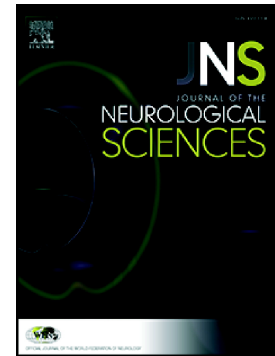# Accepted Manuscript

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Public Stroke Knowledge, Awareness, and Response to Acute Stroke: Multi-center study from 4 Egyptian Governorates

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Abstract

Background and Purpose—Acute stroke treatment has significantly improved over the years in Egypt. However, there is often notable delay in pre-hospital and in-hospital management of acute stroke patients. The delay may be largely attributed to poor stroke knowledge and awareness of the general public and this study was aimed at the evaluation of the abovementioned factors.

Methods—Descriptive cross-sectional study involving 1154 participants from 4 governorates using a questionnaire in Arabic, collecting sociodemographic data, participants' risk factors, and knowledge and stroke awareness (risk factors, symptoms, prevention, treatment and prognosis, action in response to acute stroke). Data were collected during the World stroke day October 29, 2015.

Results—Study participants were found to have a low level of awareness of stroke with median percent score of 35.7% and interquartile range (IQR) of 17.86. Higher income, level of education, having risk factors and knowing someone with stroke were significant predictors of a higher level of stroke awareness.

Conclusion—In general, low public stroke awareness has been detected among Egyptians, and this is a call for healthcare authorities to invest inpublic education programmes among the Egyptian population.

Key Words: Stroke, Knowledge, Awareness, Stroke response, Egypt, Developing countries

1. Introduction:

The World Health Organization (WHO) estimates that 85% of stroke deaths now occur in low and middle-income countries including Egypt, the Middle East's most populated country with an estimated population of 92 million inhabitants[1].

Acute stroke treatment has improved significantly since the implementation of specialised stroke units and thrombolytic therapy. Achieving efficient use of thrombolytic therapy within the right time window requires multilevel intervention and coordination to influence the knowledge and behaviour of the public, the response of Emergency Medical Services (EMS), and the coordination of diagnostic and treatment facilities at the hospitals[2,3]. One vital component for the success of stroke management and its timely implementation is to improve public knowledge about stroke, focusing on individuals at high risk and their caregivers[4].

Not only does Egypt suffer a large number of new strokes per year estimated around 150000 to 210000 events[5], but also there is evidence of a notable practice gap including significant delaysin pre-hospital as well as in-hospital management of acute stroke.

This delay may be largely attributed to poor public stroke knowledge and awareness; this isan important issue that has not been well studied. The most comprehensive systematic review article byJones et al., (2010) included 39 studies[6], with only one study from an Arab country; Oman[7], and none were from Africa. This provided the rationale and need for this study, aiming to shed some light on this under-investigated aspect of stroke management.

2. Objectives:

The aim of the present study is to assess stroke nowledge, and awareness ofrisk factors, warning symptoms, prevention, treatment, and prognosis, as well as response to suspected acute stroke among participants from the general population of four Egyptian governorates.

3. Methods:

This study is a descriptive cross-sectional multi-centre study conducted in four governorates:Cairo (the urban capital), Tanta (city in Northern Egypt), Assiut (city in Southern Egypt), and Beni-Suef (mainly rural city near Cairo). Theserepresent Egypt's three main regions: Central capital, Northern Nile river delta, and Southern Upper Egypt.

Quota non-random sample technique was used to collect data from a total of 1154 participants. The research was conducted according to the principles of the Declaration of Helsinki. All participants gave informed written consent.

Participants were interviewed in person by doctors or medical students using a questionnaire in Arabic for data collection. This questionnaire was prepared after careful review of similar stroke awareness articles including the American Stroke Association online awareness materials. Close ended questions which allow more than one choice were used. Content validity of the questionnaire was revised by three neurologists and edited accordingly. It included sociodemographic data (age, sex, education and income), participants' risk factors, and knowledge about stroke (risk factors, symptoms,

prevention, treatment and prognosis). Time for filling the questionnaire averaged <10 minutes. Data were collected during the World stroke day October 29, 2015.

