OBSTETRICS AND GYNAECOLOGY

AGE-RELATED DETERMINANTS OF THE METABOLIC SYNDROME IN WOMEN OF REPRODUCTIVE AGE OF THE MAIN ETHNIC GROUPS OF THE BAIKAL REGION

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ABSTRACT

The aim of the study. *To determine the age limit of the initial manifestations of the metabolic syndrome in women of reproductive age of the Caucasian and Asian ethnic groups.*

Materials and methods. *The study included women of reproductive age of the Russian and Buryat ethnic groups (n = 1231). We carried out general clinical examination, studied glycemia levels and lipid metabolism indicators. The analysis of the components of the metabolic syndrome was performed taking into account age characteristics and ethnicity. Threshold values for the age of metabolic disorders manifestation were determined.*

Results. *It was found that the main components of the metabolic syndrome in women of reproductive age of the Russian and Buryat ethnic groups were a decrease in high-density lipoprotein (HDL), an increase in waist circumference, and an increase in blood pressure. The age-related determinants of the metabolic syndrome in the population of women of reproductive age in the Baikal region were determined. It was shown that the age-related determinants of the metabolic syndrome in Caucasian and Asian women do not differ significantly and amount to 33.5 years (95% confidence interval (95% CI): 32.5; 38.5) and 36.5 years (95% CI: 27.5; 52.5), respectively. A universal critical age value was determined as 34.5 years (95% CI: 32.5; 38.5), which is associated with a significant increase in the prevalence of the metabolic syndrome in accordance with the ATP III criteria. The ranking of metabolic syndrome criteria in the studied groups revealed the following order of their occurrence: the decrease in HDL index prevailed, followed b ythe increase in waist circumference, blood pressure, glucose and triglycerides; no dependence on the ethnicity was found.*

Conclusion. *When assessing the age-related determinants of the metabolic syndrome in the mixed Caucasoid-Asian group, it is advisable to use universal approaches, taking into account the cut-off point of age, which is 34.5 years. The determination of age criteria for the correct classification of patients with respect to the manifestations of the metabolic syndrome is necessary to analyze the contribution of the age factor to the implementation of various metabolic syndrome predictors,to develop prognostic models, and to use effective age-determined markers of metabolic disorders.*

Key words: *metabolic syndrome, age, threshold values, women, ethnicity*

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ВОЗРАСТНЫЕ ДЕТЕРМИНАНТЫ МЕТАБОЛИЧЕСКОГО СИНДРОМА У ЖЕНЩИН РЕПРОДУКТИВНОГО ВОЗРАСТА ОСНОВНЫХ ЭТНИЧЕСКИХ ГРУПП ПРИБАЙКАЛЬЯ

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РЕЗЮМЕ

Цель исследования. *Определить возрастной предел начальных проявлений метаболического синдрома (МС) у женщин репродуктивного возраста европеоидной и азиатской этнических групп.*

Материалы и методы. *В исследование вошли женщины репродуктивного возраста русской и бурятской этнических групп (n = 1231); проведено общеклиническое обследование, исследование уровней гликемии и показателей липидного обмена. Выполнен анализ компонентов метаболического синдрома с учётом возрастных особенностей и этнической принадлежности. Определены пороговые значения возраста манифестации метаболических нарушений.*

Результаты. *Установлено, что основными компонентами метаболического синдрома у женщин репродуктивного возраста русской и бурятской этнических групп были снижение липопротеинов высокой плотности (ЛПВП), увеличение окружности талии, повышение артериального давления. Определены возрастные детерминанты метаболического синдрома в популяции женщин репродуктивного возраста Прибайкалья. Показано, что возрастные детерминанты метаболического синдрома у женщин-европеоидов и представительниц азиатской этнической группы существенно не отличаются и составляют 33,5 года (95%-й доверительный интервал (95% ДИ): 32,5; 38.5) и 36,5 года (95% ДИ: 27,5; 52,5) соответственно. Определено универсальное критическое значение возраста – 34,5 года (95% ДИ: 32,5; 38,5), с которым ассоциировано существенное увеличение распространённости метаболического синдрома в соответствии с критериями ATP III. Ранжирование критериев метаболического синдрома в исследуемых группах выявило следующий порядок их встречаемости: превалировало снижение показателя ЛПВП, далее – увеличение значений окружности талии, артериального давления, глюкозы и триглицеридов, отсутствовала зависимость от этнической принадлежности.*

