

AWARENESS OF PHYSICIANS ABOUT STROKE IN EMERGENCY SETTINGS IN THE AL-JOUF REGION, SAUDI ARABIA

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ABSTRACT

Stroke is the second leading cause of mortality and the third leading cause of disability after cancer and ischemic heart disease. Recognizing acute stroke symptoms and understanding its diagnosis and treatment is critical. To assess the level of awareness of Physicians about Stroke in emergency settings in the Al-Jouf Region, Saudi Arabia, and its relation to different socio-demographic factors. A cross-sectional study included 119 physicians from emergency departments in different Hospitals in Al-Jouf Region in Saudi Arabia in 2021. They were surveyed by using a validated self-administered questionnaire. Participants were selected by using a convenient non-probability sampling technique. Data analysis was performed by using Statistical Package for Social Science. This study included 119 participants. Most of them were males and the mean age of respondents was 36.7 ±9 years (23 to 60). The mean awareness score was 17.8 ±SD 4.2 out of a total score of 28 points. Furthermore, our findings demonstrated that most physicians showed a poor level of awareness about stroke (75.6%) and only 24.4% of physicians revealed a good level of awareness about stroke in ER settings. There was no significant association between the level of awareness about stroke in ER settings and the socio-demographic characteristics of respondents. The majority of physicians in different hospitals in the Al-Jouf Region in Saudi Arabia showed a poor level of awareness about stroke in ER settings. Further investigation and exploration is needed; also more strategies and interventions are required to improve health workers' knowledge and awareness of stroke.

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Introduction

Stroke is a medical condition arising from abnormal cerebrovascular blood circulation leading to an acute state of cerebral shock. It has been highlighted as the first leading cause of disability in elderlies, while it is the 5th most prominent cause of death in the general population. Two specific types of strokes make up the vast majority of stroke cases including ischemic stroke and hemorrhagic stroke. Each of these types and subtypes has different underlying causes and pathogenesis mechanisms [1, 2].

Ischemic stroke is the most commonly encountered type of stroke accounting for almost 85% of stroke cases. It is due to the obstruction of a blood vessel inside the brain that leads to the disruption of blood circulation interrupting the normal supply or drainage of blood from brain tissues. The ischemic stroke is further divided according to the Acute Stroke Treatment (TOAST) classification, which includes the following five subtypes: atherosclerosis (large blood vessel obstructions), lacunar infarcts (small blood vessel obstructions), cardio-embolism, strokes of other determined etiology and strokes of undetermined etiology [3, 4].

Hemorrhagic stroke is characterized by internal bleeding inside the brain due to the rupture of a blood vessel. Almost 15% of stroke cases are caused by a hemorrhagic event in the brain. This type of stroke is further divided into two sub-types including

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intracerebral hemorrhage (ICH), referring to bleeding in the parenchymal region of the brain, and subarachnoid hemorrhage (SAH), referring to subarachnoid space-associated bleeding. The latter subtype is known to cause almost 5% of the total stroke events encountered [5].

The mechanisms of disease onset differ depending upon the type of stroke encountered. Generally, an obstruction inside a blood vessel may form either due to the accumulation of lipoprotein cholesterol (LDL) or by the deposition of red blood cells caused by other underlying abnormalities such as cardiovascular malfunction. These buildups can lead to a reduction in the diameter of the blood vessel and can partially or completely block the blood flow through these vessels [6, 7]. As a result, the oxygen supply to nearby neurons is restricted and subsequently the loss of cellular ability to generate ATP through aerobic metabolism. Therefore, the ATP-driven sodium-potassium pumps located across the cellular membranes fail to operate. Consequently, the accumulation of sodium ions inside the cell leads to depolarization and stimulates the receptors to allow an increased influx of calcium ions inside the cell. Subsequently, constant neuronal firing occurs which ultimately leads to the death of neurons. Moreover, continuous blockage in blood vessels usually increases the pressure resulting in vessel bursting. The rupture site attracts the platelets and fibrins by exposure to cholesterol crystals and releases small emboli which can further initiate stroke in other vessels as well [1, 3, 6, 7].

