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Research Article

Awareness of Transient Ischemic Attack Among Adults in the Western Region of Saudi Arabia: A Cross-sectional Study

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ABSTRACT

Background: Transient ischemic attack (TIA), characterized by temporary neurological dysfunction due to reduced cerebral blood flow, poses a significant stroke risk. However, this study aims to assess the level of knowledge and awareness about TIA among Saudi adults in this area. **Methods:** A cross-sectional study was conducted in the Western region of Saudi Arabia from November 2023 to July 2024 by using an online questionnaire. Participant were Saudi adults aged 18 years or older. **Results:** A total of 442 participants were surveyed to assess their demographic profiles, understanding of TIA, awareness of risk factors, and knowledge of appropriate actions and management principles. Results showed that (57.7%) correctly identified TIA as a temporary blockage of brain blood flow, while (10.2%) had misconceptions. About (61.3%) recognized TIA as a stroke warning sign and (63.6%) acknowledged it as an emergency. Hypertension was the most recognized risk factor (86%), followed by diabetes mellitus (51.1%), with only (25.3%) identifying atrial fibrillation as a risk factor. In terms of action, (74.7%) would call an ambulance for TIA symptoms, (64.5%) knew about blood thinners in TIA management, and (79.6%) understood early intervention's importance. Preventive measures, such as managing high blood pressure (59.5%) and adopting a healthy lifestyle (65.4%), were also recognized. Conclusion: Knowledge levels varied significantly by age, sex, occupation, marital status, and income, with younger, male, student, unmarried, and higher-income individuals showing greater awareness. The findings indicate a notable gap in TIA knowledge, underscoring the need for targeted public health initiatives.

INTRODUCTION

Transient ischemic attack (TIA) is a critical medical condition characterized by a temporary episode of neurological dysfunction due to focal brain, spinal cord, or retinal ischemia without acute infarction or permanent tissue damage. Historically defined by the duration of symptoms, the contemporary understanding of TIA emphasizes its role as an ischemic penumbra, a reversible ischemic zone that can either progress to a full-blown stroke or resolve without significant damage. TIAs generally last less than an hour, often only minutes, and serve as a vital warning for potential ischemic stroke, with the highest risk of stroke occurring within the first 48 hours following a TIA (Hadjiev & Mineva, 2007; Panuganti et al., 2025). Immediate and comprehensive management is crucial, including aggressive treatment of hypertension, high-dose statin therapy, antiplatelet therapy, blood sugar control, and lifestyle modifications. Effective treatment of TIA can significantly reduce the risk of subsequent strokes or further TIAs by up to 80% (Hadjiev & Mineva, 2007; Panuganti et al., 2025).

The prevalence of TIA in Western countries is estimated by the American Heart Association to range from 29.0 to 61.0 per 100,000 individuals, with variations in incidence attributed to advancements in the identification and management of vascular risk factors (Degan et al., 2017). Despite the global focus on stroke and TIA awareness, research specific to Saudi Arabia remains limited. A study conducted at a tertiary center in Saudi Arabia revealed that among 1,249 patients admitted to the stroke unit, 802 were diagnosed with either TIA or ischemic stroke (Homoud et al., 2020). This indicates a significant burden of cerebrovascular events in the region but highlights a gap in comprehensive community-level awareness. International studies provide insight into TIA awareness and knowledge. A 2010 nationwide survey in China, involving 98,658 adults, revealed a TIA prevalence of approximately 2.27%, with only 3.08% of the population demonstrating adequate knowledge of TIA (Wang YiLong et al., 2015). Similarly, an Internet-based survey in Japan indicated that 38.2% of respondents had good knowledge of TIA, with higher awareness

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among older adults and those with more education (Akiyama & Hasegawa, 2013). In the U.S., a survey by The National Stroke Association found that 37.5% of adults possessed good TIA knowledge, with awareness again being higher among older individuals and those with prior stroke experiences (Johnston et al., 2003). In Saudi Arabia, a cross-sectional online survey conducted between May and July 2022 assessed general knowledge about stroke risk factors, symptoms, and responses.

The study revealed that while 62.5% of the Saudi population had good stroke knowledge, only 25.5% recognized TIA as a precursor to stroke. Knowledge was notably higher among older individuals, those with higher education levels, and those with personal experience of stroke or TIA (Alzayer et al., 2023). This indicates a need for improved public education and awareness regarding TIA. Local health policies and initiatives in Saudi Arabia, such as the Saudi Health Council's Stroke Awareness Campaign and the National Stroke Prevention Program, aim to enhance public understanding of stroke and TIA and improve early detection and management. These programs focus on educating the public about risk factors, symptoms, and the importance of timely medical intervention (Algahtani et al., 2024).

