



Evaluation of nutritional status of patients referred with stroke

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Abstract

A better understanding of stroke pathogenesis through the identification of stroke risk and protective factors can lead to new strategies for stroke prevention. This study investigates the diet of stroke patients and whether there is a relationship between the diet pattern and their age, gender, recurrence of stroke, mortality, and duration of hospitalization. This is a cross-sectional prospective study that included all stroke patients referred to the emergency department between April 2022 and June 2022. The daily diet and demographic characteristics of patients were collected. 100 patients (65% men) were included. According to the statistical analysis, type of oil, and sugar consumption were correlated with the gender of patients (p values of .001 and .014, respectively). Also, correlations between age of patients and number of meals consumed in a day, grain serving, meat consumption and serving, and fruit serving were detected (p values of .030, .001, .0009, .003, and .043, respectively). Additionally, correlations between mortality and the number of meals in a day, meat consumption, and fruit serving were found (p values of .011, .033, and .033, respectively). Our study found that the number of meals consumed in a day, grain servings, meat consumption, and fruit servings in elderly patients is less than in young ones. Additionally, in patients, a higher number of meals consumed in a day, meat consumption, and fruit servings are detected. In stroke patients, women consume liquid oil, while men consume solid oil. Additionally, sugar consumption in male patients is higher than in female patients.

Keywords: NIS, traumatic brain injury, neuropsychological impairment scale, mortality rate, recovery

1. Introduction

Stroke is known as a leading cause of morbidity and mortality worldwide; also, it is responsible for notable healthcare costs, reduced quality of life, failure of productivity, and mortality (2). Therefore, recognition of risk factors and preventive strategies is valuable (1).

Among the preventive strategies, modifiable lifestyle factors play an important role in the secondary stroke prevention (3). Recent evidences demonstrated reduces in the risk of stroke-related illnesses, recurrent strokes, and poor cardiovascular results following a healthy lifestyle and controlling risk factors including unhealthy diet (2, 4-6). Because of the effective role of diet and nutrients in the prevention and control of the risk of stroke (7), we aimed to perform study to assess the dietary styles of stroke patients and their relation with age, gender, and recurrence of stroke in them.

2. Materials and Methods

2.1. Patients

This is a prospective cross-sectional and analytical study. All patients who have been referred to the emergency department

of Imam Reza Hospital as a referral stroke center, with a diagnosis of acute stroke (ischemic, hemorrhagic, or SAH) in April, up to June 2022 were included in the study. Patients who had left the hospital before further investigation and those who didn't have consent to participate in the study were excluded.

The study protocols have been approved by the Ethics Committee of the Medical Faculty at Tabriz University of Medical Sciences (IR.TBZMED.REC.1401.472.).

2.2. Data collection

We utilized a questioner to record the patient's daily diet (Supp1). We asked patients to fill the questioner. Additionally, a first-degree relative who lives with the patient were asked to fill the questioner in cases who were unable to speak. The demographic characteristics were also recorded during hospitalization.

2.3. Statistical analysis

The obtained data, including age, gender, type of stroke, and risk factors, were tested for normality of distribution by the Kolmogorov-Smirnov test. Due to the non-normal distribution

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of the data sets, the 25th and 75th percentiles and median were calculated, and the linear regression statistical method was used for further statistical analysis. All statistical analysis has been done using SPSS version 21 statistical analysis (SPSS, Inc., Chicago, Ill.) software.

3. Results

A total of 100 patients were included in the study (65 male and 35 female). The age distribution of patients followed the normal distribution, according to the results of the Kolmogorov-Smirnov statistical method. The 25th and 75th percentiles of age (56 years and 74.75 years), body weight (65 kg and 80 kg), height (163 cm and 174 cm), and BMI (22.34 kg/m² and 28.84 kg/m²) of patients were calculated.

Diabetes mellitus was the most common chronic disease among these patients; however, more than half of them had never been diagnosed before.

Among the patients, 91% experienced a stroke for the first time, 5 were discharged without neurological deficits, 64% left the hospital with neurological deficits, and 31% eventually died.

More than half of the patients were fed orally during hospitalization, which decreased to 39% at the time of discharge. The hospitalization period of the patients was 11.26 ± 12.98 days. The minimum hospitalization period was one day, and the maximum was 87 days (Table 1).

Table 1. Demographic and socioeconomic status of included patients

Characteristic	Items	Frequency	Percentage (%)
Gender	Female	35	35%
	Male	65	65%
Completed education	Primary	75	75%
	high school diploma	13	13%
	A college or university degree	11	11%
	graduate or professional degree	1	1%
Occupational status	Retired		
	Work less		
	Others		
Smoking	Never smoked	45	45%
	history of smoking	19	19%
	Currently smoking	36	36%
Drug abuse	Yes	5	5%
	No	95	95%
Alcohol consumption	Yes	3	3%
	No	97	97%
Nutritional state at administration	Oral	53	53%
	Enteral	46	46%
	Parenteral	1	1%
Nutritional state at discharge	Oral	39	39%
	Enteral	60	60%
	Parenteral	1	1%

The routine laboratory tests were performed on the patients at the time of their visits to the emergency room. As a result, the mean levels of FBS and BS were higher than normal. More detailed data is given in Table 2.

