Awareness of stroke signs, symptoms, and risk factors among Jazan University students
An analytic cross-sectional study from Jazan, Saudi Arabia

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Abstract

In the Kingdom of Saudi Arabia, the lifetime risk of stroke is estimated to be between 23% and 28.9%, whereas in Jazan region of the Kingdom there is a high prevalence of sickle cell anemia, which is known to increase the risk of stroke. This study aimed to assess awareness of stroke signs, symptoms, and risk factors among university students in the southern region of Saudi Arabia. In this analytical cross-sectional study, data obtained through an online questionnaire were collected from 897 university students. Data were entered, cleaned, and analyzed using SPSS (IBM, Chicago IL) software version 28. Knowledge was assessed using both open- and closed-ended questions (CEQ). The participants were predominantly female (72%), single (86.8%), a fifth had relatives with cerebrovascular accident (CVA), and a third knew a person with CVA. The open-ended questions showed that 11.8% did not know any symptoms or signs and 25% knew only 1, while in the CEQs, hypertension was selected by 83.0%. Regarding knowledge about symptoms and signs, 33.7% and 21.9% recognized weakness and speech disturbance, respectively, whereas in the CEQs, around 60% selected others. Regarding actions that should be taken if CVA is suspected, >80% preferred going directly to the hospital. The best time to seek professional care was considered to be within 4 hours by 47.5%, 10.3% suggested a later timing, and 42.3% had no knowledge of what to do. Multivariate logistic regression revealed that pursuing a health-related specialty and previous stroke experience in close relatives were significantly associated with good stroke knowledge. The level of knowledge and correct timing and action among participants were better than those reported nationally and internationally. However, there is still room for improvement in awareness, which is recommended to improve the outcomes.

Abbreviations: CEQ = close-ended questions, CVA = cerebrovascular accident, KSA = Kingdom of Saudi Arabia, OEQ = open-ended question.

Keywords: awareness, cerebrovascular accident (CVA), Jazan, knowledge, Saudi Arabia, stroke

1. Introduction

Stroke, also known as a cerebral vascular accident (CVA), is the second leading cause of death worldwide.[1] Feigin et al (the GBD 2016 Lifetime Risk of Stroke Collaborators) estimated the global lifetime risk of stroke to be approximately 25%, with a relative increase of 8.9% since 1999, for both men and women, equally, from the age of 25 years onward.[2] The risk of ischemic stroke was higher than that of hemorrhagic stroke (18.3% and 8.2%, respectively). In the Kingdom of Saudi Arabia (KSA), the lifetime risk of stroke is estimated to be between 23% and 28.9%.[2] Regarding the risk factors, 10 modifiable stroke risk factors were found to be responsible for 90% of all strokes: hypertension, smoking, diabetes mellitus, physical activity, diet, psychosocial factors, abdominal obesity, alcohol, cardiac causes, and apolipoproteins[3] (p. 2). Age and hypertension were considered to be the strongest risk factors.[4,5]

The speed of receiving care is crucial to stroke outcome. Regarding delays in patients requiring urgent care, Moser et al[6] suggest 3 phases of delay. The first potential delay occurs between the onset of symptoms and decision to seek care. The second occurs between seeking care and the first contact with medical professionals. The third occurred between contact with medical professionals and arrival at a medical facility. Moser et al's model was discussed in a study on acute coronary

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syndrome, but can be adopted for stroke. It was found that most of the delay occurs in the first 2 phases, where better chances for improvement are more likely.[6]

Recognition of stroke symptoms and signs is the first step necessary for starting the process of early treatment and a good functional outcome, such as that noted in the California Acute Stroke Pilot Registry (CASPR), which reported the possibility of a >6-fold increase in the overall rate of fibrinolytic treatment within 3 hours if patients arrive early after onset.[7]

Public and health professional education has been proposed as a strong recommendation in the Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association.[8]

Studies conducted in the KSA have shown low awareness levels regarding CVA and an urgent need for public health interventions.[9,10] However, these studies did not focus on Jazan province, which, in addition to the high national prevalence figures of CVA, also lies in the southwestern parts of the KSA and ranks second among the provinces with the highest prevalence of sickle cell anemia (SCA).[11] It is well known that SCA significantly increases the risk of CVA.[12] This study aimed to assess awareness among Jazan University students about stroke signs and symptoms, risk factors, and their perceptions about the seriousness of the problem.

2. Materials and methods

2.1. Study design and site

An observational, analytic, cross-sectional study was performed among Jazan University students between June 25 and July 30, 2022. The University is located in Jazan City, at the Southwestern corner of KSA, includes 26 colleges, and hosts >50,000 students.