Given the evident gaps in TIA awareness within the Saudi population, especially in the Western region, this study aims to assess the level of knowledge and awareness about TIA among Saudi adults in this area. By evaluating the understanding of TIA symptoms, risk factors, and urgent care responses, this research seeks to provide insights into current knowledge gaps and inform strategies for improving public health education and intervention efforts.

MATERIALS AND METHODS

Study design and participants

This descriptive cross-sectional study was conducted in the Western region of Saudi Arabia from November 2023 to July 2024. The study aimed to assess knowledge, attitudes, and sociodemographic characteristics related to transient ischemic attack (TIA) among Saudi adults. The target population included Saudi adults residing in various cities across the Western region, irrespective of their city, gender, or educational background.

Inclusion criteria and sample size

Participants were included if they were Saudi adults aged 18 years or older. Individuals were excluded if they chose not to participate or were under the age of 18. A convenience sampling method was employed, and the estimated sample size was 385 participants. Using OpenEpi's online sample size calculator version 3.0, the sample size was determined based on a 5% margin of error, a 95% confidence interval, and an expected response rate of 50%. To account for potential non-responses and data loss, the target sample size was set at 500 participants. Ultimately, 442 participants were recruited, with the sample evenly distributed among the cities in the Western region.

Data collection

Data were collected through a systematic, self-administered online questionnaire developed and validated by three neurology consultants. The questionnaire, available in Arabic to ensure comprehension, was divided into three sections:

1. Sociodemographic characteristics: This section gathered data on age, gender, nationality, educational level, occupation, marital status, income, and history of TIA.

2. Knowledge and attitudes regarding TIA: This section was subdivided into four parts:

Part 1: Six questions assessing general knowledge about TIA, including its definition and symptoms.

Part 2: Multiple-choice questions evaluating awareness of TIA risk factors.

Part 3: Three questions examining attitudes towards acute treatment and first aid for TIA patients.

Part 4: Seven questions assessing attitudes towards TIA prevention

3-Information sources and preferences: This section included three questions about participants' sources of TIA information and their preferences.

The questionnaire included true/false, multiple-choice, and "I do not know" response options.

Data analysis

Data were initially recorded in an Excel spreadsheet and then imported into Statistical Package for the Social Sciences (SPSS) software, version 26, for analysis. Descriptive statistics were used to summarize categorical data with frequencies, percentages, and numbers. Numerical data were described using mean ± standard deviation or mean and range. Pearson's Chi-square Test (χ^2) was employed to analyze categorical data, while the Independent Student's t-Test was used to compare means between two continuous variables. A significance level of 0.05 was set, with results considered statistically significant if the p-value was below 0.05.

Ethical considerations

The Biomedical Research Ethics Committee at Umm Al-Qura University in Makkah City, Saudi Arabia approved this study (approval number HAPO-02-K-012-2024-01-1977). We obtained an informed consent from all participants before they completed the questionnaire, ensured their voluntary participation and the confidentiality of their provided data.

RESULTS

Table 1: General characteristics of the studied participants

Characteristics		Frequency (n=442)	Percentage (%)
Age (Years)	Below	28	6.3
	30 - 20	228	50.5
	40 - 31	69	15.6
	50 - 41	50	11.3
	60 - 51	51	11.5
	More than 60	20	4.5

Sex	Male	211	47.7
	Female	231	5
Nationality	Saudi	417	94.3
	Non-Saudi	25	5.7
Educational level	High school degree	75	17.0
	Diploma degree	17	3.8
	Bachelor's degree	300	67.9
	Postgraduate degree	50	11.3
Occupation	Student	152	34.4
	Employed	176	39.8
	Unemployed	114	25.8
Marital status	Married	180	40.7
	Unmarried	262	59.3
Income	5000 - 0	225	50.9
	10,000 – 5001	76	17.2
	10,001 – 15,000	76	17.2
	15,001 – 20,000	48	10.9
	More than 20,000	17	3.8
History of stroke or TIA	Yes	6	1.4
	No	436	98.6

Table 1 presents the general characteristics of the 442 study participants. The majority of participants were aged between 20 and 30 years (50.7%, n=224), with smaller proportions in other age groups. The gender distribution was nearly balanced, with 47.7% (n=211) male and 52.3% (n=231) female. Most participants were Saudi nationals (94.3%, n=417), while a small fraction were non-Saudi (5.7%, n=25).

