

# Effect of an educational intervention on knowledge and perception of individuals at risk for stroke in Tabuk, Saudi Arabia

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### ABSTRACT

**الأهداف:** أظهرت العديد من الدراسات ضعف المعرفة بالسكتة الدماغية وآثارها على الأفراد المعرضين للخطر مما يزيد من الحاجة إلى برامج تعليمية لتعزيز الوعي في هذا المجال. نحن نهدف إلى تقييم تأثير برنامج تثقيفي على معرفة وفهم السكتة الدماغية لدى الأفراد المعرضين لخطر الإصابة بها.

**المنهجية:** تم تصميم هذه الدراسة، التي أجريت في عيادات التثقيف الصحي بمستشفى الملك سلمان للقوات المسلحة لتقييم وعي الأشخاص المعرضين لخطر الإصابة بالسكتة الدماغية قبل وبعد تقديم المحتوى التثقيفي. يتألف هذا المحتوى من شرح وجهها لوجه مدته 4 دقائق من قبل أحد المثقفين الصحيين المدربين ومقطع فيديو مدته 99 ثانية ومطوية قصيرة. تم إجراء التقييم من خلال استبيان مصمم لهذا الغرض.

**النتائج:** شارك ما مجموعه 313 شخصاً في هذه الدراسة. قبل التدخل أدرك 63.6% أن السكتة الدماغية ترجع إلى اضطراب في تدفق الدم مما يؤدي إلى فقدان وظائف المخ. بعد تقديم المحتوى التثقيفي ارتفعت النسبة إلى 97.1%. كما صرح 34.8% (109) من المشاركين أنهم يعرفون أعراض السكتة الدماغية، و 55.96% كانوا يعرفون 2-4 أعراض قبل التدخل. رفع المحتوى التثقيفي هذه النسب إلى 98.4% و 79.8% على التوالي. ارتبطت المعرفة الجيدة بأعراض السكتة الدماغية وعوامل الخطر بالسن الأصغر والمستوى العالي من التعليم.

**الخلاصة:** يؤدي المحتوى التثقيفي المقدم بالحوار المباشر من قبل مثقفين مدربين ومقاطع الفيديو والنشرات إلى تحسن كبير في فهم أعراض السكتة الدماغية وعوامل الخطر لدى الأفراد المعرضين لذلك.

**Objectives:** To assess the effect of an educational program on the knowledge and perception of stroke in individuals at risk.

**Methods:** This quasi experiment study, conducted in Health Education Clinics at King Salman Armed

Forces Hospital, was designed to assess the knowledge of people who were at risk for stroke, before and after delivering educational content. This content comprised 4-minute face-to-face explanation by a trained educator, 99-second video clip and a short hand-out. The assessment was performed by administering a structured questionnaire.

**Results:** A total of 313 people participated in this study. Before the intervention, 63.6% understood stroke to be due to a disturbance in blood flow resulting in loss of brain function. After delivery of the educational content, the percentage raised to 97.1%. Thirty-Four and Eight percent (109) of participants stated they knew stroke symptoms, and 55.96% knew 2 to 4 symptoms prior to intervention. Our educational content raised these percentages to 98.4% and 79.8% respectively. Good knowledge of stroke symptoms and risk factors was associated with younger age and higher level of education.

**Conclusion:** Educational content by means of one-to-one interaction with trained educators, video clips and handouts results in significant improvement in understanding of stroke symptoms and risk factors among at-risk participants.

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Stroke is a preventable and treatable disease. It can present with sudden onset of neurological disturbance, including limb weakness or numbness, visual loss or disturbance of speech or balance.<sup>1</sup> The World Health Organization (WHO) defined stroke as “a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours, or leading to death with no apparent cause other than a vascular origin.”<sup>2</sup> According to the WHO, 15 million people suffer stroke worldwide each year. Of these people, 5 million die, and another 5 million are left permanently disabled. Multiple studies suggest the possibility of reducing the incidence of stroke events and their impact on patients’ lives and community by increasing public awareness of the warning signs of stroke and its potential risk factors through educational programs. Stroke has a sudden and sometimes devastating impact on the patients and their families, who need information and support to guide them through these events. This study aims to assess knowledge and perception of stroke among individuals at risk for stroke in Tabuk, Saudi Arabia and to provide educational instruction.

In this study, our objectives were to: Test the knowledge of stroke, its warning signs and risk factors in individuals at risk for stroke, Assess the effects of an educational program on knowledge and perception of these individuals, Improving the knowledge of stroke warning signs and risk factors among individuals at risk.