2.2. Data collection tools and techniques

A questionnaire containing 42 questions divided into 3 sections was used for data collection. The first section requested information on demographic characteristics, previous experiences with CVA, and sources of CVA information. The second section assessed knowledge of potential risk factors, signs, and symptoms of stroke. In this section, respondents were first asked open-ended questions (OEQs), then questions in a closed-ended format about possible risk factors, signs, and symptoms from which they were required to choose options that they thought were related to stroke. The third section asked about the actions to be taken upon encountering CVA, the appropriate time to seek care, perceptions of stroke management outcomes, and the seriousness of the condition.

In total, 37 questions pertained to the CVA knowledge. Each question was assigned a score (correct = 1; incorrect = 0). The total score was calculated as the overall knowledge score for each participant. A score of less than the median was classified as poor knowledge, and scores equal to or greater than the median were classified as good.

2.3. Sampling technique and sample size

The sample size of this study was calculated using the following formula:

$$N = [(z)^2 \, (p) \, (1-p)]/(d)^2,$$

where N is the sample size, z is the reliability coefficient ($z = 1.96$, 95% confidence interval), p is the expected population proportion, and d is the desired interval width (5.0%). The sample size obtained by using this formula was 384. The time required for data collection was set at 40 days. Convenience sampling was also conducted. The online self-administered questionnaire was prepared in Google Forms and sent to all currently enrolled Jazan University students via social media and emails by class leaders.

2.4. Data analysis

Data were analyzed using the statistical software SPSS (IBM, Chicago, IL) version 28. Descriptive and inferential statistics were used for the analysis. Categorical data were compared using the chi-square test. Statistical significance was set at P value <.05, with a P value <.01 considered to indicate high significance. Regression analysis was conducted to identify any predictors of knowledge level.

2.5. Ethical considerations

Ethical issues were addressed in accordance with the guidelines of the Helsinki Declaration and the Saudi Bioethics standards. Approval was obtained from the Standing Committee for Scientific Research Ethics-Jazan University (HAPO-10-Z-001) reference (REC-43/11/262). Consent was obtained at the start of the online questionnaire. Access to data was restricted to the research team.

3. Results

During the allotted time period, 1019 responses were obtained. After thorough data cleaning, 122 were rejected; for example, those reporting an unlikely age, such as >50 or <15 years, and those who chose an academic year that did not exist for the chosen specialty.

Of the 897 participants, the age of participants was 21.9 ± 2.24, with the majority of respondents identifying as female 639 (72.2%) and single 779 (86.8%). There were 761 (84.8%) participants who had prior knowledge of CVA, 173 (19.3%) knew relatives with CVA, and 290 (32.3%) knew a person with CVA. Details of the demographic characteristics are presented in Table 1.

Knowledge about stroke risk factors was explored by asking participants to enumerate in writing as much as they could in an open-ended format. They were later offered the option to choose from. For the OEQs, the most common risk factor was hypertension (37.1%). Each of stress, diabetes mellitus, old age, and smoking was mentioned by approximately 11% of participants, and those who could not mention any risk factors

Table 1

Demographic data of participants (n = 897).

Age	Mean ± SD, yr	21.9 ± 2.24
Sex	Male	258 (28.8%)
	Female	639 (71.2%)
Marital status	Single	779 (86.8%)
	Married	109 (12.2%)
	Widowed	1 (0.1%)
	Divorced	8 (.9%)
Student specialty	Health	663 (73.9%)
	Non-health	234 (26.1%)
Level	First	67 (7.5%)
	Second	146 (16.3%)
	Third	188 (21.0%)
	Fourth	180 (20.1%)
	Fifth	177 (19.7)
	Sixth	139 (15.5)
Relatives with CVA	Yes	173 (19.3%)
	No	724 (80.7%)
Prior knowledge of CVA	Yes	761 (84.8%)
	No	136 (15.2%)
Knows a person with CVA	Yes	290 (32.3%)
	No	607 (67.7%)

CVA = cerebrovascular accident, SD = standard deviation.

accounted for 39.5% of the participants. Of the remaining participants, 44.5% identified 1 risk factor and 3.6% mentioned >2 (Table 2).

When asked with close-ended questions (CEQs) about stroke risk factors with options, most of the participants selected hypertension (744, 83.0%). The least frequently selected correct risk factors were alcohol consumption, stress, and inactivity, which were chosen by only about a third of the participants. Most participants correctly selected excessive vegetable intake and constipation as not being risk factors for CVA: 93.5%, 91.4%, and 88.5%, respectively (Table 2). There is a significant difference in favor of students pursuing health-related specialties regarding knowledge of the majority of risk factors written or chosen from the offered options.

