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Public stroke awareness among Gharbia governorate inhabitants: a cross-sectional study

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Abstract

Background Stroke is the most common acquired neurological disease in the adult population worldwide with an incidence of 16 million new cases every year responsible for about 6.1 million deaths and 130.6 million disability-adjusted life-years (DALYs). The objectives of this work were to study the level of stroke awareness and the proper response for suspected stroke patients in urban and rural areas of Tanta City, Egypt. The study was conducted on 1869 Egyptian Citizens; 908 and 961 reside in urban and rural areas, respectively, who were submitted to a face-to-face interview using the stroke awareness questionnaire (Arabic version).

Results Rural participants showed a significant reduction in acute cerebrovascular stroke (CVS) awareness and knowledge including the most affected organ by CVS, what are the risk factors, what are the early stroke symptoms, is there specific treatment for acute ischemic stroke, and what is the proper reaction when confronted with a case of acute CVS?

Conclusion Urban populations have better recognition of stroke risk factors, early stroke symptoms, and the proper response when confronted with a case of acute CVS when compared with rural people possibly due to better socio-economic status and higher educational levels.

Keywords Acute ischemic stroke, Early stroke management, Stroke awareness, Urban and rural areas

Introduction

During much of the twentieth century, the medical profession held a nihilistic view regarding acute ischemic stroke (AIS) management, and it was believed that little could be done to alter the natural history of the condition [1]. However, the past two decades witnessed a quantum leap in early stroke management, the most important of which is the growing use and expanded eligibility of IV thrombolysis (IVT) and mechanical thrombectomy (MT) which changed our visions of stroke from a largely untreatable condition in its acute phase to a true medical emergency that is potentially treatable and sometimes curable [2]. However, the use of such treatment modalities is limited by the short time window from symptom onset to recanalization procedures (4.5 h for IVT and 6 h for MT) resulting in losing the opportunity for their use in many potentially eligible patients [3].

Developed countries made good use of this opportunity through extensive stroke awareness programs with consecutive regression of stroke-related mortality to become the fifth cause of death. Unfortunately, low, and middle-income countries did not follow a parallel way which maintained stroke to still be the second cause of

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death [4]. In Egypt, the incidence of stroke is 240/100,000 (250,000 new stroke patients per year), 10% of whom die very early within 1-month post-stroke, and the remainder is left with variable degrees of disabilities which necessitate big changes in stroke logistics face this public health problem [5].

Many studies showed that early stroke treatment delay is common, but the patterns and causes vary a lot among different populations and regions which necessitate tailored solutions suitable for the local health problems [6]. One of the most important influencing factors is the residence which greatly affects stroke literacy and the best way of dealing with early stroke patients. Many faulty customs and traditions may result in losing the opportunity for reperfusion therapies with a resultant poorer stroke outcomes. Till now there is no universal definition distinguishing rural from urban communities which often leads to unnecessary confusion and unwanted mismatches in program eligibility. Researchers often apply criteria related to settlement size, population density, or economic advancement which reflects multidimensional concepts [7]. In the USA, an urbanized area is defined as adjacent, densely settled census block groups that meet minimum population density requirements of at least 50,000 people. In Egypt, rural areas are defined as the areas in which most people work in agriculture, herding, or fishing. The number of inhabitants is not a parameter as the villages range in population from 500 to > 10,000 [8].

The aim of this work ass to study and compare the level of awareness and knowledge of risk factors, early warning symptoms, and the proper response for suspected stroke patients in urban and rural areas of Tanta City, Egypt.

Methods

This work was an observational randomized cross-sectional study conducted on a sample of 1869 Egyptian Citizens, Tanta City, Gharbia Governorate. Included subjects were collected from inhabitants and passengers of Route of Shuber till child garden who represented the urban sample (group-I) and inhabitants of Shuber countryside represented rural areas (group-II). The study was held in the period from the 1st of February till the end of March 2022.

The study protocol was approved by the Research Ethics Committee and Quality Assurance Unit (approval code: 35278/02/22), participation in the study was voluntary, and written informed consents were approved by all participants.

