Metabolic syndrome as a risk factor for ischemic stroke

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Abstract

Background: Ischemic stroke is the leading cause of disability and a major cause of mortality worldwide. It is predominantly seen in the elderly and in patients with the metabolic syndrome (MS) [1, 2].

Material and methods: A "case-control" study was performed on 125 subjects with ischemic stroke and on 300 subjects without stroke. After the patients or their relatives signed an informed written consent, according to the declaration of Helsinki, the baseline data was collected by questionnaire. All subjects underwent a complete clinical examination and ultrasound examination of the extracranial carotids. Ischemic stroke diagnostic was made by a neurologist and confirmed by a brain CT scan. MS diagnostic was made according to the diagnostic criteria of the American Cardiology Association (AHA), the National Heart, Lung and Blood Institute (NHLBI) and the International Diabetes Federation (IDF) (2009).

Results: Fifty-four percent of patients and 36% of controls had metabolic syndrome criteria according to AHA, NHLBI, IDF (OR: 2.1; CI (1.1, 3.1), p=0.05). The prevalence of atherosclerotic plaques at the level of the extracranial carotid section was significantly higher in patients with stroke compared to the control group (67.2 % vs. 20,0%).

Conclusions: In our study generally metabolic syndrome was higher in stroke patients but different components of this syndrome were significantly high either. So management of individual components of the metabolic syndrome is recommended, including lifestyle measures (exercise, appropriate weight loss, proper diet) and pharmacotherapy (medications for BP lowering, lipid lowering, glycemic control, and antiplatelet therapy).

Key words: metabolic syndrome, stroke, risk factor, atherosclerosis.

Introduction

Stroke is the second major cause of death worldwide and may soon become the leading cause of death [1]. The ischemic stroke risk factors are classified as modifiable and unmodifiable ones and include arterial hypertension, diabetes mellitus, dyslipidemia, cigarette smoking, alcohol consumption, oldness, gender, etc. Furthermore, metabolic syndrome (MS) is known as an independent risk factor of vascular disease and stroke either [1, 2]. MS confers a 5-fold increase in the risk of type 2 diabetes mellitus and 2-3-fold the risk of developing cardiovascular disease over the next 5 to 10 years [3]. Further, patients with the MS are at 2- to 4-fold increased risk of stroke, a 3- to 4-fold increased risk of myocardial infarction, and 2-fold the risk of dying from such an event compared with those without the syndrome [4, 5]. Worldwide prevalence of MS ranges from <10% to as much as 84%, depending on the region, urban or rural environment, composition of the population studied, and the definition of the syndrome used [6, 7]. The IDF estimates that one-quarter of the world's adult population has the MS [8].

This study was preformed to evaluate the metabolic syndrome rate in ischemic stroke patients compared to controls.

Material and methods

A "case-control" study was performed on 125 subjects with ischemic stroke that were examined in the Cerebrovascular Diseases Neurology Department of the Emergency Medicine Institute, in the period of March 2015–July 2015. 300 subjects without stroke were examined during an epidemiological study of risk factors for stroke in the population of the Republic of Moldova from October till November 2015.

The patients were selected according to the MS diagnostic criteria of the American Cardiology Association (AHA), the National Heart, Lung and Blood Institute (NHLBI) and the International Diabetes Federation (IDF) (2009). After the patients or their relatives signed an informed written consent, according to the declaration of Helsinki, the baseline data was collected by questionnaire. All subjects underwent a complete clinical examination and ultrasound examination of the extracranial carotids. Ischemic stroke diagnostic was made by a neurologist and confirmed by a brain CT scan.

Definition of metabolic syndrome

We used revised American Cardiology Association, the National Heart, Lung and Blood Institute and the International Diabetes Federation (2009), which defined metabolic syndrome as the presence of ≥3 of the following:

- Abdominal obesity as determined by waist circumference ≥94 cm for men and ≥80 cm for women,
- Triglycerides ≥150 mg/dL (≥1,7 mmol/l),
- HDL cholesterol <40 mg/dL (<1,0 mmol/l) for men and <50 mg/dL (<1,3 mmol/l) for women,
- BP ≥130/≥85 mm Hg, Fasting glucose ≥100 mg/dL (≥5,6 mmol/l).

