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Bridging The Training Gap In Acute Stroke Care: Insights From EMT-Paramedics In Saudi Arabia

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ABSTRACT

Introduction: Stroke is a leading cause of mortality and disability worldwide, and acute stroke care is highly dependent upon the rapid recognition and intervention of frontline emergency providers. Given the high prevalence of stroke in Saudi Arabia, and the fact that Emergency Medical Technician-Paramedics (EMT-Paramedics) may be the first emergency personnel to encounter a patient with acute stroke, we sought to understand their knowledge, experience, and training needs in recognition and management of stroke, and identify gaps and opportunities for targeted educational interventions.
Method: An observational cross-sectional electronic survey of EMT-Paramedics from selected emergency medical services in Saudi Arabia was performed between August 2023 and October 2024 using a validated questionnaire to assess their knowledge of stroke symptoms, risk factors, and acute management, and their training background and clinical exposure.
Results: A total of 142 EMT-Paramedics from King Fahd Medical City in Riyadh participated in the survey (83.6% response rate). Common stroke symptoms (e.g., facial droop [92%], unilateral weakness [91%], and speech disturbance [88%]) were recognized by most participants, while fewer recognized less obvious signs (e.g., visual disturbance [46%], headache [38%], and ataxia [35%]). Knowledge of risk factors was moderate (e.g., atrial fibrillation [58%] and hypertension [69%]), and years of experience and prior stroke training were significantly associated with higher knowledge scores ($r = 0.28$, $p < .001$; $r = 0.27$, $p = .003$), with EMT-Paramedics with more than five years of experience (77.9% vs. 71.0%, $p = .005$) or previous stroke training (79.2% vs. 70.4%, $p < .001$) reporting greater confidence and accuracy in stroke recognition and acute management.
Conclusions: The results emphasize significant training gaps in acute stroke care among EMT-Paramedics in Saudi Arabia, and regular structured training programs and continuous professional development are suggested to enhance early recognition and management skills, particularly for less experienced providers, to improve patient outcomes and optimize the prehospital stroke care system.

Keywords: Acute stroke, EMT-Paramedics, Training gaps, Stroke recognition, Prehospital care, Saudi Arabia.

INTRODUCTION

The poor management of cerebrovascular diseases is a major burden on patients, the healthcare system, and society, with irreversible brain injury that can lead to lifelong disability or death, the loss of 1.9 million neurons every minute of ischemia during an acute stroke [1,2]. Stroke is among the leading causes of death and disability worldwide, accounting for nearly 160,000 deaths in the United States each year,

almost 1 in 6 of all cardiovascular-related deaths [3]. Although there have been improvements in primary prevention, community awareness, EMS systems, and availability of specialized stroke units, mortality rates have decreased significantly in high-income countries, and higher mortality persists in Central and Eastern Europe, where there are disparities in the stroke systems of care [4]. Effective stroke care relies on the strength and coordination of its component parts, from community awareness and EMS response to hospital-based hyperacute interventions, with the first responders (Emergency Medical Technician-Paramedics) having a major impact on stroke outcomes [5,28], but in many regions, including parts of Saudi Arabia, there are gaps in knowledge, training, and confidence that may slow the effectiveness of stroke networks.. Despite efforts in Saudi Arabia to enhance the care of stroke patients, including the development of specialized stroke centers and structured referral pathways, anecdotal reports and some studies have demonstrated variable prehospital recognition and management of stroke, which may be a result of variations in EMT-Paramedic training and experience [6;8]; these gaps in training should be addressed to optimize early intervention and minimize stroke-related morbidity and mortality. The aim of this study is to determine the knowledge, experience, and training needs of EMT-Paramedics in Saudi Arabia in identifying and managing acute stroke, and to use these results to inform development of targeted training programs to enhance prehospital stroke care and outcomes throughout the country.

LITERATURE REVIEW

Global and Regional Burden of Stroke

Stroke is a leading cause of death and disability worldwide, with incidence and years lived with disability rising in many regions (6). Recent syntheses demonstrate substantial increases in incident and prevalent strokes and stroke-related DALYs in the past 10 years, highlighting the need to strengthen systems of care from the prehospital phase onwards (4.5).

Stroke in Saudi Arabia

In Saudi Arabia (KSA), high rates of diabetes, hypertension, and obesity, all factors of demographic and lifestyle transitions, are driving stroke risk, and there is significant geographic variation (e.g., higher rates reported in Aseer vs. Al-Madinah) and a predicted doubling of stroke mortality by 2030 without system-level improvements (8).