4. Statistical Analysis:

Data were coded and entered using Excel 2010. SPSS version 20 was used to analyse the data. Qualitative data were summarized using number and percent. Quantitative data were summarized using suitable measures of central tendency and dispersions according to distribution of data.

Total stroke awareness score was calculated out of 28 points. Each stroke knowledge question scored 1 for correct answer. Stepwise linear regression analysis was done to detect significant predictors of stroke awareness among study population. A "P" value of less than or equal to 0.05 was considered statistically significant.

5. Results:

A total of 1154 participants were interviewed and completed the designed questionnaire. The participants' demographic details; age, sex, education level and monthly income, place for receiving medical care and prevalence of stroke risk factors among participants are presented in Tables 1 and 2. The level of knowledge regarding acutestroke symptoms, predisposing risk factors, stroke prevention, and management strategies are illustrated in Table 3, Table 4 and Table 5. Study participants were found to have low level of awareness of stroke with minimum score of 3.6%, maximum of 100%, median percent score of 35.7% and interquartile range (IQR) of 17.86 (Figure 1).

Table 1. Socio-demographic characteristics of study participants (n=1154).

Variable		Number (%)
Age groups **(in years)**	<25	415 (36%)
	25-35	182 (15.8%)
	35-45	311 (26.9%)
	45-55	162 (14%)
	55-65	39 (3.4%)
	>65	45 (3.9%)
Sex:	Male	562 (48.7%)
	Female	592 (51.3%)
Education:	Illiterate	52 (4.5%)
	Primary	446 (38.6%)
	Secondary	225 (19.5%)
	University	431 (37.3%)
Monthly Income (USD)	<50	516 (44.7%)
	50-150	428 (37.1%)
	150-300	131 (11.4%)
	300-500	53 (4.6%)
	>500	26 (2.3%)

Table 2. Stroke risk factors and places of receiving medical care of study participants (n=1154).

Variable		Number (%)
Stroke risk factors*:	Hypertension	230 (19.9%)
	Diabetes	165 (14.3%)
	Hypercholesterolemia	55 (4.8%)
Place of receiving medical care*:	Public hospital	622 (53.9%)
	Private hospital	311 (26.9%)
	Polyclinic	30 (2.6%)
	Private clinic	108 (9.4%)
	Home visit by physician	16 (1.4%)
	Pharmacy	98 (8.5%)

*questions with possible more than one answer

Table 3. The knowledge and awareness among study participants regarding organ affected and symptoms of stroke (n=1154).

Item	Correct answer No. (%)
The brain is the affected organ in stroke.	862 (74.7)
Stroke symptoms:	
• Face weakness	654 (55.9)
• Speech impairment	575 (49.8)
• Loss of consciousness	478 (41.4)
• Impairment of balance	442 (38.3)
• Headache	397 (34.4)
• Visual impairment	321 (27.8)
• All of the above	213 (18.5)

Table 4. The knowledge and awareness among study participants regarding risk factors and prevention of stroke (n=1154).

Item	Correct answer No. (%)
Risk factors for stroke:	
• Hypertension	842 (73)
• Smoking	532 (46.1)
• High cholesterol levels	510 (44.2)
• Diabetes mellitus	394 (34.1)
• Obesity	181 (15.7)
• Hormonal	133 (11.5)
• All of the above	126 (10.9)
Prevention of stroke:	
• Hypertension control	788 (68.3)
• Cessation of (quit)smoking	546 (47.3)
• Healthy diet	539 (46.7)
• Physical activity	517 (44.8)
• Lowering cholesterol levels	461 (39.9)
• Diabetes mellitus control	366 (31.7)
• All of the above	205 (17.8)
Stroke Prophylaxis medications:	
• Hypertension treatment	571 (49.5)
• Aspirin	561 (48.6)

• Lipid lowering medications	374 (32.4)
• Diabetes treatment	287 (24.9)
• Clopidogrel	163 (14.1)
• All of the above	117 (10.1)

Table 5. The knowledge and awareness among study participants regarding stroke treatment and the response when stroke was suspected (n=1154).

