Medical Science

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General public awareness toward early manifestation of acute stroke among adults in Western Region of Saudi Arabia

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ABSTRACT

Introduction: Stroke is a devastating neurological condition. No recent studies conducted in the Western Region of Saudi Arabia regarding stroke. Therefore, our aim is to assess the awareness towards early manifestations of acute stroke among adults in the Western Region and to identify a relationship between the level of awareness and different sociodemographic data. *Method:* A cross-sectional study will be conducted by using validated questionnaire among general public from July 2022 to November 2022. The data will be collected through social media. *Result:* A total of 352 participants completed the questionnaire. Almost (67%) were female, majority from Medina Province (76.1%), about 92.0% have heard about the terminology Stroke. Good awareness was leaning towards younger age groups. Furthermore, educational level has a significant difference on the level of awareness on stroke symptoms manifestations at p-value = 0.001, others demographic factors are not correlate with the level of awareness regarding stroke. *Conclusion:* The percentage of participants with good awareness was almost the same as that of those with poor awareness, therefore, this knowledge gap must be fixed to improved prevention.

Keywords: Awareness, Stroke, Early, Signs, Western Region, Saudi Arabia.

1. INTRODUCTION

Stroke is a devastating neurological condition that is one of the major causes of adult dependence and long-term disability worldwide (Soto-Camara et al., 2020; Mubaraki et al., 2021). It is the second leading cause of death in the world, accounting for 9.7% of all deaths (Mubaraki et al., 2021). As a result, stroke remains a global health issue as well as a social problem (Soto-Camara

et al., 2020).

Stroke can cause brain tissue damage as a result of ischemia or hemorrhage, leading to cognitive and neurological deficits. An ischemic stroke is the most common type of stroke, which is caused by a blockage of the arterial supply to the brain. The annual incidence of acute stroke in the Kingdom of Saudi Arabia is 29 per 100,000 individuals, with up to a 6.4% mortality rate. For people over the age of 65, the incidence is increased by up to 670-970 per 100,000 individuals (Mubaraki et al., 2021). The rising incidence is related to changing lifestyle, as well as the high prevalence of chronic diseases (Alhazzani et al., 2019).

In comparison to developed countries, the average age of stroke in Gulf countries is relatively young, at around 55 years old. Furthermore, 18% of stroke patients were under the age of 45, according to the statistics (Naguib et al., 2020). Early identification of stroke warning signs with optimal care of acute attack is important to improve stroke outcomes as well as reduce the burden of stroke complications. Stroke warning signs include sudden onset of numbness, confusion, weakness of the face, arm, or leg, severe headache; speaking difficulties; trouble seeing; or walking (Mubaraki et al., 2021). Delays in recognizing acute stroke warning signs, seeking medical advice, or managing acute attacks all contribute to increased stroke-related morbidity and mortality (Naguib et al., 2020). Several studies have found that the level of stroke awareness in the community has a significant impact on the incidence and outcomes of stroke (Alhazzani et al., 2019). It is of great importance to assess public awareness of acute stroke risk factors, warning signs and seek medical care as soon as possible in order to enhance the proper reaction, hence improve treatment outcome (Naguib et al., 2020).

According to studies conducted in the Kingdom of Saudi Arabia, the Saudi population has a significant lack of stroke awareness. Mubaraki et al., (2021) conducted a descriptive cross-sectional study in Taif city in July 2021, which revealed a wide gap in knowledge of the warning signs and symptoms of stroke, which is particularly noticeable in those who are older and have a lower education level. Alluqmani et al., (2021) conducted a study for adult people in Medina city in April 2021 to assess public awareness of ischemic stroke, which showed more than half of the participants had a significant stroke knowledge deficit. In March 2021, a study conducted among the Saudi population to assess the level of awareness toward early manifestations of stroke found a few gaps regarding specific aspects of stroke as well as a significant difference between the level of education and the level of awareness about stroke (Al-Etesh et al., 2021).

We can say that there have been no recent studies showing improvement in Saudi's awareness of acute stroke, as well as no study conducted in the Western Region of Saudi Arabia to assess the awareness towards early manifestations of acute stroke, determine knowledge gaps and develop effective educational programs. As we conduct this study, we specifically aim to assess the awareness towards early manifestations of acute stroke among adult residents in the Western Region of Saudi Arabia and to identify a relationship between the level of awareness regarding stroke and different sociodemographic data.