Regarding educational levels, a significant proportion had a Bachelor's degree (67.9%, n=300), followed by those with a high school degree (17.0%, n=75). Occupation-wise, 39.8% (n=176) were employed, 34.4% (n=152) were students, and 25.8% (n=114) were unemployed. In terms of marital status, 59.3% (n=262) were unmarried, while 40.7% (n=180) were married. Income distribution showed that half of the participants earned between 0 and 5000 SAR (50.9%, n=225). Only 1.4% (n=6) reported a history of stroke or TIA, indicating that the majority had no such history.

These findings highlight a youthful, predominantly Saudi, and educated population with a significant portion engaged in employment or education, and low prevalence of stroke or TIA history.

Table (2.1,2.2) provides an overview of participants' knowledge and understanding regarding TIA symptoms, risk factors, and urgent care. Regarding TIA symptoms, 57.7% (n=255) correctly identified that TIA is a temporary blockage of blood flow to the brain with symptoms typically lasting less than five minutes. However, 32.1% (n=142) did not know this information, and 10.2% (n=45) provided an incorrect response. When asked whether TIA is a warning sign of a future stroke, 61.3% (n=271) correctly affirmed this, while 27.6% (n=122) were unsure, and 11.1% (n=49) answered incorrectly. Similarly, 63.6% (n=281) correctly identified TIA as an emergency condition, whereas 20.1% (n=89) were uncertain, and 16.3% (n=72) incorrectly thought it was not an emergency.

On the association between advancing age and TIA, 50.5% (n=223) acknowledged this link, with 24.9% (n=110) unsure and 24.7% (n=109) disagreeing. Regarding TIA treatment, 55.2% (n=244) recognized that TIA is treatable, while 35.3% (n=156) were unsure, and 9.5% (n=42) believed it was not treatable. For risk factors, hypertension was recognized by 86.0% (n=380) of participants, while other risk factors were less consistently identified: diabetes mellitus (51.1%, n=226), hyperlipidemia (54.8%, n=242), smoking (57.0%, n=252), obesity (52.7%, n=233), and family history of stroke/TIA (59.7%, n=264). Asthma, urinary tract infections, and atrial fibrillation were less recognized as risk factors, with correct responses at 4.8% (n=21), 4.3% (n=19), and 25.3% (n=112) respectively.

Lastly, 48.0% (n=212) of participants correctly distinguished that TIA symptoms are shorter in duration compared to a stroke, reflecting a partial understanding of the temporal differences between these conditions. These results highlight a generally good understanding of TIA as a temporary and treatable condition and its risk factors but indicate areas for improvement in knowledge about specific risk factors and the urgency of TIA.

Table 3 illustrates participants' understanding of general management principles for TIA. Regarding the appropriate first action when experiencing TIA symptoms, a significant majority of participants (74.7%, n=330) correctly identified the need to immediately call an ambulance. In contrast, only 12.4% (n=55) suggested visiting a family doctor, and a minimal proportion recommended resting and monitoring the condition or watching it without seeking medical attention (3.4%, n=15; 0.7%, n=3; 0.2%, n=1, respectively). Additionally, 8.6% (n=38) were unsure of the correct response. When asked about commonly used drugs for TIA treatment, 64.5% (n=285) correctly identified blood thinners, whereas 2.7% (n=12) believed painkillers were used, and only 0.7% (n=3) thought antibiotics were appropriate. A significant portion (32.1%, n=142) did not know the correct treatment options.

The importance of early intervention in TIA management was well-recognized, with 79.6% (n=352)

Table 2.1: Evaluation of participants' knowledge and understanding of TIA symptoms, risk factors, and urgent care

Question	Response	Frequency (n=446)	Percentage (%)
1-TIA, is a temporary blockage of blood flow to the brain and the symptoms usually last less than five minutes?	Yes	255	57.7
	No	45	10.2
	I don't know	142	32.1

2-TIA is a warning sign of a future stroke ?	Yes	271	61.3
	No	49	11.1
	I don't know	122	27.6
3-TIA is an emergency condition?	Yes	281	63.6
	No	72	16.3
	I don't know	89	20.1
4- Advancing age is associated with Transient Ischemic Attack (TIA)	Yes	223	50.5
	No	109	24.7
	I don't know	110	24.9
5-Dose Transient Ischemic Attack (TIA) treatable?	Yes	244	55.2
	No	42	9.5
	I don't know	156	35.3

acknowledging it as extremely crucial. Conversely, 8.4% (n=37) deemed it moderately crucial, 0.9% (n=4) considered it not very crucial, and 11.1% (n=49) were unsure. Most participants understood the role of lifestyle factors in TIA prevention. A majority acknowledged that managing high blood pressure (59.5%, n=263), maintaining a healthy diet, and engaging in regular exercise (83.0%, n=367) were essential. Additionally, 80.5% (n=356) recognized the importance of controlling blood sugar and cholesterol levels. However, 26.9% (n=119) incorrectly thought that smoking cessation was not important for TIA prevention, while 55.0% (n=243) correctly affirmed its importance.