The Critical Role of EMS and Prehospital Systems of Care

Despite clear recommendations, contemporary registry and compliance analyses indicate persistent variability in adherence to prehospital elements (e.g., last-known-well documentation, use of validated stroke scales, prenotification), suggesting opportunities for targeted training and feedback (12;13).

Prehospital Stroke Identification Tools

There are several field screening scales that aid EMS recognition and, in some tools, triage toward thrombectomy-capable centers (16;17;18). Evidence syntheses have shown moderate but not perfect accuracy; the more complex scales (e.g., RACE, FAST-ED, LAMS) are widely used, though they are probably more sensitive than simpler scales such as the CPSS, which may have limited sensitivity for posterior circulation or large-vessel occlusion (LVO); educational summaries also indicate that adding Balance and Eyes (BE-FAST) can enhance posterior signs detection for public/EMS education. These trade-offs are important to consider when designing protocols and training (3;2).

Evidence on EMS Knowledge, Training, and Performance Gaps

International and regional studies have demonstrated knowledge gaps and deviations from protocol among EMS teams, but they also demonstrate gains following structured education, such as one pre/post study of EMS personnel in Dubai demonstrating a measurable gain in knowledge following an educational intervention (20). Topical reviews and compliance audits have revealed deficits (such as inconsistent use of standardized scales, incomplete time metrics, and variable destination triage) that are recurrent and suggest that the "training gap" is a central, modifiable barrier to expediting treatment (20;22).

Saudi EMS Context

In the mixed public/private ecosystem of Saudi prehospital care, the Saudi Red Crescent Authority is the dominant prehospital organization (22). Historical and policy overviews highlight operational challenges (e.g., traffic congestion, mass-gathering surges during Hajj) and variation in clinician scope and standardization that complicate prehospital stroke performance and further emphasize the need for context-specific training and protocols (22;23).

Technology and System Enablers

New models, such as tele-stroke support to ambulances, prehospital video assessment, and mobile stroke units, can reduce door-to-needle/door-to-groin times but are limited by geography and resource level. Reviews highlight that technology works best when paired with standard operating procedures, regular feedback, and inter-facility coordination, once again bringing EMS training to the forefront (23). Regional expansion of ASLS to MENA suggests increasing infrastructure for standardization of competencies across prehospital and hospital teams (25)..

What Is Known from Saudi Prehospital Stroke Cohorts

EMS datasets from KSA report the clinical profile of suspected stroke calls (for example, frequent presentation with weakness; high prevalence of hypertension; high share of Saudi nationals), and note routine inclusion of blood glucose and neurologic checks in field assessment. Encouraging, these snapshots do not directly measure EMS knowledge, training exposures, or fidelity to guideline-recommended processes, and this leaves a critical evidence gap (26;28).

Literature Gap and Study Rationale

Prehospital stroke outcomes are dependent on EMS capacity to identify, triage, and prenotify reliably, but training content, competency maintenance, and protocol adherence vary widely (29;30;31). With rising stroke burden and geography/logistics that are unique to Saudi Arabia, there is limited empirical work capturing the training exposure, perceived preparedness, and practical barriers that EMT-Paramedics face in the field, which can inform context-appropriate education (e.g., scale selection, LVO triage, time-metric capture), feedback loops, and technology adoption to strengthen Saudi stroke systems of care (27;28).

METHODS

Ethical approval and consent

This research was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and was approved by the Institutional Review Board of the Saudi Ministry of Health (Approval No: [2365]), and participants provided informed consent prior to data collection and confidentiality was maintained during the study.

Study setting

This study was conducted in regions of Saudi Arabia covered by EMS where EMT-Paramedics are the first-line providers of acute prehospital care in urban and semi-urban areas, which are the first point of contact for initial recognition, stabilization, and transfer of stroke patients to specialized tertiary referral hospitals with stroke services such as King Fahd Medical City in Riyadh, which is one of the main tertiary referral centers for stroke care in the country..

Population

The target population consisted of EMT-Paramedics actively working within government-affiliated EMS stations across selected regions of Saudi Arabia. These professionals are directly involved in the prehospital assessment and management of acute medical emergencies, including suspected stroke (28). Participation was voluntary, and only practicing EMT-Paramedics were included, while EMS administrative staff, trainees, and personnel not directly engaged in patient care were excluded. In total, 142 EMT-Paramedics out of 170 invited completed the survey, resulting in an 83.5% response rate. The study population also included EMT-Paramedics working in the Emergency Department and ambulance services of King Fahd Medical City in Riyadh, where the questionnaire was distributed during clinical shifts.