2. MATERIALS AND METHODS

This study will be carried out as a cross-sectional study design and it will be conducted as a questionnaire among the general public in the Western Region of Saudi Arabia from July 2022 to November 2022. The data were collected through social media using a self-administered questionnaire via Google Form, which was previously used in a study published and conducted in Saudi Arabia in 2021 and proved to be valid and reliable (Al-Etesh et al., 2021). Permission to use the questionnaire was obtained from the author via email communication. Some of the demographic data items on the questionnaire were modified to match our study.

Study population and sampling

All participants who met the selection criteria, all male and female adults from all races and ethnicities living in the Western Region of Saudi Arabia who were non-health practitioners and above 18 years old, are enrolled and agreed to participate in the study. They were invited to participate on a voluntary basis and with an anonymous identity. Data will be collected by using a valid self-administered questionnaire via Google form and the link will be shared by researchers and data collectors and sent to online groups that involve adults over 18 years old through social media (i.e., What's App, Twitter and Telegram). The participants will sign an online consent form before answering the questionnaire.

All participants who are living outside the Western Region of Saudi Arabia, health practitioners, people under the age of 18 and those who refuse to participate are excluded from our study. To ensure study accuracy, questionnaire settings have been set to exclude health practitioners from study, if the answer to the Q: "Are you a health practitioner?" yes, it will be automatically moved to the end of the form. We have also turned on the option to only receive one response from each participant, in order to ensure that the response is not submitted more than once.

The sample size was calculated using an online calculator at https://www.openepi.com/SampleSize/SSPropor.htm (Sullivan et al., 2022), based on a confidence level of 95%, 5% margin of error. A recent study published in March 2021 found the level of awareness of stroke early manifestation among general public to be 64.6% (Al-Etesh et al., 2021). When we enter all this data into the electronic calculation of sample size, we find the estimated sample size is 352.

Measurement

The validated questionnaire is provided in English and Arabic. It includes socio demographic data such as age, gender, residence and level of education. It also includes questions about the general public's awareness of early manifestations of stroke.

Data Management and analysis plan

This study was analyzed using IBM SPSS version 23 (IBM Corp., Armonk, N.Y., USA) and visually presented by using Graph Pad Prism version 8 (Graph Pad Software, Inc., San Diego, CA, USA). A simple descriptive statistic was used to define the characteristics of the study variables through a form of counts and percentages for the categorical and nominal variables while continuous variables are presented by mean and standard deviations. To measure the "Level of awareness about stroke early manifestations", a scoring system was used. Each of the correct responses of the questions involved was given 2 points, incorrect answers were given 0 point and neutral was given 1 point. A simple additive method was used to get the total score of the correct answers and converted it to a hundred-point scale. A cut-off of 75% and above was interpreted as "Good awareness" and below 75% was interpreted as "Poor awareness". To establish a relationship between categorical variables, this study used chi-square test. These tests were done with the assumption of normal distribution. Lastly, a conventional p-value < 0.05 was the criteria to reject the null hypothesis.

Ethical consideration

Participants were asked for their consent to complete the questionnaire, and they can withdraw from the study at any time. Through the research steps, privacy and confidentiality were maintained. The data are only accessible by the main author and co-authors. This study received ethical approval from the Institutional Review Board (IRB), General Directorate of Health Affairs in Madinah, Saudi Arabia (22-062).

3. RESULTS

This cross-sectional study involved a questionnaire about general public awareness of the early manifestation of acute stroke among adults in the Western Region of Saudi Arabia. A total of 352 participants completed the questionnaire. In terms of demographics, there were 236 female participants involved (67%) and 116 males (33%). The most dominant age group is 18-25 years old at 41.8% of the 352 study samples (Table 1).

There were 92.9% of the interviewees that Saudi (327) and more than half are single (183 participants at 52.0), while 42.6% or 150 were married. In terms of educational attainment, there were 61.1% or 215 interviewees that have a Bachelor's degree, while there were 30.75% or 108 of the participants are employed. There were 76.1% or 268 interviewees that came from Medina Province, while 84 or 23.9% came from Mecca Province (Table 1).