Заключение. *При оценке возрастных детерминант метаболического синдрома в смешанной европеоидно-азиатской группе целесообразно использовать универсальные подходы с учётом точки отсечения возраста, составляющей 34,5 года. Определение возрастных критериев для правильной классификации пациенток относительно проявлений метаболического синдрома необходимо для анализа вклада возрастного фактора в реализацию различных предикторов МС, разработки прогностических моделей и применения эффективных возраст-детерминированных маркеров метаболических нарушений.*

Ключевые слова: *метаболический синдром, возраст, пороговые значения, женщины, этника*

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INTRODUCTION

Metabolic syndrome (MS) is characterized by high prevalence and is a combination of various clinical and metabolic factors, including arterial hypertension, dyslipidemia, abdominal obesity, hyperglycemia, often associated with proinflammatory and prothrombotic conditions, as well as insulin resistance [1, 2]. These factors are due to the complex interaction of the age component, the genetic component, a sedentary lifestyle, and excessive calorie intake [3]. The development of MS contributes to a decrease in the quality of life, and is also a predictor of the growth of type 2 diabetes mellitus, cardiovascular diseases, an increase in the proportion of disability and mortality of patients [4]. The multiplicity of symptoms requires an integrated approach to the problem of MS, based both on drug exposure and on the prevention of the development of this pathology, aimed at timely management of risk factors and lifestyle modification [5].

Understanding the epidemiology of MS is crucial for the treatment of this endocrine disorder. The prevalence of MS varies from 10 % to 84 % worldwide and depends on the applied diagnostic criteria, sociodemographic characteristics of the surveyed population, taking into account gender, age, ethnicity, region of residence, etc. [6]. Thus, MS is often found in Europeans, this pathology is much less common in Southeast Asian countries, while the dynamics of the prevalence of MS in this region is comparable with Western countries [4]. It is known that in the early reproductive period, the incidence of MS is slightly higher among men, and in older age, the female population with MS dominates [7].

In Russians, MS is detected in 33 % of cases aged 25–64 years, and their proportion increases with age and has regional and ethnic characteristics [5, 8]. It is known that representatives of the Buryat ethnic group are less susceptible to disorders of lipid and carbohydrate metabolism [9–11].

MS can have particularly important consequences for women's health, since it is considered as a risk factor for ovarian menstrual cycle disorders, polycystic ovary syndrome, infertility, endometrial hyperplasia, oncological processes and other pathological conditions [12, 13]. So far, there have been no studies on the development of metabolic syndrome in the reproductive age in the female population, taking into account ethnic characteristics, in the territory of the Baikal region.

One of the important issues in understanding the pathogenesis of MS is the age threshold for manifestations of metabolic changes [13, 14], since, in the clinical aspect, timely exposure to polymetabolic disorders is reversible and has a favorable prognosis [15]. Thus, it seems relevant to determine the threshold values of the age of MS manifestation in women of fertile age [16].

THE AIM OF THE STUDY

To determine the age limit of the initial manifestations of the metabolic syndrome in women of reproductive age of the Caucasian and Asian ethnic groups.

MATERIALS AND METHODS

Women of reproductive age (18–44 years old) (n = 1231) who were subject to annual preventive examination at their place of work and lived in the Irkutsk region and the Republic of Buryatia were examined. Inclusion criteria: availability of signed informed consent; willingness of the participant to comply with all research procedures; accessibility throughout the duration of the study; reproductive age – 18–44 years inclusive.

Non-inclusion/exclusion criteria: current pregnancy or lactation; ablation of the uterus and/or appendages on both sides; endometrial ablation and/or uterine artery embolization; factors that increase the risk to the subject or prevent the participant from fully fulfilling the conditions of the study or not allowing the completion of the study; unwillingness to participate or difficulties in understanding informed consent or goals and requirements research; taking insulin sensitizers for 3 months.

