Factors associated with knowledge and awareness of stroke among the Lebanese population: A cross-sectional study

RESEARCH ARTICLE

REVISED Factors associated with knowledge and awareness of stroke among the Lebanese population: A cross-sectional study [version 2; peer review: 2 approved]

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Abstract

Background: Evaluation of the knowledge about stroke in the general population is extremely vital as it prevents stroke development, limits complications, and achieves better quality of life. We assume that the general Lebanese population lacks awareness about stroke and its associated complications. This study aims to evaluate stroke knowledge and determine the factors associated with stroke awareness among the general Lebanese population.
Methods: This cross-sectional study assessed respondents' sociodemographic characteristics and the identification of risk factors, warning signs, stroke consequences, and early response to stroke symptoms. A total of 551 Lebanese adults without a history of stroke filled in an online self-reported questionnaire publicly shared on social applications. Logistic regression analysis was performed to identify the factors associated with poor knowledge of stroke.
Results: Among the 551 participants enrolled, 403 (74.2%) were

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females and 312 (56.7%) were under 30 years of age. Females compared to males and employed compared to unemployed had significantly higher odds of identifying at least one risk factor (OR=4.3 [95%CI=1.1;16.8] and 6 [95%CI=1.2;29.6], respectively). Also, when compared to unemployed, employed participants had significantly higher odds of recognizing at least one of the early stroke symptoms (OR=3.3 [95%CI=1.2;8.9]) and identifying at least one of the stroke consequences (OR=5.3 [95%CI=1.1;25.9]). Reaching a university level of education compared to a school level was associated with significantly higher odds (OR=2.3 [95%CI=1.1;4.8]) of taking a patient to a hospital.

Conclusion: Well-educated, employed, and female participants were more knowledgeable about stroke. Tailored interventions focusing on individuals with inadequate stroke literacy are needed. Further studies, more representative of the general Lebanese population with a larger sample size, are necessary to confirm our findings.

Keywords
stroke; knowledge; awareness

Any reports and responses or comments on the article can be found at the end of the article.

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REVISED **Amendments from Version 1**

The introduction was expanded in the second version upon the request of the reviewers.
The objective is stated clearly and a comparison to the neighbouring countries is added.
A complete list of affiliations is available in the second version of the article.

Any further responses from the reviewers can be found at the end of the article

Introduction

Ischemic stroke is neurologic dysfunction caused by sudden embolic occlusions in the cerebral vessel.[1,2] It accounts for around 87% of all cases of stroke worldwide and is a major contributing cause of mortality and a significant factor of disability in adults.[3,4] In Lebanon, the adjusted prevalence of stroke is 0.5%, and the cumulative mortality rates are 14.1% at one month.[5,6]

Primary prevention against stroke is considered a cornerstone in minimizing stroke development. It is reached through a variety of strategies that focus on identifying related risk factors, implementing preventative measures, and educating patients. Awareness programs should aim to increase community knowledge, which is one of the most effective prevention measures; this raises the need for an accurate assessment of stroke knowledge and its related triggers.[7–11] Moreover, knowledge will not only improve patients' quality of life but can also prevent health care professionals from being overwhelmed when stroke cases arrive in the hospital at an early stage.[12] This is noteworthy as 80% of stroke cases are preventable if adequate precautions and measures are taken promptly.[13]

Therefore, it is essential to explore features such as lifestyle, behavior,[14,15] educational background, smoking history,[15] and socioeconomic status[15,16] to understand the disparities in stroke knowledge between different sociodemographic groups. Since stroke risk factors (e.g., history of hypertension, diabetes) are identifiable in individuals with low socioeconomic, past medical history is also an important factor to investigate. Educational level, personal history of smoking, and high-income status have been associated with increased stroke knowledge.[17] Concerning gender, there are conflicting results. Some studies reported that females are more likely than males to present non-traditional stroke warning signs, develop stroke, and arrive late to the hospital[18–20]; on the contrary, other studies showed that females can identify all the five conventional warning signs of a stroke and quickly call the emergency line.[21]

In Lebanon, various studies were conducted that assessed stroke risk factors, prevalence, adherence to post-discharge medications, and acute hypertension treatment.[5,6] However, no nationwide study has been conducted yet. Only one study assessed the public awareness of stroke but examined a small population, as it was limited to the capital city.[22] In Jordan, a recent nationwide study revealed that educational level, gender, and socioeconomic income are correlated with early identification of stroke.[23] Thus, this study aims to 1) evaluate stroke knowledge (i.e., definition, risk factors, and early warning signs, potential consequences) and 2) determine the factors associated with stroke awareness (i.e., attitude and reaction of people) among the general Lebanese population.

