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RELATION BETWEEN OBESITY LEVEL AND THE RISK OF COMORBIDITY BASED ON BODY WEIGHT, PHYSICAL ACTIVITY AND POSITIVE FAMILY HISTORY

ODNOS STEPENA GOJAZNOSTI I RIZIKA KOMORBIDITETA NA OSNOVU INDEKSA TELESNE MASE, FIZIČKE AKTIVNOSTI I POZITIVNE PORODIČNE ANAMNEZE

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Ključne reči
gojaznost, indeks telesne mase, ishemijska bolest srca, fizička aktivnost, genetski uticaj

Abstract

INTRODUCTION. Obesity carries high, very high or extremely high risk of comorbidity, mostly for ischemic heart disease.
AIM. To establish the obesity level and risks of comorbidity for ischemic heart disease based on values of body mass index, physical activity and positive family history.
MATERIALS AND METHODS. The investigation encompassed 200 patients (100 males and 100 females) between 18 and 65 years of age, with ischemic heart disease diagnosis. Data were collected during cardiological examinations in Health center „Novi Sad" during thirteen months period.
RESULTS. Overweight women comprised 44% and men 47% of all patients. Obese patients, with different level of obesity, were 25% among women and 27% among men. 9% of women and 14% of men is engaged in physical activity. Positive family history is present in 62% women and 75% men.
CONCLUSION. Subjects of both genders from obese group have high, very high or extremely high comorbidity risk, mostly of ischemic heart disease. Physical activity is not present enough in patient's daily routine. Effect of positive family history among subjects is not negligible.

INTRODUCTION

Ischemic heart disease (IHD) may be expressed in its course as one or more clinical forms and variants. Presently, ischemic heart disease is considered ad a complex set of various forms – from stable angina to the acute myocardial infarction as the most urgent condition, with unstable angina and its numerous variants in between with all its complex pathogenesis i.e. structural and functional changes. [1]

Risky health behaviors: tobacco and alcohol consumption, as well as the lack of physical activity, contribute to development and progression of coronary diseases, and

changing these habits is a part of coronary syndromes therapy.[2] Effects of general (non-specific) stressors threaten genetically weaker parts of tissues, organs and organism. Present scientific position is to define coronary-prone personality as a carrier of certain psychological traits which are able, alone or with other factors of coronary risk, to cause ischemic heart disease or acute myocardial infarction. [3]

Insufficient physical activity and sedentary life style are connected to some forms of disability: coronary disease, stroke, arterial hypertension, diabetes, and osteoporosis. Physically inactive persons run twice a risk from developing cardiovascular diseases than physically active ones. Physical activity has beneficial effect on mental state, increasing tolerance to emotional strain and reducing psychological pressure and stress. [4,5] Decreased physical activity is one of factors that may cause obesity in all ages. [6]

International disease classification considers obesity as a body weight way above constitutional standards, as a result of excessive accumulation of fat in the body. [7]

Recommendation of the World Health Organization is to calculate level of weight using body mass index (BMI) – relation between body weight and square of body height that may be: [8]

- overweight   BMI = 25-29.9
- obese class I   BMI = 30-34.9
- obese class II   BMI = 35-39.9
- obese class III   BMI $\geq$ 40

For prompt determination of BMI there are ready-made diagrams where it is simple to overlap body mass and height and to read body mass index accordingly.
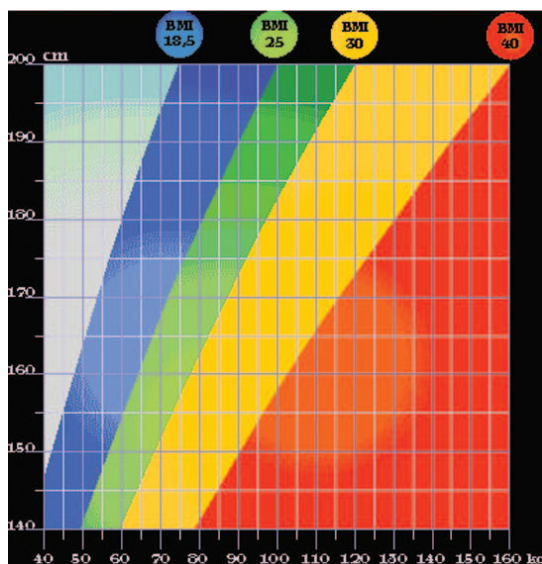

