ORIGINAL ARTICLE

The importance of education in patients with metabolic syndrome with regard to their knowledge and attitudes about the disease, and the impact of education on laboratory parameters

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ABSTRACT

Aim A metabolic syndrome (MetS) increases the risk of heart disease and diabetes mellitus type 2, thus the aim of this study is to correlate the clinical and laboratory parameters in patients suffering from MetS who have previously had education compared to patients who have not had any education about a healthy lifestyle, and to check their knowledge and attitudes about healthy lifestyle.

Methods The study included patients of both genders aged 18 - 70 years, diagnosed with MetS, who are members of the Association of Diabetics in Canton of Sarajevo. It used anthropometric parameters, laboratory findings, and an original, structured questionnaire about diet and frequency of physical activities.

Results Clinical and laboratory parameters did not differ significantly between educated and uneducated patients, as well as habits in diet, physical activity, and knowledge about metabolic syndrome. The questions from the questionnaire have shown a good value of variance, suggesting that the questionnaire can be considered reliable.

Conclusion This study showed that people with metabolic syndrome are not educated and motivated enough to change their lifestyle. The need for education of such patients is necessary.

Key words: cardiovascular disease, dyslipidemia, type 2 diabetes mellitus

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INTRODUCTION

Metabolic syndrome (MetS) is a group of diseases that together increase the risk of metabolic disorders such as insulin resistance, and diabetes mellitus, atherosclerotic cardiovascular disease, and cerebrovascular accident (1). To establish the diagnosis, it is necessary to meet at least three criteria according to the International Diabetes Federation (IDF) (2).

It is estimated that about 12–37% of the population of Asia and 12–26% of the population of Europe suffer from the metabolic syndrome (3,4). The pathophysiological mechanisms of MetS are complex and insulin resistance, neurohormonal activation, and chronic inflammation are thought to be the main triggers in the progression of the metabolic syndrome (5). Furthermore, genetic and acquired factors can influence the occurrence as well as the progression of MetS (6). Proinflammatory cytokines released from adipose tissue are responsible for the development of atherosclerosis (6). Furthermore, metabolic syndrome can also cause processes that cause liver damage by causing steatosis that can progress to non-alcoholic steatohepatitis, fibrosis, cirrhosis, and hepatocellular carcinoma (7).

To establish a diagnosis, it is first necessary to obtain data from medical history. Furthermore, checking the vital signs and appearance of the patient may lead physicians to suspect hypertension, dyslipidemia, or other metabolic diseases. It is necessary to examine the patient about life habits with special reference to diet and physical activity (8). Family history examination is necessary given the strong influence of genetics on MetS. Moreover, a detailed physical examination is necessary, because peripheral neuropathy, retinopathy, acanthosis nigricans may indicate metabolic disorders (9). A thorough medical history and physical examination are the basis for establishing a MetS diagnosis.

After medical history and physical examination, laboratory tests should be performed to confirm the diagnosis. Blood pressure, lipid profile, and blood sugar should be determined first. Also, it is desirable to determine liver and kidney enzymes. In patients in whom atherosclerotic changes are suspected, it is necessary to evaluate patients for signs of cardiac ischemia, infarct (10,11).

MetS treatment should focus on treating the cause. If the cause is obesity, it is necessary to recommend diet and exercise to the patient (12). If the patient has high blood pressure, it is recommended that the blood pressure is about 140/90 mmHg, while in patients with diabetes about 130/80 mmHg (12). In patients older than 60 years, the goal should be less than 150/90 mmHg (12). If the patient has high lipids, it is necessary first to recommend a diet, and if the diet has minimal effect, it is necessary to start a drug treatment. The first line in the treatment of hyperlipidemia is statins, however fibrates, niacin, and omega acids are also available in the treatment (13). Bariatric surgery is recommended in patients with severe obesity. The indication for bariatric surgery is a body mass index (BMI) $\geq$ 40 kg/m2 or in those with a BMI $\geq$ 35 kg/m2 and other comorbidities (14).

The consequences of MetS on the health of patients as well as on the entire health care system has not been sufficiently researched in Bosnia and Herzegovina (B&H).

The aim of this study was to determine the frequency of education about healthy lifestyle (proper diet and physical activity) in people suffering from MetS, to correlate the clinical and laboratory parameters in the patients suffering from MetS who had previously had education compared to the patients who had not had any education about a healthy lifestyle, and to check knowledge and attitudes of the patients about the healthy lifestyle through a pilot project analysis of a questionnaire (about diet, and physical activity) by using the Likert scale in order to point out the problem of educating patients with MetS. This work would be useful in the process of adopting a program to promote physical activity and proper nutrition.

PATIENTS AND METHODS

Patients and study design

The study included 40 patients of both genders diagnosed with MetS, aged 18 - 70 years, and all are members of the Association of Diabetics in Canton of Sarajevo. Patients were chosen by using random selection during the period from September 2019 to January 2020.

