) – 5 criteria, whereas 25.5% (37 pts) of the participants presented 1 criterion, and 37.9% (55 pts) – 2 of the mentioned criteria (see fig. 1). Gender distribution revealed that 24.7% (20 pts) boys and 25% (16 pts) girls had 3 positive criteria, and 14.8% (12 pts) boys and 7.8% (5 pts) girls – 4-5 criteria for metabolic syndrome ($\chi 2 = 1.77$; $p > 0.05$).

The assessment of pediatric MS was also performed by detecting the components and their association. The prevalence of cases with defined MS was assessed using *clustering patterns,* is estimated according to the number of criteria (see tab.1).

Table 1.

The study of metabolic syndrome components, their association, and clustering

MS, components	Total (no,. %)	Gender (no.,%) ($\chi 2 = 27.35$; $p< 0.01$)	
		Males	Females
WC	37 (25.5%)	20 (24.7%)	17 (26.6%)
WC+HBP	23 (15.9%)	19 (23.5%)	4 (6.3%)
WC+Glu	4 (2.8%)	2 (2.5%)	2 (3.1%)
WC+TG	2 (1.4%)	1 (1.2%)	1 (1.6%)
WC+HDLc	26 (17.9%)	7 (8.6%)	19 (29.7%)
WC+Glu+HBP	1 (0.7%)	-	1 (1.6%)
WC+TG+HDLc	12 (8.3%)	8 (9.9%)	4 (6.3%)
WC+HDLc+HBP	15 (10.3%)	5 (6.2%)	10 (15.6%)
WC+TG+HBP	8 (5.5%)	7 (8.6%)	1 (1.6%)
WC+HDLc+Glu+HBP	2 (1.4%)	1 (1.2%)	1 (1.6%)
WC+TG+HBP+Glu	1 (0.7%)	1 (1.2%)	-
WC+TG+HDLc+HBP	11 (7.6%)	8 (9.9%)	3 (4.7%)
WC+TG+HDLc+Glu	2 (1.4%)	2 (2.5%)	-
WC+TG+HDLc+Glu+HBP	1 (0.7%)	-	1 (1.6%)

Note: The values are presented as absolute values (and percentage) for statistically significant categorical data $p <0.01$; WC - waist circumference; TG - triglyceride; HBP - high blood pressure values; Glu - glucose; HDLc - high density cholesterol.

Cluster WC + HDLc + HBP was found in 10.3% of cases (15 pts), WC + TG + HDLc was registered in 8.3% (12 pts), WC + TG + HDLc + HBP – 7.6% (11 pts), WC + TG + HBP – 5,5% (8 pts) of cases. The clusters WC + HDLc + Glu + HBP and WC + TG + HDLc+ Glu were found to exhibit the same frequency of 1.4% (2 pts), whereas WC + Glu + HBP, WC + TG + Glu + HBP and CA + TG + HDL + Glu + HBP in 0.7% (1 pts) of cases. Gender-based clustering showed higher rate of WC + HDL + HBP in females vs male 15.6% (10 pts) vs 6.2% (5 pts) ($p < 0.01$); higher WC + TG + HDL cluster rate in males vs females 9.9% (8 pts) vs 6.3% (4 pts) ($p < 0.01$); high rate of WC + TG + HDLc + HBP cluster in males vs females 9.9% (8) vs 4.7% (3 pts) ($p < 0.01$); WC + TG + HBP cluster prevailing in males vs females 8.6% (7 pts) vs 1.6% (1 pt) ($p < 0.01$). Obesity cases were found to be associated with dyslipidemia, high BP and glycoregulation disorders (similar data was found in specialized literature among adult population, whereas no data were recorded for pediatric population).