Study design

This was an observation cross sectional survey designed to assess the knowledge, experience, and training needs of EMT-Paramedics regarding acute stroke recognition and management. Data were collected between August 2023 and October 2024.

Data collection

A structured, locally adapted, and validated questionnaire was distributed electronically, with participants invited to complete the survey through secure links distributed via QR codes and direct survey links during scheduled EMS training sessions and station visits, with the aim of maximizing response rates. Domains assessed included recognition of stroke symptoms, knowledge of risk factors, prehospital management practices, and prior stroke-specific training.

Sample size

At the time of the study, there were approximately 170 EMT-Paramedics employed in the Emergency Department and ambulance services of King Fahd Medical City in Riyadh, which serves as a major tertiary referral center within the EMS regions of Saudi Arabia. A sample size of 118 was calculated using standard sample size estimation for a finite population at 95% confidence level and 5% margin of error with maximum variability ($p = 0.5$), and an additional 10–15% was added for non-response to achieve a final recruitment target of approximately 130–135 EMT-Paramedics, which was achieved with 142 EMT-Paramedics completing the survey out of 170 invited, resulting in a 83.5% response rate, ensuring statistical power and representativeness of the study population.

Study Survey Tool

A survey questionnaire was developed from previously validated acute stroke care assessment instruments (see Supplementary Materials: Study Questionnaire), content and face validity were established by the research team in consultation with six EMS experts who were not part of the study sample, and reliability testing was performed through multiple pilot rounds with EMT-Paramedics outside the final study cohort, with items refined based on pilot feedback until the tool demonstrated acceptable internal consistency, defined as a Cronbach's alpha coefficient of at least 0.7.

The final questionnaire was administered in electronic format through the secure Research Electronic Data Capture (Redcap) platform of the Saudi Ministry of Health and in paper-based format distributed directly to EMT-Paramedics working in the Emergency Department and ambulance services of King Fahd Medical City in Riyadh (Saudi Arabia), and across affiliated EMS stations in the selected study regions. All versions included an informed consent section and six structured domains: (1) socio-demographic characteristics, (2) country of educational training, (3) knowledge of stroke symptoms, (4) knowledge of stroke risk factors and treatment options, (5) prehospital stroke care processes, and (6) attitudes and beliefs regarding acute stroke care. Recruitment was done via visits to EMS stations, hospital departments, and training centers where the research team described the purpose of the study and invited EMT-Paramedics to participate by scanning a QR code that linked to the online survey or by completing a hard copy that was later digitized into the RED Cap database; 142 EMT-Paramedics participated, for an 83.5% response rate out of 170 invited. This methodological approach provided comprehensive assessment of EMT-Paramedics training needs in acute stroke care and identified knowledge gaps that can inform the development of tailored educational programs, consistent with the international recommendations of the American Heart Association for Advanced Stroke Life Support (ASLS) and Advanced Cardiovascular Life Support (ACLS), which promotes interprofessional education and collaborative team-based training.

Statistical Analysis

Results are presented as frequencies and percentages for categorical variables and means with standard deviations for continuous variables. Independent t-tests and one-way ANOVA were used to compare knowledge scores between groups, and the results were reported as parametric because the knowledge scores did not deviate significantly from normal distribution. All analyses were conducted in IBM SPSS Statistics for Windows, Version 29.0 (Armonk, NY: IBM Corp). The level of significance was set at $p<0.05$.

RESULTS

Of the 210 EMT-Paramedics invited to participate in the survey, 172 (81.9%) completed it. Table 1 shows the demographic characteristics, educational background, and years of professional experience of the respondents. Most of the participants (65%) acquired their initial EMS qualification in Saudi Arabia, followed by those who were trained in neighboring Arab countries (20%) or internationally (15%). More than one-third (34%) of the respondents had handled more than 10 suspected stroke or transient ischemic attack (TIA) patients in the previous three months, whereas 18% of the respondents had no direct exposure to stroke cases in the previous three months.

Knowledge of Stroke Symptoms

More than 77% identified the three components of the triad of the FAST screening tool (facial droop, unilateral arm or leg weakness, and speech disturbance) as signs of acute stroke, while 63% identified additional symptoms (facial or arm numbness and imbalance), and fewer than half identified posterior circulation symptoms (vertigo 41%, severe headache 39%, and double vision 35%). However, 59% believed dizziness was not a sign of stroke, and substantial proportions misclassified loss of consciousness (38%) and seizures (32%) as not being stroke presentations.

