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Original article

Stroke knowledge among emergency centre visitors: A cross-sectional multicenter survey

Olfa Chakroun-Walha [a,*], Amal Samet [a], Marwa Ben Abdallah [a], Sana Benmansour [b], Fadhila Issaoui [c], Manel Rebai [d], Karama Ben Messaoud [b], Cyrine Benali [a], Wassel Mokni [d], Abdennour Nasri [a], Imen Rejeb [c], Noureddine Rekik [a]

[a] Emergency Department, University Hospital Habib Bourguiba Sfax, Tunisia
[b] Emergency Department, Regional Hospital Kébili, Tunisia
[c] Emergency Department, Regional Hospital Gabes, Tunisia
[d] Emergency Department, Regional Hospital Sidi Bouzid, Tunisia

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ABSTRACT

Introduction: Stroke is a public health problem worldwide. Community stroke knowledge is crucial to guide the prevention approach. We aimed to evaluate the level of stroke knowledge among the visitors to Emergency Centres (ECs) in the southern region of Tunisia concerning factors of risk, symptoms, and treatment of stroke.
Methods: A multicenter cross-sectional survey about stroke knowledge; conducted in five ECs for 10 days. All the visitors to these ECs were invited to participate in this survey. In each center, one investigator had to conduct the questionnaire. We used the stroke knowledge test (SKT).
Results: We enrolled 839 participants aged at 44 ± 7 years and with an M/F sex-ratio at 0.9. Relatives and mass media were the most reported sources of information about stroke. In 32.3% of cases, the participants had a university schooling level. The upper quartile had an SKT score of 55% or over (n = 247; 29.4%). The SKT score was significantly higher in young, female participants, in rural centers, with a university level of schooling and with no reported chronic diseases. Receiving information about stroke through the medium of television or via relatives was an independent predictor of a high SKT score compared with other knowledge sources.
Conclusion: This study emphasises the urgent need for improving the population's knowledge about stroke in Tunisia. These findings may reflect the lack of government policies for education and training on stroke. A national educating program is necessary to implement to increase stroke knowledge.

African relevance

- Community stroke knowledge is crucial to guide the prevention approach.
- Awareness and accurate understanding of stroke consequences may improve the outcomes.
- This is a survey of stroke knowledge in subjects visiting the Emergency Centre.

Introduction

Cerebrovascular accidents are the second leading cause of death in the world. Globally, 70% of strokes and 87% of both stroke-related deaths and disability-adjusted life years occur in low- and middle-income countries [1–4]. In Tunisia, according to the World Health Organization (WHO) reports, Noncommunicable Diseases (NCDs) are estimated to account for 86% of all deaths. From these deaths, 44% are secondary to cardiovascular diseases (CVD) [5]. Unfortunately, until 2017, there is still no national system response to prevent strokes in Tunisia [5]. Stroke was not considered a public health problem in the 1990s [6]. However, recent studies confirm the growing rates of stroke in Tunisia, mainly among young adults, and the high physical and psychological disabilities [7–9]. The WHO projects concur with these findings. The highest increase in CVD mortality is expected within the African region (27%) [10]. A recent modeling approach has demonstrated that primary prevention is much effective than secondary or tertiary prevention approaches [11]. Awareness and accurate understanding of stroke consequences may improve the outcomes. Several

* Corresponding author at: Service des urgences et SAMU04 SFAX, Route EL Aïn Km 0.5, 3029 Sfax, Tunisia.
E-mail address: chakroun_olfa@medecinesfax.org (O. Chakroun-Walha).

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studies have evaluated the population knowledge about stroke to guide their health system procedures. In Tunisia, stroke management has been improved, with the use of thrombolysis and interventional management. Unfortunately, the delay between the stroke onset and the admission in ECs is still long. This fact may be explained, in part, by the poor stoke knowledge. However, to the best of our knowledge, there is no published data about Tunisian community knowledge and/or awareness about stroke. For this reason, we decided to realise a multicenter survey.

Methods

Research setting

It is a multicenter, cross-sectional study, conducted over a convenience ten-day period. We have randomly chosen the inclusion days within the study period, during which the investigators were available in the five centers (from July 1st, 2017 to November 31st, 2017). One investigator was assigned to each center to conduct the questionnaires. We conducted this study in five Emergency Centres in the central and southern regions of Tunisia. Only one of these ECs was in a university hospital, the unique teaching hospital in the south of Tunisia. The four other centers were in regional hospitals. Two centers are in urban areas, and three are in rural regions.