The study was conducted through a face-to-face interview between participants and doctors or medical students using a stroke awareness questionnaire held in Arabic (the mother language of participants) for a better understanding of the questions. The questionnaire was adopted from similar stroke awareness articles including the American Stroke Association online awareness materials. The content validity of the questionnaire was revised by three neurologists and edited accordingly.

Exclusion criteria encompassed people who disagreed to complete the interview, pediatric populations (< 18 years) and non-Egyptians as well as healthcare professionals to avoid selection bias due to their higher level of medical knowledge than the general population.

The study's questionnaire started with a message that explain the objectives and the benefits of our study, confirm the confidentiality of collected data, and asked for consent to complete its application. It also included 16 questions regarding the sociodemographic data (age, gender, level of education, and level of income), chronic diseases as well as knowledge and attitude of participants toward stroke including risk factors, symptoms, prevention, prognosis, and best response in case of acute early stroke settings (Additional file 1).

In this study, it was difficult to get such knowledge by open-ended questions, but it became easy for people to reach their answers when we gave the options in close-ended ones in a one-to-one interview with a trial of using open-ended questions first to see if it affects their answers or not which was giving wrong impressions about their real knowledge. Studied persons were divided regarding their monthly income according to the World Bank Group Criteria into below average, average, and above average if their income is $\leq$1500, 155–3000, and > 3000 Egyptian pounds, respectively. Regarding the educational level, studied individuals were divided according to years of education into $\leq$6, 6–9, 9–12, and > 12 years.

Statistical analysis was performed using SPSS Prism, version 20, 2013 created by IBM, Illinois, Chicago, USA. Categorical variable differences were analyzed using Chi-square while numerical ones were analyzed by Student's *t*-test. Regression analysis was used to study the influence of one or more independent variables on a dependent variable. *P*-value $\leq$ 0.05 was considered statistically significant.

Results

The present study included 1869 persons answered a questionnaire checking their stroke awareness; 908 and 961 reside in urban and rural areas, respectively. The age of the studied urban subjects was 18–75 (25.95 ± 10.3) years which was significantly lower than rural subjects whose age was 18–81 years (38.73 ± 15.81) with *p*-values < 0.001. Regarding sex, the urban group showed significantly higher female sex compared to the rural group (*p*-value < 0.001). At the same time, the present study showed highly significant increases in both monthly

income and educational level of urban participants compared to rural ones with a p-value < 0.001. At the same time, urban participants showed highly significant increases in the incidence of diabetes mellitus (DM), rheumatic fever, coronary heart diseases, hypertension, dyslipidemia, and smoking compared to rural participants (p-value < 0.05) (Table 1).

The results identified a lack of interest in getting medical information either from the newspapers, TV programs, or even social media in a large sector of included participants without a significant difference between urban and rural participants (88.7% versus 88.3%, respectively; p-value = 0.775). At the same time, the study revealed a significant increase in getting medical care from the general health centers and rural medical units under the management of the Egyptian ministry of health as well as pharmacists and paramedical persons in rural participants compared to urban ones with p-value 0.002, < 0.001 and < 0.001, respectively. On the other hand, urban contributors showed a significant increase in getting medical care from private clinics compared to urban ones (p-value < 0.001). Both groups showed no significant differences in getting medical care from general hospital clinics as well as emergency departments with a p-value > 0.05. The study also showed that 94.6% of urban and 93% of rural participants sought medical consultations only, when necessary without any significant difference between both groups (p-value = 0.084). Only 5.4% and 7% of the urban and rural population undergo regular medical consultations at weekly, monthly, or annual intervals (Table 2).