Regarding symptoms and signs of stroke, the OEQ revealed that 11.8% of respondents did not know any symptoms or signs, 25% mentioned only 1, and about 14% mentioned >3 signs or symptoms. Weakness and speech disturbance were most frequently mentioned (33.7% and 21.9%, respectively). Of the participants, 39.5% were unable to mention any risk factors, 44.5% identified 1, and 3.6 who mentioned >2. When asked CEQs, the most commonly recognized symptoms and signs were speech disturbance, weakness in any part of the body, loss of vision, loss of consciousness, weakness on 1 side of the body, headache, and numbness on 1 side of the body, which were chosen by approximately 60% of the participants (Table 3). In both the OEQs and CEQs, students of health-related specialties showed significantly better knowledge of all symptoms and signs.

Regarding the action that should be taken if CVA is suspected, 726 (80.9%) reported going directly to the hospital, 110 (12.3%) preferred going to a neurologist, 172 (23.9%) did not know what to do, 20 (2.2%), 16 (1.8%) preferred calling a general practitioner, and 5 (0.5%) preferred calling a religious person or a herbalist (Table 4).

Regarding the timing of seeking urgent care, 47.5% of participants mentioned that the patient should go to the hospital within 4 hours of the CVA, 92 (10.3%) selected to go to the

hospital after 4 hours, and 379 (42.3%) had no knowledge of what to do.

There was a significant difference ($P < .001$) between health- and non-health-related specialties in their knowledge of the action to be taken when CVA was suspected. However, there was no significant difference in the optimal time to seek medical attention (Table 4).

The vast majority of respondents considered stroke to be either a fatal or very severe illness (48.3 and 45.9%, respectively). More than half of the respondents (52.3%) considered stroke dangerous, most (70.5%) thought that stroke could be treated, and 54.1% thought that all CVA patients had the same signs (Table 5).

3.1. CVA

Binary regression showed that health specialty, stroke experience in close relatives, and read or heard of something about CVA were significantly associated with having good stroke knowledge (Table 6).

In the multivariate logistic regression model, only health specialty students and previous stroke experience in close relatives were significantly associated with good stroke knowledge (Table 7).

4. Discussion

This study revealed good to moderate levels of knowledge about various aspects of stroke among university students in Jazan. The findings can be used to inform target areas and audiences of interventions aimed at improving the outcomes of CVA.

Hypertension was the most cited risk factor for the OEQs. This pattern is notable in international[13] and national[10,14] studies. This risk factor was followed by old age, which is consistent with the fact that it was recognized as the second or third most known risk factor in 2 national studies.[9,10] These 2 risk factors, hypertension and old age, are acknowledged to be the strongest, as reported by Caplan[5] and Aigner et al.[4] In general, the study participants had relatively good knowledge of the most recognizable risk factors, exceeding those cited by national[9,10] and international studies.[15] These results remain consistent if we compare what is cited in the literature with our non-health specialty students alone; they are still better in most cases. One exception was a study conducted in Spain,[13] in which participants had a much higher level of knowledge of all risk factors. Alcohol, which is banned in KSA, is still recognized as a risk factor by a good proportion of participants (30.8%), which is better than the 20.8% cited in a study in Australia,[15] but lower than the 90% cited in a study in Spain.[13] Alcohol consumption is not prohibited in any of these countries.

Most symptoms and signs were identified in approximately 60% of participants. This knowledge was lower than that cited by Segura et al,[13] but generally higher than some local studies,[9] [14] and higher than that reported in an international study.[16]

Regarding actions to be taken in the case of suspected CVA, 80.9% of participants preferred to go directly to the hospital. This is similar to the >80% reported by Alluqmani et al[17] and higher than the 67.2% reported in the nearby city of Abha.[10] However, the comparison with some other studies was difficult, probably due to the nonuniformity in question phrasing and the regional availability and affordability of ambulances and other emergency services.

Participants exhibited good attitude toward stroke. Except for a very few (0.3%) respondents, the overwhelming majority considered stroke to be either fatal (433, 48.3%), very severe (412, 45.9%), or severe (5.5%).

Multivariate analysis revealed that the most important predictors were pursuing a health-related specialty or having experienced stroke with a close relative. Having prior

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Table 2

Participants' knowledge of stroke risk factors (n = 897).