Population

The study population consisted of consecutive subjects (patients, relatives, and/or visitors) presenting to the participating ECs during the inclusion days. In Tunisia, it is estimated that 2/3 of the overall population have at least one visit to an EC per year. The study was designed to have a 99% confidence level with a 5% margin of error. As a result, 587 participants were the minimum requirement for this study. The sample calculation was based on the WHO statistics [5]: in Tunisia, the cardiovascular risk factors ranged between 12 and 33%. We decided to choose the highest rate. With this estimation, we aimed to have at least one third of the participants with a cardiovascular risk factor. We also decided to have comparable proportions of participants in the different centers. We had chosen to include a convenience proportion of at least 10% of the daily visits in each center.

We included subjects aged 18 years or over, presenting to the EC in the inclusion period and consenting to participate in the survey. Before the discharge from the EC, the investigator explained to the participant the aim of the study, obtained the consent, and then began the questionnaire. Subjects with communication troubles were not included.

Research tool

The questionnaire consisted of three parts. In the first part, the demographic features (age, sex, marital status, schooling level) were collected. The second part evaluated general knowledge about stroke. It began with the question "have you any information about stroke?". Then, there was a series of multiple-choice questions (MCQ): stroke is a communicable disease, the most concerned organ is, stroke is a preventable disease; it needs ran urgent management, alternative medicine is useful in its management. The third part consisted of the Stroke Knowledge Test [12]. It consisted of 20 items on stroke risk factors, signs and symptoms, prevention, prevalence, treatment, and rehabilitation. We have changed the answers to the question concerning the stroke prevalence according to the national data reported by the Tunisian Institute of Statistics. The 20 MCQ items were constructed in a multiple-choice format. For each item, five answers were proposed, and, there was one correct option, three distracters, and an "I don't know" option. The obtained data were recorded and validated by an expert. Each correct answer was given one (1) mark and a wrong answer was given no (0) mark. The sum of marks was multiplied by 5; the possible scores ranged from 0 to 100%. A higher score indicates good knowledge. In this study, the participants having a score in the upper quartile were considered with a high level of knowledge about stroke.

The SKT was forward and backward translated into the Tunisian dialect by two language experts. The backward translated version was compared to the original version. A draft instrument was developed and pretested with 20 volunteers responding to the inclusion criteria, selected in one center among the EC visitors. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national). The approval from this ethics committee is not required for this type of study at our institution.

Data analysis

For reliability testing, the internal consistency of the questionnaire was examined by Cronbach's alpha coefficient (0.78). A Cronbach's alpha value of 0.50–0.70 is acceptable [13], while 0.70 or higher shows good homogeneity among the items [14].

The normal distribution of the data was verified. Data reported in the text and tables indicate the mean ± standard deviation (SD) for numeric variables and percentages or ranges for categorical variables. To compare qualitative variables, we used the Pearson Chi square-test and the Fisher exact test. To compare numerical variables, we used the student's *t*-test. Student's t-test (normally assumption-verified) and the chi-square ($\chi 2$), or Fisher's exact test (when $\chi 2$ assumptions of low expected cells were verified) were used to compare the group of patients who had high SKT score to those with a low SKT score. The coefficient r of Pearson was used to analyse the correlation between the total SKT score with the different items of the questionnaire. Predictors of high SKT scores were evaluated by univariate and by multivariate (multiple logistic stepwise regression procedure) analyses. Odds ratios were estimated from the b coefficients obtained, with respective 95% confidence intervals (CI 95%). The significance level was a two-sided $p < 0.05$ for all the used tests.

Results

Demographic data

We enrolled 839 participants responding to the inclusion criteria. Subjects aged 65 or over-represented 16.2% of the sample (n = 136) (extremes: 18 and 93 years). Seventeen participants had at least three chronic diseases (2.0%) (Table 1). Almost the third of the participants (n = 278; 33.1%) reported knowing someone with a stroke. This person was as follows: one of the parents (n = 101/278), a brother or a sister (n = 17), and a friend or a neighbor (n = 138). The sociodemographic

Table 1
Demographic features of the participants (n = 839).