**Methods.** We conducted this study over twelve weeks from December 2017 to February 2018. The study design is quasi-experimental one group pre post-intervention design based on an interview survey administered to participants before and after an educational intervention. Individuals at risk for stroke were interviewed using a structured questionnaire before and after educational instruction to assess their awareness about the warning signs and risk factors of stroke. The target population for our study was individuals who were at risk for stroke in Tabuk, Saudi Arabia.

A stroke risk quiz designed by American Stroke Association was used as an inclusion/exclusion criteria to identify potential study participants.<sup>3</sup>

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Participants who answered yes to most of stroke risk quiz were considered potential candidates for this study (inclusion criteria). Participants who answered No to most of stroke risk quiz were excluded from this study (exclusion criteria), Investigators performed a stroke risk quiz. The target population was determined at the triage nursing room in the medical clinics by administering the stroke risk quiz.

Participants were divided in 2 groups based on gender, with help of random sampling technique participants included in the study. Sample size of 397 participants was calculated by using 95% confidence level, 5% absolute precision and by taking expected percentage of good knowledge of stroke as 70% respectively.<sup>4</sup>

The interview between the health educator and participant assessed perception of stroke and knowledge of its risk factors by using a standardized questionnaire described below. This was followed by delivery of educational material on stroke to the participant over a period of 5 to 7 minutes by the educator. Immediately after the intervention, the participant’s knowledge and perception of stroke and its potential risk factors were evaluated using same standardized questionnaire described below. We used the educational material developed by the Saudi Stroke Association. The material was delivered by a 4 minute face-to-face interaction, a 99-second video explaining stroke to laypeople (content from the Saudi Stroke Association) and a small booklet given to participants.<sup>5</sup>

Two educators, one male and one female, delivered the educational material to the participants. The educators were trained by a lecture to familiarize them with the systematic way of delivering the educational material. Educators were dressed in casual clothing while delivering the material to allay anxiety. The Face, Arm, Speech Test (FAST) approach<sup>5,6</sup> was used to educate about the warning signs and three main symptoms of stroke - face drooping, arm weakness, and speech difficulty, in addition to other symptoms.

Data were collected using a standardized questionnaire with options for multiple responses and open-ended questions. The questionnaire was adopted from a previous study done in Uganda by Nakibuuka et al<sup>4</sup> with few modifications related to cultural differences. Data collection was carried out by an interview to fill out the questionnaire in Arabic. An Arabic translation of the questionnaire was validated through revision carried out by 2 professional interpreters. A pilot study to test the validity of the Arabic version of the questionnaire was carried out on twenty candidates who were bilingual health care providers.

An electronic version and a hard copy version of the questionnaire were made available. The questionnaire covered socio-demographic characteristics, perception of stroke, knowledge of stroke warning signs and risk factors, response of participants to a stroke event and sources of information about stroke. The knowledge of stroke warning signs was categorized based on the numbers of stroke warning signs identified. Individuals who could identify five to ten stroke warning signs were considered to have good knowledge, identifying 2 to 4 warning signs was considered fair knowledge, and those who identified one stroke warning sign considered to have poor knowledge.<sup>7,8</sup> A similar categorization was used for a participants' knowledge of risk factors of stroke. Data were described and analyzed using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.)

The study setting was the medical clinic (family medicine, diabetes, neurology and cardiology) at King Salman Armed Forces Hospital and King Khalid Armed Forces Hospital in Tabuk, Saudi Arabia. These clinics had a separate room for health education where the educational program was administered.

Written consent to participate in the study was obtained from all the participants. In addition, all participants were assured of data confidentiality and were informed that the study is for the purpose of improving public awareness to stroke. Approval was obtained from the research ethics committee of the Scientific Research Center at the Medical Services Department for Armed Forces Hospitals.

**Results.** A total of four hundred participants were candidates for the study. The final analysis included 313 participants, 154 (49.2%) men and 159 (50.8 %) women who were identified as high risk for stroke by the stroke risk assessment quiz. Sociodemographic characteristics of our study population are shown in Table 1.

**Definition and concept of stroke.** A pre-intervention knowledge assessment showed that 85.9% (n=269) of participants could recognize the brain as the organ affected by stroke while 6.4% (n=20) pointed out the head and 0.6% (n=2) chose nerves. Other participants chose that other organs were also affected, including the heart 6.1% (n=19), blood vessels 0.6% (n=2), and kidney 0.3% (n=1). On the other hand, post-intervention knowledge assessment showed an improvement in understanding the definition of stroke. Of the group, 98.1% (n=307) of participants named brain as the organ affected by stroke. The question 'Stroke occurs as a result of?' drew a higher number of correct responses (loss of brain function due to disturbance of blood flow to the brain) after intervention (97.1% (n=304) vs. 63.6% (n=199) pre-intervention). Of the group, 11.8% (n=37) of participants had mentioned that stroke was due to the collection of fluid within the brain, 4.8% (n=15) responded as it was due to an abnormal growth of tissues within the brain, and 19.8% (n=62) had responded, "I do not know" in the pre-intervention assessment Table 2.