Regarding knowledge and awareness of the studied participants of cerebrovascular stroke, the results revealed that 91.3% of urban versus 73.6% of rural participants know that the brain is the primary organ affected by acute CVS (p-value < 0.001). The urban population was also significantly better aware of stroke risk factors including hypertension, smoking, and dyslipidemia compared to rural studied persons (p-value < 0.001). They also show better knowledge regarding early stroke symptoms compared to rural participants. Only 2.1% of urban and 11.2% of rural failed to mention one of the common symptoms of stroke (p-value < 0.001). Most of the studied urban and rural participants answered that stroke is a preventable disease, which could be ascertained through control of risk factors including hypertension, smoking cessation, dyslipidemia, daily exercise, and healthy diet

Table 1 Sociodemographic characteristics of participants

	Urban (*n*: 908)	Rural (*n*: 961)	Chi-square	
			X^2	*p*-value
Gender				
Male	347 (38.2%)	446 (46.4%)	12.83	< 0.001*
Female	561 (61.8%)	515 (53.6%)		
Educational level				
≤ 6 years	132 (14.5%)	54 (5.6%)	441.17	< 0.001*
6–9 years	67 (7.4%)	162 (16.9%)		
9–12 years	94 (10.6%)	463 (48.2%)		
> 12 years	615 (67.5%)	282 (29.3%)		
Monthly income				
Below average	221 (24.3%)	325 (33.8%)	145.73	< 0.001*
Average	464 (51.1%)	497 (51.7%)		
Above average	103 (11.3%)	71 (7.4%)		
Chronic illness and vascular risks				
Asthma	18 (2%)	28 (2.9%)	1.69	0.19
Diabetes mellitus	33 (3.6%)	106 (11%)	37.1	< 0.001*
Rheumatic fever	17 (1.9%)	39 (4.1%)	7.68	0.006*
Cardiovascular diseases	13 (1.4%)	53 (5.5%)	22.85	< 0.001*
Hypertension	59 (6.5%)	140 (14.6%)	31.96	< 0.001*
Dyslipidemia	16 (1.8%)	35 (3.6%)	6.22	0.013*
Renal failure	2 (0.2%)	8 (0.8%)	3.29	0.07
No chronic illness	645 (71%)	498 (51.8%)	72.55	< 0.001*
Smoking	100 (11%)	166 (17.3%)	15.07	< 0.001*
Others[a]	42 (4.8%)	53 (5.5%)	0.54	0.46

*Significant

[a] Others denote orthopedic problems, GIT disorders, or a history of trauma or accidents

Table 2 Availability of medical care for participants

	Urban (*n*: 908)	Rural (*n*: 961)	Chi-square	
			X^2	*p*-value
Interest in medical information				
Interested	102 (11.3%)	112 (11.7%)	0.079	0.775
Not interested	806 (88.7%)	849 (88.3%)		
How to get medical care?				
General health centers[a]	81 (8.9%)	130 (13.5%)	9.89	0.002*
Private clinics	427 (47%)	360 (37.5%)	17.52	< 0.001*
General hospitals clinics	204 (22.5%)	181 (18.8%)	3.77	0.052
Pharmacist	206 (22.7%)	276 (28.7%)	22.85	< 0.001*
Emergency department	33 (3.6%)	26 (2.7%)	1.31	0.25
Paramedical relatives	1 (0.1%)	15 (1.6%)	11.58	< 0.001*
When do you get a consultation?				
Weekly	3 (0.3%)	8 (0.8%)	2.012	0.156
Monthly	28 (3.1%)	46 (4.8%)	3.561	0.059
Annually	15 (1.7%)	13 (1.4%)	0.277	0.595
When necessary	862 (94.9%)	894 (93%)	2.987	0.084

*Significant

[a] General Health Centers or rural medical units under the management of the Egyptian ministry of health

but urban participants had significantly higher awareness compared to rural ones (p-value < 0.001). At the same time, 61% of urban and 63.2% of rural participants thought that aspirin use could reduce the risk of stroke (p-value = 0.34). In a parallel way, the urban population showed a significantly higher percentage of thinking that clopidogrel, antihypertensive, and antihyperlipidemic drugs can reduce the risk of stroke compared to rural subjects (p-value < 0.001) (Table 3).

Surprisingly, the rural population showed a significantly higher ratio of history of confrontation with AIS patients, awareness of the existence of specific AIS treatment as well as the presence of a time window during which the patient needs to receive treatment, compared to the urban population (p value < 0.0001). Regarding the appropriate reaction when faced with a case of acute CVS, urban reported a significantly higher ratio of immediate patient transfer to the ED while rural showed a higher percent of antiplatelet or anticoagulant trials (p-value < 0.001). The results showed no correlation between participants suffering from chronic illness or vascular risk factors and the proper response when confronted with AIS patients. In both studied groups, there is a significant increase in stroke awareness in male participants compared to females (Table 3).