Table 1 Characteristics of the participants (n=352)

Variables	Categories	Frequency	Percentage
Gender	Male	116	33.0
	Female	236	67.0
Age	18-25	147	41.8
	26-35	62	17.6
	36-45	65	18.5
	46-55	54	15.3
	56-65	20	5.7
	66 or above	4	1.1
Nationality	Saudi	327	92.9
	Non-Saudi	25	7.1
Marital status	Single	183	52.0
	Married	150	42.6

	Divorced	10	2.8
	Widowed	9	2.6
Educational level	Primary	6	1.7
	Intermediate	8	2.3
	Secondary	104	29.5
	Bachelors	215	61.1
	Higher degree	19	5.4
Occupational status	Employed	108	30.7
	Unemployed	73	20.7
	Private business	13	3.7
	Retired	27	7.7
	Other	131	37.2
Living in	Medina Province	268	76.1
	Mecca Province	84	23.9

The first part of the study was a survey on sources of knowledge about Stroke early manifestations. Majority or 92.0% (324 of 352) have heard about the terminology Stroke, while 33.5% of them knew about it primarily because of social media. Other sources of information were family and friends (23.0%), healthcare staff (12.5%) and other (8.0%). Meanwhile, majority or 62.2% agreed that there is no sufficient knowledge about stroke in Western Region of Saudi Arabia. Most of them or 88.4% thought that social media is the most effective method to improve awareness about stroke among the population and 94.0% also agreed that stroke awareness campaigns must be launched in the Western Region of Saudi Arabia (Table 2).

Table 2 Sources of knowledge about stroke early manifestations (n=352).

Variables	Categories	Frequency	Percentage
Have you ever heard about the name "Stroke"?	Yes	324	92.0
	No	13	3.7
	I am not sure	15	4.3
If yes, what was the primary source of your information?	Family/friends	81	23.0
	Electronic/print media	81	23.0
	Social media	118	33.5
	Healthcare staff	44	12.5
	Other	28	8.0
Do you think there is sufficient knowledge about stroke in western region of Saudi Arabia?	Yes	30	8.5
	No	219	62.2
	I am not sure	103	29.3
What is the most effective method to improve awareness about stroke among the population?:[a]	TV channels	106	30.1
	Print media	52	14.8
	Social media	311	88.4
	School and universities	193	54.8
	I don't know	11	3.1
Do you think that more stroke awareness campaigns must be launched in western region of Saudi Arabia?	Yes	331	94.0
	No	4	1.1
	I am not sure	17	4.8
[a]-Multiple answer question, please don't add count and percentages.			

The second part of the questionnaire discussed awareness about stroke's early manifestations. Participants (92.3%) thought that stroke is a disease of the brain, having 66.5% were aware that a sudden problem in speaking is a warning sign. In terms of sudden problem in visualization from one or both eyes as a warning sign, 59.9% of the participants were aware of it, while 65.3% and 63.4% were aware of the sudden numbness in one side of face and/or one arm or leg; and sudden onset of confusion, dizziness, and difficulty in walking is a sign of stroke, respectively. Responses were divided when asked about genetic factors that can increase

chances of stroke as 35.5% said they knew, 26.4% said they do not, and 38.1% said they are not sure. Meanwhile, 51.7%, 68.8%, and 74.7% agreed that unhealthy food consumption, smoking, and alcoholism can increase the risk of stroke, respectively. On the other hand, only 27.0% or 95 participants knew that there is treatment available for stroke while the majority (53.1%) said they did not know. Majority or 78.7% of the interviewees agreed that stroke can actually cause sudden death (Table 3).

From these questions, level of knowledge on Stroke's early manifestations was assessed. Most of the questions were answered correctly by the interviewees, although in the question "Do you think genetic factors can increase chance of stroke in a person?", the responses have been divided. Lastly, participants were neutral regarding knowledge on the available treatments for stroke.