Nutritional status of patients, including number of meals in a day, grain, dairy, meat, fruit, vegetables, oil, and sugar consumption, and its correlation with gender, age, stroke recurrence, mortality, and duration of hospitalization were collected and summarized with details in Table 3.

According to the statistical analysis, type of oil and sugar consumption were correlated with the gender of patients (*p* values of .001 and .014, respectively). Our data analysis also showed correlations between age of patients and number of meals consumed in a day, grain serving, meat consumption and serving, and fruit serving (*p* values of .030, .001, .0009, .003, and .043, respectively). Also, correlations between mortality

and the number of meals in a day, meat consumption, and fruit serving were detected (*P* values of .011, .033, and .033, respectively). There was no correlation between the diet of patients and the recurrence of stroke. Also, no significant association between duration of hospitalization and dietary factors was found (Table 3).

4. Discussion

Numerous studies have investigated the association between dietary factors and stroke risk. They have suggested that there is clear evidence supporting the advantages of certain dietary factors over others (8).

For instance, consumption of vegetables and fruits is protective against stroke, and use of three to five servings per day was correlated with decreased stroke risk in comparison to the consumption of fewer than three servings of fruit and vegetables per day (8).

Table 2. Routine laboratory test results for patients

Laboratory Index	Mean	SD
ALP	210.67	71.62
ALT	25.34	15.17
AST	27.71	17.89
BS	169.60	78.89
Chol	185.24	68.47
Cr	1.35	1.39
FBS	140	96.58
Hb	15.28	16.24
HCT	43.76	40.04
HDL	37.58	41.62
LDL	126.07	101.52
Tg	183.86	104.08
Urea	46.96	21.82

ALP, alkaline phosphatase; ALT, alanine transaminase; AST, aspartate aminotransferase; BS, blood sugar; Chol, cholesterol; Cr, creatinine; Tg, triglyceride; FBS, fasting blood sugar; Hb, hemoglobin; HCT, hematocrit; HDL, high density lipopolysaccharide; LDL, low density lipopolysaccharide; SD, standard deviation

During a 4-year follow-up with 54,504 subjects in the Danish Diet, Cancer, and Health Study, 266 cases of ischemic stroke were identified, indicating a significant reduction in stroke risk with fruit consumption. Similar patterns were seen for most fruits and vegetables, although the risks were significant only for citrus fruits. Also, the association between total vegetable intake and stroke was unclear (9).

The Framingham Study (1966-1969), enrolled 832 men, aged 45–65 years, who were free of CVD. Through 20 years of follow-up, the study detected 97 incident strokes, 73 of which were complete strokes, and 24 transient ischemic attacks (TIA). Among the complete strokes, 61 cases were ischemic and 14 were hemorrhagic, with two patients having both types of stroke. The study discovered that increasing fruit and vegetable consumption reduced the risk ratio across all quintiles. Precisely, a 22% reduction in the risk of all types of stroke and TIA was seen with every increase in three daily servings of fruits and vegetables (age-adjusted RR, 0.78; 95% CI, 0.62–0.98) (10).

Liang et al. have examined soy consumption and its association with stroke incidence. They have reported a meaningful difference in mean weekly soy food intake between stroke groups and controls (11). Also, a protective effect of soy and isoflavone intake against the risk of ischemic stroke and MI has been observed in a prospective study that was done by Kokubo Y et al (12).

According to previous studies that have been performed mostly in Japanese populations, soy products seem to be protective against ischemic stroke, but the numbers of such studies are too small to allow conclusions to be drawn considering the different soy products and/or to extrapolate the outcomes to other populations (8).

The DASH diet, which contains high intake of vegetables, fruits, grains, nuts, low-fat dairy products, chicken, and fish and low intake of red meat, sweets, and refined carbohydrates, has revealed to have great efficacy in lowering blood pressure and low-density lipoproteins, as risk factors for CVD (13). Although Fung et al. found a benefit to a DASH diet in terms of stroke risk; their findings were not statistically significant (14). They also examined the effects of a Mediterranean and prudent diet on stroke risk and realized that they were correlated with diminished stroke risk but not significant (15, 16).

Existing evidence has illustrated the effects of food groups such as fruits and vegetables, fish, and specific dietary patterns in reducing stroke risk and mortality. Other nutritional elements, such as animal products, soy, whole grains, and other dietary forms, require more explanation (8).

In this study, we looked at the relationship between dietary components like fruits and vegetables, whole grains, full-fat and low-fat dairy, fatty and lean meat, fat and oil, and carbohydrates and age, gender, stroke recurrence, mortality, and duration of hospitalization in 100 patients referred to a stroke referral center (Imam Reza Hospital).

Our study revealed that the number of meals consumed in a day, grain servings, meat consumption, and meat servings in elderly patients are less than in young ones. Also, a higher number of meals consumed in a day, meat consumption, and fruit servings are detected in stroke patients who have died through hospitalization. Also, our study found that in stroke patients, women dominantly consume liquid oil; however, men consume solid oil instead. Additionally, we found that sugar consumption in male patients is higher than in female patients.