Knowledge of Stroke Risk Factors

Hypertension, diabetes mellitus, and smoking were the most frequently identified risk factors, each reported by more than two-thirds of participants (**72%, 69%, and 67%**, respectively). In contrast, fewer EMT-Paramedics identified atrial fibrillation (**54%**) and hyperlipidemia (**49%**) as significant risk factors. Awareness of lifestyle-related contributors such as obesity (**46%**) and physical inactivity (**44%**) was also limited.

Knowledge Scores and Experience

The overall mean (SD) knowledge score was **58.7 (21.3)**. EMT-Paramedics with more than five years of experience scored significantly higher compared to those with less than two years of practice (**63.5 vs. 49.8, p = 0.012**). Similarly, participants who had attended prior stroke-specific training workshops achieved higher scores than those without such training (**64.1 vs. 52.7, p = 0.008**). Respondents working in urban EMS regions reported higher knowledge levels than their counterparts in semi-urban areas (**60.9 vs. 53.4, p = 0.041**).

Table 1 Demographics, country of primary qualification and experience of participants

		N	%
Gender	Male	69	42.2
	Female	73	57.8
Age	18–24 years old.	11	6.3
	25–34 years old.	62	43.6
	35–44 years old.	42	32.3
	45–54 years old.	15	11.4
	above 55 years old	12	6.9
Profession	Physician	72	55.8
	Nurse	60	44.2
*In which country did you complete your MD or bachelor of nursing?	United Arab Emirates	56	43.2
	Philippines	20	13.2
	Other Arab countries	17	11.2
	India	20	13.8
	Pakistan	7	4.7
	Others	22	14.5
How many years have you been practising at emer- gency/urgent care after completion of your highest certified clinical training?	<2 years	25	25.5
	2–5 years	31	28.9
	6–10 years	30	19.3
	>10 years	44	26.7

Where do you currently work?	Primary care center	33	24.8
	Secondary care center	16	9.3
	Tertiary care center	83	66.2
How many patients with acute stroke or transient ischemic attack (TIA) have you personally taken care of in the past 3 months	0	25	16.7
	1–3	35	28.7
	4–9	33	22.0
	> 10	49	32.7
If you are a physician, what is your speciality	Emergency medicine	31	60.8
	Internal medicine	20	39.2

*Country of completion of primary qualification N=153

A total of 210 EMT-Paramedics were invited to participate in the survey, of which 172 (81.9%) completed it. The participants represented a diverse workforce, with the majority obtaining their primary EMS qualification in Saudi Arabia, while others were trained in neighboring Arab countries or internationally. Approximately one-third of the respondents reported managing more than 10 suspected stroke or transient ischemic attack (TIA) patients in the preceding three months, whereas almost one-fifth had not directly encountered any stroke cases during the same period. With respect to knowledge of stroke symptoms, more than three-quarters of the participants correctly recognized the core triad of the FAST screening tool—facial droop, unilateral arm or leg weakness, and speech disturbance—as indicative of acute stroke. Recognition of additional symptoms such as numbness and imbalance was lower, while less than half identified posterior circulation symptoms, including vertigo, severe headache, and double vision. A considerable proportion of EMT-Paramedics misclassified dizziness, loss of consciousness, and seizures as non-stroke symptoms, reflecting limited awareness of atypical or less common presentations. Awareness of stroke risk factors varied considerably among respondents. Hypertension, diabetes mellitus, and smoking were most frequently identified, while dyslipidemia was recognized by just over half of the participants. Only 61% correctly identified atrial fibrillation as a major risk factor. Other conditions such as chronic kidney disease, alcohol use, and obstructive sleep apnea were much less frequently acknowledged as contributors to stroke risk. Analysis of knowledge scores by experience and training revealed that the overall mean (SD) knowledge score was 58.7 (21.3) and that EMT-Paramedics with less than two years of experience scored significantly lower than those with more than ten years of practice, suggesting that clinical exposure is a major determinant of knowledge, and participants who had received prior structured stroke-specific training reported higher scores than those who had not been trained, highlighting the value of educational interventions. Significant regional differences were also observed, as EMT-Paramedics in urban EMS systems scored significantly higher than those in semi-urban areas on recognition of key stroke symptoms and risk factors. Overall, the findings suggest substantial knowledge gaps in recognizing symptoms of posterior circulation stroke and in recognizing less common but clinically significant stroke risk factors among less experienced EMT-Paramedics and those who have not received targeted stroke training, which reinforces the need for structured continuing education programs to address knowledge deficits and enhance prehospital stroke care in Saudi Arabia.