The results of the selective analysis of some anthropometric parameters. The studied groups were characterized by the following values (see tab.2): 80.5 ± 2.05 kg in the study group vs 73.4 ± 2.3 kg in the control group, with the statistical difference ($p < 0.01$); the height values were 168.4 ± 1.7 cm in MS group, and 161.4 ± 1.5 cm in non-MS group, with a true statistical difference; the mean BMI index showed absolute values in the study group – 28.2 ± 0.4 kg/m^2, and in the control group 27.1 ± 0.5 kg / m^2 ($p > 0.05$), according to the percentiles – 94.7 ± 0.6 vs 93.9 ± 0.4 ($p > 0.05$), and according to the Z score both groups had the same mean value of 1.7 ± 0.05 ($p > 0.05$); the mean values of WC were 94.5 ± 1.2 cm in the MS group and 90.5 ± 1.07 cm in the control group (according to the percentiles, in 100% of WC cases ≥ 90 percentile), with a statistically significant difference ($p < 0.05$); hip circumference was 103.5 ± 1.3 cm in children with MS and 98.7 ± 1.3 cm in those with non-MS, with a statistically significant difference ($p < 0.05$); abdominal index – 0.9 ± 0.01 and the waist-to-hip-ratio was higher in the study vs control group 1.88 ± 0.03 m^2 vs 1,76 ± 0.03 m^2, but with no true statistical difference ($p > 0.05$).

The results of the evaluation of some biochemical parameters. A comparative study between the biochemical indices in children with MS vs non-MS revealed the following mean values (see tab.2): TG – 1.97 ± 0.2 mmol/l, compared to 1.16 ± 0.03 mmol/l ($p < 0.001$); TCh – 4.09 ± 0.14 mmol/l, compared to 4.06 ± 0.09 mmol/l ($p > 0.05$); HDLc – 1.03 ± 0.03 mmol/l vs 1.33 ± 0.03 mmol/l ($p < 0.001$); LDLc – 2.11 ± 0.12 mmol/l vs 2.05 ± 0.17 mmol/l ($p < 0.001$); LDLc/HDLc – 2.04 ± 0.04 mmol/l vs 1.54 ± 0.05 mmol/l ($p < 0.001$); TCh/HDLc – 3.97 ± 0.01 mmol/l vs 3.05 ± 0.01 mmol/l ($p > 0.05$); β-lipoproteins 45.15 ± 1.78 mmol/l, compared to 46.74 ± 1.21 mmol/l ($p > 0.05$) and uric acid – 315.41 ± 10.65 mmol/l, compared with 292.88 ± 8.56 mmol/l ($p > 0.05$).

The results of the evaluation of the pediatric MS score. Pediatric MS score was calculated based on the reference values and by using the following formula = (2xWC/h) + (Glu (mmol/l)/5.6) + (TG (mmol/l)/1.7) + (sBP/130) - (HDLc (mmol/l)/1.02). Thus the following scores were found (participants aged 16 - 18 years were not included

Table 2.

The values of some anthropometric and biochemical parameters in children included within the research

Variables (M±m)	MS	non-MS	p-value
Weight, M±m, (kg)	80.5±2.05	73.4±2.3	<0.01
Height, M±m, (cm)	168.4±1.7	161.4±1.5	<0.01
BMI, M±m, (kg/m^2)	28.2±0.4	27.1±0.5	SI
BMI, M±m, (percentiles)	94.7±0.6	93.9±0.4	SI
BMI, M±m, (Z score)	1.7±0.05	1.7±0.05	SI
WC, M±m,(cm)	94.5±1.2	90.5±1.07	<0.05
HC, M±m,(cm)	103.5±1.3	98.7±1.3	<0.05
WHR, M±m,	0.9±0.01	0.9±0.01	SI
AI, M±m,	0.6±0.01	0.6±0.01	SI
BSA (m^2) M±m,	1.88±0.03	1.76±0.03	SI
TG (mmol/l)	1.16±0.03	1.97±0.2	<0.001
TCh (mmol/l)	4.06±0.09	4.09±0.14	SI
HDLc (mmol/l)	1.33±0.03	1.03±0.03	<0.001
LDLc (mmol/l)	2.05±0.17	2.11±0.12	<0.001
TCh/HDLc	3.05±0.01	3.97±0.01	SI
LDLc/HDLc	1.54±0.05	2.04±0.04	<0.001
β-lipoproteins (mmol/l)	46.74±1.21	45.15±1.78	SI
Uric acid (mmol/l)	292.88±8.56	315.41±10.65	SI