The multi-variate logistic regression analysis showed statistically significant high odds of the influence of residence in rural or urban areas on stroke knowledge and attitude compared to age, gender, educational level, monthly income, and the presence of chronic illness or stroke risk factors (Table 4).

Discussion

Stroke is an appropriate description of the disease that occurs "at a stroke" characterized by a rapidly developing insult followed by long-term physical, emotional, social, and financial consequences [9]. Prehospital delay is the weak link in every stroke chain of survival logistics and the main contributor to the loss of the opportunity for recanalization therapies. This prolongation in the onset-to-door time is highly influenced by social awareness which is the primary objective of this study through the comparison of urban and rural population's knowledge about AIS, stroke warning signs, and the best response when confronted with a case of suspected AIS [10].

The study showed a significant increase in the monthly income of the urban population compared to rural ones which significantly influenced the way to get medical care where average and above average outcome participants prefer getting medical care from the private clinic while those with low income, get medical care and consultation from pharmacists and governmental services. This result spotlighted the rule of general practitioner doctors and pharmacists as basic sources of medical information in the Egyptian population which necessitate their training and increase their stroke awareness. This result is following the work of Terrazas and Blitchtein [11] who identified that earning for employed workers is more feasible in urban than rural areas with a consecutive large gap in income as well as the accessibility of medical services which may make many people vulnerable to migration pressure and leaving their homes in the countryside and migrate towards urban centers both within their own countries and across borders.

The study showed a higher frequency of chronic illnesses and vascular risks among the rural participants including hypertension, DM, dyslipidemia, heart diseases, and smoking possibly due to the older age of rural participants were older and more prone to vascular risk existence. This result is passed with that of Sergeev [12] who stated that stroke vascular risks, as well as stroke-related mortalities, are more common in populations residing in rural areas possibly due to lower quality of stroke services. At the same time, the work of Lindroth et al. [13] agreed with this result as they identified a higher burden of cardiovascular risk factors including higher cholesterol and obesity in rural than urban communities due to older age and the more sedentary life of Sweden's rural societies.

The results showed higher educational and socio-economic levels of the urban population compared to rural ones, yet the great majority of both groups sought medical services only when necessary which points to the weak and defective long-term adherence to primordial and primary preventive stroke prevention strategies among both urban and rural Egyptian communities. This result is following the work of Meschia et al. [14] who determined that primary and secondary stroke preventions are the most effective strategies for reducing the health and economic consequences of cerebrovascular diseases including frequent follow-up of high-risk people and estimation of their stroke probability through an objective global risk assessment tool.

The study showed low interest in getting medical knowledge from different media and greater interest in following football matches, TV series, and cooking shows which point to the stereotyped, boring, and non-attractive nature of the medical TV programs as well as newspapers articles with consecutive little effect on the population medical knowledge. This result is going with the works of Kohok et al. [15] as well as Kleindorfer et al. [16] who stated that optimal treatment recommendations for stroke prevention and management exist, yet treatment targets are often unmet due to weak health systems-based interventions whose goals improved access to stroke treatment and improved stroke outcomes.