Methods

Ethical approval

The study was conducted based on the declaration of Helsinki and was approved by the ethics committee at the School of Pharmacy of the Lebanese International University (2020RC-035-LIUSOP). Written informed consent was obtained from all participants before inclusion in the study.

Study design and procedure

This descriptive observational cross-sectional study was carried out from September 2020 through January 2021 on the Lebanese population from all Governorates (Beirut, Mount Lebanon, North, South, and Beqaa), using an anonymous online survey. A snowball sampling method was used to abide by the lockdown restrictions enforced by the Lebanese Government. An electronic survey was developed using the Google forms platform and was distributed through different social media platforms (i.e., WhatsApp, LinkedIn, and Facebook). The link to the questionnaire was posted by the authors on each platform and made available to all the users, who are given the right to share. No particular group was targeted. Participation in this survey was voluntary and free of charge. Participants over the age of 18 were eligible, while those with a history of stroke were excluded. The anonymity of the participants was guaranteed during the data collection process.

Sample size calculation

Based on another study, which concluded that around 71.8% of the participants were able to identify at least three out of five stroke risk factors,[24] and in the absence of similar studies in Lebanon, the Epi Info software version 7.2 (population survey; https://www.cdc.gov/epiinfo/index.html) calculated a minimum sample of 312 participants at a confidence level of 95%. The purpose of oversampling is to take into account patients' refusal.

Questionnaire

The questionnaire was distributed in Arabic, the native language of Lebanon.[25] The questionnaire was structured initially in the English language and then translated by a single bilingual translator, whose native language is Arabic and fluent in English. An expert committee formed by healthcare professionals and a language professional verified the Arabic-translated version. A backward translation was then performed by a native English speaker translator, fluent in Arabic and unfamiliar with the concepts of stroke. The back-translated English questionnaire was subsequently compared with the original English one, by the expert committee, aiming to discern discrepancies and solve any inconsistencies between the two versions. The process of forward-back translation was repeated until all ambiguities disappeared. It was self-administered and required approximately 20 minutes to be completed.

The questionnaire is similar to those used in the literature.[22,24,26–33] The current questionnaire, methods, and tools used in this study were mainly adapted from a study conducted in Jordan in which the general knowledge about stroke was assessed.[23] The questionnaire was structured similarly to the one of Jordan in all the aspects that covered stroke knowledge except for the sociodemographic factors (i.e., economic status and residence area) because of the discrepancy between the two countries. However, differences were only in the sociodemographic characteristics due to the slight variation between the two countries. The questionnaire was structured to collect information about stroke in terms of symptoms, risk factors, early warning signs, and complications. Participants completed it without the assistance of investigators to avoid any potential influence when responding to questions. The opening section of the questionnaire covered the sociodemographic characteristics, including age, marital status, smoking status (positive when participant smoked for at least a year), employment status (employed versus unemployed), monthly income, residence (urban versus rural), educational level, and past medical history determined by self-report such as ever being diagnosed with the medical condition by a healthcare professional (e.g., hypertension, diabetes mellitus, dyslipidemia). Age was classified into four categories (18-29, 30-49, 50-70, and above 70 years) while family income was divided into three categories: low (<1,500,000 Lebanese Lira (LL)), intermediate (1,500,000-3,000,000 LL), and high (>3,000,000 LL).[25,30]