***Note**: Values are presented as mean ± standard deviation for a number of values; SI - statistically insignificant (p> 0.05); the value of p <0.05 = considered significant; the value of p <0.001 = considered significant; BSA - body surface area; AI - abdominal index; WHR –waist-to-hip-ratio; HC – hip circumference; WC -* waist circumference*; BMI - body mass index; TG – triglycerides, TCh – total cholesterol, HDLc – high density cholesterol, LDLc – low density cholesterol*

in the study, considering their small number, thus requiring application of other formulas): L_0 – 2,20 ± 0,05, L_1 – 2,58 ± 0,11 (p > 0,05) (see fig 2.), by gender: 2.94 ± 0.1 – for females, 2,97 ± 0.05 (p > 0.05) – for males.

The correlation coefficient of the pediatric MS score with the clinical and paraclinical parameters was assessed, showing a strong positive association with TG (+ 0.9**, p < 0.001), waist, age, weight, BMI, BSA, AI, SBP, DBP, LDLc (+ 0.3**, p < 0.001), HG (+ 0.24**, p < 0.001), Glu (+ 0.2**, p < 0,05), OD (+ 0.2*, p > 0.05), LVPWd (+ 0.23**, p < 0.001), LV Mass (+ 0.2*, p > 0.05), and strong negative association with HDLc (- 0.6**, p < 0.001), WHR (- 0.21*, p > 0.05). There are no similar data recorded in specialized literature, thus comparative studies were not performed.

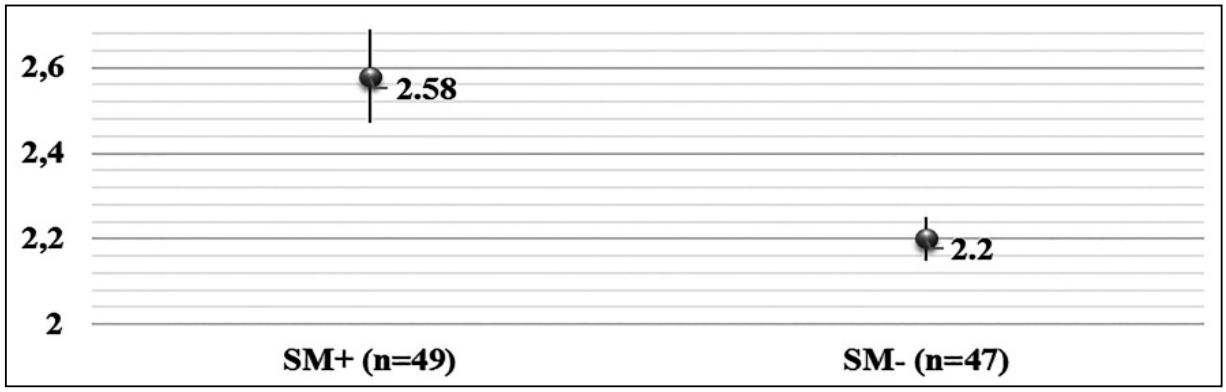

Figure 2. **The pediatric MS score in children (p > 0.05)**

Note: *MS + – confirmed metabolic syndrome, MS - – non - confirmed metabolic syndrome, n – number of participants*