Statistical analysis

Data were analyzed by SPSS version 16.0; chi-square test and t-student were used for comparisons between two groups.

Results

Mean age of the studied groups was 66 years in case group and 50.25 in controls. Fifty-four percent of patients and 34% of controls had metabolic syndrome criteria according to AHA, NHLBI, IDF (OR: 2.1; CI (1.1, 3.1), p=0.05).

Totally prevalence of MS in women was more than in men in control subjects (54.4% women in patients with stroke vs. 66,0% women in control group) but there was no significant difference between them.

Fifty-seven percent of patients and 30% of controls had basal plasma glucose level higher than 5,6 mmol/l (p-value =0.001) (tab. 1).

Table 1

Characteristics of patients with ischemic stroke and control group

	Patients (125 subjects)	Controls (300 subjects)	P value
Mean age	66,00 years	50,25 years	0,001
Female	68 (54,4%)	198 (66%)	
Male	57 (45,6%)	102 (34%)	
Percent of positive metabolic syndrome	68 (54,4%)	108 (36%)	0,001
Percent of high blood pressure	113 (90%)	132 (44%)	0,001
Percent of low HDL-cholesterol	50 (40%)	31 (10%)	0,001
Percent of high waist circumference	102 (82%)	165 (55%)	0,001
Percent of high tryglicerides	35 (28%)	68 (23%)	0,05
Percent of high basal plasma glucose level	71 (57%)	92 (30%)	0,001

The tryglicerides level was significantly higher in patients than in controls (p-value =0.05). The HDL level in patients was significantly lower than controls (40% vs. 10%) (p-value =0.001).

Waist circumferences quantified in patients were higher than controls, 82% of patients and 55% of controls had high waist circumference (p-value= 0.001).

Ninety percent of patients and 44% of controls had hypertension (P-value =0.001).

Atherosclerotic plaques at the level of the extracranial carotid section were found in 67.2% (84 subjects) of the participants from the basic group compared to 20.0% (60 subjects) from the control group.

Discussion

The result of our study showed significant differences in metabolic syndrome among stroke patients and control subjects.

Although it is not clear how MS can increase the rate of vascular diseases and its mechanism is in doubt but MS is known as a vascular disease independent risk factor and associates with high risk of vascular events in ischemic stroke patients in many studies.

In our study generally metabolic syndrome was higher in stroke patients but different components of this syndrome were significantly high either.

Prevalence of hypertension was significantly high in stroke patients compared to controls (90% vs. 44%) and basal plasma glucose level was more (>5,6 mmol/l) in stroke patients (57%) than in controls (30%).

In this study, it was demonstrated that the frequency of MS in women was not more than in men, like other studies the correlation of vascular disease and MS proved to be in both genders. Moreover, male patients with the metabolic syndrome had higher mortality than others [8].

Our finding consists of other studies that showed more important roles of metabolic syndrome and higher risk of stroke in MS patients in both genders compared to controls [8] according to these studies, the frequency of stroke became two times higher.

As MS increases intra- and extra-cranial atherosclerosis it can be associated with higher risk of stroke, a lot of studies showed that half of patients with symptomatic intra- and extra- cranial atherosclerotic disease had metabolic syndrome [9, 10, 11, 12].

The metabolic syndrome is currently more frequent and a large number of people worldwide are in danger [3, 7, 8]; therefore, it is necessary to pay attention to the frequency of this syndrome in order to control the vascular disease prevalence, especially in the elderly.

Conclusions

In MS the risk of cerebrovascular diseases is multifactorial and its early detection and its treatment can prevent vascular events. As the frequency of metabolic syndrome in stroke patients is higher than in controls, it is important to manage the individual components of the metabolic syndrome, including lifestyle measures (exercise, appropriate weight loss, proper diet) and pharmacotherapy (medications for blood pressure lowering, lipid lowering, glycemic control, and antiplatelet therapy).

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