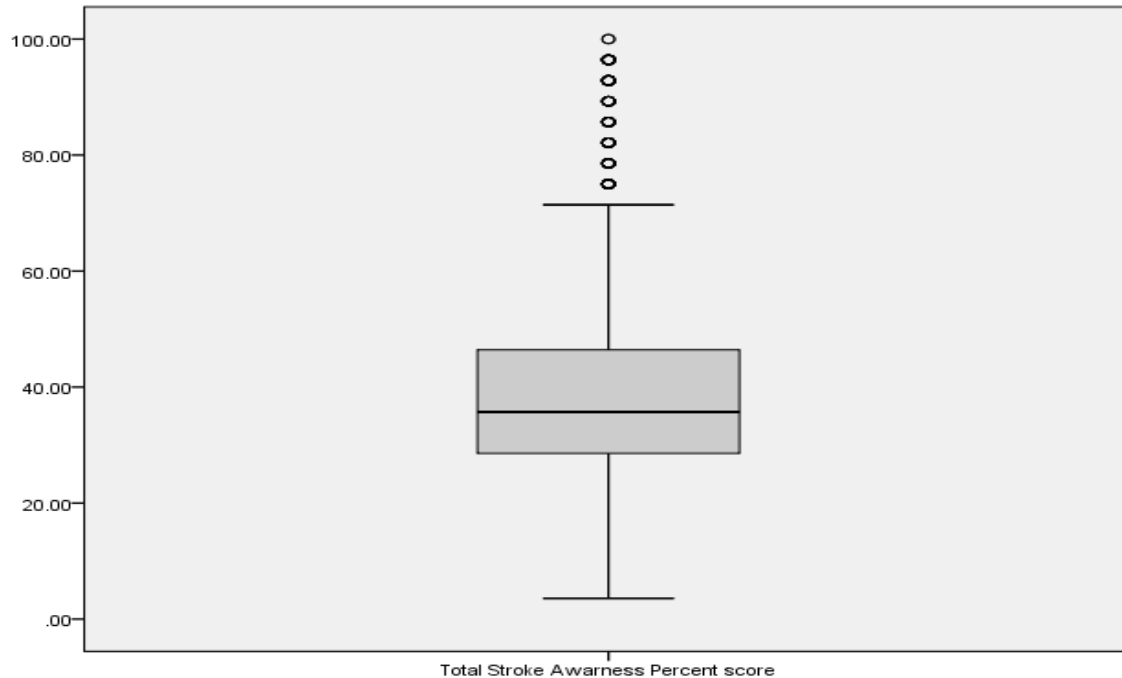| Item	Correct answer No. (%)
Treatment of stroke:	
• Stroke can be treated	521 (45.1)
• Best period for stroke treatment is < 4.5 hours	276 (23.9)
• Clot dissolving treatment (Alteplase) identification	102 (8.8)
What to do when stroke is suspected:	
• Wait	430 (37.3)
• Call EMS	396 (34.3)
• Call doctor	138 (12)
• Give analgesics	104 (9)
• Transfer to neurologist	86 (7.5)

Figure 1.Box and whisker plot showstotal stroke awareness percent score among study participants.

Multiple linear regression analysis showed that higher income, higher level of education, having stroke risk factors, and knowing someone with stroke were significant predictors of a higher level of stroke awareness among study population $R^2 = 0.041$ (Table 6).

Table 6. Predictors of stroke awareness among study population

Predictors	P value	Regression coefficient (B)	95% CI of B	R^2
• **Income**	0.001	1.962	(3.16 – 0.76)	
• **Knowing someone with stroke**	0.001	3.798	(1.57 – 6.02)	
• **Education**	0.001	2.016	(3.20 – 0.83)	0.041
• **Having stroke risk factor**	0.004	3.343	(3.34 – 1.14)	

Excluded variables: Age and Sex

6. Discussion:

The current study showed unsatisfactory level of stroke awareness, knowledge, and poor response in the acute stroke care among Egyptians .This sample revealed that about 75% of the respondents could correctly identify the brain as the affected organ in stroke compared to only half of an Irish Semi-Rural study participants[8]. Regarding stroke risk factor identification, participants mainly identified hypertension (73%), smoking (46.1%), high cholesterol (44.2%), and diabetes (34.1%). That was in accordance with most similar studies, where knowledge of hypertension as a risk factor ranged from 20% to 94%, whilst awareness of smoking as a risk factor ranged from 23% to 75%[6].