The second section evaluated the general knowledge related to stroke. Participants responded to whether stroke is a disease that: 1) affects the brain, 2) is an old person disease, 3) is contagious, 4) is hereditary, and 5) and can be prevented. Also, this section assessed awareness of the risk factors of stroke, including old age, hypertension, diabetes mellitus, heart disease, high cholesterol, smoking, alcohol consumption, physical inactivity, obesity, and stress. Furthermore, this section focused on participants' knowledge of early stroke warning signs including 1) sudden numbness or weakness of the face, arms, or legs, 2) sudden difficulty speaking or understanding speech, 3) sudden blurry vision or visual impairment in one or both eyes, 4) sudden dizziness or loss of balance or coordination, and 5) sudden severe headache. Additionally, participants reported potential consequences of stroke: 1) movement and functional problems (i.e., one-sided paralysis, loss of ability to walk, tiredness, fatigue), 2) Cognitive and memory problems (i.e., loss of ability to speak, write, read, remember or understand), 3) visual problems (i.e., loss of sight or blurred vision), 4) emotional and personality changes (i.e., depression, anger, mood changes), and 5) long-term disabilities. Three questions assessed the attitude and the reaction of people towards a patient experiencing stroke (e.g., willingness to take a patient to hospital care); two others were on the curiosity and self-assessment while the last one was to determine the sources of information of knowledge about stroke. Participants were given one point for each correct response to the above statements (see extended data – date key).[25] Missing answers were not counted.[26] Sometimes, multiple answers were allowed; that is why the total score was higher than the total number of questions.

Statistical analysis

Data collected were analyzed using the Statistical Package for Social Sciences version 25.0 (SPSS; https://www.ibm.com/be-en/products/spss-statistics). A freely accessible software alternative software to run this analysis is RStudio (https://www.rstudio.com/products/rstudio/download/). Continuous variables were presented as mean standard deviation and 95% confidence interval. Categorical and ordinal variables were shown as frequencies (n) and percentages (%). Correlations between risk factors, early symptoms, and consequences of stroke with the socio-demographics and past medical history were determined by the Pearson chi-square or Fisher's exact test if the cell count was less than five.

Logistic regressions models were used to assess the association between sociodemographic factors, the medical history that showed a $P<0.2$ in the bivariate analysis and identified a total number of risk factors, identified a total number of early

symptoms, identified a total number of consequences, and willingness to take a patient to a hospital. Potential confounders were eliminated if P>0.2 to protect against residual confounding.

The results were presented in the form of odds ratios (OR) and 95% confidence interval. Statistical tests were two-tailed and indicated statistical significance at P<0.05.

Results

Sample description

Out of the total 551 participants enrolled in the study, 403 (74.2%) were females, 312 (56.7%) were under 30 years of age, and almost half were single and residing in rural areas. The most common concomitant disease was dyslipidemia (17.6%), followed by obesity (16.8%) and peptic ulcer (16.2%). The sociodemographic factors results are displayed in Table 1.[25] Almost all the participants had heard of stroke (93.6%); 69.1% know about stroke if someone around had the disease.

Table 1. Participants' socio-demographic characteristics, past medical history, and familiarity with stroke.

Variables (N=551)	Categories	Frequency (%)
Socio-demographic characteristics		
Gender	Male	140 (25.8)
	Female	403 (74.2)
Age (years)	<30	312 (56.7)
	30-49	175 (31.8)
	>50	63 (11.5)
Residence area	Urban	256 (46.8)
	Rural	291 (53.2)
Marital status	Single	274 (50.1)
	Married	254 (46.4)
	Divorced	12 (2.2)
	Widowed	7 (1.3)
Education (years)	School (maximum 12)	53 (9.6)
	University (minimum 13)	497 (90.4)
Employment status	Unemployed	246 (44.9)
	Employed	302 (55.1)
Income level	Low (<1,500,000 LL*)	199 (43.2)
	Medium (1,500,000-3,000,000 LL*)	206 (44.7)
	High (>3,000,000 LL*)	56 (12.1)
History of smoking (≥1 year)	Yes	147 (27.4)
Past medical history	Hypertension	64 (12.3)
	Diabetes mellitus	37 (7.2)
	Dyslipidemia	91 (17.6)
	Arrhythmia	81 (15.7)
	Kidney disease	22 (4.3)
	Peptic ulcer	82 (16.2)
	Depression	73 (14.2)
	Obesity	87 (16.8)
Familiarity with stroke	Ever heard of stroke	511 (93.6)
	History of stroke in the family	150 (27.8)
	Personally know someone with stroke	378 (69.1)

*LL, Lebanese Lira.