Overall, these results indicate a strong understanding of the critical aspects of TIA management and prevention, though there remains some confusion about the immediate steps to take and the significance of smoking cessation in prevention efforts

Table 2.2: Evaluation of participants' knowledge and understanding of TIA symptoms, risk factors, and urgent care

6-Which of the following do you believe are recognized risk (factors for TIA? (Select all that apply			
Hypertension	Yes	380	86.0
	No	62	14.0
Asthma	Yes	21	4.8
	No	421	95.2
Diabetes mellitus	Yes	226	51.1
	No	216	48.9
Hyperlipidemia	Yes	242	54.8
	No	200	45.2
Urinary tract infection	Yes	19	4.3
	No	423	95.7
Atrial fibrillation	Yes	112	25.3
	No	330	74.7
Smoking	Yes	252	57.0
	No	190	43.0
Obesity	Yes	233	52.7
	No	209	47.3
Family history of stroke/TIA	Yes	264	59.7
	No	178	40.3
7-How does TIA differ from a stroke in terms of symptom duration?	TIA symptoms are shorter in duration	212	48.0

Table 4 shows the correlation between participants' knowledge levels of TIA and their general characteristics. Knowledge of TIA varied significantly with age (p=0.018). Among those aged 20-30 years, 59.3% had good knowledge compared to only 7.2% of those under 20 years. Participants aged 31-40 years and 41-50 years had lower proportions of good knowledge (9.0% and 8.4%, respectively), while those over 60 years showed a similar pattern to the younger groups. There was a significant difference in knowledge levels between males and females (p=0.031). Males had a higher proportion of poor knowledge (57.4%) compared to females (42.6%), whereas females demonstrated a higher proportion of

moderate knowledge (58.4%) and good knowledge (47.3%) than males.

No significant difference in TIA knowledge levels was found between Saudis and non-Saudis (p=0.391), with both groups showing similar distribution across poor, moderate, and good knowledge categories. Educational attainment did not significantly affect knowledge levels (p=0.148). Participants with a Bachelor's degree had the highest proportion of good knowledge (68.3%), followed by those with a postgraduate degree (10.2%). High school

Table 3: Understanding of general management principles for TIA among participants

	Frequency(442)	%
11-If someone is experiencing TIA symptoms, what is the first action should be taken?		
Visit family doctor for consultation	55	12.4
Immediately call the ambulance	330	74.7

Rest for few hours and check the condition before going to the hospital	15	3.4
Rest for few days and check the condition before going to the hospital	3	0.7
Watch the condition without going to the hospital	1	0.2
I don't know	38	8.6
12- Which types of drugs are commonly used to treat TIA?		
Blood thinner	285	64.5
Painkillers	12	2.7
Antibiotics	3	0.7
I don't know	142	32.1
13-How crucial is early intervention in the management of TIA?		
Extremely crucial	352	79.6
Moderately crucial	37	8.4
Not very crucial	4	0.9
I don't know	49	11.1
14- Managing high blood pressure is not an essential component of TIA prevention?		
Yes	97	21.9
No	263	59.5
I don't know	82	18.6
15- healthy diet and regular exercise play an important role in preventing TIA?		
Yes	367	83.0
No	16	3.6
I don't know	59	13.3
16- Controlling blood sugar and cholesterol level play an important role in preventing TIA?		
Yes	356	80.5
No	17	3.8
I don't know	69	15.6
17- Smoking cession is not important in TIA prevention		
Yes	119	26.9
No	243	55.0
I don't know	80	18.1

graduates and diploma holders showed lower levels of good knowledge

There was a strong correlation between occupation and knowledge levels ($p<0.001$). Students had the highest proportion of good knowledge (47.3%), while employed individuals and the unemployed had lower proportions (32.3% and 20.4%, respectively). Marital status significantly influenced TIA knowledge ($p=0.002$). Unmarried participants had a higher proportion of good knowledge (67.7%) compared to married individuals (32.3%).

