

Metabolic syndrome in ischemic stroke: A case control study

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Introduction: The metabolic syndrome has known as an independent risk factor of stroke. The occurrence of this syndrome is due to genetic factors and lifestyle. This study was performed on the frequency of metabolic syndrome prevalence in ischemic stroke patients compare to control. **Materials and Methods:** One hundred ischemic stroke patients and 100 controls (with the same age and sex) were evaluated for this study. **Result:** 62% of patient and 34% of controls had metabolic syndrome criteria according to National Cholesterol Education Program (NCEP) {OR: 3.2; 95% CI (1.9–9.7), $P=0.001$ } Prevalence of metabolic syndrome in women was more than men (52% vs. 44%) {OR: 0.72; 95% CI (0.4, 1.3)}. Beside of metabolic syndrome, prevalence of metabolic syndrome components was significantly higher in stroke patients compare to controls. **Conclusion:** Metabolic syndrome prevalence are more common in stroke patients compare to controls, but it should be noticed that the controls are in a risk of future stroke so they need special treatment to prevent it.

Key words: Metabolic syndrome, prevalence, stroke

INTRODUCTION

Stroke is the most common reason of disability affects of more than 700 000 individuals and the third cause of death in the world per year.^[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, male gender, etc. Furthermore, metabolic syndrome (MetS) is known as an independent risk factor of CAD and stroke either.^[2,3] The MetS rate depends on genetic and nongenetic^[4,5] and the metabolic syndrome characterizes by cluster of risk factors including obesity, insulin resistance, hypertension, hypertriglyceridemia and low HDL cholesterol.^[6] Hwang IC *et al.* demonstrated that according to NECP criteria FBS was the most important factor of increasing cardiovascular disease.^[7] Intrinsically the frequency of MetS in the United States is more than 47 million individuals and it increases with age for instance 6.7% in 20–29 years old compare to 43.5% in 60–69 ones.^[7]

MetS is associated with different kind of diseases such as development of myocardial ischemia, ischemic stroke, extra and intracranial atherosclerotic, and asymptomatic carotid atherosclerotic plaques.^[8–12]

Some studies showed that lifestyle can affect on

the MetS occurrence, so the risk of ischemic stroke decreases consequently by changing it; however, Safarzadegan *et al.* showed there was no significant correlation between lifestyle and MetS.^[13,14]

So to identify the MetS rate, lifestyle changing and medical treatment decrease the stroke attack.^[11]

This study was performed to evaluate the metabolic syndrome rate in ischemic stroke patients compare to controls

MATERIALS AND METHODS

This case-control study was performed from 2008 to 2009 in neurology ward of Alzahra hospital, Isfahan.

One hundred ischemic stroke patients were enrolled randomly among the patients of neurologic ward. Ischemic stroke diagnosis was made by neurologist and confirmed by brain CT scan in more than 45-years old patients. Exclusion criteria were past history of previous stroke or using Statins during past three months and sever cardiorenal or nutritional disorder that would affect blood pressure or lipid and glucose. One hundred controls with the same sex and age that had negative history of cerebrovascular disease and myocardial infarction were recruited.

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After taking an informed written consent, conforming to the current revision of the declaration of Helsinki from the patients or their relatives the baseline data were collected by questionnaire. The Ethical Review Committee of Isfahan University of Medical Sciences approved the study protocol.

Blood pressure was measured after 48 h of initiation symptoms and repeated two times by 10-min interval, in calm and comfortable situation.

FBS, TG, and HDL were measured 72 h after admission under a fast condition.

Waist circumference was measured by tape-measure from 10 cm above anterior superior iliac spine (ASIS).

Definition of metabolic syndrome

We used revised National Cholesterol Education Program (NCEP) criteria for definition of the metabolic syndrome, patients who had three of following symptoms suffered from metabolic syndrome:

- Abdominal obesity (waist circumference >90 cm for men or >80 cm for women).
- Triglycerides >150 mg/dL.
- HDL <40 mg/dL for men or <50 mg/dL for women.
- Systolic blood pressure >130 or diastolic blood pressure >85 mmHg.
- FBS >100 mg/dL or receiving antihypertensive treatment.