Many pathological and behavioral conditions have been reported to contribute to a higher risk of experiencing a stroke such as prolonged hypertension, obesity, diabetes, smoking, genetic factors, and unhealthy lifestyle. In addition, relationships have been established between underlying medical conditions such as atrial fibrillation or cerebral amyloid angiopathy and higher stroke rate. This is due to the reason that small obstructive particles or embolus can be formed in the vascular supply that may lead to cerebrovascular blockage or rupture of the brain vessels in elder patients. Moreover, disorders like vasculitis, clotting disorders, or cervical arterial dissection may also increase the risk of stroke in the young population [8-10].

Due to the association of stroke with underlying diseases and increased risk in the elder population, the incidence of stroke inside the health care facilities and emergency rooms is increased. It is estimated that almost 10% of overall stroke attacks are encountered in patients already admitted to healthcare units [11]. Therefore, healthcare providers and patient management staff must be aware of the warning signs of a stroke for immediate identification, diagnosis, and treatment of the stroke patient. The famous proverb "Time is brain" is equally applicable in the timely management of stroke because, with each second of blocked oxygen supply, millions of neuronal cells die. Early warning signs of stroke include numbness, confusion, troubled sight and movement, severe headache, lack of coordination, and loss of balance during the walk. It is recommended to immediately check a suspected stroke patient through the FAST (Face-Arm-Speech-Time) test by asking him to smile and noticing if one side of face drops, asking him to raise both arms and checking if one arm drops and noticing if the speech is slurred along with time recording [1, 2, 12, 13].

Computed tomography (CT) scan must be applied as the first and most important diagnostic tool when the early warning signs are suggestive of a stroke. A CT scan can help in the differentiation between ischemic stroke and hemorrhagic stroke. Magnetic resonance imaging (MRI) can be used to diagnose ischemic stroke for evaluation of vascular infarction; however, it is not very efficient in terms of time and availability. CT angiography and long-term monitoring through echocardiography are also important diagnostic tools for stroke management. Treatment options are purely based on the identification of the underlying cause or type of stroke. The patient must be facilitated to ensure clear airways, normal breathing, and blood circulation. Basic biochemical profiling shall be obtained to assess the overall health condition of the patient. In the case of an identified blood clot, fibrinolytic or thrombolytic therapy is used to resolve the problem. In contrast, vascular rupture or sepsis requires a more time-constrained approach with a team of professionals aware of the procedures [1, 2, 13].

Literature Review

Stroke has been reported as a major cause of mortality and morbidity both in developing and developed countries [14]. It has been estimated that the lifetime risk of stroke in a population aged more than 25 years is 24.9% as reported by Global Burden of Disease (GBD) 2016 Lifetime Risk of Stroke Collaborators [15]. A considerable number of stroke cases are encountered in patients who have been admitted to a healthcare facility for treatment of other diseases. This emphasizes the need for improved awareness among hospital staff and caregivers for timely and effective stroke patient management [11].

A study conducted in an academic medical center located in Michigan (United States) to assess stroke-related knowledge among nursing staff working in the emergency department suggested satisfactory stroke outcome expectations as more than 85% of the participants correctly identified major warning signs of stroke [16].

In contrast, misdiagnosis of the stroke was commonly observed by primary care physicians and emergency room staff in a study carried out in the United Kingdom (UK), where the initial diagnosis of stroke was more correct when the medical staff used the FAST test for initial suspicion [17]. Moreover, another study from the UK designed and tested the efficacy of a stroke evaluation tool in emergency rooms named as Recognition of Stroke in the Emergency Room (ROSIER) scale. The study collected data on suspected stroke cases in the emergency room for one year to assess the designed tool. The study concluded by identifying the significant effectiveness of the ROSIER scale for differentiation between acute stroke and stroke mimics in emergency room stroke referrals [18].

Moving to a field survey carried out in China, the overall awareness level among medical staff was 70%. The study highlighted the need for training sessions and educational programs among the healthcare staff to increase their skills in addressing risk factors and guiding the practices toward the management of stroke [18].