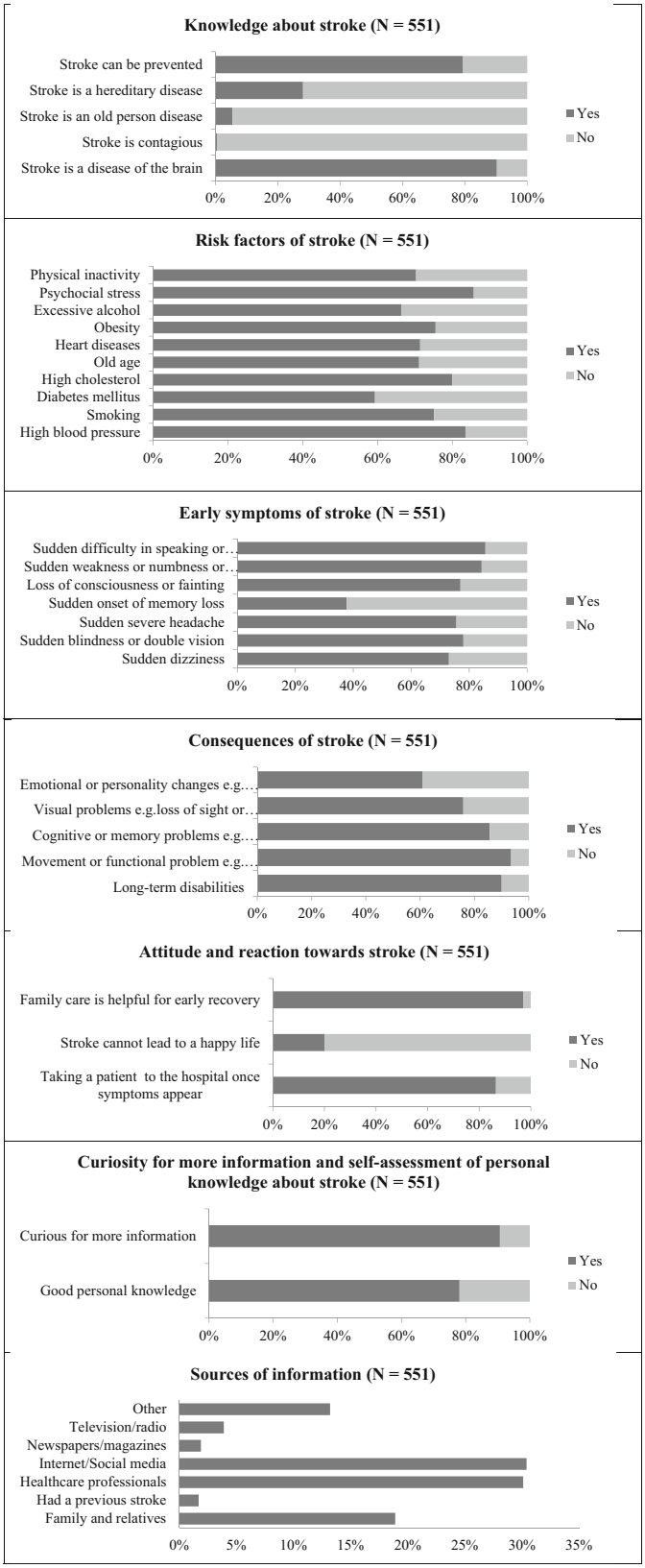

Figure 1. Percentages (%) of responses regarding stroke' knowledge, risk factors, early symptoms, attitude and reaction toward stroke, consequences, and sources of information.

Stroke knowledge, risk factors, early warning signs, consequences, and sources of information

Our sample revealed a variable level of knowledge about stroke (Figure 1 and Table 2). The majority were aware that stroke is a brain disease and that it can be prevented (80% and 90%, respectively). Approximately half of the participants could identify four out of five correct answers related to stroke knowledge. Furthermore, 90% believed that psychosocial stress was the most common risk factor for stroke, followed by hypertension and dyslipidemia. The most common warning signs were 'Sudden difficulty in speaking or understanding speech' and 'Sudden weakness/numbness of the arms/face/legs', accounting for 85%. Only 26% identified all the risk factors, 22.7% recognized all the symptoms, and 44% stated all possible stroke consequences. Internet/social media (30%), healthcare professionals (30%), and family/relatives (18.9%) were the main sources of information of knowledge about stroke. It is noteworthy that missing answers were not counted in the analysis.