However, there was no correlation between the diet of patients and the recurrence of stroke, and no significant association between duration of hospitalization and dietary factors was found. However, further investigations were needed to evaluate these relations within other populations and with larger sample sizes.

Limitations

In this study, we assessed the diet of stroke patients and its correlations with the patients' age, gender, mortality, and duration of hospitalization. However, our study was unable to compare the diets of patients with and without stroke. So, it is better to design a study to assess this comparison.

Table 3. Relationship of dietary groups' servings with gender and stroke recurrence

		Gender		P value of the correlation with gender	Stroke recurrence		P value of the correlation with stroke recurrence	P value of the correlation with age	P value of the correlation with death	P value of the correlation with duration of hospitalization
		Female	Male		No	Yes				
number of meals in a day	Main meal=3 Snack=1	6	12	.539	0	2	.102	.030	.011	.367
	Main meal=2 Snack=2	14	22		0	2				
	Main meal=3 Snack=3	2	2		0	1				
	Main meal=2 Snack=0	0	1							
	Main meal=3 Snack=3	10	18							
	Main meal=3 Snack=4-5	3	10		1	0				
Grain serving (days in a week)	3-5	10	12	.232	1	0	.07	.001	.155	.843
	6-10	16	31		0	4				
	>10	9	22		0	1				
Dairy consumption (days in a week)	0	4	7	.718	1	2	.410	.549	.500	.123
	1-2	15	30							
	3-4	9	15		0	1				
	5-6	2	8		0	1				
	7	5	5		0	1				
Dairy servings in a day	<1	8	17	.351	1	0	-	.977	.167	.860
	1-2	20	42		0	3				
	2-3	2	2							
	>3	1	0							
Dairy fat level	Low fat	9	21	.664	0	2	.838	.241	.237	.249
	Traditional	15	24		1	0				
	Full fat	11	20		0	1				
Meat consumption (days in a week)	0	1	5	.541	0	1	.838	.0009	.033	.796
	1-2	17	27		1	2				
	3-4	13	27		0	2				
	5-6	3	5							
	7	1	0							
Meat servings in a day	<1	3	8	.771	1	0	.121	.003	.171	.999
	1-2	10	19		0	2				
	2-3	17	28		0	2				
	>3	4	9		0	1				
Meat fat level	Low-fat (lean)	20	33	.785	1	4	.704	.323	.161	.105
	Full fat	13	29		0	1				
Fruit consumption (days in a week)	0	4	11	.929	0	1	1.0	.112	.062	.419
	1-2	20	28		1	3				
	3-4	4	13		0	1				
	5-6	3	4							
	7	4	7							
Fruit servings in a day	<1	6	10	.570	1	2	.495	.042	.033	.650
	1-2	23	39		0	1				
	2-3	4	7		-	-				
	3-4	0	2		-	-				
Vegetable consumption (days in a week)	0	3	16	.056	0	1	.704	.265	.491	.254
	1-2	20	35		1	4				
	3-4	9	8		-	-				
	5-6	1	2		-	-				
	7	2	2		-	-				
Vegetable servings in a day	<1	22	28	.444	0	3	.685	.085	.499	.332
	1-2	8	17		1	0				
	2-3	3	5		0	1				
Oil type	Liquid	9	38	.001	1	2	.374	.143	.055	.810
	Semi-solid	4	5		-	-				

	Solid	21	22		0	3				
	Olive	1	0		-	-				
Oil consumption (days in a week)	3	0	2	.073	-	-	-	.814	.960	.813
	4	0	2		-	-				
	5	0	1		-	-				
	7	34	58		1	5				
Oil servings in a day	<1	1	4	.596	1	0	.142	.921	.658	.458
	1-2	7	10		0	2				
	2-3	7	19		0	1				
	3-4	11	20		0	2				
	>5	8	12		-	-				
Sugar consumption (days in a week)	0	4	3	.014	0	1	.704	.657	.527	.597
	1-2	5	0		-	-				
	3-4	2	5		-	-				
	5-6	2	5		-	-				
	7	22	51		1	4				
Sugar servings in a day	<1	4	7	.103	-	-	.685	.060	.737	.640
	1-2	13	9		0	1				
	2-3	10	24		1	3				
	3-4	4	12		-	-				
	>5	3	8		-	-				

Conflict of interest

All authors declare any conflict of interest.

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None to declare.

Authors' contributions

Concept: S.S., S.S.V., Design: S.S., S.S.V., Data Collection or Processing: A.A., Z.P., Analysis or Interpretation: S.S.V., R.R.G., P.V., S.S., Literature Search: S.S.V., R.R.G., P.V., S.S., Writing: S.S.V., R.R.G., P.V., S.S.

Ethical Statement

The study protocols have been approved by the Ethics Committee of the Medical Faculty at Tabriz University of Medical Sciences (IR.TBZMED.REC.1401.472.).

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