Figure 1. Body mass index diagram [9]

High body mass index (above 30 kg/m^2) is the independent predictor of increased cardiovascular risk. [10]

AIM

To establish level of obesity and comorbidity risk for ischemic heart disease, based on values of body mass index, physical inactivity and positive family history.

MATERIALS AND METHODS

Retrospective-prospective study encompassed 200 patients, both genders (100 males and 100 females), between 18 and 65 years of age, that were treated in Health center „Novi Sad" with ischemic heart disease diagnose (angina, previous myocardial infarction) during 13 months period.

The study was approved by the Ethical committee of the Faculty of Medicine at the University of Novi Sad and directorate of the Health center „Novi Sad". Each patient include in this study signed Informed consent of subjects.

Necessary data about subjects were collected from their history, medical documentation, and results of anthropometric measurements. Body height was measured using Martin type anthropometer with 0.1 cm precision. Subject stands barefoot, with arms relaxed beside the body, with heels touching and toes apart, and is asked to inhale deeply and keep upright position. Body weight was measured by digital decimal scale PPW 2200 manufactured by Bosch, in the morning, before the first meal, and after emptying bladder and bowel. Measurement has been done while subject is barefoot and in underwear. Obtained value was expressed in kilograms (kg). After both measurements (height and weight), value for body mass index was calculated using formula BMI = Weight (kg) / Height (m) x Height (m)

Information about presence of risk factors for ischemic heart disease, such as positive family history and physical activity was obtained from patients' history.

All the data obtained were entered in a computer database of the SPSS system (Statistical Package for Social Science) on a personal computer. For statistical analysis, appropriate statistical programs were used. Value threshold for statistical significance was $p < 0.05$. For numerical data the mean was calculated, with standard deviation, and differences between subjects were evaluated using „t" test. For nonparametric data χ^2 test was used. Results are shown in tables and graphs.

RESULTS

According to data collected, the average age of subjects was 56 years for females and 55 years for males (p 0.05).

Average value of subjects' body weight was 73 kg for females and 85 kg for males (p 0.01).

After processing data for body weight and height, the average value for the body mass index was calculated: 27 kg/m^2 for both genders, as shown in Table 1.

Table 1. *Demographic data for subjects*

	females	males
	X ± SD	X ± SD
Age (years)	56,11 ± 7,99	55,41 ± 7,42
Body weight (kg)	73,18 ± 13,83	85,14 ± 15,64
BMI (kg/m^2)	27,45 ± 4,95	27,65 ± 4,43
No. of patients	**100**	**100**

BMI – body mass index

By comparison between BMI value obtained for subjects and standardized BMI values, results were obtained regarding weight categories, as shown in Tables 2 and 3.

Table 2. Weight categories for female subjects according to BMI

	WEIGHT CATEGORY	PERCENT
FEMALES	Underweight	1 %
	Normal weight	30 %
	Overweight	44 %
	Obese	25 %
	Total	100 %

Table 3. Weight categories for male subjects according to BMI

	WEIGHT CATEGORY	PERCENT
MALES	Normal weight	26 %
	Overweight	47 %
	Obese	27 %
	Total	100 %

Obese subjects had different levels of obesity according to BMI (Tables 4 and 5), and therefore different risk level of co morbidity – level I obesity has high, level II very high and level III extremely high risk of co morbidity, mostly of ischemic heart disease.

