

## Dietary Intake of Different Carbohydrates Among Incident Stroke Patients During Previous Year

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### ABSTRACT

**Background:** Stroke is a leading cause of preventable morbidity and mortality in the United States. Numerous studies have shown that dietary carbohydrates play an important role in stroke incident. Therefore, this study aimed to assess the association between dietary intake of carbohydrate and its types and stroke incidence among Iranian adults.

**Methods:** A case-control study was performed among 46 men (5618) and 23 women (527) admitted to the Al Zahra hospital with stroke and 60 healthy people were chosen in control group. Dietary intake was measured by food frequency questionnaire (FFQ) including 168 items. Food processor software (version 2) was used to analyze data.

**Results:** Anthropometric indices of male and female patients were (BMI: 29.75), (Waist: 112.15) and (BMI: 25.535), (Waist: 92.5) respectively. Energy intake and carbohydrate consumption of patients in both genders was higher than the healthy subjects which was statistically significant among men ( $P < 0.05$ ). Across different carbohydrate sources, refined carbohydrates consumption was higher among patients in both gender rather than the healthy subjects. While, the healthy people had a higher whole grain consumption.

**Conclusions:** High carbohydrate intake specially refined sources with high glycemic index (GI) and glycemic load (GL) is associated with increased risk of stroke. Hence, dietary intake requires improvement to provide protection from life threatening outcomes.

**Keywords:** Carbohydrate, glycemic index, stroke

### INTRODUCTION

Stroke is a leading cause of preventable morbidity and mortality in the United States.<sup>[1]</sup> Although the death rate from stroke has declined, it is still the third cause of death worldwide.<sup>[2,3]</sup> In the past decade, there was a reduction in stroke incidence in western communities, while it exceeded by 20% in developing countries.<sup>[3]</sup> The main risk factor for

stroke is high blood pressure.<sup>[4,5]</sup> Recently; diabetes, hypercholesterolemia, and obesity have been attributed to increased risk of stroke by means of impaired endothelial function.<sup>[2,4,6,7]</sup> It seems that lifestyle and diet play a major role in stroke incidence which will develop a survival strategy for its prevention and management.<sup>[1,3,8,9]</sup> Narrative studies have released that adherence to dietary approaches to stop hypertension (DASH) and Mediterranean dietary patterns; rich in fruits, vegetables, low-fat dairy products, and low in saturated fatty acids, will decrease the risk of stroke.<sup>[1,3,8]</sup> Many studies have focused on fat component of diets and achieved contrast results, although carbohydrate has received less attention.<sup>[3,9]</sup> Carbohydrate is a main source of energy for body requirements, which exceeded intake will lead to chronic diseases such as obesity, insulin resistance, and stroke.<sup>[1,3,9]</sup> It has been advocated that both quantity and quality of carbohydrate affect metabolic health.<sup>[5,9]</sup> Food with high glycemic index (GI) and glycemic load (GL) has been shown to increase the risk of stroke, but the results are inconsistent in different populations.<sup>[3]</sup> It has been indicated that whole grain intake is associated with a trend towards a reduction in stroke incidence.<sup>[3,5,9]</sup> Moreover, it has been reported that cereal and whole grain containing fiber are inversely associated with the risk of stroke.<sup>[3,5,9]</sup> Taken together, data on association between carbohydrate consumption and its type and stroke incidence are limited in Asian countries. So the current study aimed to assess the association between dietary intake of carbohydrate and its types and stroke incidence among Iranian adults.

## METHODS

This case-control study was carried out among 46 men (age (MeanSD): 56.18 years) and 23 women (age (MeanSD): 52.7 years) with stroke admitted to the Al Zahra hospital located in Isfahan-Iran. Sixty healthy people (30 men, 30 women) participated in the experiment as control group from orthopedic ward of that hospital. Data on weight and height of subjects were collected through a self-reported questionnaire by patient's relatives. BMI was calculated by dividing weight (kg) on height (m<sup>2</sup>). Waist circumferences

of patients were measured to compute waist to hip ratio by trained staff. Dietary intake of carbohydrate was estimated by a validated food frequency questionnaire (FFQ) including 168 items. Food processor software (version 2) was used to analyze data.