Besides, a cross-sectional survey was conducted in Pakistan enrolling 100 general practitioners to analyze their knowledge and attitude toward the treatment options for stroke. The study focused to assess the practitioners who were working near a hospital providing thrombolytic therapy for ischemic stroke patients. The majority of the general practitioners were lacking updated information about the beneficial effects of thrombolytic therapy, the agents used, and the importance of glucose or blood pressure control in stroke patients [19].

Additionally, an Indian study analyzed the knowledge and awareness level of medical students and practitioners regarding stroke risk factors especially obstructive sleep apnoea. The findings of the study suggested a poor level of awareness among both medical students and medical practitioners about the risk factors of stroke and hypertension [20]. Meanwhile, a cross-sectional study was conducted in Nigeria to assess the awareness level of students and staff in the medical departments of a university. The outcomes of the study indicated a general lack of knowledge and awareness about common warning signs and risk factors of stroke. It was suggested that educational programs shall be conducted to improve the general awareness of stroke signs, symptoms, and risk factors to reduce disease-associated mortality and morbidity in the studied population [21].

Furthermore, a large study reported the assessment of stroke-related knowledge and awareness in the general public and patients from Gulf Cooperation Countries (GCC) including Qatar, Oman, Saudi Arabia, Kuwait, Bahrain, and the United Arab Emirates. The majority of the patients (almost 70%) had never heard about stroke and had no knowledge about the disease or its risk factors. Surprisingly, the patients who had a greater risk of stroke showed the worst level of awareness about stroke. This study results strongly suggested the need for educating and training healthcare workers to improve the patient's understanding of the disease [22].

In Dubai, a cross-sectional study was carried out on staff members to assess their stroke-related awareness level in emergency medical services. The outcomes identified poor awareness levels before an intervention, as only 68% of participants correctly identified stroke types. Moreover, only 6.6% of the participants could correctly identify stroke mimics. After the educational intervention, these aspects of stroke awareness were remarkably improved among the participating staff members [23].

On a national level, a study was carried out to assess the awareness level, knowledge, and practical impacts of experienced emergency staff working in Saudi emergency services in Riyadh city. More than 100 practitioners and medical staff from emergency services were enrolled in the study. It was noted that the majority of the emergency health providers lacked knowledge about the initial suspicion protocol of stroke patients. Around 98% of the participants used to dispatch the patients to the nearby hospital without getting knowledge about the facilities provided by the hospital. Almost 6% of the study participants were not aware of the basic symptoms and warning signs of stroke. The outcomes of the study indicated a strong need for medical staff training equipped with diagnostic tools, screening assistance, and dispatch protocol implementation to improve disease management and control the burden of disease in the Saudi population [24]. Therefore, the study objective was to assess the level of awareness of Physicians about Stroke in ER settings in the Al-Jouf Region, Saudi Arabia, and its relation to different socio-demographic factors.

Materials and Methods

Study Design and Population

This is a cross-sectional study conducted in Al- Jouf, Saudi Arabia in 2021 in different Emergency Department in many hospitals in Al Jouf region: King Abdulaziz Specialist Hospital, Metaab bin Abdulaziz Hospital, Domat-Aljandal general hospital, Tabarjal general hospital, and Al Qurayyat General Hospital. The study population included all physicians working in ER settings in selected Hospitals in Al-Jouf Region in Saudi Arabia. Medical Students and Non- physician staff were excluded from the study.

Data Collection Tools

A convenient non-probability sampling technique was employed to collect the data from the participants. The study was conducted by using a self-administered questionnaire. The aim of the study was clearly explained in the interface. A validated questionnaire was used based on previous studies [19]. It was pretested in a pilot study over a sample of 10 participants whose results were not included in the study. Some modifications were done accordingly to insure clarity and easy understanding of the questions.

The questionnaire contained 2 parts:

- Socio-demographic characteristics of the participants: age group, nationality, and residence.
- Questions about Awareness of Physicians about Stroke in ER settings in Al-jouf Region, Saudi Arabia.

A common grading method was used for each variable in this questionnaire as follows: 2 points were given to the correct option, 0 for the incorrect answer, and 1 for neutral. After data collection, a participant who correctly answers 75% or more of the questions (21 points out of 28) was considered Aware of Stroke.