Table 3 Stroke knowledge and awareness among studied participants

	Urban (*n*: 908)	Rural (*n*: 961)	Chi-square	
			X^2	*p*-value
What is the most affected organ by cerebrovascular stroke?				
Spinal cord	25 (2.8%)	112 (11.7%)	137.73	< 0.001*
Brain	829 (91.3%)	707 (73.6%)		
Musculoskeletal	2 (0.2%)	22 (2.3%)		
Peripheral nerves	43 (4.7%)	54 (5.6%)		
Other organs	5 (0.6%)	93 (9.7%)		
Which of the following factors are risks of a stroke?				
Hypertension	775 (85.4%)	709 (73.8%)	38.24	< 0.001*
Pneumonia	62 (6.8%)	75 (7.8%)	0.65	0.42
Smoking	404 (44.5%)	311 (32.4%)	0.76	< 0.001*
Diabetes mellitus	224 (24.7%)	254 (26.4%)	22.85	0.39
Asthma	52 (5.7%)	41 (4.3%)	2.1	0.16
Hyperlipidemia	493 (54.3%)	328 (34.1%)	11.58	< 0.001*
None of the above	0 (0%)	121 (12.6%)	122.2	< 0.001*
Which of the following is a symptom of a stroke?				
Weakness of the upper and lower extremities	514 (56.6%)	422 (43.9%)	30.09	< 0.001*
Facial deviation or speech problems	483 (53.2%)	338 (35.2%)	61.56	< 0.001*
Sudden visual impairment	194 (21.4%)	105 (10.9%)	37.86	< 0.001*
Sudden gait impairment or imbalance	349 (38.4%)	226 (23.5%)	48.78	< 0.001*
Sudden new onset headache	302 (33.3%)	220 (22.9%)	24.92	< 0.001*
Sudden loss of consciousness	353 (38.9%)	229 (23.8%)	49.3	< 0.001*
None of the above	19 (2.1%)	108 (11.2%)	61.66	< 0.001*
What are the factors that could help to prevent stroke?				
Blood pressure control	689 (75.9%)	512 (53.3%)	103.85	< 0.001*
Treatment of the chest infection	78 (8.6%)	57 (5.9%)	4.92	0.03*
Smoking cessation	447 (49.2%)	311 (32.4%)	55.09	< 0.001*
Tight diabetic control	283 (31.2%)	233 (24.2%)	12.01	< 0.001*
Treatment of bronchial asthma	62 (6.8%)	25 (2.6%)	18.79	< 0.001*
Treatment of dyslipidemia	441 (48.6%)	243 (25.3%)	109.57	< 0.001*
Daily exercise	602 (66.3%)	345 (35.9%)	172.6	< 0.001*
Healthy diet	587 (64.6%)	370 (38.5%)	127.7	< 0.001*
None of the above	4 (0.4%)	129 (13.4%)	119.06	< 0.001*
Is there a specific treatment for acute ischemic stroke				
Yes	443 (48.8%)	680 (70.8%)	106.03	< 0.001*
No	54 (5.9%)	60 (6.2%)		
I do not know	411 (45.3%)	221 (23%)		
Do you dealt with or heard about someone suffered of acute cerebrovascular stroke				
Yes	456 (50.2%)	701 (72.9%)	101.7	< 0.001*
No	451 (49.7%)	260 (27.1%)		
Is there a time window during which acute ischemic stroke patient should receive treatment?				
Yes	471 (51.9%)	578 (60.1%)	15.22	< 0.001*
No	76 (8.4%)	52 (5.4%)		
I do not know	361 (39.8%)	331 (34.4%)		

Social stroke awareness requires more than just simple advice, a stereotyped brochure from the physician, or a boring TV program while programs using theoretical models and innovative behavioral interventions including digital phenotype analysis, social network analysis, gamification, and machine learning offer opportunity for improved stroke awareness as well as sustainable behavioral change.

Table 3 (continued)

	Urban (*n*: 908)	Rural (*n*: 961)	Chi-square	
			X^2	*p*-value
What is your reaction when you see a person suffering from stroke symptoms				
Wait until the next day	5 (0.6%)	9 (0.9%)	73.16	< 0.001*
Immediate call of emergency medical service	253 (27.9%)	155 (16.1%)		
Call emergency medical service after few hours	4 (0.4%)	5 (0.5%)		
Call in-home private medical service	65 (7.2%)	74 (7.7%)		
Wait for possible spontaneous recovery	4 (0.4%)	2 (0.2%)		
Give him antiplatelets or anticoagulants	548 (60.4%)	625 (65%)		
Immediate transport to ED in nearest hospital	13 (1.4%)	38 (4%)		
Transport to ED department after few hours	6 (0.7%)	10 (1%)		
None of the above	7 (0.8%)	43 (4.5%)		
Which of the following treatments reduces the likelihood of stroke in high-risk people?				
Aspirin	554 (61%)	607 (63.2%)	0.92	0.34
Clopidogrel (Plavix)	121 (13.3%)	74 (7.7%)	15.8	< 0.001*
Antihypertensive	423 (46.6%)	301 (31.3%)	45.84	< 0.001*
Diuretics	67 (7.4%)	24 (2.5%)	24.01	< 0.001*
Diabetic drugs	140 (15.4%)	119 (12.4%)	3.6	0.06
Antihyperlipidemic drugs	289 (31.8%)	189 (19.7%)	36.27	< 0.001*
All the above	14 (1.5%)	14 (1.5%)	0.023	1.0
None of the above	43 (4.7%)	138 (14.4%)	49.44	< 0.001*