Characteristics	Values
Age; years (mean ± SD)	45 ± 16
Sex; n (%)	
Female	420 (50.1)
Male	419 (49.9)
Highest completed education level; n (%)	
Illiterate	85 (10.1)
Graduated from primary school	139 (16.6)
Graduated from middle school	98 (11.7)
Graduated from secondary school	246 (29.3)
University degree	271 (32.3)
Medical condition; n (%)	
Hypertension	148 (17.6)
Diabetes mellitus	161 (19.2)
High level of cholesterol and/or triglycerides	65 (7.7)
Stroke	22 (2.6)
Overweight	95 (11.3)
No reported chronic disease	287 (34.2)

characteristics are detailed in Table 1.

General knowledge about stroke

The participants reported having information about stroke in 63.3% of cases (n = 531) (Table 2). Mass and social media were less reported as sources of knowledge (Table 2).

Stroke knowledge test

The mean score of SKT was 38 ± 21% (extremes: 0 and 95%). The upper quartile had an SKT score of 55% or over (n = 247; 29.4%). The total SKT score was highly correlated to the preventing role of aspirin, the relation between transient ischemic attack (TIA) and stroke, and the need for urgent management of stroke (Table 3).

In univariate analysis, the SKT score was statistically higher in young, female participants, in rural centers, with a university level of schooling and with no reported chronic diseases (Table 4). In multivariate analysis, the independent predictors of a high SKT score were the information by the family members or by the television (Table 5).

Discussion

This study indicates the urgent need for improving the population's stroke knowledge in Tunisia. The general stroke knowledge in our sample is worrying. Only the upper quartile of our sample had an SKT score of 55% or over. A low level of awareness of stroke has also been reported in Egypt, with a median percent score of 35.7% [15]. Similar data on stroke awareness was reported in rural and urban areas in Brazil but are different from other findings in Nigeria [16–18].

The assessment of the participants' beliefs about stroke was quite surprising. It was considered as a communicable disease in 15.7% of cases. Moreover, >25% of the participants ignored that brain is the concerned organ. Besides, 40.2% of the subjects had the belief that alternative medicine may be useful in its treatment. In a Spanish population, 60% thought that religion helped them to recover after a stroke [19]. In this same research, almost half of the patients were able to explain the biological mechanisms of stroke [19]. In our population, a

Table 2
General information about stroke (n = 839).

	Values
Answer by 'yes' to the question 'have you information about stroke'; n (%)	531 (63.3)
Source of information about stroke; n (%)	
Relatives or family members	209 (24.9)
Radio	193 (23.0)
Internet	115 (13.7)
Television	111 (13.2)
Studies	94 (11.2)
Health professionals	92 (11.0)
Social media	72 (8.6)
Magazines and/or journals	62 (7.4)
Information about the characteristics of stroke; n (%)	
Is a communicable disease	132 (15.7)
The major concerned organ is	710 (84.6)
The brain	
The heart	65 (7.7)
The kidneys	85 (10.1)
No idea	47 (5.5)
Is a preventable disease	704 (83.9)
Concern only the older adults	417 (49.7)
Needs an urgent management	516 (61.5)
Alternative medicine is useful in its management	337 (40.2)

Table 3
High SKT score predictors in multivariate analysis.

	Correct answer; n(%)	Coefficient r of Pearson	p
The mechanism of stroke	426 (50.8)	0.59	$<10^{-3}$
Diabetes as a risk factor of stroke	275 (32.8)	0.40	$<10^{-3}$
Correlation of the atrial fibrillation with stroke	96 (11.4)	0.12	$<10^{-3}$
The most concerned age group by stroke	326 (38.9)	0.29	$<10^{-3}$
The delay of warning signs of TIA	277 (33.0)	0.44	$<10^{-3}$
The warning signs of stroke	322 (38.4)	0.32	$<10^{-3}$
The main purpose of rehabilitation	163 (19.4)	0.37	$<10^{-3}$
The role of aspirin in preventing stroke	457 (54.5)	0.66	$<10^{-3}$
Risk factors of stroke	355 (42.3)	0.49	$<10^{-3}$
Correlation between TIA and stroke	462 (55.1)	0.65	$<10^{-3}$
Role of surgery in stroke management	333 (39.7)	0.62	$<10^{-3}$
Available method of stroke treatment	317 (37.8)	0.37	$<10^{-3}$
The most important risk factor for stroke	358 (42.7)	0.54	$<10^{-3}$
Incidence of stroke in Tunisia each year	122 (14.5)	0.24	$<10^{-3}$
Relation between alcohol consumption and stroke	360 (42.9)	0.44	$<10^{-3}$
Physical disability caused by stroke	367 (43.7)	0.57	$<10^{-3}$
Prevention methods of stroke	396 (47.2)	0.48	$<10^{-3}$
Impact of smoking on the risk of stroke	158 (18.8)	0.15	$<10^{-3}$
Need of urgent management of stroke	493 (58.8)	0.64	$<10^{-3}$
Need of rehabilitation in case of stroke	298 (35.5)	0.27	$<10^{-3}$