An anthropometric examination was performed (measurement of height, weight, waist circumference) [17]. Waist circumference (WC) was measured with a centimeter tape with an accuracy of 0.5 cm in the standing position, at the end of exhalation. The location of the tape was strictly horizontal at the level of the crista iliaca. Blood pressure (BP) was measured in the patient's sitting position, after a 5-minute rest, with an Omron automatic tonometer on the right shoulder of the subject.

Blood samples were taken from the ulnar vein in fasting state, after 12 hours of fasting. Blood serum was obtained by low-speed centrifugation.

Laboratory methods included the determination of serum lipid spectrum, high-density lipoprotein (HDL), cholesterol (CS), triglyceride (TG) and glucose levels. TG, HDL and glucose levels were determined using BioSystems diagnostic kits spectrophotometrically on a VTS-350 analyzer (BioSystems, Spain). Standardization and quality control of analyses were carried out in accordance with the requirements of the Federal System for External Quality Assessment of Clinical Laboratory Studies.

MS was determined according to the criteria of NCEP ATP III (The National Cholesterol Education Program's Adult Treatment Panel III), adopted in 2004 with changes in approaches to assessing fasting glycemia and waist circumference proposed by the International Diabetes Federation (IDF, International Diabetes Federation) in 2005. To diagnose metabolic syndrome, any three of the five criteria must be present: triglycerides ≥ 1.7 mmol/L; HDL < 1.3 mmol/L; glucose ≥ 5.6 mmol/L; blood pressure ≥ 130 mmHg or ≥ 85 mmHg; FROM ≥ 80 cm in women [3].

The implementation of data collection and storage methods was carried out using the REDcap information system.

The calculation of the sample size was performed using the interactive software PS: Power and Sample Size Calculation version 3.1.2.

Statistical methods included descriptive statistics, statistical hypothesis testing using the following criteria: t-test, Mann – Whitney U-test, Fisher's exact test, Pearson's χ^2 test, Z-test, criterion of statistical significance of the difference in *td* fractions. The level of statistical significance is $p < 0.05$.

In addition, to determine the threshold values of the age associated with the presence/absence of MS, ROC analysis was used with the calculation of the area under curve (AUC).

The implementation of statistical methods is carried out using the programming languages R 4.2.1 (R-studio; pROC library) and Python 3 (PyCharm; Pandas, Scipy libraries).

All studies were conducted in accordance with the World Medical Association Declaration of Helsinki (1964, as amended in 2013). The study was approved by the Committee on Biomedical Ethics at the Scientific Centre for Family Health and Human Reproduction Problems (extract from the minutes of the meeting No. 2.1 dated February 24, 2016).

This work was carried out within the framework of the state task «Pathophysiological mechanisms and genetic and metabolic predictors of maintaining reproductive health and longevity in various age, gender and ethnic groups» (FGMZ-2021-0002; state no. registration in the Unified State Register of Medical Sciences 121022500180-6) using the equipment of the Center for the Development of progressive personalized Health Technologies of the Scientific Centre for Family Health and Human Reproduction Problems (Irkutsk).

STUDY RESULTS

During the examination of 1,231 women of reproductive age, metabolic syndrome was detected in 297 (24.12 %) of them. The frequency of MS detection among participants of Caucasian ethnicity was 24.42 %, among Asian women – 23.4 % ($p_z = 0.37$). The average age of women with metabolic syndrome was 36.78 ± 5.7 vs. 33.59 ± 6.39 in women without MS.

The main characteristics of women of reproductive age of Caucasian and Asian ethnicity, depending on the presence and absence of metabolic syndrome, are presented in Table 1.

As can be seen in Table 1, in the subgroups with MS, both among women of Caucasian ethnicity and Asian women, the levels of TG, glucose, blood pressure and waist circumference are naturally higher with a decrease in HDL. When assessing the hierarchy of representation of various components, Caucasians with MS were more likely to have reduced HDL values (in 95.75 % (203/212)), an increase in WC (in 89.15 % (189/212)), SBP (in 68.87 % (146/212)), DBP (in 62.74 % (133/212)), glucose (in 40.09 % (85/212)) and TG (in 16.98 % (363/212)) than in the group without MS. A similar pattern was observed in the group of Asian women with MS: a high incidence of women with low HDL levels (in 95.29 % (84/85)), an increase in WC (in 91.76 % (78/85)), SBP (in 65.88 % (56/85)), DBP (in 58.82 % (50/85)), glucose was revealed (in 28.24 % (24/85)) and TG (in 15.29 % (13/85)) in comparison with the group without MS. Ethnic differences were recorded only in relation to the TG index, the frequency of increase of which was more often found in the group of Caucasians compared with Asians.