Income levels were also significantly associated with knowledge levels ($p=0.024$). Participants with an income of 0-5000 had the highest proportion of good knowledge (56.9%), while those with higher incomes showed lower proportions. There was no significant difference in knowledge based on personal history of stroke or TIA ($p=0.612$), with similar knowledge distribution across the categories.

These results highlight that age, sex, occupation, marital status, and income significantly influence knowledge about TIA, whereas educational level, nationality, and personal medical history do not.

DISCUSSION

TIA is a very important risk factor and warning sign of upcoming stroke,(Johnston et al., 2000; Kennedy et al., 2002) of those diagnosed of TIA approximately 11% will suffer a stroke in 3 months and the risk remains high for the upcoming months and years (Johnston et al., 2000; Whisnant & Wiebers, 1987; Whisnant et al., 1996; Wilterdink & Easton, 1992). Previous studies have shown that Saudi population have suboptimal health awareness with poor health related information (Abdel-Latif & Saad, 2019; Almubark et al., 2019). Abdel-Latif and Saad reported that 34.4% of Saudi population had basic health literacy whereas 43.8% had moderate literacy rate (Abdel-Latif & Saad, 2019). Similarly, in another study from Saudi Arabia including 3557 respondents, 46% participants had low literacy rates (Almubark et al., 2019). Good public awareness about TIA, its significance and management will share in decreasing the incidence of stroke and improve mortality and morbidity outcomes.

Our study included 442 participants, 94.3% of them were Saudis, and 52.3% were females and the most common age group was 20-30 age range (50.7%). 67.9% of them had a bachelor's degree, employed (39.8%) and most of them didn't have a history of previous TIA (98.6%). The demographic characteristics was comparable to a study conducted on the Japanese population (Akiyama & Hasegawa, 2013). Regarding risk factors many studies have found that apart from the duration of symptoms, the pathophysiology and the risk factors of TIA are similar to that of stroke (Dennis et al., 1989; Whisnant et al., 1999). Our population recognized hypertension (86%), smoking (57%), hyperlipidemia (54.8%) and diabetes mellitus (51.1%) as potential risk factors and correctly recognized

UTI (95.7%) and asthma (95.2%) as non-risk factors. Only 25.3% of the participants considered atrial fibrillation as a risk factor. Previous studies conducted in Saudi Arabia and Oman reported that participants

recognized hypertension as the most common risk factor for stroke and associated conditions similar to our study (Al Shafaee et al., 2006; AlOtaibi et al., 2017; Bakraa et al., 2021). For example, Bakraa et al. reported that 81.7% of the participants identified hypertension as a risk factor (Bakraa et al., 2021). Hypertension and psychological stress was reported by studies conducted in Lebanon and Morocco as the most common risk factors (Khalil & Lahoud, 2020; Kharbach et al., 2020; Tun et al., 2017). Hypertension, smoking, physical inactivity and diabetes was recognized by participants of a study conducted in USA (Reeves et al., 2002). On the other hand hypertension and diabetes millets were underappreciated in other studies (Alzayer et al., 2023; Hickey et al., 2009; Kim & Yoon, 1997; Malaeb et al., 2022; Sug Yoon et al., 2001; Sundseth et al., 2014).