Statistical Analysis

The statistical website OpenEpi14 [25] was used to determine the sample size in an infinite population, assuming a level of awareness of the warning signs of strokes of 50%, at 5% precision, and statistical power of 95%.

$$\text{Sample size } n = \lceil \text{DEFF} * N_p (1 - p) \rceil / \lceil (d2/Z21 - \alpha/2 * (N - 1) + p * (1 - p)) \rceil \quad (1)$$

These inputs yielded a sample size of at least 201 participants.

Data were coded, entered, and analyzed using the Statistical Package for Social Science (SPSS) version 23. Qualitative data were expressed in the form of numbers and percentages (No. & %). Chi-square (χ^2) test was used to evaluate the relationships between participants' characteristics and level of awareness.

Ethical Considerations

Respective approval of the study was obtained from the Research Ethics Committee at Al-Jouf University. All participants were volunteers and asked to do their best. All data were kept confidential and used only for research purposes.

Results and Discussion

Socio-Demographic Data

A total of 119 respondents filled out the questionnaire. The socio-demographic characteristics of participants were summarized in **(Table 1)**. More than two-thirds of the participants were males (73.1%) and the majority of them were non-Saudi (70.6%). The mean age of respondents was 36.7 \pm 9 years (aged between 23 and 60 years). In addition, our results showed that residents represented more than one-third of physicians who participated in our study, followed by a specialist, medical interns, and general physicians. The highest percentage of participants was recruited from Primary Health Care Center (39.5%), followed by Suayer Hospital which included about one-fifth of physicians, whereas the consultants were the least included in our study.

Table 1. Socio-demographic characteristics of the participants (n=119)

Variable	Category	N (%)
Gender	Male	87 (73.1)
	Female	32 (26.9)
Nationality	Saudi	35 (29.4)
	Non-Saudi	84 (70.6)
You are now:	Consultant	2 (1.7)
	General Physician	21 (17.6)
	Medical Intern	27 (22.7)
	Resident	42 (35.3)
	Specialist	27 (22.7)
Hospital	King Abdulaziz Specialist Hospital	10 (8.4)
	Domat-Aljandal general hospital	4 (3.4)
	Al Qurayyat General Hospital	9 (7.6)
	Metaab bin Abdulaziz hospital	19 (16)
	Tabarjal general hospital	5 (4.2)
	Primary Health Care Center	47 (39.5)
	Suayer Hospital	25 (21)

Findings revealed that most physicians faced a stroke case in their practice (64.7%). Regarding training or educational session about stroke management, the majority of our respondents (84%) received this training during their medical education and 64.7% of physicians received it after completing their medical education (**Table 2**).

Table 2. Training or educational session about stroke management during and after medical education

Question	Yes	No	I don't remember
Have you ever faced a stroke case in your practice?	77 (64.7%)	38 (31.9%)	4 (3.4%)
Have you ever received any training or educational session about stroke management during your medical education?	100 (84%)	13 (10.9%)	6 (5%)
Have you ever received any training or educational session about stroke management after your medical education?	77 (64.7%)	37 (31.1%)	5 (4.2%)

Awareness about Stroke in ER Settings

Out of a total score of 28 points, the mean awareness score was 17.8 ± 4.2 (Range 3 – 27). **Figure 1** shows that only 24.4% of physicians showed a good level of awareness about stroke in ER settings and most of the physicians (75.6%) showed a poor level of awareness.