It was noted that regardless of ethnicity, the average age of women with MS was higher compared to the group without MS. Due to the importance of the age factor in the manifestation of MS, it was interesting to identify cut-off points in the population of women in the Baikal region, taking into account the ethnic factor.

At the first stage, we determined the universal value of the age associated with the manifestation of MS in the combined Caucasian-Asian population of women of reproductive age – 34.5 years (95% confidence interval (95% CI): 32.5; 38.5) (Fig. 1).

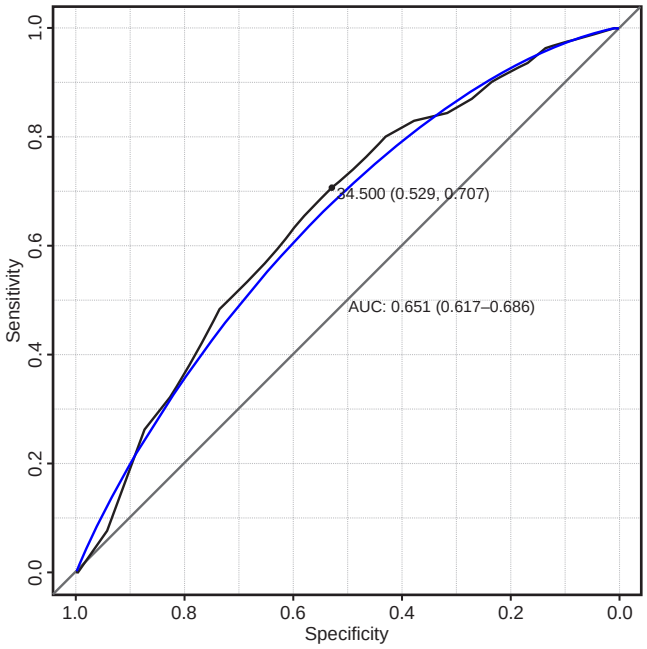

FIG. 1.

Threshold value ("cut-off") of age associated with the presence/absence of metabolic syndrome in the general population of women in the Baikal region

When analyzing the frequency of MS and its individual manifestations, taking into account the established age cut-off point, it was demonstrated that in the group of women aged ≥ 34.5 years, the frequency of MS is 17.3 % higher than in younger women (32.3 % vs. 14.9 %; $p_z = 0.0001$).