Out of 40 patients, 29 previously had education about lifestyle by doctors and nurses, via leaflets, media, internet, books, and 11 patients previously had no education. All patients gave a written consent for participation in the study. The consent of

the Board of Directors and the Ethics Committee of the Association of Diabetics of Sarajevo Canton was obtained.

Methods

During the trainings at the Association of Diabetics in Canton of Sarajevo, the frequency of MetS criteria was determined according to the IDF definition (2): waist circumference as a mandatory criterion, whose values vary depending on ethnicity (for Europeans it is ≥94 cm for males or ≥80 cm for females), and at least two additional criteria such as fasting blood glucose ≥5.6 mmol/L or taking medications for hyperglycaemia, blood pressure ≥130/85 mmHg, or taking medications for hypertension, triglycerides ≥1.7 mmol/L or taking medications for hypertriglyceridemia, high-density lipoproteins <1.03 mmol/L for males or <1.29 mmol/L for females or taking medications.

The study used anthropometric parameters (age, body weight, body height, body mass index, waist circumference, blood pressure), laboratory findings (sugar, cholesterol, high-density lipoproteins, low-density lipoproteins, triglycerides) and the original, structured questionnaires about diet (nutrition questionnaire), frequency of physical activities (questionnaire about physical activity), knowledge and understanding of patients, constructed for this research. The Likert scale (15) with offered answers was used for the evaluation of answers: 1- do not agree at all; 2 - disagree; 3 - neither agree nor disagree; 4 - agree; 5 - totally agree (Table 1, Table 2)

Table 1. Nutrition questionnaire for patients with and without education

Question
How often do you eat simple carbohydrates (CH) (cakes, chocolate, honey, jam, other sweets, juices) in quantities greater than 100g?
How often do you eat complex CHs (bread, pastries, potatoes, rice, pie, beans, pasta) in an amount greater than 300g?
How often do you eat more than 300g of protein (lean meat, fish, lean cheese, eggs, skim milk)?
How often do you eat more than 100g of fat (oil, olive oil, butter, cream, greasy cheese, greasy milk, fatty meat)?
How often do you eat more than 300g of fruit (all types of fruit)?
How often do you eat more than 300g of vegetables (except potatoes and beans)?
How often do you consume more than 5g of salt?
How often do you drink more than one alcoholic beverage (1.5 dl of wine, 3 dl of beer and 0.3 dl of spirits)?

*offered answers: not at all, every day, two times per week, once per month

Table 2. Questionnaire about diet and physical activity

Claim*
Proper nutrition is characterized by moderation, diversity and balance
All types of food can be an integral part of proper and a balanced diet, provided that portion size is adapted to gender, age and type physical activity
Proper nutrition maintains good health, meets energy needs and enables performing physical activity
Any increase in BW (body weight) increases the risk of dyslipidemia, high BP, cardiovascular diseases, carcinomas
Proper nutrition can improve health
With proper nutrition, they can reduce excess weight
Reduced salt intake can reduce cardiovascular risk
Reduced fat intake can reduce cardiovascular risk
The increase in BW is due to the entry of a larger number of /more than needed
Regular physical activity is a good way of calorie consumption
Physical activity has a positive effect on your health and helps you feel good
Cigarette consumption has a detrimental effect on your health
Balanced and healthy diet, enough physical activities, stress-free life, avoiding smoking and alcohol, represents a healthy lifestyle
Lifestyle changes need to be introduced gradually and should become a part of everyday life

Offered answers were used for the evaluation according to the Likert scale: 1- do not agree at all; 2 - disagree; 3 - neither agree nor disagree; 4 - agree; 5 - totally agree

Statistical analysis

The $\chi 2$ test was used for statistical processing. Cronbach's alpha was used in order to assess the reliability. T-tests were used for the comparison of independent samples between groups. The $p<0.05$ was used for statistical significance.

RESULTS

There was no statistically significant difference in the patients' age and gender between the groups, without and with the education ($p=0.1307$ and $p=0.3992$, respectively).

No statistically significant difference was recorded in the values of systolic and diastolic blood pressure in the group without the education in relation to the group that had the education ($p=0.9631$ and $p=0.8043$, respectively), as well as comparing the values of blood sugar, cholesterol, high-density lipoproteins and low-density lipoproteins (Table 3).

The patients in the group with no previous education had higher waist circumference and BMI compared to the group with previous education ($p=00104$ and $p=0.0472$, respectively) (Table 3)

Triglyceride values and excess body weight that patients should lose in the group of patients who

Table 3. Distribution of patients with and without education with clinical and laboratory parameters