Table 3 Awareness about Stroke early manifestations (n=352)

Variables	Brain	Lung	Heart	I am not sure
Stroke is a disease of which body part/organ?	325 (92.3%)	0 (0.0%)	16 (4.5%)	11 (3.1%)
		Yes	No	I am not sure
Sudden problem in speaking is a warning sign of stroke?		234 (66.5%)	25 (7.1%)	93 (26.4%)
Sudden problem in visualization from one or both eyes is a sign of stroke?		211 (59.9%)	28 (8.0%)	113 (32.1%)
Sudden numbness in one side of face, one arm or leg is a sign of stroke?		230 (65.3%)	20 (5.7%)	102 (29.0%)
Sudden onset of confusion, dizziness and difficulty in walking is a sing of stroke?		223 (63.4%)	30 (8.5%)	99 (28.1%)
Do you think genetic factors can increase chance of stroke in a person?		125 (35.5%)	93 (26.4%)	134 (38.1%)
Unhealthy food consumption can increase risk of stroke?		182 (51.7%)	60 (17.0%)	110 (31.3%)
Smoking can increase risk of stroke?		242 (68.8%)	30 (8.5%)	80 (22.7%)
Alcoholism can increase risk of stroke?		263 (74.7%)	13 (3.7%)	76 (21.6%)
Is there any treatment available for stroke?		95 (27.0%)	70 (19.9%)	187 (53.1%)
		Agree	Disagree	I am not sure
Can stroke cause sudden death?		277 (78.7%)	14 (4.0%)	61 (17.3%)

Consequently, scores were obtained from their answers to the questionnaire. Minimum percentage score was 31.82% while the maximum score was 100% with a mean of 75.93% standard deviation of 14.6%. In terms of awareness, more than half or 54.3% were found to have good awareness – that is having a score of more than 75%, while 45.7% were found to have poor awareness to the disease (Figure 1).
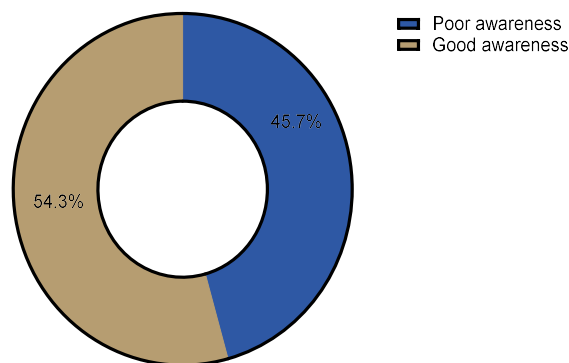

Figure 1 Level of awareness about stroke early manifestations.

Risk factors of stroke were also identified and participants were asked of which of these risks were they aware of. There were 56.0% of the study samples knew about hypertension, 46.9% knew of vascular rupture disease, 34.9% knew of heart disease, 31.0% of dyslipidemia, 23.9% of diabetes, 10.2% of arterial fibrillation, 1.7% of peptic ulcer. There were 13.4% who knew all of the aforementioned diseases and 18.2% who did not know them (Figure 2).
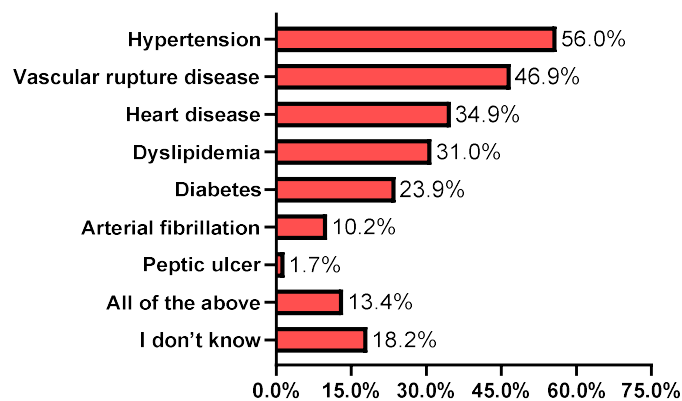
Figure 2 Which of the following diseases are common risk factors of stroke?