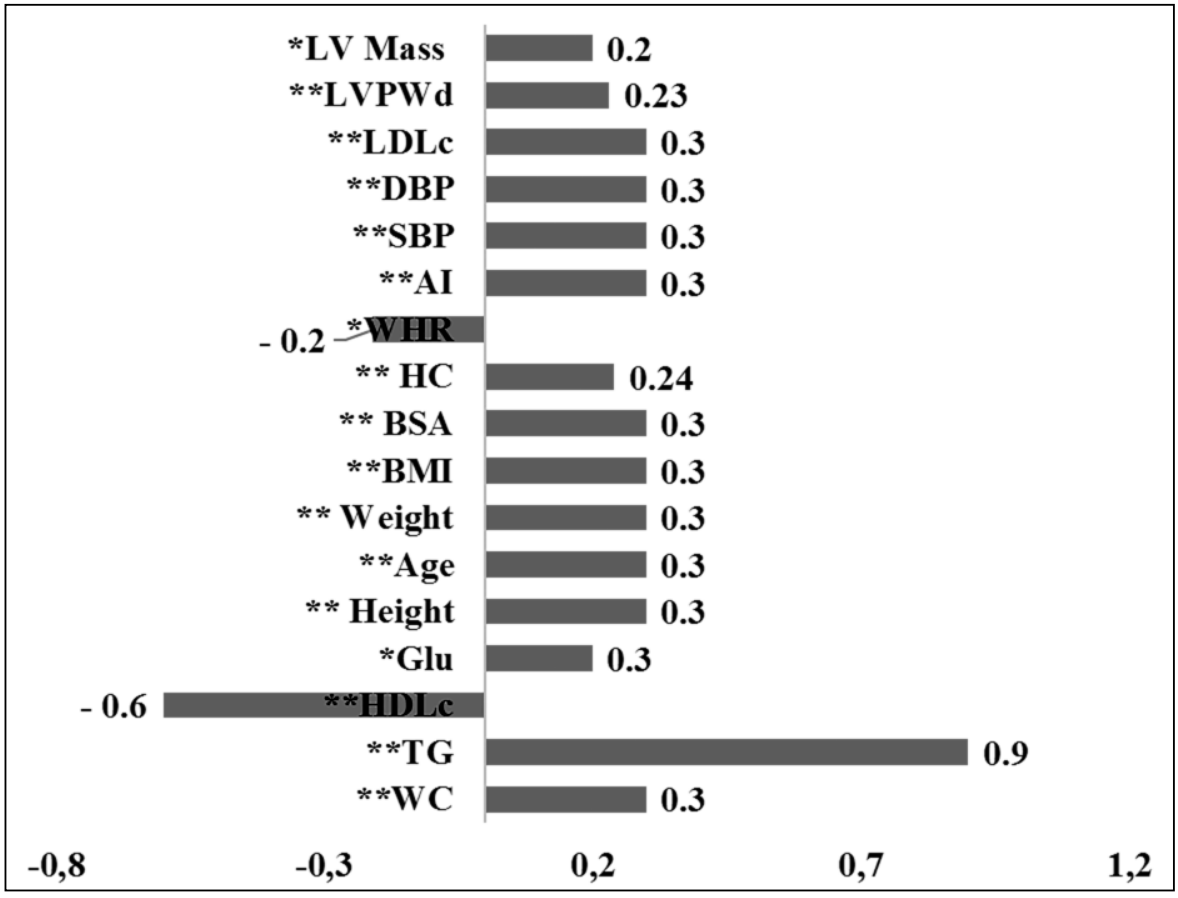

Figure 3. **Statistical correlations of pediatric MS score**

Note: *** p<0.001;* p<0.05; r – Pearson correlation coefficient; BMI – body mass index; WC - waist circumference; HC – hip circumference; AI – abdominal index; WHR – waist-to-hip ratio; BSA - body surface area; HDLc – high density cholesterol; LDLc – low density cholesterol; Glu – glucose; TG – triglycerides, SBP – systolic blood pressure; DBP – diastolic blood pressure; LVPWd – left ventricular posterior wall; LV Mass – left ventricular mass*

DISCUSSIONS

MS is a clinical condition, which is associated with an increased risk of cardiovascular diseases [4]. The present study has investigated a well-defined general population, aged between 10–18 years, the prevalence of the MS and that of its contributors, as well as the pediatric MS score and his relationship with the clinical and paraclinical parameters.