Table 2. Number of stroke risk factors, early symptoms, and consequences that were identified by the participants.

Variables (n=551)	Categories	Frequency (%)	Cumulative frequency (%)*
Number of correct answers regarding stroke in the general knowledge	Less than two	0 (0)	0 (0)
	Two	7 (1.3)	7 (1.3)
	Three	52 (9.6)	59 (10.9)
	Four	225 (41.6)	284 (52.5)
	Five	257 (47.5)	541 (100)
Number of identified risk factors of stroke	Zero	12 (2.2)	12 (2.2)
	One	9 (1.7)	21 (3.9)
	Two	11 (2)	32 (5.9)
	Three	20 (3.7)	52 (9.5)
	Four	34 (6.2)	86 (15.8)
	Five	30 (5.5)	116 (21.3)
	Six	63 (11.6)	179 (32.8)
	Seven	68 (12.5)	247 (45.3)
	Eight	78 (14.3)	325 (59.6)
	Nine	78 (14.3)	403 (73.9)
	Ten	142 (26.1)	545 (100)
Number of identified early symptoms of stroke	Zero	22 (4.1)	22 (4.1)
	One	14 (2.6)	36 (6.6)
	Two	13 (2.4)	49 (9)
	Three	57 (10.5)	106 (19.6)
	Four	74 (13.7)	180 (33.2)
	Five	117 (21.6)	297 (54.8)
	Six	122 (22.5)	419 (77.3)
	Seven	123 (22.7)	542 (100)
Number of identified consequences of stroke	Zero	12 (2.2)	12 (2.2)
	One	16 (2.9)	28 (5.2)
	Two	35 (6.4)	63 (11.6)
	Three	74 (13.6)	137 (25.2)
	Four	167 (30.8)	304 (56)
	Five	239 (44)	543 (100)

*Missing answers were not included in the analysis.

Table 3. Association of risk factors, early symptoms, and consequences of stroke with the socio-demographic characteristics and past medical history.

Variables (N=551)		Risk factor(s) identified (≥1)			Early symptom(s) identified (≥1)			Consequence(s) identified (≥1)		
		Yes (n=533), n (%)	No (n=12), n (%)	P-value	Yes (n= 520), n (%)	No (n=22), n (%)	P-value	Yes (n= 520), n (%)	No (n=22), n (%)	P-value
Socio-demographic characteristics										
Gender	Male	132 (25.1)	7 (58.3)	0.016†	129 (25)	8 (40)	0.133	134 (25.6)	6 (50)	0.089
	Female	394 (74.9)	5 (41.7)		386 (75)	12 (60)		390 (74.4)	6 (50)	
Age (years)	<30	302 (56.7)	6 (50)	0.832	294 (56.5)	12 (54.5)	0.880	300 (56.5)	6 (50)	0.698
	30-49	169 (31.7)	5 (41.7)		166 (31.9)	8 (36.4)		170 (32)	4 (33.3)°	
	> 50	62 (11.6)	1 (8.3)°		60 (11.5)	2 (9.1)°		61 (11.5)	2 (16.7)°	
Residence area	Urban	245 (46.2)	9 (75)	0.048†	240 (46.4)	14 (63.6)	0.113	246 (46.6)	6 (50)	0.815
	Rural	285 (53.8)	3 (25)°		277 (53.6)	8 (36.4)		282 (53.4)	6 (50)	
Marital status	Single	263 (49.6)	8 (66.7)	0.602	257 (49.7)	12 (54.5)	0.368	261 (49.4)	8 (66.7)	0.602
	Married	248 (46.8)	4 (33.3)°		242 (46.8)	9 (40.9)		248 (47)	4 (33.3)°	
	Divorced	12 (2.3)	0 (0)°		12 (2.3)	0 (0)°		12 (2.3)	0 (0)°	
	Widowed	7 (1.3)	0 (0)°		6 (1.2)	1 (4.5)°		7 (1.3)	0 (0)°	
Educational level	School	48 (9)	3 (25)°	0.093	47 (9)	3 (13.6)°	0.445	45 (8.5)	5 (41.7)	0.003†
	University	485 (91)	9 (75)		473 (91)	19 (86.4)		486 (91.5)	7 (58.3)	
Employment status	Unemployed	233 (96.3)	9 (3.7)	0.032†	223 (93.7)	15 (6.3)	0.020†	230 (96.2)	9 (3.8)	0.030†
	Employed	298 (99)	3 (1)°		295 (97.7)	7 (2.3)		299 (99)	3 (1)°	
Income level	Low (<1,500,000 LL*)	196 (43.4)	2 (28.6)°	0.340	187 (42.6)	7 (41.2)	0.660	194 (43.2)	3 (33.3)°	0.892
	Medium (1,500,000-3,000,000 LL*)	202 (44.7)	3 (42.9)°		197 (44.9)	9 (52.9)		201 (44.8)	5 (55.6)	
	High (>3,000,000 LL*)	54 (11.9)	2 (28.6)°		55 (12.5)	1 (5.9)°		54 (12)	1 (11.1)°	
History of smoking (≥1 year)	No	383 (73)	5 (50)	0.147	374 (73)	14 (70)	0.764	383 (73)	6 (54.5)	0.183
	Yes	142 (27)	5 (50)		138 (27)	6 (30)		142 (27)	5 (45.5)	