Meanwhile, the most common warning signs of stroke according to the participants was a troubled vision or movement (52.8% were aware), lack of coordination (46.0%), sudden numbness (44.3%), difficulty in walking (42.6%), sudden headache (36.9%), stomach pain (4.5%), sudden hunger (2.3%). There were 11.4% who knew all of the aforementioned signs and 22.7% who did not know them (Figure 3).
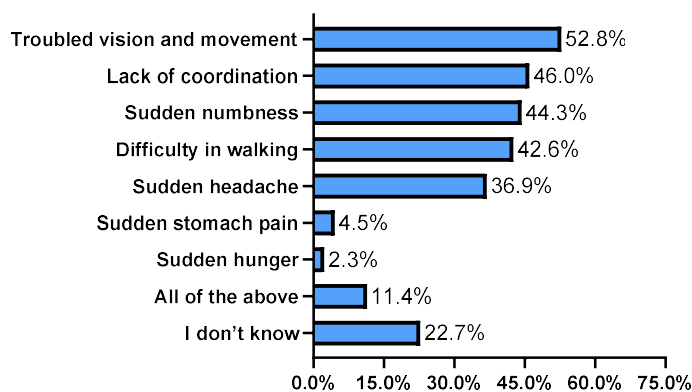

Figure 3 Which of the following are common warning signs of stroke?

Most of the interviewees answered that once they observed early warning signs of stroke in a person, they would call emergency health service (83.5%). On the other hand, 7.1% said they are not sure (Figure 4).
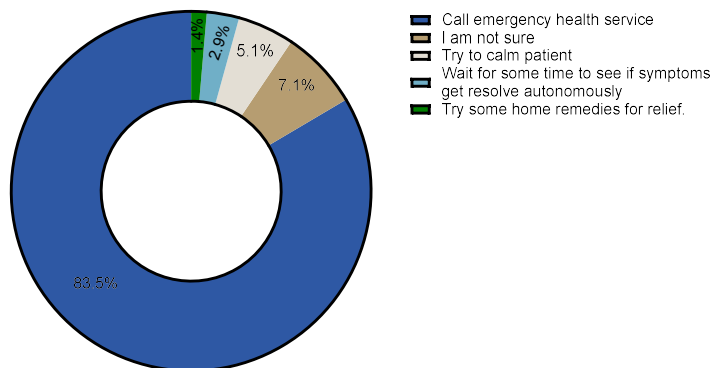

Figure 4 If you observe early warning sign of stroke in a person, what would you do?

Lastly, statistical analysis was used to determine the correlation of the level of awareness of stroke early manifestation and different socio-demographic factors. Gender was not a significant factor on the level of awareness at p-value=0.0.71. In terms of age, different age groups have different levels of awareness and was found to be significant amongst different age groups at p-

value=0.039 using Chi-Square Test at < 0.05 level. Good awareness was leaning towards younger age groups. Nationality, marital status, occupational status, geographic location are demographic factors that do not correlate with the level of awareness with p-values of 0.514, 0.059, 0.076 and 0.099, respectively. On the other hand, educational level has a significant difference on the level of awareness on stroke symptoms manifestations at p-value=0.001. Those that attained secondary, Bachelors and higher degree, were leaning towards good awareness (Table 4).

Table 4 The relationship between level of awareness about stroke early manifestations and different socio-demographic factors (n=352).

Studied group	Level of awareness about stroke early manifestations.				p-value
	Poor awareness		Good awareness		
	n	%	n	%	
Gender					
Male	61	52.6%	55	47.4%	0.071
Female	100	42.4%	136	57.6%	
Age					
18-25	54	36.7%	93	63.3%	
26-35	38	61.3%	24	38.7%	
36-45	33	50.8%	32	49.2%	0.039*
46-55	24	44.4%	30	55.6%	
56-65	10	50.0%	10	50.0%	
66 or above	2	50.0%	2	50.0%	
Nationality					
Saudi	148	45.3%	179	54.7%	0.514
Non-Saudi	13	52.0%	12	48.0%	
Marital status					
Single	71	38.8%	112	61.2%	
Married	80	53.3%	70	46.7%	0.059
Divorced	5	50.0%	5	50.0%	
Widowed	5	55.6%	4	44.4%	
Educational level					
Primary	5	83.3%	1	16.7%	
Intermediate	8	100.0%	0	0.0%	
Secondary	36	34.6%	68	65.4%	0.001*
Bachelors	104	48.4%	111	51.6%	
Higher degree	8	42.1%	11	57.9%	
Occupational status					
Employed	55	50.9%	53	49.1%	
Unemployed	39	53.4%	34	46.6%	
Private business	7	53.8%	6	46.2%	0.076
Retired	13	48.1%	14	51.9%	
Other	47	35.9%	84	64.1%	
Living in					
Medina Province	116	43.3%	152	56.7%	0.099
Mecca Province	45	53.6%	39	46.4%	

*-significant using Chi-Square Test at <0.05 level.