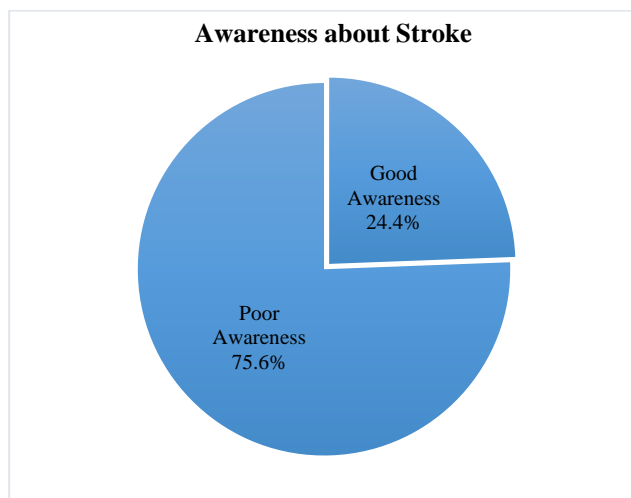


Figure 1. Awareness of stroke

Table 3 describes an awareness of stroke in ER settings among participants. More than half of the participants demonstrated that they knew about two major types of strokes (57.1%) and that stroke by intra-cerebral bleeding is a sub-type of ischemic stroke (55.5%). In addition, the majority of physicians (79.8%) declared that ischemic stroke is more commonly encountered than hemorrhagic stroke. Most of the participants (78.2%) showed that Obstruction in the cerebrovascular vessel is the primary cause of ischemic stroke. On the other side, a rupture in the cerebrovascular vessel was the most commonly reported primary cause of hemorrhagic stroke. Furthermore, intra-cerebral bleeding and subarachnoid bleeding were the most commonly recognized major types of hemorrhagic stroke, reported by 60.5% and 52.1% of the participants respectively.

Our result demonstrated that 61.3% and 76.5% of physicians recognized the common warning signs and risk factors of stroke respectively. More than half of physicians reported that they were aware of the FAST test for stroke suspicion and 95.8% of participants agreed that time is an important factor in the treatment and management of stroke.

About two-thirds of participants were aware of the immediate measures taken by healthcare staff to facilitate a suspected stroke patient. Moreover, 62.2% of physicians considered Computed Topography as an emergency diagnostic tool for stroke. The vast majority of respondents reported that endoscopy is not used in the diagnosis of stroke and almost half of the physicians stated that angioplasty and Fibrinolysis therapy are used for an identified clot in the blood vessel.

Table 3. Awareness of Stroke in ER Settings

Question	N (%)
How many major types of strokes do you know about?	
2	68 (57.1%)
3	23 (19.3%)
More than 3	19 (16%)
I don't know	9 (7.6%)
Which type of stroke is more commonly encountered?	
Ischemic stroke	95 (79.8%)
Hemorrhagic stroke	18 (15.1%)
I don't know	6 (5%)
Which of the following is NOT a sub-type of ischemic stroke?	
Stroke by atherosclerosis	7 (5.9%)
Stroke by lacunar infarcts	15 (12.6%)
Stroke by cardio-embolism	9 (7.6%)
Stroke by intra-cerebral bleeding	66 (55.5%)
Stroke of other determined etiology	12 (10.1%)
Stroke of undetermined etiology	18 (15.1%)
I don't know	21 (17.6%)
What is the primary cause of ischemic stroke?	