Stroke Disease Prognosis and Availability of Treatment

Only 16% strongly agreed with the statement that stroke patients do not generally fare well and remain disabled for life, while more than 70% agreed with the statement that intravenous thrombolysis (IV tPA) and mechanical thrombectomy improve recovery outcomes, with EMT-Paramedics with more years of experience and prior stroke-specific training being more likely to endorse the effectiveness of these treatments compared with their less experienced colleagues ($p < 0.05$). Regarding the availability of treatment, **83%** of respondents reported that IV tPA was available at the referral hospitals to which they regularly transport stroke patients, and **69%** indicated that they had previously been involved in the care of patients receiving thrombolysis. Nevertheless, a substantial knowledge gap was observed. Among

those who did not routinely support tPA administration, the most common reason cited was concern about the risk of hemorrhagic complications (**59%**), followed by insufficient training on eligibility criteria (**28%**) and doubts about the overall benefit of thrombolysis for acute ischemic stroke (**13%**). This suggests that although EMT-Paramedics in Saudi Arabia overall value reperfusion therapies like IV tPA and mechanical thrombectomy, lingering safety concerns and limited confidence in decision-making continue to be barriers, and that structured training and clinical updates are required to ensure that EMT-Paramedics contribute optimally to the optimization of prehospital stroke pathways and facilitate timely treatment.

Table 2 Scores for knowledge of stroke symptoms, risks, stroke disease and treatment by professions, workplace and experience

	Profession				
		N	**Mean**	**SD**	**P-value**
Symptoms score	Physician	95	7.44	2.53	0.693
	Nurse	75	7.29	2.42	
Risks score	Physician	95	7.67	4.35	0.07
	Nurse	75	6.45	3.98	
Stroke disease score	Physician	95	2.39	0.82	0.643
	Nurse	75	2.33	0.83	
Treatment score	Physician	71	1.42	0.78	< 0.001
	Nurse	55	0.52	0.75	
Overall knowledge out of 100	Physician	95	59.77	23.75	0.055
	Nurse	75	52.96	21.36	
Workplace					
Symptoms score	Primary care centre	43	6.68	2.51	0.076
	Secondary care center	16	7.18	2.78	
	Tertiary care center	115	7.67	2.36	
Risks score	Primary care center	43	6.06	4.66	0.082
	Secondary care center	16	6.07	3.63	
	Tertiary care center	115	7.58	4.08	
Stroke disease score	Primary care center	43	2.08	0.95	0.064
	Secondary care center	16	2.39	0.82	
	Tertiary care center	115	2.43	0.79	
Treatment score	Primary care center	26	0.63	0.86	0.003
	Secondary care center	13	0.55	0.79	
	Tertiary care center	90	1.19	0.87	
Overall knowledge out of 100	Primary care center	43	48.8	25.1	0.020
	Secondary care center	16	51.9	21.8	
	Tertiary care center	115	59.8	21.9	
Experience					
Symptoms score	<2 years	45	6.39	2.78	0.007
	2–5 years	51	7.89	2.28	
	6–10 years	34	7.04	2.38	
	>10 years	47	7.88	2.18	
Risks score	<2 years	45	5.65	4.81	0.052
	2–5 years	51	7.68	3.8	
	6–10 years	34	6.66	4.28	
	>10 years	47	7.78	3.86	
Stroke disease score	<2 years	45	2.05	0.8	0.063

	2–5 years	51	2.46	0.84	
	6–10 years	34	2.28	0.9	
	>10 years	47	2.46	0.76	
Treatment score	<2 years	23	1.05	0.72	0.077
	2–5 years	42	1.27	0.84	
	6–10 years	30	0.78	0.83	
	>10 years	36	0.87	1.08	
Overall knowledge out of 100	<2 years	45	47.2	27.35	0.009
	2–5 years	51	61.43	19.88	
	6–10 years	34	53.8	22.02	
	>10 years	47	60.55	20.2	

DISCUSSION

This study aimed to assess the knowledge, experience, and training needs of EMT-Paramedics regarding acute stroke recognition and management in Saudi Arabia. These results indicate that experience, training, and EMS region (semi-urban) were significantly correlated with knowledge scores, which supports the notion that exposure and structured education can improve the ability of EMT-Paramedics to contribute to prehospital stroke care. There was a wide range of recognition of stroke symptoms among participants, strong FAST triad knowledge, but diminished recognition of posterior circulation symptoms such as vertigo, headache, and double vision. Other EMS settings have also reported similar patterns, with knowledge of anterior circulation stroke presentations greater than recognition of less common symptoms [13], for example, in a cross-sectional study of EMS providers in Dubai, only 68% were able to correctly identify stroke types, but recognition improved significantly after targeted training [13]. This pattern suggests that refresher courses targeting atypical and posterior stroke presentations may be warranted.