**Warning symptoms of stroke.** In the pre-intervention assessment, only 34.8% (n=109) of participants said they knew stroke symptoms. Out of these participants, 2.75% (n=3/109) knew at least 5 stroke symptoms, 55.96% (n =61/109) knew two to four stroke symptoms, and the rest 41.28% (n=45/109) knew only one stroke symptom. Good knowledge of stroke symptoms was associated with younger age ( $p \leq 0.001$  OR 13.66, 95% CI 3.17-58.18) and a higher level of education ( $p=0.363$  OR 0.596, 95% CI 0.19-1.81). Male gender was associated with better knowledge ( $p=0.989$  OR 1.003, 95% CI 0.60- 1.67). After intervention, 98.4% (n=308) said they knew the warning symptoms of stroke. Of these participants, 17.2% (n=53/308) knew at least 5 symptoms, 79.87% (n=246/308) knew 2 to 4 symptoms and 2.92% (n=9/308) knew one stroke symptom. Table 2 shows participants' knowledge of the warning symptoms of stroke before and after intervention.

**Risk factors of stroke.** In the pre-intervention assessment of stroke risk factors, 41.5% (n=130) said they knew stroke risk factors. Of these participants, 3.84% (n=5/130) knew at least 5 risk factors, 37.69%

**Table 1 -** Socio-demographic characteristics of participants. N=313

Characteristics	n (%)
<b>Age</b>	
<20 years	46 (14.7)
20-39	161 (51.4)
40-59	84 (26.8)
60-80	22 (7)
<b>Gender</b>	
Male	154 (49.2)
Female	159 (50.8)
<b>Education</b>	
Never attended school	27 (8.6)
Secondary school and lower	113 (36.1)
College and above	173 (55.3)
<b>Marital status</b>	
Married	181 (57.8)
Single	109 (34.8)
Divorced	8 (2.6)
Widow	15 (4.8)

**Table 2 -** Knowledge of stroke warning symptoms as reported by participants before and after intervention.

Statements	Pre Intervention (n=313)	Post Intervention (n=313)	P-value
Concept of stroke pre & post intervention	n (%)		<0.001
Sudden loss of brain functions because of disturbance in blood flow to the brain	199(63.6)	304(97.1)	
Collection of fluids within the brain	37(11.8)	5(1.6)	
Abnormal growth of tissues within the brain	15(4.8)	1(0.3)	
I don't know	62(19.8)	3(1)	
<i>Do you know any stroke Warning Symptoms?</i>			
Yes	109(34.8)	308(98.4)	
No	204(65.2)	5(1.6)	
If Yes	109(34.8)	308 (98.4)	
Face drooping/ facial asymmetry	20(18.3)	267(86.6)	<0.001
Arm/ one side of the body weakness or Paralysis	68(62.3)	292(94.8)	<0.001
Speech/reading difficulty	31(28.4)	278(90.2)	<0.001
Numbness/dead sensation	22(20.1)	83(26.9)	0.162
Walking / balance difficulties	4(3.6)	32(10.3)	0.031
Visual difficulty/ loss of vision	6(5.5)	26(8.4)	0.322
Fainting/ loss of consciousness	25(22.9)	25(8.1)	<0.001
Sudden severe headache	12(11)	64(20.7)	0.023
Dizziness	7(6.4)	18(5.8)	0.827
Temporary loss of memory	4(3.6)	5(1.6)	0.206
Seizures	3(2.7)	4(1.2)	0.312
Shortness of breath/Chest Pain	4(3.6)	0(0)	-
Migraine	1(0.3)	0(0)	-

Significant at  $p$ -value<0.05

(n=49/130) knew 2 to 4 risk factors, and 58.46% (n=76/130) knew one risk factor. A good knowledge of stroke risk factors was associated with younger age ( $p=0.015$  OR 5.053, 95% CI 1.36–18.74) and a higher level of education ( $p=0.843$  OR 0.896, 95% CI 0.30 - 2.63). Male gender was associated with better knowledge ( $p=0.179$  OR 0.715, 95% CI 0.43 - 1.16). After the health education intervention, 94.6% of participants (n=296) said they knew stroke risk factors. Of these participants, 22.97% (n=68/296) knew at least five stroke risk factors, 73.64% (n=218/296) knew 2 to four stroke risk factors, and 3.37% (n=10/296) knew one stroke risk factor. A small number of participants in the pre-intervention assessment recognized obesity and smoking as a risk factor of stroke (Table 3). Cultural beliefs as a risk factor for stroke dropped significantly from 5.1% in the pre-intervention assessment to 0.6% in the post-intervention assessment. These beliefs included envy, witchcraft, cold weather, cold water, sunstroke and lack of drinking water. Table 3 shows the participants' knowledge of the risk factors of stroke before and after intervention.