Risk factors	Correct answer # (%) N = 897
Open-ended questions	
Hypertension	333 (37.1%)
Stress	103 (11.5%)
Diabetes mellitus	99 (11.0%)
Old age	98 (10.9%)
Smoking	92 (10.3%)
Close-ended questions	
Hypertension	744 (83.0%)
Diabetes mellitus	434 (48.4%)
Smoking	470 (52.5%)
Vegetable intake	839 (93.5%)
Old age	541 (60.4%)
Ischemic heart disease	519 (57.9%)
Constipation	820 (91.4%)
High serum cholesterol levels	482 (53.8%)
Alcohol	276 (30.8%)
Previous stroke	563 (62.8%)
Previous transient ischemic attack	450 (50.2%)
Stress	301 (33.6%)
Inactivity	301 (33.6%)
Family history	457 (51.0%)
Obesity	373 (41.6%)

Table 3

Participants' knowledge of stroke signs and symptoms (n = 897).

Variable	Correct answer # (%)
Open-ended questions	
Weakness in any part of the body	302 (33.7%)
Speech disturbance	196 (21.9%)
Headache	150 (16.7%)
Loss of consciousness	116 (12.9%)
Numbness on one side of the body	96 (10.7%)
Close-ended questions	
Weakness in any part of the body.	595 (66.3%)
Weakness on one side of the body	550 (61.3%)
Numbness on one side of the body	534 (59.5%)
Loss of consciousness	567 (63.2%)
Speech disturbance	662 (73.8%)
Loss of vision	580 (64.7%)
Headache	547 (61.0%)
Vomiting	304 (33.9%)
Moth deviation	359 (40.0%)
Dizziness	439 (48.9%)

Table 4

Knowledge of the action to be taken and the preferred time to go to the hospital when seeing a patient with CVA among health and non-health specialty students.

Variable	Total (n = 897)
Action that should be taken if CVA is suspected?	
Go to pharmacy	6 (0.7%)
Call a general practitioner	16 (1.8%)
Go to neurologist	110 (12.3%)
Direct to hospital	726 (80.9)
Call a religious healer	3 (0.3%)
Call an herbalist	2 (0.2%)
Wait and notice development	11 (1.2%)
Do nothing	3 (0.3%)
Unsure	20 (2.2%)
Preferred time to go to the hospital	
Within 4 h	426 (47.5%)
After 4 h	92 (10.3%)
Unsure	379 (42.3%)

CVA = cerebrovascular accident.

knowledge (read/heard) about stroke negatively affected the level of knowledge, which was also noted by Alhazzani et al.[10]

This study revealed a relatively good level of knowledge about stroke risk factors, symptoms, signs, actions to be taken in case of an encounter with stroke, and attitudes toward the seriousness of the condition. However, there is room for improvement given the importance and urgency of the situation, and the expected benefits of recognition of symptoms and signs and early action. The most important predictor is previous stroke experience in close relatives. Improved training and retraining for future professionals coupled with awareness campaigns for nonprofessionals are recommended.[10]

5. Limitations

The authors acknowledge the limitations of this study. Convenience sampling and the population restricted to students of the study area necessarily require that any generalizations be made with caution.

Author contributions

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Table 5

Participants' perceptions of the gravity of stroke, thoughts about stroke therapy, and its seriousness (n = 897).

	Gravity		Stroke is treatable		Stroke is dangerous		All CVA patients have the same signs
Fatal	433 (48.3%)	Yes	632 (70.5%)	Yes	469 (52.3%)	Yes	485 (54.1%)
Very severe	412 (45.9%)						
Severe	49 (5.5%)	No	265 (29.5%)	No	428 (47.7%)	No	412 (45.9%)
Slight/ harmless	3 (0.3%)						

CVA = cerebrovascular accident.

Table 6

Univariate relationships between demographic factors and having good knowledge about stroke.

Factors	n	OR	95% CI	*P*
Age <22	404	0.76	0.57–1.00	NS
Male	258	0.74	0.54–1.01	NS
Health specialty students	663	3.14	2.25–4.38	<.001
Knew a person with CVA	290	1.00	0.70–1.43	NS
Stroke experience in close relatives	173	1.75	1.14–2.69	.011
Read/heard something about CVA	761	2.31	1.51–3.53	<.001

CI = confidence interval, CVA = cerebrovascular accident, NS = not significant, OR = odds ratio.

Table 7

Significant predictors of having good knowledge about stroke based on multivariable logistic regression.

Factors	n	OR (95% CI)	P
Age <22	404	1.32 (1.0–1.75)	NS
Male	258	1.35 (0.99–1.85)	NS
Health specialty students	663	0.32 (0.23–0.44)	<.001
Knew a person with CVA	290	1.00 (0.70–1.43)	NS
Stroke experience in close relatives	173	0.57 (0.37–0.88)	.011
Read/heard something about CVA	761	0.43 (0.28–0.66)	<.001

CI = confidence interval, CVA = cerebrovascular accident, NS: not significant, OR = odds ratio.

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