Obstruction in the cerebrovascular vessel	93 (78.2)
Rupture in the cerebrovascular vessel	10 (8.4%)
Obstruction in the cardiovascular vessel	18 (15.1%)
Rupture in the cardiovascular vessel	3 (2.5%)
I don't know	4 (3.4%)
What is the primary cause of hemorrhagic stroke?	
Obstruction in the cerebrovascular vessel	9 (7.6%)
Rupture in the cerebrovascular vessel	99 (83.2%)
Obstruction in the cardiovascular vessel	5 (4.2%)
Rupture in the cardiovascular vessel	6 (5%)
I don't know	6 (5%)
Which of the following are major types of hemorrhagic stroke?	
Stroke by atherosclerosis	8 (6.7%)
Stroke by lacunar infarcts	4 (3.4%)
Stroke by subarachnoid bleeding	62 (52.1%)
Stroke by cardio-embolism	8 (6.7%)
Stroke by intra-cerebral bleeding	72 (60.5%)
Stroke of other determined etiology	7 (5.9%)
Stroke of undetermined etiology	8 (6.7%)
I don't know	10 (8.4%)
What are the common warning signs of stroke?	
Numbness	41 (34.5%)
Vomiting	23 (19.3%)
Headache	37 (31.1%)
Digestion problem	10 (8.4%)
Trouble in walking and sight	36 (30.3%)
Slurred speech	46 (38.7%)
Confusion	39 (32.8%)
Loss of balance	26 (21.8%)
All of the above	73 (61.3%)
I don't know	1 (0.8%)
What are the common risk factors of stroke?	
Hypertension	47 (39.5%)
Obesity	33 (27.7%)
Diabetes	33 (27.7%)
Smoking	35 (29.4%)
Genetic factors	29 (24.4%)
Unhealthy lifestyle	24 (20.2%)
Underlying medical conditions	24 (20.2%)
All of the above	91 (76.5%)
I don't know	0 (0%)
Are you aware of the FAST test for stroke suspicion?	
Yes	67 (56.3%)
No	18 (15.1%)
I am not sure	34 (28.6%)
Do you think time is an important factor in the treatment and management of stroke?	
Agree	114 (95.8%)
Disagree	3 (2.5%)
I don't know	2 (1.7%)
What is the immediate measure taken by healthcare staff to facilitate a suspected stroke patient?	
Supplement the patient with intravenous glucose	7 (5.9%)
Ensure clearing of airways	10 (8.4%)
Check for normal breathing	7 (5.9%)
Ensure normal blood circulation	14 (11.8%)
All of the above	80 (67.2%)
I don't know	1 (0.8%)
Which of the following is considered an emergency diagnostic tool for stroke diagnosis?	
Magnetic Resonance Imaging	19 (16%)
Computed Topography	74 (62.2%)
Echocardiography	5 (4.2%)
All of the above	29 (24.4%)
I don't know	1 (0.8%)

Which of the following is NOT used in the diagnosis of stroke?	
Magnetic Resonance Imaging	5 (4.2%)
Computed Topography	2 (1.7%)
Echocardiography	25 (21%)
Endoscopy	109 (91.6%)
All of the above	2 (1.7%)
I don't know	2 (1.7%)
Which of the following therapy is used for an identified clot in a blood vessel?	
Angioplasty	58 (48.7%)
Fibrinolysis therapy	63 (52.9%)
Nephrectomy	1 (0.8%)
All of the above	4 (3.4%)
I don't know	5 (4.2%)

Factors Associated with the Level of Awareness About Stroke in ER Settings

There was no significant association between the level of awareness about stroke in ER settings and any of the socio-demographic characteristics of participants nor with receiving training/educational sessions about stroke management. However, females and non-Saudi physicians showed a slight predominance of good awareness about stroke in ER settings with no statistical significance. Moreover, consultant physicians showed the highest level of good awareness (50%) about stroke in ER settings compared to others without any significant difference (P value= 0.667) (Table 4).

Table 4. Factors associated with the level of awareness about stroke in ER settings

Variable	Category	Level of Awareness		P value Chisq Test
		Good	Poor	
Gender	Male	20 (23%)	67 (77%)	0.563
	Female	9 (28.1%)	23 (71.9%)	
Age (Years)	20-30	8 (22.2%)	28 (77.8%)	0.821
	31-40	12 (26.7%)	33 (73.3%)	
	41-50	8 (26.7%)	22 (73.3%)	
	51-60	1 (12.5%)	7 (87.5%)	
Nationality	Saudi	7 (20%)	28 (80%)	0.474
	Non-Saudi	22 (26.2%)	62 (73.8%)	
You are now:	Consultant	1 (50%)	1 (50%)	0.667
	General Physician	3 (14.3%)	18 (85.7%)	
	Medical Intern	6 (22.2%)	21 (77.8%)	
	Resident	12 (28.6%)	30 (71.4%)	
	Specialist	7 (25.9%)	20 (74.1%)	
Hospital	Al Qurayyat General Hospital	2 (22.2%)	7 (77.8%)	0.601
	Domat-Aljandal general hospital	2 (50%)	2 (50%)	
	King Abdulaziz Specialist Hospital	3 (30%)	7 (70%)	
	Metaab bin Abdulaziz hospital	4(21.1%)	15 (78.9%)	
	Primary Health Care Center	8 (17%)	39 (83%)	
	Suayer Hospital	8 (32%)	17 (68%)	
	Tabarjal general hospital	2 (40%)	3 (60%)	
Faced a stroke case in practice	Yes	19 (24.7%)	58 (75.3%)	0.504
	No	10 (26.3%)	28 (73.7%)	
	Don't remember	0 (0)	4 (100%)	
Received training/educational session about stroke management during medical education	Yes	25 (25%)	75 (75%)	0.653
	No	2 (15.4%)	11 (84.6%)	
	Don't remember	2 (33.3%)	4 (66.7%)	
Received training/educational session about stroke management after medical education	Yes	17 (22.1%)	60 (77.9%)	0.654
	No	11 (29.7%)	26 (70.3%)	
	Don't remember	1 (20%)	4 (80%)	