Table 3. *Continued*

Variables (N=551)		Risk factor(s) identified (≥1)			Early symptom(s) identified (≥1)			Consequence(s) identified (≥1)		
		Yes (n=533), n (%)	No (n=12), n (%)	P-value	Yes (n= 520), n (%)	No (n=22), n (%)	P-value	Yes (n= 520), n (%)	No (n=22), n (%)	P-value
Past medical history										
Hypertension	No	448 (87.8)	8 (80)	0.354	435 (87.3)	19 (95)	0.493	447 (87.6)	10 (90.9)	1.000
	Yes	62 (12.2)	2 (20)◦		63 (12.7)	1 (5)◦		63 (12.4)	1 (9.1)◦	
Diabetes Mellitus	No	465 (92.8)	9 (90)	0.532	454 (92.7)	18 (94.7)	1.000	464 (92.6)	11 (100)	1.000
	Yes	36 (7.2)	1 (10)◦		36 (7.3)	1 (5.3)◦		37 (7.4)	0 (0)◦	
Dyslipidemia	No	417 (82.2)	9 (90)	1.000	406 (82)	18 (90)	0.551	416 (82.1)	11 (100)	0.226
	Yes	90 (17.8)	1 (10)◦		89 (18)	2 (10)◦		91 (17.9)	0 (0)◦	
Arrhythmia	No	424 (84.1)	9 (90)	1.000	414 (84.1)	17 (85)	1.000	424 (84.1)	10 (90.9)	1.000
	Yes	80 (15.9)	1 (10)◦		78 (15.9)	3 (15)◦		80 (15.9)	1 (9.1)◦	
Kidney disease	No	475 (95.6)	10 (100)	1.000	463 (95.5)	20 (100)	1.000	475 (95.6)	11 (100)	1.000
	Yes	22 (4.4)	0 (0)◦		22 (4.5)	0 (0)◦		22 (4.4)	0 (0)◦	
Peptic ulcer	No	416 (83.9)	8 (80)	0.669	407 (84.1)	15 (75)	0.347	417 (83.9)	8 (80)	0.668
	Yes	80 (16.1)	2 (20)◦		77 (15.9)	5 (25)		80 (16.1)	2 (20)◦	
Depression	No	429 (85.5)	10 (100)	0.371	422 (86.3)	16 (80)	0.504	430 (85.7)	10 (90.9)	1.000
	Yes	73 (14.5)	0 (0)◦		67 (13.7)	4 (20)◦		72 (14.3)	1 (9.1)◦	
Obesity	No	420 (83)	9 (90)	1.000	409 (82.8)	18 (90)	0.551	419 (82.8)	11 (100)	0.225
	Yes	86 (17)	1 (10)◦		85 (17.2)	2 (10)◦		87 (17.2)	0 (0)◦	

◦Fisher's exact test was used when the cell counts were less than 5.
†Significant P-values.
*LL, Lebanese Lira

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Table 4. Association of taking a patient who is experiencing stroke to the hospital with socio-demographic characteristics, and past medical history.