TABLE 1

CHARACTERISTICS OF WOMEN OF REPRODUCTIVE AGE OF CAUCASIAN AND ASIAN ETHNICITY WITH AND WITHOUT METABOLIC SYNDROME

Parameters	Caucasians (*N* = 868)		Asians (*N* = 363)		*p*
	MS+ (*N* = 212)	MS– (*N* = 656)	MS+ (*N* = 85)	MS– (*N* = 278)	
	1a	1b	2a	2b	
	M ± Std Me (25; 75)				
WC, cm	91.38 ± 12.08 90.00 (83.00; 100.00)	73.44 ± 9.82 73.00 (66.00; 78.00)	90.11 ± 10.91 87.00 (83.00; 95.00)	74.70 ± 10.05 73.00 (67.00; 80.00)	$p_{1a-1b} < 0.001^3$ $p_{2a-2b} < 0.001^3$ $p_{1a-2a} = 0.284^3$ $p_{1b-2b} = 0.051$
Glucose, mmol/L	5.34 ± 0.88 5.34 (4.74; 5.85)	4.84 ± 0.74 4.81 (4.30; 5.32)	5.09 ± 1.07 4.85 (4.40; 5.69)	4.62 ± 0.57 4.56 (4.18; 5.06)	$p_{1a-1b} < 0.0013$ $p_{2a-2b} < 0.0013$ $p_{1a-2a} = 0.0043$ $p_{1b-2b} < 0.0013$
HDL, mmol/L	0.95 ± 0.21 0.94 (0.84; 1.06)	1.15 ± 0.31 1.10 (0.93; 1.34)	1.01 ± 0.18 1.02 (0.88; 1.14)	1.21 ± 0.26 1.19 (1.02; 1.36)	$p_{1a-1b} < 0.0013$ $p_{2a-2b} < 0.0013$ $p_{1a-2a} = 0.0093$ $p_{1b-2b} < 0.0013$
TG, mmol/L	1.18 ± 0.49 1.05 (0.84; 1.52)	0.90 ± 0.35 0.88 (0.65; 1.13)	1.17 ± 0.41 1.10 (0.92; 1.36)	0.93 ± 0.33 0.91 (0.70; 1.16)	$p_{1a-1b} < 0.0013$ $p_{2a-2b} < 0.0013$ $p_{1a-2a} = 0.6473$ $p_{1b-2b} = 0.1603$
SBP, mmHg	135.35 ± 13.45 133.00 (128.00; 141.00)	119.04 ± 11.32 119.00 (112.00; 125.00)	135.67 ± 14.48 134.00 (126.00; 143.00)	117.65 ± 10.85 117.00 (110.00; 124.00)	$p_{1a-1b} < 0.001^3$ $p_{2a-2b} < 0.001^3$ $p_{1a-2a} = 0.958^3$ $p_{1b-2b} = 0.055^3$
DBP, mmHg	86.92 ± 9.00 87.00 (81.00; 91.00)	76.14 ± 8.60 76.00 (70.00; 81.00)	87.32 ± 11.48 87.00 (80.00; 92.00)	76.42 ± 8.13 76.00 (71.00; 81.00)	$p_{1a-1b} < 0.001^3$ $p_{2a-2b} < 0.001^3$ $p_{1a-2a} = 0.943^3$ $p_{1b-2b} = 0.595^3$
	n*/*N (%)				
WC ≥ 80 cm	189/212 (89.15 %)	125/651 (19.20 %)	78/85 (91.76 %)	72/276 (26.09 %)	$p_{1a-1b} < 0.001^2$ $p_{2a-2b} < 0.001^2$ $p_{1a-2a} = 0.670^1$ $p_{1b-2b} = 0.019^2$
Glucose ≥ 5.6 mmol/L	85/212 (40.09 %)	87/644 (12.51 %)	24/85 (28.24 %)	16/272 (5.88 %)	$p_{1a-1b} < 0.001^2$ $p_{2a-2b} < 0.001^2$ $p_{1a-2a} = 0.055^2$ $p_{1b-2b} = 0.001^2$
HDL < 1.3 mmol/L	203/212 (95.75 %)	455/644 (70.65 %)	81/85 (95.29 %)	174/272 (63.97 %)	$p_{1a-1b} < 0.001^2$ $p_{2a-2b} < 0.001^2$ $p_{1a-2a} = 0.538^1$ $p_{1b-2b} = 0.046^2$
TG ≥ 1.7 mmol/L	36/212 (16.98 %)	11/644 (1.71 %)	13/85 (15.29 %)	4/272 (1.47 %)	$p_{1a-1b} < 0.001^2$ $p_{2a-2b} < 0.001^2$ $p_{1a-2a} < 0.001^2$ $p_{1b-2b} = 0.979^2$
SBP ≥ 130 mmHg	146/212 (68.87 %)	90/656 (13.72 %)	56/85 (65.88 %)	31/278 (11.15 %)	$p_{1a-1b} < 0.001^2$ $p_{2a-2b} < 0.001^2$ $p_{1a-2a} = 0.618^2$ $p_{1b-2b} = 0.285^2$
DBP ≥ 85 mmHg.	133/212 (62.74 %)	95/656 (14.48 %)	50/85 (58.82 %)	38/278 (13.67 %)	$p_{1a-1b} < 0.001^2$ $p_{2a-2b} < 0.001^2$ $p_{1a-2a} = 0.531^2$ $p_{1b-2b} = 0.745^2$

Note. MS+ – presence of metabolic syndrome; MS– – absence of metabolic syndrome; SBP – systolic blood pressure; DBP – diastolic blood pressure; p^1 – Fisher's exact test; p^2 – Pearson's χ^2 test; p^3 – Mann – Whitney U-test

The most significant increase is the frequency of MS components in the older age group: it was registered to increase by 24.17 % (49.3 % vs. 25.1 %; p_z = 0.0001), SBP – by 21 % (36.1 % vs. 15.1 %; p_z = 0.0001), DBP – by 15.3 % (32.9 % vs. 17.5 %; p_z = 0.0001).