## RESULTS

Anthropometric indices of male and female patients are shown in Table 1. Energy intake of patients in both genders was higher than the healthy subjects which was statistically significant among men ( $P < 0.05$ ). Stroke patients had a higher consumption of carbohydrate (g/d) compared to healthy people [Table 2]. Across different carbohydrate sources, all patients in both gender consumed different sources of refined carbohydrate more than healthy subjects. In contrast, the consumption of whole grain sources was higher in healthy people than stroke patients [Table 3].

## DISCUSSION

The findings of our study showed that energy intake and carbohydrate consumption in stroke patients were significantly more than control group. In addition, we found that the mean intake of refined carbohydrate sources was higher in all patients rather than healthy people, while their whole grains intake was lower than healthy subjects. Several previous studies have also revealed similar results that carbohydrate consumption is high in other eastern communities like Japan.<sup>[2,10]</sup> In addition, it has been shown that whole grain consumption was inversely related to stroke incident.<sup>[3,5,9]</sup> Within a prospective study, Lagiou *et al.*,<sup>[11]</sup> cited that low carbohydrate-high protein diets was related to less cardiovascular risk factors. A meta-analysis done by Dong<sup>[12]</sup> indicated that high dietary GI and GL significantly increased coronary heart disease in women but not men. In addition, the harmful effects of high dietary GL appeared more evident in the

**Table 1:** Anthropometric measurements of stroke patients

Gender	BMI (kg/m <sup>2</sup> )	Waist (cm)	WHR
Male	5/729	15112	1/02/1
Female	5/35/25	892	1/09/0

All values are mean SD, BMI=Body mass index  
WHR=Waist to hip ratio

**Table 2:** Energy and carbohydrate intake across different genders in all population

Variables	Male			Female		
	Stroke	Healthy	P value	Stroke	Healthy	P value
Energy (kcal)	9202845	4852360	04/0	4402235	5252185	23/0
Carbohydrate (g)	134407	75339	11/0	68342	77322	4/0

All values are mean SD

**Table 3:** Different sources of carbohydrate consumption across all population

Food items	Male stroke (g)	Male stroke (kcal)	Healthy male (g)	Healthy male (kcal)
Whole grains				
Bread	172	505	141	415
Rice	300	363	241	292
Noodles	21	34	40	45
Others	5	8	10	15
Refined carbohydrate				
Sugar	48	185	28.5	110
Jelly, jam, honey	17	48	8.2	23
Sweet beverage, candy, chocolate	58	130	27	60
Food items	Female stroke (g)	Female stroke (kcal)	Healthy female (g)	Healthy female (kcal)
Whole grains				
Bread	123	360	112	330
Rice	216	262	200	242
Noodles	27	30	22.5	25
Others	6.5	10	3.3	5
Refined carbohydrate				
Sugar	22.5	87	17.5	67
Jelly, jam, honey	13	36	9	25
Sweet beverage, candy, chocolate	38	85	24	53

overweight and obese. Furthermore, Oba *et al.*,<sup>[2]</sup> pointed that high GL and GI carbohydrates and rice consumption could increase the risk of stroke in Japanese population. Numerous interventions have documented beneficial effects of low GI and GL diets on lipid profiles.<sup>[13-16]</sup> Moreover, other investigations have found that low GL and GI diets improve glycemic control in diabetic patients<sup>[17]</sup> which epidemiologic studies suggested that type 2 diabetes has been an important risk factor for stroke.<sup>[6]</sup> The underlying mechanism is that dietary GI and GL may have influence on factors other than glucose intolerance and insulin resistance which lead to stroke.<sup>[2]</sup> It has been advocated that high-GI sources affects endothelial function and accelerate atherosclerosis progression.<sup>[18,19]</sup> This study has several limitations. The FFQ in this study was not specially designed to derive dietary GI and GL

values, as in many other studies. The stroke patients may have been misdiagnosed. The statistical analysis should be interpreted with caution because we did not perform statistical tests to specify differences across groups. The strength of this study was human-based nature of subjects. In conclusion, we found that high carbohydrate intake specially refined sources with high GI and GL is associated with increased risk of stroke. Lack of data on association of carbohydrate consumption and stroke risk factors is utterly obvious. The more clinical-based studies are needed to confirm this association.

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