Variables (N=551)		Taking a patient who is experiencing stroke to the hospital)		
		Yes (n=473), n (%)	No (n=74), n (%)	P-value
Socio-demographic characteristics				
Gender	Male	117 (25)	23 (31.9)	0.211
	Female	351 (75)	49 (68.1)	
Age (years)	<30	263 (55.6)	46 (62.2)	0.475
	30-49	153 (32.3)	22 (29.7)	
	>50	57 (12.1)	6 (8.1)	
Residence area	Urban	214 (45.3)	41 (56.9)	0.066†
	Rural	258 (54.7)	31 (43.1)	
Marital status	Single	237 (50.3)	35 (47.9)	0.567
	Married	216 (45.9)	37 (50.7)	
	Divorced	12 (2.5)	0 (0)°	
	Widowed	6 (1.3)	1 (1.4)°	
Educational level	School	39 (8.2)	13 (17.6)	0.011†
	University	434 (91.8)	61 (82.4)	
Employment status	Unemployed	207 (85.2)	36 (14.8)	0.383
	Employed	265 (87.7)	37 (12.3)	
Income level	Low (<1,500,000 LL*)	174 (43)	25 (44.6)	0.932
	Medium (1,500,000-3,000,000 LL*)	181 (44.7)	25 (44.6)	
	High (>3,000,000 LL*)	50 (12.3)	6 (10.7)	
History of smoking (≥1 year)	No	336 (72.4)	53 (73.6)	0.832
	Yes	128 (27.6)	19 (26.4)	
Past medical history				
Hypertension	No	400 (87.9)	57 (86.4)	0.720
	Yes	55 (12.1)	9 (13.6)	
Diabetes Mellitus	No	414 (92.8)	61 (92.4)	0.803
	Yes	32 (7.2)	5 (7.6)	

Table 4. *Continued*

Variables (N=551)		Taking a patient who is experiencing stroke to the hospital)		
		Yes (n=473), n (%)	No (n=74), n (%)	P-value
Dyslipidemia	No	377 (83.8)	50 (73.5)	0.038†
	Yes	73 (16.2)	18 (26.5)	
Arrhythmia	No	379 (84.6)	55 (82.1)	0.599
	Yes	69 (15.4)	12 (17.9)	
Kidney disease	No	423 (95.7)	63 (95.5)	1.000
	Yes	19 (4.3)	3 (4.5)◦	
Peptic ulcer	No	373 (84)	52 (82.5)	0.767
	Yes	71 (16)	11 (17.5)	
Depression	No	389 (87.2)	51 (76.1)	0.015†
	Yes	57 (12.8)	16 (23.9)	
Obesity	No	374 (82.9)	56 (84.8)	0.697
	Yes	77 (17.1)	10 (15.2)	

◦Fisher's exact test was used when the cell counts were less than 5.
†Significant p-values.
*LL, Lebanese Lira

Bivariate analysis

A significantly higher percentage of females versus males (74.9% vs. 25.1%), residents of the rural versus urban areas (53.8 % vs. 46.2%), and employed versus unemployed (99% vs. 96.3%) correctly identified risk factors. Moreover, a significantly higher percentage of participants who had a job versus unemployed (97.7% vs. 93.7%) recognized at least one warning symptom of stroke. A significantly higher percentage of subjects with university level of education compared to school level (91.5 % vs. 8.5%) and those employed versus unemployed (99% vs. 96.2%) correctly identified the consequences emerging from stroke (Table 3).

A significantly higher number of correct answers was associated with university compared to school level of education (91.8% vs. 8.2%), no history of dyslipidemia compared to having dyslipidemia (83.8% vs. 16.2%), and no history of depression versus having depression (87.2% vs. 12.8%) (Table 4).