4. DISCUSSION

By identifying the level of awareness and then consequently improving awareness to the public about the early manifestations of stroke, prevention would be addressed and would then lead to further reduction of the incidence of experiencing one, leading to reduced morbidity and mortality and lowered overall disease burden. The study was able to achieve its goal on assessing the general public's knowledge on early manifestation of stroke in Western Saudi Arabia and identifying the correlation of socio-demographic factors on their level of awareness. Al-Etesh et al., (2021) conducted a study about this but they were able to cover the whole of Saudi Arabia. This study was even more specific to the people in Western Region of Saudi Arabia, particularly those that lived in Medina Province and Mecca Province.

Most of the participants were female (2/3 or 67%) and all were Saudi, majority originating from Medina (76.1%) and 23.9% from Mecca. Approximately 2/3 of them had a bachelor's degree as well and belonged to 18-25 years age group (41.8%). In this study, the percentage of participants that have good awareness was almost the same as those with poor awareness (54.3% versus 45.7%, respectively). Al-Etesh et al., (2021) made a study that found the majority had a good awareness of the early manifestations as compared to this study, which has equally good/poor awareness. Robinson et al., (2013) conducted a study in the UK that showed a good level of awareness, with the same percentage as Al-Etesh.

The dominating age group in this study was 18-25 years old, obviously sourcing out their information on the disease with the help of social media as this is the most available medium of knowledge transfer nowadays. On the other hand, sources from health care staff were found low at 12.5%, of which must be strengthened especially in this region in Saudi Arabia where there was equally good/poor awareness on the early manifestations of stroke since information was not readily accessible. Apart from that, the availability of the information in social media was believed to be the most effective method of spreading information as well. In regards to warning signs, this study agreed that sudden problem in visualization from one or both eyes as a warning sign is the most common one and is aligned to other studies (Robinson et al., 2013). Meanwhile, in a study made in Ireland, general signs of stroke were not really identified by the public (Fogle et al., 2008).

Robinson et al., (2013) conducted a study that revealed the same finding of our study were most participants knew stroke can cause sudden death, but most of them still did not know of the availability of treatment for the disease, although the majority agreed that they knew what to do in case warning signs manifested, which is to call the emergency hotline. This entails that the public has a positive attitude towards handling emergency situations at the time of manifestation of stroke. As mentioned, educational attainment really helped establish knowledge on the disease and awareness of the warning signs, risk factors and what to do in case of stroke. The younger age group, having more access to digital information was found to be the most knowledgeable age group as well. Meanwhile, geographic locations are not significantly affecting awareness when compared within two locations, but this group location has a low level of awareness compared to the whole of Saudi.

This study, covering the areas of Medina Province and Mecca Province has a 45.7% poor awareness. Murabaki et al., (2021) conducted a study that revealed 67.9% of poor general knowledge in Taif, Saudi Arabia. On the other hand, another study revealed that 76.6% had poor awareness of the early manifestations in Eastern Saudi Arabia (Mousa et al., 2020). Another study made to assessed high-risk patients and their knowledge on these early signs and they found that majority had poor awareness (Al-Beladi et al., 2018).

In another study made in Qassim region, there were also more people with poor awareness to the disease in general among patients with hypertension (Mersal et al., 2020). Alsubaie et al., (2020) did a study in Eastern KSA with high school females and discovered the same results (low awareness). Lastly, people in Tabuk, KSA manifested poor performance on the level of knowledge on the disease (Faisal et al., 2019). This study displayed equal levels of awareness of warning signs and manifestations of strokes across other regions in Saudi Arabia. Most of the participants were aware of the possible causes of stroke (unhealthy lifestyle) and risk factors partnered with the disease. Further studies have to be established covering the whole country to be able to understand which regions needed more support in spreading awareness of the disease and then consequently leading to better prevention.