Importantly, 35.3% of the participants could correctly name at least one risk factor, while 21% could correctly name 2 risk factors, with34.9% of them naming 3 or more risk factors.10.9% of respondents correctly identified all risk factors for stroke, while 8.8% of respondents were unable to identify a single risk factor. The ability to name one or more risk factors showed a wide variation between other similar studies, ranging from 18% [9] to 94% with open-ended questions,andfrom 42% to 97% with closed questions[6.]

Regarding the knowledge of measures to reduce stroke risk, the current study participants correctly recognized the following: control of hypertension (68.3%), smoking cessation (47.3%), healthy diet (46.7%), Physical Activity (44.8%), cholesterol lowering (39.9%), and diabetes control (31.7%).

Study participants were able to identify the following stroke warning symptoms; facial weakness (55.9%), speech disturbance (49.8%), loss of consciousness (41.4%), impairment of balance (38.3%), headache (34.4%), and visual loss (27.8%). The ability to name at least one symptom of stroke varied significantly between studies and ranged from 25% to 100%[6].

Similar to risk factor identification, the recognition of stroke symptoms varied according to the nature of the questions posed. In one study, only 24% of participants could identify numbness or weakness as symptoms of stroke when asked open-ended questions, compared with 95% when asked closed-ended questions[10].

According to our study, the participants' responses as to actions taken ifa close relative was suspected to be having an acute stroke varied as follows:37.3% of respondents would wait for spontaneous recovery, 34.3%would call emergency services, 12% would call a doctor for a home visit, 9% would give the patient analgesics, and 7.5% would take the patient to a clinic. That means about nearly half of the respondents (46.3%) wouldtake no action. This percent is very high compared to similar studies where only <10% would take actions other than calling emergency services or going to a hospital[6].

Of concern is that these alarming stroke awareness results among the general public seem to be shared by some healthcare professionals in Egypt. A recent survey at two university hospitals revealed that more than a third of healthcare professionals failed to correctly identify symptoms of acute stroke, and only half of them would advise a suspected acute stroke patient to immediately go to a hospital[11].

Finally, regarding the knowledge of Stroke Treatment, 23.9% of study participants knew the best period for stroke treatment and only 8.8% correctly identified the name of the thrombolytic agentAlteplase.Few studies asked about acute treatment for stroke: one studystated that 67.7% believed that some kind of treatment was available, with only one individual out of 801sayingthat "some kind of medicine" could be given intravenously in the first 3 hours[12]. Another study found that no more than (16.8%) had heard about Alteplase, with only 1.4%knowingits correct effective time window for use[9].In a third study,only 23.3% of respondents were aware of thrombolytic therapy for acute ischemic

stroke, and of this number only59.9% knew about the time window[13]. In a study involving hospital clinical staff, only 49% were aware of thrombolysis treatment, and only 48% could identify the correct time window[14].

7. Conclusion:

Findings from our study demonstrates low public awareness in our Egyptian population sample. This is an alarming situation requiring healthcare authorities in Egypt to invest in Public education programmes to increase knowledge of stroke and what to do in the event of a suspected acute stroke. These measures are imperative in order to improve stroke awareness and subsequent appropriate management among the Egyptian population.

8. Source of Funding:

None

9. Conflicts of interests and Disclosures:

None

10. References:

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Highlights

- The study participants from 4 Egyptian governorates had low level of knowledge and awareness of stroke.
- Higher income, level of education, having risk factors and knowing someone with stroke were significant predictors of higher level of stroke awareness among study group.
- Public education programmes to increase knowledge and awareness of stroke are necessary to improve stroke management among Egyptian population.