TIA: transient ischemic attack.

Table 4
High SKT score predictors in univariate analysis.

	High SKT score	Low SKT score	p
Female; n (%)	145 (58.7)	275 (46.5)	0.001
Age; years (mean ± SD)	38 ± 12	47 ± 17	$<10^{-3}$
Urban region; n (%)	75 (47.2)	365 (84.7)	$<10^{-3}$
University schooling level; n (%)	110 (44.5)	161 (27.2)	$<10^{-3}$
Medical history of hypertension; n (%)	43 (21.7)	105 (37.8)	$<10^{-3}$
Medical history of diabetes; n (%)	24 (12.2)	137 (43.6)	$<10^{-3}$
Medical history of dyslipidemia; n (%)	14 (7.1)	51 (20.4)	$<10^{-3}$
Overweight; n (%)	15 (7.5)	80 (28.5)	$<10^{-3}$
No chronic disease; n (%)	141 (57.1)	146 (24.7)	$<10^{-3}$
Knowing someone having stroke; n (%)	132 (53.4)	146 (50.0)	0.4
Having information about stroke; n (%)	208 (84.2)	323 (54.7)	$<10^{-3}$
Source of information is			
Internet; n (%)	38 (15.4)	77 (13.0)	0.37
Social media; n (%)	31 (12.6)	41 (6.9)	0.01
School; n (%)	43 (17.4)	51 (8.6)	$<10^{-3}$
Radio; n (%)	45 (18.2)	148 (25.0)	0.03
Television; n (%)	54 (21.9)	57 (9.6)	$<10^{-3}$
Magazines and/or newspapers; n (%)	20 (8.1)	42 (7.1)	0.66
Family members; n (%)	104 (42.1)	105 (17.7)	$<10^{-3}$
Health professionals; n (%)	48 (19.4)	44 (7.4)	$<10^{-3}$

Table 5
High SKT score predictors in multivariate analysis.

	Odds ratio	Confidence interval	p
The source of information is			
Family members; n (%)	1.9	1.2–3.2	0.006
Television; n (%)	2.1	1.3–3.8	0.001

similar rate has been found (50.8%).

In prior studies, stroke knowledge has been appraised in three main dimensions: risk factors, early clinical signs, and possible management procedures. In our study, the risk factors were recognised in <45%. Smoking was not reported as a stroke predictor (18.8%). These results concur with those of a Brazilian survey and with European data [16,20–22]. In a survey performed among Berlin residents, hypertension was the most commonly referred stroke-related risk factor (43%), as in other studies (41.8%) [16,21,22]. Higher rates are reported in older populations [23]. The other stroke risk factors seem to be not well recognised [16,21,22]. In our population, the atrial fibrillation was hugely unknown.

Gomes also determined whether participants had information on stroke prevention [16]. Most people cited regular physical activity (39.8%), whereas blood pressure control was suggested in only 28.4% of cases [16]. The question about the warning stroke signs had a correct answer in 38.4% of cases. The lower stroke awareness level about warning signs is consistent with previous reports [17,23–27]. Most of the early stroke signs were recognised as such by less than half of the surveyed subjects in various samples [17,23–27]. In our survey, the transient ischemic attack is an unrecognised entity.