Item		Poor (%) N	Moderate (%) N	Good (%) N	P-value
Age	Below 20	0 (0.0%)	16 (7.2%)	12 (7.2%)	0.018
	20-30	28 (51.9%)	97 (43.9%)	99 (59.3%)	
	31-40	7 (13.0%)	47 (21.3%)	15 (9.0%)	
	41-50	8 (14.8%)	28 (12.7%)	14 (8.4%)	
	51-60	8 (14.8%)	25 (11.3%)	18 (10.8%)	
	More than 60	3 (5.6%)	8 (3.6%)	9 (5.4%)	
Sex	Male	31 (57.4%)	92 (41.6%)	88 (52.7%)	0.031
	Female	23 (42.6%)	129 (58.4%)	79 (47.3%)	
Nationality	Saudi	49 (90.7%)	211 (95.5%)	157 (94.0%)	0.391
	Non-Saudi	5 (9.3%)	10 (4.5%)	10 (6.0%)	
Educational level	High school Degree	14 (25.9%)	29 (13.1%)	32 (19.2%)	0.148
	Diploma Degree	4 (7.4%)	9 (4.1%)	4 (2.4%)	
	Bachelor's Degree	30 (55.6%)	156 (70.6%)	114 (68.3%)	
	Postgraduate Degree	6 (11.1%)	27 (12.2%)	17 (10.2%)	
occupation	Student	14 (25.9%)	59 (26.7%)	79 (47.3%)	0.001>
	Employed	20 (37.0%)	102 (46.2%)	54 (32.3%)	
	Unemployed	20 (37.0%)	60 (27.1%)	34 (20.4%)	
Marital status	Married	32 (59.3%)	94 (42.5%)	54 (32.3%)	0.002
	Unmarried	22 (40.7%)	127 (57.5%)	113 (67.7%)	
Income	0-5000	28 (51.9%)	102 (46.2%)	95 (56.9%)	0.024
	5001-10,000	14 (25.9%)	44 (19.9%)	18 (10.8%)	
	10,001-15,000	8 (14.8%)	43 (19.5%)	25 (15.0%)	
	15,001-20,000	4 (7.4%)	26 (11.8%)	18 (10.8%)	
	More than 20,000	0 (0.0%)	6 (2.7%)	11 (6.6%)	
History of stroke or TIA	Yes	0 (0.0%)	3 (1.4%)	3 (1.8%)	0.612
	No	54 (100.0%)	218 (98.6%)	164 (98.2%)	

Although there are multiple literature evaluating the knowledge regarding stroke and TIA together there is very limited evidence available evaluating the knowledge regarding TIA alone and this was reported also by another study (Johnston et al., 2003). A study by Johnston et al. investigated the prevalence and knowledge of TIA in US adults. Their study included 10,112 participants. Their findings showed that only 8.2% could define TIA whereas 8.6% were able to detect a TIA symptom. Males, individuals with low income, and less educated were less knowledgeable regarding TIA (Johnston et al., 2003).

Of our population 55.2% believed it's treatable, 63.6% recognized TIA as an emergency condition AND 74.7% would call an ambulance if someone was experiencing a TIA. 79.6% understood the importance of the early intervention and 64.5% knows that blood thinners are used in the management. Similarly, another Saudi study have reported that 87% of the participants recognized the need of urgent medical seeking (Basfar et al., 2016). Other studies in Oman, Lebanon, Jordan and Spain were aware of the importance of early seeking medical advice (Al Shafaee et al., 2006; Barakat et al., 2021; Malaeb et al., 2022; Segura et al., 2003). On the other hand a study conducted on a Chinese population conducted on patients diagnosed with TIA reported that 86% of the patients didn't seek medical advice and therefore didn't received appropriate care and that patients with TIA was underdiagnosed (Wang YiLong et al., 2015). And this explains the low hospitalization rate of patients with TIA (Wang et al., 2011). More over delayed seeking of medical advice was common even among those with TIA diagnosis by a physician and 16% presenting for evaluation more than a week after the diagnosis (Malaeb et al., 2022). Many people even though there is no need for medical attention after a TIA incident as reported by other studies (Shelton & Gaines, 1995). Another Saudi study have reported that less than the half of its participants would take a patient with stroke immediately to hospital (Alzayer et al., 2023). Another study conducted in Saudi Arabia have found that older citizens failed to recognize the importance of calling the emergency or taking the patient to the hospital and would rather advise him to stay at home and rest to recover from the stroke (Alreshidi et al., 2017). A Japanese study have reported that 30% of the respondents didn't consider TIA as an emergency (Akiyama & Hasegawa, 2013). 57.7% of our participants clearly understood that TIA is a temporary blockage of the blood flow, 61.3% recognized TIA as a warning sign of a stroke and 48% clearly identified that TIA had a shorter duration. A study conducted in China reported that only 3.08% of the participants have heard of TIA and that it produces symptoms similar to that of stroke and were able to mention at least one of its typical symptoms (Wang YiLong et al., 2015). A systematic review reported that knowledge regarding stroke was suboptimal among different populations (Stroebele et al., 2011). Many reviews also reported low level of knowledge regarding stroke even among hospitalized patients (Jones et al., 2010; Nicol & Thrift, 2005; Soto-Cámara et al., 2020). Johnston et al., 2003 also reported that only 8.2% were able to identify TIA and 8.6% were able to mention at least one symptom which reflects low knowledge level (Johnston et al., 2003). Another study have reported that 57% could identify the warning signs of TIA and stroke with only 32% consider numbness and weakness as warning signs (Pancioli et al., 1998). Becker et al., 2001 reported that 39% of the participants could name a symptom of stroke or TIA (Becker et al., 2001). These discrepancies could be attributed to the difference in demographical characteristic for each study such as education level and age, type of the participants, evaluation method and tools used for evaluation. The reason behind the delay in seeking evaluation and medical help appears to be due to the lack of knowledge about TIA symptoms and consequences and the serious nature of the stroke (Shelton & Gaines, 1995; Williams et al., 1997). The resolution of symptoms usually perceived by the public as the medical attention is no longer needed after a TIA attack (Rodriguez et al., 2001). As a result the patient usually presented to the hospital with a full stroke after a previous TIA (Akiyama & Hasegawa, 2013). Reducing the burden of TIA as a risk factor to stroke could extremely decrease the burden of stroke itself and because of the high incidence of stroke this can have a substantial effect on the public health (Johnston et al., 2003). Providing early treatment and medical care could reduce the incidence of stroke after TIA (Geeganage et al., 2012; Lavallée et al., 2007; Rothwell et al., 2007; Wang et al., 2013). So as most of literature agrees that the knowledge regarding TIA is deficient, educating the public is a recommended priority and can have a major impact on the public health. Akiyama et al., 2013 reported that the television and related electronic media was the primary source of information about TIA and stroke and that the conventional education programs as lectures, hand-distributed flyers and posters are ineffective so we recommend using the modern day media to conduct programs directed to elevate the awareness about the health conditions like TIA (Akiyama & Hasegawa, 2013).