The rates of HDL decrease and glucose increase did not differ statistically significantly in the age groups. At the same time, some statistically significant increase in the proportion of women with increased TG was revealed – 5.8 % versus 4.6 % (p_z = 0.00003) – in the older age group.

As a result of the analysis of ROC curves for representatives of the Caucasian race, the cut-off point for age was 33.5 years (95% CI: 32.5; 38.5) (Fig. 2), for Asian women – 36.5 years (95% CI: 27.5; 52.5) (Fig. 3).

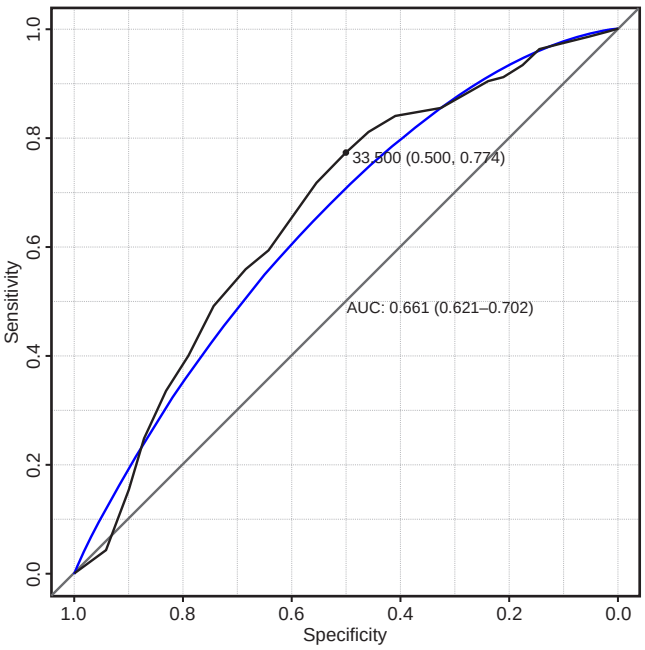

FIG. 2.

Threshold value ("cut-off") of age associated with the presence/absence of metabolic syndrome in Caucasoid women of the Baikal region

The threshold values («cut-offs») were compared using the 95% CI intersection estimation technique, while the absence of statistically significant differences in age cut-off points in the group of Caucasians and Asians was shown.

As can be seen from table 2, the use of ethnically determined criteria for determining age cut-off points is not accompanied by significant changes in the frequency of detection of MS and its individual components in older and younger women. The above confirms the expediency of applying a universal age criterion associated with the manifestation of MS in women of reproductive age.

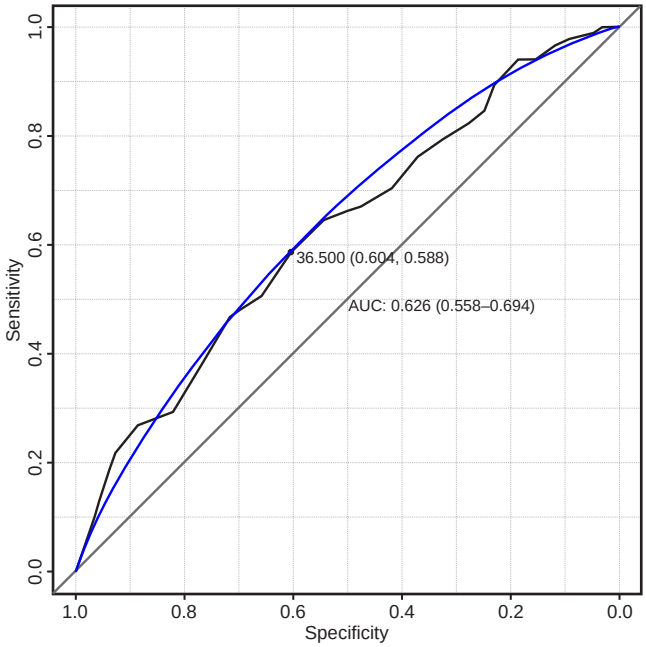

FIG. 3.