ED emergency department

*Significant

Table 4 Uni- and multi-variate regression analysis between urban and rural participants' groups regarding stroke knowledge and awareness

	Univariate		Multivariate	
	HR (95% CI)	*p*-value	HR (95% CI)	*p*-value
Age	0.586 (0.412–0.745)	0.027*	0.712 (0.425–2.763)	0.143
Gender	0.657 (0.384–0.867)	0.019*	0.712 (0.542–3.854)	0.204
Educational level	0.702 (0.494–0.907)	0.026*	0.527 (0.419–4.065)	0.284
Monthly income	0.749 (0.408–2.765)	0.187		
Residence	0.438 (0.207–0.639)	0.001*	0.582 (0.376–0.804)	0.006*
Chronic illness	0.486 (0.267–0.742)	0.032*	0.649 (0.427–2.854)	0.362
How to get medical care	0.672 (0.548–3.476)	0.596		
When do you get medical consultation?	1.749 (0.589–5.142)	0.387		

HR hazard ratio

*Significant

Regarding stroke awareness, most of the urban population could tell that the brain is the primary organ affected in stroke patients with a lower percentage of the rural participants answering this question in the right way and a significant proportion of them said they do not know or stroke affects the whole body. This could reflect lower stroke knowledge among the countryside people. This result is following the work of Bahnasy et al. [17] who stated that management of CVA in rural communities is challenging due to lower stroke awareness and knowledge which results in wasting the opportunity for recanalization therapies. The research of Akinyemi et al. [18] determined that about 29% of Nigerian hospital workers did not recognize the brain as the organ affected by cerebrovascular stroke.

The studied urban population showed a higher level of knowledge about the risk factors compared with the rural ones. Hypertension was the most identifiable risk factor

for ischemic stroke in our population in the rural subjects with the closed-ended questions followed by hyperlipidemia and smoking. These results were completely different when we tried the open-ended question first with most of the answers being due to the stress of life, the sadness or it happening suddenly for no reason identified and they did not mention any chronic diseases as risk factors. Similar results were obtained in many studies in the middle east where hypertension got the highest percentage of the studied population including the works of Osama et al. [19] who determined that >90% of the Egyptian population living in the Ismailia governorate (rural and urban) know that hypertension is the most important stroke risk. Similar results are attained in the study of Madae'en et al. [20] done in Jordon. Hyperlipidemia and smoking were the second and third stroke risks to be identified by included subjects especially in urban individuals compared to rural ones. The study revealed that DM came in fourth place without significant difference between urban and rural studied persons. In the open-ended questions, most participants answered that it is a cause of peripheral neuropathy. These results agreed with that of Shehata et al. [21] who studied workers in Cairo University Hospitals and concluded that hypertension, stress, and hyperlipidemia were the most recognizable stroke risk factors.

After the identification of hypertension, DM, and dyslipidemia as the main risk factor to develop stroke while treatment of these factors could reduce the probability of stroke occurrence and development. Daily exercise, healthy diets, and smoking cessation are chosen by a significant number of both populations. The higher educational level and socioeconomic status tipped the scale of urban participants' knowledge. Regarding stroke prophylaxis, aspirin was the most widely known drug followed by antihypertensive and antihyperlipidemic, and lastly clopidogrel. These results are in harmony with the work of Ouyang et al. [22] who concluded that lower socioeconomic status in rural communities is associated with greater stroke recurrence due to inadequate vascular risk reduction and unhealthy behavior modification.