The syndrome was found to have a considerable prevalence in the pediatric population, averaging 36.6% of all subjects aged between 10-18 years, with some greater prevalence among boys (39.5% vs 32.8%), which was consistent with previous studies [4].

Regarding the MS-related factors, apart from visceral adiposity present by definition in 100% of cases, high TG (25.5%), high BP (42.8%), and low HDLc (47.6%) values were the most frequently detected.

The assessment of pediatric MS was also performed by detecting the components and their association. The prevalence of cases with defined MS was assessed using clustering patterns, is estimated according to the number of criteria. The clusters WC + HDLc + HBP, WC + TG + HDLc, WC + TG + HDLc + HBP, WC + TG + HBP were the most frequently registered. Obesity cases were found to be associated with dyslipidemia, high BP, and glucose regulation disorders (similar data was found in specialized literature among the adult population, whereas no data were recorded for the pediatric population).

In our study, MS subjects-compared to non-MS had significantly higher values of weight, waist circumference, hip circumference, triglycerides, as well as lower levels of HDL-cholesterol. The anthropometric and biochemical data altogether are the most important features of metabolic syndrome in this research.

To evaluate pediatric MS score is a method for quantification of metabolic status [3]. The results of the study indicated that the validity of the pediatric MS score for predicting it was high. The pediatric MS score is simple and practical, it could be used in clinical and research practice. The study regarding the relationship between pediatric MS syndrome score with cardiovascular risk factors in children with metabolic syndrome found an association with the anthropometric and hemodynamics parameters, the lipid profile, and the glucose level, echocardiographic parameters such as cardiac remodeling, and not found a correlation with echographic parameters of epicardial fat and vascular remodeling. There are no similar data recorded in specialized literature, thus comparative studies were not performed.

In conclusion, the search for a balance between simplicity and accuracy resulted in the development of a pediatric MS score. The pediatric MS score has a high correlation with the clinical and paraclinical parameters while being much easier local late without the need for advanced software.

Therefore, pediatric MS score is appropriate for use in every day clinical practice and research as well for the evaluation and follow-up of individual patients.

CONCLUSIONS

1. According to the International Diabetes Federation definition was found that 24.9% of the subjects presented 3 criteria, 11% – 4 criteria, and 0.7% – 5 positive criteria (25.5% – 1 criterion, 37.9% – 2 criteria) for metabolic syndrome. Waist circumference ≥ 90 percentile was recorded in 100% of cases, high density cholesterol value <1.03 mmol/l /1.29 mmol/l – in 47.6%, triglyceride value ≥ 1, 7 mmol/l – in 25.5%, systolic blood pressure value ≥ 130 mmHg/diastolic blood pressure ≥ 85 mmol/l – in 42.8%, and glucose values ≥ 5.6 mmol/l – in 7.6%.
2. The research was demonstrated accuracy together with superior simplicity and the ability to evaluate and follow-up individual patients make pediatric MS score very convenient for use in clinical practice and research as well. The study regarding the relationship between pediatric MS score with cardiovascular risk factors in children with metabolic syndrome found an association with the anthropometric and hemodynamics parameters, the lipid profile, and the glucose level, echocardiographic parameters such as cardiac remodeling, and not found a correlation with echographic parameters of epicardial fat and vascular remodeling.

PRACTICAL RECOMMENDATIONS

1. In children aged 10 – 18 years, with abdominal obesity, it is recommended to perform a screening of the metabolic syndrome, for research evaluating cardiometabolic risk.
2. It is recommended to implement the pediatric MS score, which will facilitate the detection of children with metabolic syndrome and increased risk for complications, especially cardiovascular.

CONFLICT OF INTERESTS

The authors do not declare any conflict of interest.

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