Table 4. Distribution of obesity level in female subjects

	OBESITY LEVEL	PERCENT
OBESE FEMALES	Level I	18 %
	Level II	5 %
	Level III	2 %
	Total	25 %

Table 5. Distribution of obesity level in male subjects

	OBESITY LEVEL	PERCENT
OBESE MALES	Level I	23 %
	Level II	3 %
	Level III	1 %
	Total	27 %

From all subjects, 9% females and 14% males engaged in recreational physical activity (Graphs 1 and 2), without statistically significant differences between genders (p 0.05).
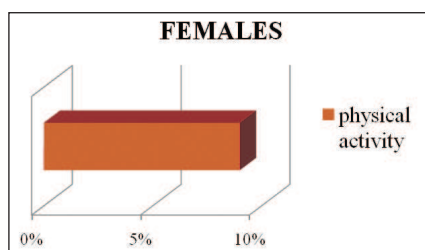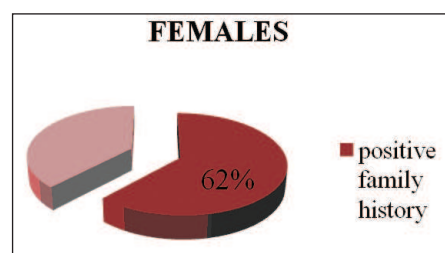

Graph 1. Percent of female subjects engaging in recreational physical activity
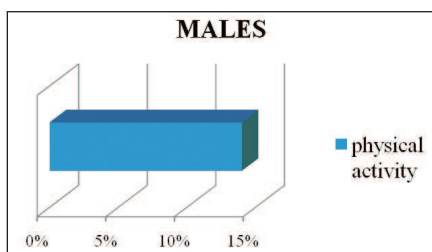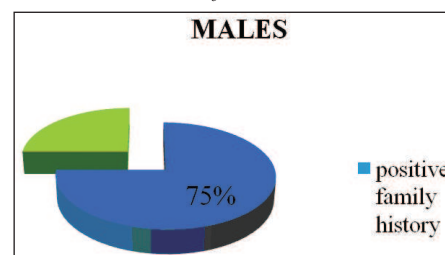

Graph 2. Percent of male subjects engaging in recreational physical activity

Positive family history was present in 62% female and 75% male subjects (Graphs 3 and 4), without statistically significant differences between genders (p 0.05).

Graph 3. Percent of female subjects with positive family history for IHD

Graph 4. Percent of male subjects with positive family history for IHD

DISCUSSION

Risk factors for IHD may be unmodifiable (genetic predisposition, older age, male gender) and modifiable (arterial hypertension, high LDL and low LDL levels, diabetes, obesity, smoking, physical inactivity, stress). [11]

Obesity causes mechanical, physical and metabolic stress that considerably threatens one's health. Long-term persistence of obesity will cause a number of complications on different organs and organ systems [12], especially on the cardiovascular system. Body weight and BMI have considerable effect on development of metabolic disorders, i.e. glucose intolerance disorder. [13]

Table 6. Obesity classification according to BMI-body mass index values and risk of obesity comorbidity [12]

WEIGHT CATEGORY	BMI (kg/m²)	RISK OF OBESITY COMORBIDITY
Normal weight	18.5 – 24.9	**Average**
Overweight	25 – 29.9	**Slightly elevated**
Obesity level I	30 – 34.9	**High**
Obesity level II	35 – 39.9	**Very high**
Obesity level III	≥ 40	**Extremely high**

Results of this investigation show that, according to the average BMI value, 44% females are overweight, with moderately increased risk of obesity comorbidity, and 25% are obese – (18% obese level I with high co morbidity risk, 5% obese level II with very high co morbidity risk and 2% obese level III with extremely high risk of obesity co morbidity, particularly for IHD).

In males, 47% were overweight, with moderately increased risk of obesity co morbidity, and 27% are obese (obese level I in 23%, with high risk of obesity co morbidity, 3% obese level II with very high risk of comorbidity and 1% men obese level III with extremely high risk of obesity comorbidity, particularly for IHD). There were no statistically significant differences between genders.