Threshold value ("cut-off") of age associated with the presence/absence of metabolic syndrome in Asian women of the Baikal region

DISCUSSION

Currently, MS has acquired the status of one of the most significant public health problems [9-11]. In patients with metabolic syndrome, compared with those without it, the probability of the onset of cardiovascular diseases over the next 5–10 years is 2 times higher, and throughout life it is many times higher. Moreover, MS is associated with a significant, namely a 5-fold increase in the risk of diabetes mellitus [18], although the syndrome itself does not include many factors reflecting the absolute risk, such as age, gender, smoking and the level of low-density lipoprotein cholesterol.

In Russia, few epidemiological studies have been conducted in various ethnic groups to study the prevalence of risk factors for cardiovascular diseases, as well as MS and its components. The results indicate some specificity of MS manifestations in women of Caucasian and Asian ethnicity.

Thus, in a study on the prevalence of arterial hypertension (AH) in different ethnic groups (Buryats, Russians) conducted by Z.H. Malakshinova in Ulan-Ude [19], Buryats registered hypertension more often than Russians, mainly due to DBP. Levels of cholesterol, LDL cholesterol and TG increased in both groups, and statistically significant ethnic differences in cholesterol levels were revealed only in the 30–39 age group.

In the Kemerovo simultaneous epidemiological study (Gornaya Shoriya) conducted in 1999 and included 550 Shorians and 665 non–Shorians over the age of 18, a higher incidence of MS was detected in women of the alien population (ethnic group – Russians), whereas

TABLE 2

COMPARATIVE ANALYSIS OF THE FREQUENCY OF METABOLIC SYNDROME AND ITS CHARACTERISTICS IN WOMEN OF CAUCASIAN AND ASIAN ETHNICITY IN AGE GROUPS DEFINED USING UNIVERSAL AND ETHNICALLY DETERMINED THRESHOLD VALUES OF THE AGE