In our study 20-30 age group had the highest good knowledge level. Akiyama et al., 2013 reported lack of knowledge about the urgency of the TIA which was more apparent in young more than in adult participants (Akiyama & Hasegawa, 2013). On the other hand Alreshidi et al., 2017 also reported that older Saudi citizens failed to recognize the urgency of transferring a patient with a stroke to the hospital (Alreshidi et al., 2017). These differences could be attributed to other demographical factors such as education level and cultural aspects and differences in selection and evaluation tools and other methodological aspects.

To better understand TIA awareness in general public, it is important to understand cultural and socioeconomic that influence health knowledge, attitudes, and behaviors. Culture can be defined as shared practices, values, and beliefs that are inherited through generations and shaped by factors such as religion, ethnicity, and societal frameworks. In Arabic and Muslim societies, cultural customs and beliefs have a profound impact on healthcare (Al-Yateem et al., 2023). These beliefs influence perceptions of individuals related to health and illness. According to Alsharif et al., culture and religion play a significant role in shaping the belief of Saudi population (Alsharif et al., 2023). Furthermore, cultural beliefs about stroke and neurological conditions may impact TIA awareness.Age, sex, occupation, marital status and income appears to affect the knowledge in which males predominates good

and poor knowledge level while female predominates moderate knowledge category. Gender disparities in healthcare in Saudi Arabia has been documented previously in various studies (Almalki & Ashdown, 2024; Alzaaqi et al., 2025). A study by Habib et al. reported that gender disparities exists in healthcare access in Saudi Arabia (Habib et al., 2022). In some cases, women may not have immediate access to healthcare facilities or may require family permission before seeking care, which could further delay medical intervention for TIA. Similarly, regarding economic status, significant difference was observed in individuals. This aligns with previous systematic review Stack et al., who reported that increase in knowledge level related to stroke was associated with higher socioeconomic parameters (Stack et al., 2020). Similarly, another study showed that lower-income individuals tend to have lower awareness of TIA and stroke symptoms, often due to limited access to health education resources (Ramírez-Moreno et al., 2016). In the present study, students had better knowledge than other occupations and un-married had better knowledge than married. On the other hand educational level, history of stroke and nationality didn't affect the knowledge level according to our results. The findings of the present study regarding non-significant influence of education level on knowledge level is not consistent with previous studies which have shown that educational level a significant factor in knowledge and attitude of an individual (Alhazmi et al., 2020). Similarly, Abutaima et al., in their study showed that participants with university education had highest awareness level about stroke in Saudi Arabia (Abutaima et al., 2021). Becker et al., 2001 reported lower knowledge level among men, groups with low income and education (Becker et al., 2001). Two studies conducted in USA found that ethnicity, education and income are independent risk factors of knowledge regarding TIA with those with lower incomes, education and those belong to minority population having lower knowledge (Becker et al., 2001; Johnston et al., 2003). Also Johnston et al., 2003 presumed that those with poorer education and lower socioeconomic status have a greater chance of errors in recall (Johnston et al., 2003). Wang 2015 found that higher education, living in a more developed area, regular exercise, those with dyslipidemia and current drinking was associate with a higher level of knowledge, while living in rural areas, central obesity, current smoking and lacking vegetables and fruits in diet was associated with a lower level of knowledge (Wang YiLong et al., 2015). We found that addressing the socioeconomic factors was limited across most of the studies in this topic (Bakraa et al., 2021). So we reveal and the need of high quality research addressing this specific topic explicitly.