An increase in the population's knowledge about such events can impact its burden. We rely on public awareness for its fast recognition and access to the EC. In Tunisia, we have not yet a national stroke registry, or national guidance of its prevention and management. Nevertheless, thanks to the use of thrombolysis, its management has been improved in university hospitals these last years. In these centers, its management is realised by multi-disciplinary teams including the emergency physician, the radiologist, and the neurologist. But, the delay between the clinical signs' onset of the EC admission is still long. This fact is chiefly explained by the lack of education about stroke. It can also be explained by the poor knowledge about its treatments. In Madrid, Spain, 56% of surveyed went directly to the EC despite only 27% recognised their symptoms as a stroke. The remaining stayed at home or attended to primary care physicians [19,28]. In a rural region of Spain, only 31.8% of individuals went immediately to the hospital or called an ambulance. Others waited for symptoms to improve (21.9%) or called their primary care doctor or pharmacy (21.2%) [29]. In a Georgian study [30], independently of schooling, 70% of the study group knew that they should activate the emergency medical system. The surveyed in our study were aware of the need for urgent management in 61.5% of cases, but only 37.8% knew the available treatment procedures. These findings may reflect the lack of government policies for education and training on medical emergencies and first aid in such a situation.

In addition to the low knowledge level, the predictors of stroke knowledge were surprising in our study. Our results have demonstrated lower stroke knowledge levels among subjects with a cardiovascular risk factor (hypertension or diabetes or overweight or dyslipidemia). Oppositely, the SKT score was statistically higher in the subgroup of participants without chronic disease. The stroke knowledge predictors held hugely debated in the literature. The education level is one of the most discussed factors [18,30,31]. As reported in the national data, our participants were mostly graduated from secondary school or university (61.6%). Nevertheless, the education level was not correlated to a higher stroke knowledge level. In contrast to our findings, a significant association between stroke knowledge and the educational level has been demonstrated in other developed and developing countries [18,30]. In these surveys, the more educated subgroup had a greater recognition of the clinical signs, the risk factors, and also the possible preventive measures [18,30]. In our sample, a university schooling level was associated with a higher SKT score in univariate analysis but was not an independent predictor of stroke knowledge.

The last important issue to highlight in our survey is the described sources of information about stroke. Having prior information about stroke is not enough to have a high knowledge level. Dossi et al. found that even though 95% of the respondents reported prior information about stroke, only 37% had adequate knowledge-based [32]. In our study, 63.3% of surveyed reported having prior information about stroke. Conversely, their knowledge was not accurate in most cases. The education by the relatives seems to be important in our sample, as shown in multivariate analysis. This finding was also reported by Farrag et al. [15]. Transferring stroke knowledge from children to parents has been demonstrated in a recent review [33]. In other studies, physicians and relatives are the most frequently cited information sources [28]. In our sample, mass and social media were the less reported sources of information. Nevertheless, they were correlated to a higher stroke knowledge level. The importance of television as an information source has been confirmed by its association with higher SKT scores in multivariate analysis. Some authors have tried to increase stroke knowledge using a Mobile app; the findings are still heterogeneous [34].

The main limitation of this study was its selection of a convenience sample, which might fail to be representative of the entire population. In our study, the participants were surveyed in the EC. Although this does not represent the entire population, it does reflect a reasonable proportion, as it is known that two-thirds of the population of Tunisia attends an EC every year. Even though, our results may not be generalised to the overall population.

Another limitation is the lack of information about the percentage of people who refused to answer the questionnaire. Thus, further studies are warranted to confirm the results of this survey.

This survey can be the first step in evaluating population awareness about stroke. We suggest conducting further studies to examine the sources of information for the general population regarding this important condition, in order to optimise strategies to improve public education. Our intention is to both reduce the prevalence of stroke and aid the rapid recognition and response to this event when it does occur.

Conclusion

This first report of a large Tunisian sample shows low stroke awareness. Stroke knowledge needs to become an urgent national program. This survey is a step in describing what topics need to be focused on to ameliorate population stroke awareness. Our results emphasise the urgent need for population educating programs to improve prevention and early recognition of the early stroke signs.

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Authors' contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: CW contribute 30%, IR and NR 12.5%; and AS, MBA, SB, FI, MR, KBM, CB, WM and AN contributed 5% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Dissemination of results

These data have been presented in informal medical staff meetings,

and at the national congress of emergency medicine.

Declaration of competing interest

The authors declared no conflict of interest.

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