Parameter	Without education (11 patients)				With education (29 patients)				p
	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD	
Age (years)	41	64	53.64	7.06	40	70	58.00	8.28	0.1307
WC (cm)	98	139	117.82	14.04	90	127	107.93	8.67	0.0104
BW (kg)	82	155	110.41	22.76	70	138	93.57	14.83	0.009
BH (m)	1.59	1.93	1.73	0.12	1.52	1.91	1.69	0.09	0.2821
BMI (kg/m2)	27.4	50	37.01	7.90	25.4	45	32.66	5.15	0.0472
SBP (mmHg)	110	170	142.73	19.28	90	190	143.10	23.92	0.9631
DBP (mmHg)	70	100	86.82	11.24	60	110	85.69	13.28	0.8043
BP (mmHg)	4.5	21	10.77	4.60	4.3	28.8	9.68	6.30	0.6036
CHL (mmol/l)	3.3	13	6.11	2.88	2.5	7.1	5.21	1.01	0.1451
HDL (mmol/l)	0.66	1.52	0.97	0.22	0.73	1.87	1.19	0.34	0.0566
LDL (mmol/l)	1.5	12.11	3.61	3.12	0.7	4.1	2.88	0.79	0.2465
TGL (mmol/l)	1.12	29.41	6.60	9.32	0.82	5.36	2.35	1.09	0.0183
EW (kg)	15	83	42.23	21.80	9	66	29.52	13.97	0.0348

Min., minimum; Max., maximum; WC, waist circumference; BW, body weight; BH, body height; BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; BP, blood pressure; CHL, cholesterol; HDL, high-density lipoprotein; LDL, low-density lipoprotein; TGL, triglycerides; EW, excess weight

had not had education were higher comparing to the group that had had one earlier (p=0.0183 and p=0.0348, respectively) (Table 3).

Out of 40 (100%), 29 patients (72.5%) had previously had education about lifestyle change and 11 patients (27.5%) had not undergone any education.

There was no statistically significant difference in the distribution of the patients' answers to the question whether they needed education about nutrition and physical activity (p=0.5921), whether patients intended to start "living healthily" (p=0.7473), about the intake of simple carbohydrates (p=0.4759), complex carbohydrates (p=0.5976), more than 300g proteins (p=0.8576), more than 300g fruits (p=0.2308) and more than 300g vegetables (p=0.5454), consumption of more than 5g of salt (p=0.95) and drinking more than one alcoholic beverage (p=0.941) (nutrition questionnaire).

A statistically significant difference between the groups was found only in the intake of more than 100g of fat (p=0.0148).

No statistically significant difference was found in the distribution of the patients' answers to the question on low intensity physical activity (p=0.0918), moderate (p=0.0614), high intensity physical activity (p=0.6358) (questionnaire about physical activity).

The Cronbach's alpha correlation matrix was 0.7834, while the 95% lower confidence limit was 0.6916. The questions from the questionnaire showed a satisfactory correlation and had a good value of variance, suggesting that the questionnaire can be considered reliable.

DISCUSSION

This study is among a few studies showing the impact of education on MetS.

Our results showed that the mean age of patients who had been previously educated was 58, while in patients who had not, it was 53.64. The study conducted in China in 2018 showed that MetS was more common in people over the age of 65 (16). Also, the study conducted in March 2020 showed that the prevalence of MetS was associated with older age (17).

Waist circumference in educated patients in our study was lower than in non-educated. According to Fisher et al., higher WC will lead to more serious MetS conditions (18). In both educated and uneducated patients, the average BMI was above 30 kg/m^2. Also, a study conducted by Gierach et al. showed that BMI had a strong linear correlation with WC, and that obesity in males and even normal body weight in females corresponded to an increased volume of visceral tissue in the abdomen (19).

No significant difference in the distribution of the patients' answers to the question of whether they needed education about nutrition and physical activity was found in our study. On the other hand, a questionnaire study on knowledge and awareness of the metabolic syndrome conducted in undergraduate medical students at entry-level, showed that they were educated about the impact of physical activity and diet on MetS (20); however, this study included subjects who were much younger than our patients. Furthermore, a study examining knowledge about MetS syndrome in 204 hospitalized patients showed that adults with cardiometabolic risk factors were at risk of developing MetS; they were with a low level of knowledge (21).

Our patients with MetS are insufficiently educated about their condition and they do not understand the consequences of MetS. Similarly, a MetS knowledge questionnaire was conducted among adult Chinese population, and proved that the population between the age of 18 and 65 was not sufficiently familiar with MetS (22).

There are several limitations as well as benefits regarding our study. The limitation is older age of the patients, and a short period of investigation time. One of the greatest benefits is that it is the first study to examine the impact of educated and uneducated patients on MetS in Bosnia and Herzegovina, and to develop questionnaires that will be useful for further clinical practice.

In conclusion, patients diagnosed with MetS are not sufficiently educated or motivated to change their lifestyle. Clinical and laboratory parameters did not differ significantly between educated and uneducated patients, as well as habits in diet, physical activity, knowledge and attitudes. The questions from the questionnaire showed a satisfactory correlation with each other and had a good value of variance, suggesting that the questionnaire can be considered reliable. The need for education of such patients is necessary. Education should be conducted by doctors and other medical experts, media, as well as by care of the entire community, because changing attitudes and adopting a healthy lifestyle will prevent high cardiovascular risk, premature morbidity, and mortality from cardiovascular diseases.

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