**Perception and concerns about stroke.** Participants' concerns and thoughts about having a stroke were

assessed only before intervention. Knowledge of stroke recurrence and prevention was assessed before and after educational instruction (Table 4). Almost all participants thought that stroke would have some disruptive effect in their lives.

**Reaction to a stroke event.** Participants were offered multiple choices as a response to a stroke event, before and after education. In the pre-intervention period, 15.3% (n=48) reported that they would schedule an appointment with a general practitioner, 3.8% (n=12) reported that they would wait for a day or more for the symptoms to improve spontaneously, 2.2% (n=7) reported that they would seek traditional healers and herbal medicine practitioners, and 8.3% (n=26) reported that they did not know what to do in a stroke event situation. The majority of participants, 70.3% (n=220), reported that they would call for an ambulance immediately.

Post intervention, 97.8% (n=306) of participants reported that they would call for an ambulance immediately. Of the group, 1.9% (n=6) said they would book an appointment with a general practitioner, and 0.3% (n=1) said they would wait a day or more for spontaneous resolution.

**Table 3 -** Knowledge of stroke risk factors as reported by participants before and after intervention.

	Pre Intervention (n=313)	Post Intervention (n=313)	P-value
n (%)			
<i>Do you know any stroke Risk factors?</i>			
Yes	130(41.5)	296(94.6)	
No	183(58.5)	17(5.4)	
<i>If Yes</i>	130(41.5)	296(94.6)	
Old Age	8(6.1)	34(11.4)	0.089
Diabetes mellitus	32(24.6)	225(76)	<0.001
Hypertension	62.(47.6)	255(86.1)	<0.001
Stress	24(18.4)	49(16.5)	0.630
Obesity	14(10.7)	106(35.8)	0.000
Cigarette smoking	17(13)	156(52.7)	<0.001
Heart disease	5(3.8)	20(6.7)	0.233
Family history (hereditary)	9(6.9)	51(17.2)	0.005
High cholesterol	24(18.4)	94(31.7)	0.005
Arthrosclerosis	7(5.3)	25(8.4)	0.270
No physical activity	5(3.8)	17(5.7)	0.415
Previous stroke	5(3.8)	13(4.3)	0.796
Vessels occlusion/ less blood supply	11(8.4)	7(2.3)	0.004
*Cultural beliefs	16(5.1)	2(0.6)	<0.001

Significant at *p*-value <0.05, \*Cultural beliefs (envy/ witchcraft/ cold weather cold water/ sunstroke/ lack of drinking water)

**Reported sources of information about stroke prior to our educational instruction.** The participants who said that they had an idea about stroke identified their information sources to mainly comprise of media - television and social websites (37.1%). Other sources were the internet (26.3%), information from a family member or a friend (13.7%), personal experience (8.6%), books (5.8%) and miscellaneous sources (schools, lectures, doctors) (8%).

**Discussion.** Multiple studies have reported inadequate knowledge of stroke among people outside the western industrialized world.<sup>9</sup> There is a need to increase the awareness of stroke among people in developing countries. This study is a trial to assess the effect of an educational program on the knowledge and perception of individuals at risk of developing stroke. A total of 313 participants were included; about half of them (154) 49.2% were male and half (159) 50.8% were female. Nearly half of the participants (161) 51.4% aged 20-40 years old and (173) 55.3% were highly educated (Table 1).

Pre intervention assessment shows that most participants (269) 85.9% were capable of identifying the brain as the damaged organ by stroke. In our

study, we found that 63.6% of participants (n=199) were capable of defining stroke – similar results were obtained in another study in Ireland, A population-based survey in Ireland by Parahoo et al. found that the majority of the respondents were aware that the pathophysiology of stroke involved a disturbance of blood flow to the brain.<sup>10</sup> However, multiple studies in Uganda, Oman and India found that only a minority of their participants were able to identify the brain as the organ affected by stroke.<sup>4,11,12</sup>

Post intervention, 98.1% (n=307) of participants pointed to the brain as the affected organ by stroke and 97.1% (n=304) explained the mechanism of stroke (Table 2).