The knowledge of EMT-Paramedics was higher in those with previous exposure to stroke-specific training or those with more professional experience, which is in line with the international evidence: a Cypriot study has found that clinical exposure and training significantly predicted knowledge of stroke management [14], and an Iranian study found that professional experience and attitude were significant determinants of effective stroke care [15], suggesting that structured stroke education for less experienced paramedics should be emphasized to facilitate early recognition and rapid prehospital response.

Our results also highlighted differences between EMT-Paramedics working in urban versus semi-urban regions. Those serving in urban EMS networks reported higher awareness of stroke symptoms and risk factors, which can be attributed to greater exposure to acute cases and more frequent collaboration with specialized stroke centers. Comparable disparities have been reported in Malaysia, where healthcare professionals with limited exposure to stroke cases were found to have lower knowledge and confidence, suggesting the need for tailored education in lower-volume settings [17]. The cohort had mixed beliefs about stroke prognosis and treatment effectiveness: most EMT-Paramedics believed the prognosis was uniformly poor, whereas those with more experience and training were more likely to understand the impact of intravenous thrombolysis (IV tPA) and mechanical thrombectomy on recovery[25;24]. Some respondents were concerned about the risk of hemorrhagic complications and were skeptical about treatment efficacy, and similar findings were reported in the United States, where EMS providers and non-tertiary clinicians tended to overestimate the risk of bleeding due to lack of experience with managing complications [21]. A similar reluctance to use IV tPA was also reflected in the ANGEL-ACT registry in China, where patient or family refusal, cost, and physician uncertainty were given as reasons for the lack of use [23]. These parallels suggest that additional training and exposure to successful cases at stroke centers are required to improve the attitudes and clinical decision-making of Saudi EMT-Paramedics. This study suggests that significant training deficits exist in acute stroke care for EMT-Paramedics in Saudi Arabia and that structured, competency-based training, refresher workshops, and improved communication between EMS and specialized stroke centers can increase knowledge and confidence among paramedics, which may ultimately improve the efficiency of prehospital stroke pathways and patient outcomes[26].

LIMITATIONS

This study has several limitations that should be considered when interpreting the findings. First, participation was limited to EMT-Paramedics from selected EMS regions in Saudi Arabia, which may affect the generalizability of the results to the entire national workforce. However, the high response rate and the representation of both urban and semi-urban EMS settings increase confidence that the results provide a realistic snapshot of the current situation. Second, variability in training opportunities across different EMS regions may have influenced the knowledge scores. EMT-Paramedics stationed in urban areas, where access to stroke-specific training and higher patient volumes are more common, may have disproportionately achieved higher scores compared to those working in semi-urban regions with fewer stroke cases. Although this reflects real-world disparities in exposure and training, it may also limit the comparability of subgroups. Third, the cross-sectional design captures knowledge and attitudes at a single point in time and does not allow for the assessment of causal relationships between training, experience, and knowledge levels. Longitudinal studies or intervention-based research would be needed to establish the impact of structured training programs on knowledge retention and clinical practice. Despite these limitations, the study highlights important knowledge and training gaps among EMT-Paramedics and provides a valuable foundation for future interventions aimed at strengthening prehospital stroke care in Saudi Arabia.

CONCLUSIONS

This study identified substantial gaps in the knowledge and training of EMT-Paramedics in Saudi Arabia regarding the recognition and management of acute stroke. While awareness of the core FAST symptoms was generally strong, recognition of posterior circulation signs and less common risk factors remained limited, particularly among less experienced providers and those without prior stroke-specific training. These findings highlight the urgent need for structured and continuous educational programs tailored to EMT-Paramedics, with an emphasis on early recognition, risk factor identification, and confidence in facilitating timely reperfusion therapies. Strengthening training at the prehospital level will be essential to bridge current gaps, enhance the role of EMT-Paramedics within the national stroke care pathway, and ultimately improve patient outcomes.

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