Akiyama et al., 2013 also reported lower knowledge about the urgency of TIA among women compared to men (Akiyama & Hasegawa, 2013). Rural areas and lower education may be associated with higher consumption of health care resources, but less commitment to risk factor improvement plans (Basfar et al., 2016; Johnston et al., 2003). Many studies in different countries also found that increasing educational level and occupation increases the level of knowledge regarding stroke (Al Shafaee et al., 2006; Alreshidi et al., 2017; Alzayer et al., 2023; Barakat et al., 2021; Basfar et al., 2016; Duque et al., 2015; Hickey et al., 2009; Malaeb et al., 2022; Pancioli et al., 1998; Segura et al., 2003; Sundseth et al., 2014).

Most studies shared common limitations in the term of recall bias due to the nature of these studies and that the recall of each patient is not similar to the other depending on the age, educational level, socioeconomic status and other factors which affects the reliability of results also underestimation of the disease was a presumed limitation as not all patients presented to the hospitals (Akiyama & Hasegawa, 2013; Johnston et al., 2003; Wang YiLong et al., 2015).

The findings of this study have significant public health implications. This study has underscored the need for urgent public health campaign on TIA recognition and management. Awareness to at risk individuals can be give via digital media, television programs, and social media platforms. For example, Hillsdon et al. reported that patients may not perceive information during acute stage of their diagnosis and may later refer internet and peers for information regarding prevention of TIA (Hillsdon et al., 2013). Another way to raise awareness in at risk patients is through healthcare providers. Integrating TIA awareness into routine healthcare visits, such as primary care check-ups, can help patients better understand their risk factors and preventive measures. Furthermore, policies should be made to address cultural and gender disparities in access to care regarding TIA (Akiyama & Hasegawa, 2013)

Strengths and limitations

This study offers comprehensive insights into TIA awareness in the Western region of Saudi Arabia, using a robust sample size of 442 participants. The diverse demographic data, including age, education level, and employment status, enhances the study's representativeness. The findings highlight critical gaps in public knowledge and contribute to the understanding of how awareness varies by demographic factors, which can inform targeted educational strategies.

The cross-sectional design limits the ability to infer causality or long-term effects. The reliance on self-reported data may introduce response bias, and the study's sample, which is predominantly young and educated, may not fully capture the awareness levels of other population segments. Additionally, the study did not evaluate the effectiveness of specific interventions or educational programs aimed at improving TIA awareness.

Future directions and recommendations

Future research should focus on implementing and evaluating targeted educational interventions to improve TIA awareness across diverse demographics. Longitudinal studies could assess the long-term impact of these interventions on stroke prevention and management. Public health campaigns should be designed to address identified knowledge gaps and misconceptions about TIA. Efforts should also include community-based outreach programs and integration of TIA education into routine healthcare practices to enhance overall public understanding and response to TIA symptoms.

CONCLUSION AND RECOMMENDATION

The study underscores a significant gap in awareness of TIA among adults in the Western region of Saudi Arabia. Despite

some understanding of risk factors, many participants lack knowledge about the urgency and management of TIA. This gap in awareness highlights the need for targeted educational initiatives and public health campaigns to improve understanding and promote timely medical intervention. Addressing these gaps is essential for reducing stroke risk and improving health outcomes in the region. Enhanced public education and healthcare integration are crucial for fostering better awareness and prevention strategies.

AUTHOR CONTRIBUTION

All authors contributed to the research's design and implantation. Research material preparation, data collection, and analysis were performed by Mohammad U. Almatani, Mohammed F. Ghannam, Ammar M. Juraybi. Mohammad A. Ashshi, Jawad M. felemban, Bandar R. Alotaibi wrote the first draft of the manuscript. All authors read and approved the final manuscript after supervision by Omar Babateen.

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ETHICAL CONSIDERATION

The Biomedical Research Ethics Committee at Umm Al-Qura University in Makkah City, Saudi Arabia approved this study (approval number HAPO-02-K-012-2024-01-1977).

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

PARTICIPANTS CONSENT

We obtained an informed consent from all participants before they completed the questionnaire, ensured their voluntary participation and the confidentiality of their provided data.

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Not Applicable

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