Regarding stroke symptoms awareness, weakness of one side of the body was the most well-known early stroke warning sign and about 50% of participants identified hemiparesis as an early stroke symptom by close-ended questions. Urban participants were significantly knowledgeable regarding this manifestation compared to rural ones. This percentage is lower than identified by participants in the Ismailia Governorate study done by Osama et al. [19] who reported that 81.8% of studied subjects were oriented that unilateral body paralysis is an early stroke manifestation. This discrepancy points to the different stroke knowledge and awareness between the Egyptian governorate. The difference in awareness regarding early stroke manifestation is also obvious in different studies where 65% of Oman study participants, 62.2% from India, 62% from Hong Kong, 60% from South Korea, and 88% from Spain were aware of early stroke manifestations [23, 24].

Sudden facial deviation, speech problems, imbalance, and disturbed consciousness were identified by about one-third of urban participants and one-fourth to one-fifth of rural ones which spotlight the higher awareness of early stroke symptoms in urban communities. This ratio is also higher in the Ismailia Governorate study done by Osama et al. [19] which reached 53.2% of urban and 35.2% of rural persons in their study.

Concerning the best reactions when confronted with an AIS patient which is either immediate call of EMS or immediate transport to the ED in the nearest hospital, about 30% of urban and 20% of rural choose these decisions. On the other hand, the most common improper reaction was treatment trial with antiplatelets, especially large doses of acetylsalicylate, and waiting for recovery was chosen by >60% of participants with a non-significant difference between urban and rural subjects which points to the poor awareness regarding the best attitude taken towards possible acute CVS patients. Regarding the time window for IVT and MT, >50% of included subjects, did not know its existence while the remaining defined it inaccurately and mentioned a period of up to 24 h. These results are not in harmony with the work of Osama et al. [19] where 86% of participants decided to transport the patient immediately to the ED nearest hospital. The work of Shehata et al. [21] showed a higher percentage of the decision to transport the patients to the nearest hospital (60%) which is most probably due to the difference in the studied sample which was held on the workers of Cairo University Hospitals who are expected to have higher stroke awareness.

Conclusion

Egyptian citizens especially those living in the countryside have weak and inadequate knowledge regarding stroke risk factors, early stroke symptoms, and the proper response when confronted with a case of acute CVS as well as stroke preventive measures mostly due to low socioeconomic status and lesser educational levels.

Early stroke management in Egypt necessitates more comprehensive community campaigns and public stroke awareness programs for fast-track recognition and proper response when confronted with a case of acute CVS. At the same time, plans for stroke prevention require attractive, fascinating, and non-traditional mass media targeting high-risk groups and the youth who are better able to get the benefit of digital technologies.

Abbreviations

AIS	Acute ischemic stroke
CVS	Cerebrovascular stroke
DM	Diabetes mellitus
ED	Emergency department
EMS	Emergency medical service
IVT	Intravenous thrombolysis
MT	Mechanical thrombectomy

Supplementary Information

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Additional file 1. Stroke citizenship questionnaire.

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Author contributions
MEME, AAG: participated in the study's idea and design, statistical and data analysis, manuscript writing, and revision; AKS, DAA, HKS, SHM, ARA, MMMF, SAEH, REE, AGA, GIMB: participated in study's design, studied subjects' interview, data collection, statistical analysis, and manuscript writing; WSB: participated in the study's idea, design, statistical and data analysis, references collection, manuscript writing, and revision. All authors read and approved the final manuscript.

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Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The manuscript was approved by The Research Ethics Committee and Quality Assurance Unit, Faculty of Medicine, Tanta University. The URL: http://tqac.tanta.edu.eg/new-tqac/; QualityAssuranceUnit@hotmail.com; Approval Code: 35278/2/22. Name of the PI: Asmaa Khaled Shaheen. Name of the department: Neuropsychiatry. Type of the research: promotion research. Date of approval: February 2022. The study's protocol had permitted by The Research Ethics Committee and Quality Assurance Unit, Faculty of Medicine, Tanta University. Participations were voluntary, informed written consents were approved by all participants and any possible risks were clarified.

Consent for publication
Not applicable.

Competing interests
All authors disclose that they have no competing interests related to the study.

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