Parameters	Caucasians (*N* = 868) < 34.5 years (1a) (*N* = 420)	Caucasians (*N* = 868) ≥ 34.5 years (2a) (*N* = 448)	Difference 2a–1a (%)	Caucasians (*N* = 868) < 33.5 years (1b) (*N* = 376)	Caucasians (*N* = 868) ≥ 33.5 years (2b) (*N* = 492)	Difference 2b–1b (%)	Comparison 1a–1b (p_z)	Comparison 2a–2b (p_z)
	n/*N* (%)			*n*/*N* (%)				
WC ≥ 80 cm	98/417 (23.50 %)	216/446 (48.43 %)	24.93	80/374 (21.39 %)*	234/489 (47.85 %)	26.46	0.48	0.86
HDL decrease < 1.3 mmol/L	321/418 (76.79 %)	337/438 (76.94 %)	0.15	288/374 (77.01 %)	370/482 (76.76 %)	0.24	0.94	0.95
Glucose ≥ 5.6 mmol/L	78/418 (18.66 %)	94/438 (21.46 %)	2.80	68/374 (18.18 %)	104/482 (21.58 %)	3.39	0.86	0.97
TG ≥ 1.7 mmol/L	19/418 (4.55 %)	28/438 (6.39 %)	1.85	17/374 (4.55 %)	30/482 (6.22 %)	1.68	1.0	0.92
SBP ≥ 130 mmHg	67/420 (15.95 %)	169/448 (37.72 %)	21.77	59/376 (15.69 %)*	177/492 (35.98 %)	20.28	0.92	0.58
DBP ≥ 85 mmHg.	77/420 (18.33 %)	151/448 (33.71 %)	15.37	67/376 (17.82 %*)	161/492 (32.72 %)	14.90	0.85	0.75
Presence of MS	59/420 (14.05 %)	153/448 (34.15 %)	20.10	48/376 (12.77 %)*	164/492 (33.33 %)	20.57	0.60	0.79
Parameters	**Asians (*N* = 363) < 34.5 years (1a) (*N* = 161)**	**Asians (*N* = 363) ≥ 34.5 years (2a) (*N* = 202)**	**Difference 2a–1a (%)**	**Asians (*N* = 363) < 33.5 years (1b) (*N* = 204)**	**Asians (*N* = 363) ≥ 33.5 years (2b) (*N* = 159)**	**Difference 2b–1b (%)**	**Comparison 1a–1b (p_z)**	**Comparison 2a–2b (p_z)**
	n/*N* (%)			*n*/*N* (%)				
WC ≥ 80 cm	47/160 (29.38 %)	103/201 (51.24 %)	21.87	65/202 (32.18 %)	85/159 (53.46 %)	21.28	0.57	0.68
HDL decrease < 1.3 mmol/L	105/158 (66.46 %)	150/199 (75.38 %)	8.92	136/200 (68.00 %)	119/157 (75.80 %)	7.80	0.76	0.93
Glucose ≥ 5.6 mmol/L	20/158 (12.66 %)	20/199 (10.05 %)	2.61	23/200 (11.50 %)	17/157 (10.83 %)	0.67	0.74	0.81
TG ≥ 1.7 mmol/L	8/158 (5.06 %)	9/199 (4.52 %)	0.54	10/200 (5.00 %)	7/157 (4.46 %)	0.54	0.98	0.98
SBP ≥ 130 mmHg	21/161 (13.04 %)	66/202 (32.67 %)	19.63	32/204 (15.69 %)	55/159 (34.59 %)	18.90	0.48	0.70
DBP ≥ 85 mmHg.	25/161 (15.53 %)	63/202 (31.19 %)	15.66	33/204 (16.18 %)	55/159 (34.59 %)	18.41	0.87	0.49
Presence of MS	28/161 (17.39 %)	57/202 (28.22 %)	10.83	35/204 (17.16 %)	50/159 (31.45 %)	14.29	0.95	0.50

the frequency and severity of hypertension was more pronounced in Shorians [20].

A study on the characteristics of MS was also conducted among the indigenous small-numbered peoples of the Republic of Sakha (Yakutia) (96 Dolgans and 90 Evenks) of working age, from 30 to 59 years old. The association of arterial hypertension with MS was more pronounced in women compared to men.

According to our data, the frequency of MS and the hierarchy of its manifestations do not depend on ethnicity, however, ethnospecific differences in triglyceride levels were revealed.

This fact is linked to a generally accepted understanding of the nature of dyslipidemia. According to a number of studies, hypertriglyceridemia is often caused by an alimentary factor, and the European type of diet contributes to an excessive intake of fatty and carbohydrate-containing foods, which in turn has a high association with the development of coronary heart disease, nonfatal myocardial infarction, even after eliminating other risk factors. At the same time, it is believed that in certain cases hypertriglyceridemia does not affect atherosclerotic manifestations in the walls of blood vessels, and it depends on which of the five types of lipoproteins they are packed into.

It is known that the incidence of MS is associated with the age of the patient. As the total life expectancy of people increases, the number of MS patients increases; this fact determines the social significance of the problem [11, 21].

According to the results of our study, the average age in the group with MS was statistically significantly higher than in women without MS. When determining the threshold value of the age associated with a higher probability of MS, we determined that in the combined Caucasian-Asian population of women of the age category from 34.5 years, the number of women with various manifestations of metabolic syndrome increases significantly.

At the same time, an attempt to determine ethnically differentiated threshold values of the age revealed the lack of advantages of using this approach.

CONCLUSION

As a result of the study, it was found that when assessing the age determinants of MS in a mixed Caucasoid-Asian population, it is advisable to use universal approaches taking into account the age cut-off point of 34.5 years. The determination of age criteria for the correct classification of patients with respect to the manifestations of the metabolic syndrome is necessary to analyze the contribution of the age factor to the implementation of various metabolic syndrome predictors, to develop prognostic models, and effective age-determined markers of metabolic disorders.

Conflict of interest

The authors of this article declare the absence of a conflict of interest.

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