Prior to the interventional educational program, about two-thirds of the participants (n=204) stated that they do not know any stroke warning symptoms. After intervention, the result showed significant improvement occurred with about 98.4% (n=308) of the participants say yes for the same question (Table 2).

The 3 symptoms of the FAST mnemonic (facial asymmetry, arm weakness and speech difficulty) were recognized in increasing numbers after our educational intervention (18.3%, 62.3%, 28.4% to 86.6%, 94.8%, 90.2% respectively) (Table 2).<sup>5</sup> The FAST mnemonic was used in the Arabic translated version of the questionnaire from the Saudi Stroke Association's website.<sup>5</sup>

A study titled 'Diagnostic Accuracy of Stroke Referrals from Primary Care, Emergency Room Physicians, and Ambulance Staff Using the Face Arm Speech Test (FAST)' concluded that misdiagnosis of stroke is common among ER staff and primary care doctors. Paramedics using FAST achieved high levels of detection and diagnostic accuracy of stroke that proved the efficacy of this focused examination.<sup>13</sup>

Most of our participants identified weakness on one side of the body (62.3% (n=68)) and speech difficulty (28.4% (n=31)) as stroke warning signs before our instruction. Similar results were obtained in other studies from Gulf.<sup>11,14</sup>

Regarding Knowledge of Stroke risk factors, (130) 41.5% of the participants stated that they know some risk factors of stroke. After education, this percentage raised up to (296) 94.5% emphasizing again the importance and significance of the role of health education in changing the knowledge of the public (Table 3).

Hypertension received the highest score as a risk factor for stroke both before and after our educational instruction. During the educational sessions, the educators emphasized hypertension as the most important modifiable risk factor for stroke. Hypertension

**Table 4 -** Participants' Perception and Concerns, About Stroke.

Statements	n (%)	
<i>Have you thought about stroke before?</i>		
Yes	71 (22.6)	
No	242 (77.3)	
<i>If Yes (Possibility of you having a stroke in your lifetime?)</i>		
High Chance	3 (4.2)	
Moderate Chance	16 (22.5)	
Low Chance	40 (56.3)	
No Chance	12 (16.9)	
<i>Is stroke preventable?</i>	Pre intervention (n=313)	Post intervention (n=313)
Yes	189 (60.4)	308 (98.4)
No	20 (6.4)	1 (0.3)
I don't know	104 (41.5)	4 (1.3)
<i>Can a person have stroke more than once?</i>		
Yes	150(47.9%)	299(95.5)
No	33(10.5%)	4(1.3)
I don't know	130(41.5%)	10(3.2)
Significant at $p$ -value<0.05		

remains the single most important modifiable risk factor for stroke, and the impact of hypertension and nine other risk factors together account for 90% of all strokes, according to an analysis involving nearly 27,000 people worldwide (INTERSTROKE).<sup>15</sup>

Our finding of better knowledge of stroke in younger age groups, people with higher levels of education and male gender were similar to what Al Shafae et al. reported in their study.<sup>11</sup> Some western studies found that knowledge about stroke correlates positively with education, but was lower among men than in women.<sup>8,16</sup>

Pre-intervention assessment shows that 70.3% (n=220) of participants reacted by calling an ambulance in case they recognized a stroke event. These results are similar to previous studies.<sup>4,10,11,12</sup> After using the FAST approach in the educational session, (306) 97.8% of participants chose to go to the hospital immediately or would call an ambulance in case they recognized a stroke event.

Our study aimed to implement a multimodal strategy to educate individuals at risk for stroke by emphasizing stroke warning signs and risk factors. These methods included a face-to-face 5 minute educational session by a specialized health educator, a 99 second educational video, posters showing the FAST approach in the health education clinics, a small booklet handout. Materials produced by the Saudi Stroke Association<sup>5</sup>

were exclusively used to ensure the best outcome in increasing awareness among our participants.

Our study had several limitations. Despite training both our educators to deliver education to participants, there may have been differences in the methods adopted. We used 2 educators from both genders to respect the religious and cultural beliefs of our participants. Participants were offered to choose a male or female educator.

The long-term effect of our educational intervention was not measured in this study. Larger prospective studies would be required to assess this outcome. The elderly population group were the least cooperative in our study despite their risk for stroke in terms of consent and the reluctance of family members to let them participate.

In conclusion, educational reform in the form of educators delivering content, video clips and handouts is useful in teaching people to recognize stroke symptoms and risk factors, and raise awareness about the devastating outcomes of stroke on both patients' lives and those of their families. Similar reform may be useful for raising public awareness of other health issues in our community.

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