Key challenges in obesity treatment are lowering body weight and its continuance during a long-term period. That may be accomplished by increasing energy consumption via physical activities and by restricted calories intake during a certain period. [14]

The optimal result in reduction of proatherogenic risk factors - and consequently the cardiovascular risk – may be obtained by combination of long duration, high-intensity physical exercise with daily energy consumption of 900 kcal. This points to importance of behavioral life-style habits, as well as the importance of interdisciplinary approach: sports medicine, dietology, psychotherapy and treatment of obesity in order to optimize concept of cardiovascular risk optimization. [15] Due to positive effects of physical exercise on human health, World health organization supports its member countries in strengthening policy to promote physical activity. From this in 2004 „Global strategy on diet, physical activity and health" emerged, with the aim to improve health through proper nutrition and physical activities. [16]

Results of this study show that recreational physical activity is not present enough in lifestyle of subjects with IHD, without significant difference between genders. Only 9% females and 14% males are engaged in some kind of physical exercise as a recreation.

Investigation by Ranković et al. had shown that, after rehabilitation program by physical exercise in subjects with coronary heart disease, BMI value was significantly reduced, as well as systolic and diastolic blood pressure, heart rate and triglyceride level. [17]

European Heart Network organization, founded in Brussels, brings together 28 non-governmental organizations from various European countries with the aim to prevent cardiovascular diseases, and it especially emphasizes importance of regular physical activity. [18]

Alongside adequate physical activity, reduction diet is an important determinant in prevention and reduction of cardiovascular risk. [15]

Development of ischemic heart disease is affected also by factors that we cannot influence and those are unmodifiable risk factors, including, among others, genetic predisposition.

This study has shown that there is a large influence of positive family history on development of IHD: 62% in females and 75% in males (p>0,05).

Education on proper nutrition and adequate physical activity, from early childhood, can prevent development of obesity, significantly reduce the number of obese persons and thus contribute to the primary prevention of cardiovascular diseases, primarily ischemic heart disease. [19]

Paul Dudley White, famous cardiologist, had pointed as early as in 1970 that „heart disease before 80 is our fault, not God's or nature's will". Another common-sense cautionary wisdom is that after period of growth, between 25 and 30 years of age, we look as the Nature intended, from then to the mature age (about 50) we look the way we live, and after 50 we look the way we deserve to. [20]

CONCLUSIONS

•Among subjects with ischemic heart disease, according to their value of body mass index:

44% females and 47 % males were overweight, with moderately high risk of obesity comorbidity.

25% females and 27% males were obese, with high, very high and extremely high risk of obesity co morbidity, mostly ischemic heart disease.

• Only a small number of subjects are engaged in any kind of recreational physical activity, without statistically significant differences between genders.

• Effect of positive family history among subjects is not negligible, but there was no statistically significant difference between genders.

Sažetak

UVOD. Gojaznost nosi visok, veoma visok ili ekstremno visok rizik od komorbiditeta, pre svih ishemijske bolesti srca.

CILJ. Utvrditi stepen gojaznosti i rizika komorbiditeta ishemijske bolesti srca na osnovu vrednosti indeksa telesne mase, fizičke aktivnosti i pozitivne porodične anamneze.

MATERIJAL I METODE. Ispitivanje je obuhvatilo 200 pacijenata (100 muškaraca i 100 žena) sa dijagnostikovanom ishemijskom bolesti srca starosne dobi od 18 do 65 godina. Podaci su prikupljeni tokom kardioloških kontrola u Domu zdravlja „Novi Sad" u trajanju od trinaest meseci.

REZULTATI. Prekomerno uhranjenih žena je 44%, muškaraca 47%. Gojaznih ispitanika sa različitim stepenom gojaznosti među ženama je 25%, među muškarcima 27%. Rekreativnom fizičkom aktivnosti se bavi 9% žena, 14% muškaraca. Pozitivna porodična anamneza prisutna kod 62% žena, 75% muškaraca.

ZAKLJUČAK. Ispitanici oba pola iz grupe gojaznih imaju visok, veoma visok ili ekstremno visok rizik od komorbiditeta, pre svih ishemijske bolesti srca. Fizička aktivnost nije dovoljno prisutna u životima ispitanika. Nije zanemarljiv uticaj pozitivne porodične anamneze među ispitanicima.

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