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

RESULTS

In each group 50% of subjects were male and 50% were female, mean age was 62.24(±9.9) in case group and 61.24(±8.5) in controls. Sixty-two percent of patients and 34% of controls had metabolic syndrome criteria according

to NCEP {OR: 4.3CI (1.9, 9.7), $P=0.001$ }.

Totally prevalence of MetS in women was more than men (52% vs. 44%) but there is no significant difference between them {OR: 0.72 CI (0.14, 1.3)}.

Mean average of fasting blood glucose was 132.66 (±53.03) in patients and 103.01(±27.681) in controls (P -value =0.001).

Fifty-seven percent of patients and 23% of controls had FBS higher than 110 (P -value =0.001) [Table 1].

Mean average of TG was 169.71 in patients and 148.68 in controls (P -value =0.26).

The HDL level in patients was significantly lower than control (50% vs. 26%) (P -value =0.001).

Waist circumference quantify in patients were higher than controls, 85% of patients and 65% of controls had high waist circumference (P -value= 0.007).

Sixty-eight percent of patients and 35% of controls had hypertension (P -value =0.001) [Table 1].

Prevalence of smoking is higher in patients {OR: 4.3 CI (1.9, 9.7)}

DISCUSSION

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

Although it is not clear how MetS can increase the rate of CVD and its mechanism is in doubt but MetS is known as a CVD independent risk factor and associates with high risk of CVD events in ischemic stroke patients in many studies. Liu suggested a dose–response correlation between MetS

Table 1: Characteristics of patients and controls

	Patients	Controls	P value
Age Mean(±SD)	62.24 (±9.9)	61.24 (±8.5)	0.154
sex			
Female	50	50	
Male	50	50	
Percent of positive metabolic syndrome	62%	34%	0.001
FBS mean	132.66 (±53.03)	103.01 (±27.681)	0.001
percent of high BP	68%	35%	
TG mean	169.71	148.68	0.26
Percent of low HDL	50%	26%	0.001
Percent of high waist circumference	85%	65%	0.007

FBS: Fasting blood sugar; TG: Triglyceride; HDL: High density of lipoprotein

components and risk of CVD event.^[15,16]

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 compare to controls (68% *vs.* 35%) and FBS measurement was more (>110) in stroke patients (57%) than in controls (23%).

Jia *et al.* showed that the metabolic syndrome was associated with first-ever stroke in middle-aged and elderly, but blood pressure was more significantly than metabolic syndrome in this patients,^[17] in other study in Korea, Hwang *et al.* demonstrated that metabolic syndrome and FBS were the highest predicting factors of CVD.^[6]

Generally in this study, it was demonstrated that the frequency of MetS in women was not more than men, like other studies (most of them) the correlation of CVD and MetS proved in both gender. Moreover, male patients with the metabolic syndrome had higher mortality than others, even in the absence of CVD baseline and diabetes.^[18]

Our finding consists other studies that showed more important roles of metabolic syndrome and higher risk of stroke in MetS patients in both gender compare to controls^[14] according to these studies, the frequency of stroke, CHD, and MI diseases became three times higher than others.^[19]

As MetS increases intracranial atherosclerosis so can be associated with higher risk of stroke, Ovbiagele *et al.* showed that half of patients with symptomatic intracranial atherosclerotic disease had metabolic syndrome.^[20] On the other hand, prevalence of brain silent ischemic lesions increases in MetS independent of other risk factors.^[21,22]

The metabolic syndrome is currently more frequent and a large number of people in worldwide are in danger^[13,16]; therefore, it is necessary to pay attention about the frequency of this syndrome in different part of world in order to control the CVD prevalence, especially in the elderly.^[23,24]

CONCLUSION

As the frequency of metabolic syndrome in stroke patients is higher than controls, it is important to change the lifestyle in order to control this syndrome.

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1. Obesity: waist circumference above 90 cm in men and 88 cm in women
2. Insulin resistance: FBS more than or equal 100 mg/dL.
3. Hypertension (systolic blood pressure more than 130 mmHg and diastolic blood pressure greater than 85 mmHg).
4. Hypertriglyceridemia: above 150 mg/dL.
5. HDL cholesterol: less than 40 mg/dL in male and less than 50 mg/dL in female.

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