5. CONCLUSION

In this study, the percentage of participants with good awareness was almost the same as that of those with poor awareness. By utilizing social media, educational programs and the involvement of health professionals to spread awareness regarding stroke, it will be possible to fix the knowledge gap in the Western Region of the Kingdom of Saudi Arabia. More studies involving the whole of Saudi Arabia are required to determine which regions need more support in spreading awareness of stroke, resulting in improved prevention.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES AND NOTES

1. Al-Beladi BA, Al-oufi KM, Alhazmi AM, Nafea RM, Ibrahim HM. Awareness of Stroke among Diabetic and Hypertensive Patients at King Fahad Hospital in Al-Madinah, KSA, 2016. Int J Med Res Prof 2018; 4:172-176.

2. Al-Etesh N, Almsabah A, Aljanubi A, Alatawi Q, Aldalwi M, Burshaid M, Alhaddad RM, Alamer MA, Aldakhlan AM, Al-Etesh YN, Alruwaili MG, Alshalawi OD. Awareness of general public toward early manifestation of stroke in Saudi Arabia. Int J Med Dev Ctries 2021; 1077–84. doi: 10.24911/IJMDC

3. Alhazzani AA, Mahfouz AA, Abolyazid AY, Awadalla NJ, Ahmed RA, Siddiqui AF, Khalil SN. Awareness of stroke among patients attending primary healthcare services in Abha, Southwestern Saudi Arabia. Neurosciences 2019; 24 (3):214–20. doi: 10.17712/nsj.2019.3.20180041

4. Alluqmani MM, Almshhen NR, Alotaibi RA, Aljardi OY, Zahid HM. Public Awareness of Ischemic Stroke in Medina city, Kingdom of Saudi Arabia. Neurosciences 2021; 26(2):134–40. doi: 10.17712/nsj.2021.2.20200105

5. Alsubaie F, Alobaidallah F, Almustafa S, Alhazyim B, Ola Mousa AA. Assessing the knowledge of high school students about stroke as a leading cause of death in Saudi Arabia. South Asian Res J Nurs Health Care 2020; 2:17-22.

6. Alzahrani FA, Alenzy AE, Alghamdi AM. Stroke in tabuk, KSA: Awareness and prevalence of risk factors. Life sci J 2019; 16(6): 38-42. doi: 10.7537/marslsj160619.07

7. Fogle CC, Oser CS, Troutman TP, McNamara M, Williamson AP, Keller M, McNamara S, Helgerson SD, Gohdes D, Harwell TS. Public education strategies to increase awareness of stroke warning signs and the need to call 911. J Public Health Manage Pract. 2008; 14(3):e17–22. doi: 10.1097/01.PHH.0000316496.78282.47

8. Mersal F, Tork H. Stroke risk perception and its awareness among hypertensive patients in Qassim region Saudi Arabia. Majmaah j health sci 2020; 8:9-22

9. Mousa O, Almujhem AA, Aljumaan RO, Alothman MA, Sayed A, Abstract. Public awareness of stroke among adult people in eastern region of saudi arabia, community-based cross-sectional study. Merit Res J Med Med Sci 2020; 8:319-326.

10. Mubaraki AA, Alqahtani AS, Almalki AA, Almalki AH, Alamri HM, Aburass MK, Althumali ZH. Public knowledge and awareness of stroke among adult population in Taif city, Saudi Arabia. Neurosciences 2021; 26(4):339–45. doi: 10.17712/nsj.2021.4.20210057

11. Naguib R, Fayed A, AlFadhliah AB, AlMansour NS, AlDakheel RM, AlQahtani RM. Awareness about stroke and proper actions to be taken; A room for improvement. J

Stroke Cerebrovasc 2020; 29(6):104794. doi: 10.1016/j.jstroke cerebrovasdis.2020.104794

12. Robinson TG, Reid A, Haunton VJ, Wilson A, Naylor AR. The face arm speech test: does it encourage rapid recognition of important stroke warning symptoms. Emerg Med 2013; 30(6):467-471.

13. Soto-Cámara R, González-Bernal JJ, González-Santos J, Aguilar-Parra JM, Trigueros R, López-Liria R. Knowledge on signs and risk factors in stroke patients. J Clin Med 2020; 9(8):2557. doi: 10.3390/jcm9082557

14. Sullivan KM, Dean AG, Mir RA. OpenEpi - toolkit shell for developing new applications [Internet]. Openepi.com. [cited 2022 May 10]. Available from: https://www.openepi.com/ SampleSize/SSPropor.htm