The present study investigated the level of awareness towards stroke in ER settings among physicians in the Al-Jouf region in Saudi Arabia. Given that emergency medical services are crucial in the timely management of patients suffering from acute ischemic stroke, correct identification of stroke cases by ER personnel not only leads to faster transfer to the right facility yet has also been demonstrated to reduce in-hospital delays and increase the likelihood of obtaining thrombolysis [26, 27].

Our results showed that most of the respondents received training or educational session about stroke management during their medical education and almost two-thirds of them received it after their medical education. Furthermore, most physicians faced a stroke case during their practice. However, it must be noted that 75.6% of physicians showed a poor level of awareness, and only 24.4% good level of awareness. This is consistent with another study in Dubai, which concluded that the baseline awareness of most aspects of acute stroke identification and management was poor in ER participants [23]. Moreover, another study in Saudi Arabia clarified that most of the emergency medical services personnel lacked knowledge of the cardinal stroke symptoms, t-PA's principal uses, and its therapeutic time window [24]. The mean awareness score of our participants was 17.8 ± 4.2 , this score is lower than another study conducted in Taiwan (mean score: 34.2, total full score: 39) [28]. These variations in the level of awareness may be due to different populations and various interventional educational programs which differ from one country to another. In addition, different scoring systems were implicated.

Current findings demonstrated that 95.8% of participants agreed that time is an important factor in the treatment and management of stroke. Similar results were reported by a previous national study [24]. Also, most respondents recognized CT as an emergency diagnostic tool for stroke diagnosis and a higher percentage of physicians identified the treatment of ischemic stroke. Besides, our findings showed that there is no significant association between the level of awareness about stroke in ER settings and the socio-demographic characteristics of participants.

Emergency physicians play a critical role in stroke care. Hence, Saudi emergency physicians must be involved, trained, and engaged in stroke care, especially during Saudi Arabia's health-system development. As a result, educational activities are critical to enhancing Saudi physicians' understanding of stroke. According to a recent systematic review, education appears to be useful in promoting knowledge of stroke warning symptoms and reducing time delays [29]. This is confirmed by a pilot study conducted in Taiwan which revealed that an education program for dedicated Emergency Medical Services staff had improved their knowledge about stroke and their ability to identify cases of acute stroke within 3 hours of symptom onset [28]. Our research has some limitations. First, because this study only included physicians from a narrow geographic area, the results cannot be generalized. Second, there may be some selection biases present due to the nonrandom method of sampling we used in this study, this may threaten the external validity of our findings and lead to an accurate estimation of the results. Third, because of disparities in healthcare systems, our findings may not be completely applicable to other countries. As a result, additional research is required to confirm our findings. Our study's limitations also include its cross-sectional design, which could not establish a causal relationship.

Conclusion

The results of this study indicated that 3 out of 4 physicians in many hospitals of the Al-Jouf Region in Saudi Arabia had an inadequate level of awareness about stroke in ER settings. Therefore, we recommend conducting educational programs and training to enhance the level of awareness of physicians toward stroke. Further research is needed to investigate and explore this problem; more strategies and interventions are needed to improve health workers' knowledge and awareness of stroke management.

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Ethics statement: All methods were carried out following relevant guidelines and regulations. The study was approved by the institutional ethical committee of Aljouf University, Aljouf, Kingdom of Saudi Arabia.

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