Multivariable analysis

When considering the identification of at least one risk factor as the dependent variable, our analysis showed that females compared to males and employed compared to unemployed had significantly higher odds (OR 4.3 [95% CI 1.1;16.8] and 6 [95% CI 1.2;29.6], respectively).

While when considering the identification of at least one early stroke symptom as the dependent variable, employed compared to unemployed had significantly higher odds (OR 3.3 [95% CI 1.2;8.9]).

Also, when considering the identification of at least one stroke consequence as the dependent variable, employed compared to unemployed had significantly higher odds (OR 5.3 [95% CI 1.1;25.9]).

When taking the identification of at least one stroke symptom as the dependent variable, university level compared to school level of education had significantly higher odds (OR 2.3 [95% CI 1.1;4.8]) (Table 5).

Table 5. Multivariate analysis.

Variables (N=551)	β (SE)	OR (95% CI)	P-value
Risk factor(s) identified (≥1)			
Gender (female versus male*)	1.5 (0.7)	4.3 (1.1; 16.8)	0.034†
Residence area (rural versus urban*)	1 (0.7)	2.8 (0.7; 11.1)	0.149
Educational level (university versus school*)	0.3 (0.8)	1.3 (0.3; 6.9)	0.729
Employment status (employed versus unemployed*)	1.8 (0.8)	6 (1.2; 29.6)	0.028†
History of smoking (≥1 year) (yes versus no*)	-0.6 (0.7)	0.5 (0.1; 2.1)	0.366
Early symptom(s) identified (≥1)			
Gender (female versus male*)	0.8 (0.5)	2.3 (0.9; 5.8)	0.086
Residence area (rural versus urban*)	0.6 (0.5)	1.7 (0.7; 4.4)	0.241
Employment status (employed versus unemployed*)	1.2 (0.5)	3.3 (1.2; 8.9)	0.016†
Consequence(s) identified (≥1)			
Gender (female versus male*)	0.8 (0.7)	2.3 (0.6; 8.4)	0.214
Educational level (university versus school*)	1.3 (0.7)	3.5 (0.9; 13.1)	0.06
Employment status (employed versus unemployed*)	1.7 (0.8)	5.3 (1.1; 25.9)	0.04†
History of smoking (≥1 year) (yes versus no*)	-0.6 (0.7)	0.6 (0.2; 2.1)	0.404
Taking a patient to a hospital			
Residence area (rural versus urban*)	0.4 (0.3)	1.5 (0.9; 2.6)	0.136
Educational level (university versus school*)	0.8 (0.4)	2.3 (1.1; 4.8)	0.032†
Dyslipidemia (yes versus no*)	-0.4 (0.3)	0.7 (0.3; 1.3)	0.244
Depression (yes versus no*)	-0.6 (0.3)	0.5 (0.3; 1)	0.067

Abbreviations: β, Beta; SE, standard error; OR; odds ratio; CI, confidence interval.
Dependent variables: identification of stroke risk factors, stroke early symptoms, stroke consequences, taking a patient who is experiencing stroke to the hospital.
Independent variables: sociodemographic factors (gender, residence area, educational level, employment status, and smoking status).
†Significant P-values.
*Reference.

Discussion

The current study evaluated factors related to knowledge about stroke risk factors, early symptoms, and consequences in a sample of the general Lebanese population without a history of stroke. The results indicated that the majority of participants identified at least one stroke related risk factor, symptom, and consequence. Our percentages are higher than those reported in the literature, showing that at least one stroke risk factor may be identified by more than half of the sample, probably as most of our participants had a university degree.[7,34–36] A Lebanese study among 390 participants showed that 68% could spontaneously recall at least one stroke symptom, and 85.4% spontaneously recalled at least one risk factor.[22] A study done in Spain has found that 60% of the sample identified at least one risk factor,[37] and an Australian study revealed that 76% could name at least one risk factor.[7] However, other studies have demonstrated a low knowledge of stroke risk factors and symptoms in the general population.[38–40]

Our results revealed that hypertension and psychological stress were the most known risk factors, with a percentage close to 80%. A previous study in Lebanon found that the most recalled risk factor was hypertension (48.2%), followed by stress (43.1%).[22] A study in Morocco among 469 participants has found similar results, with a percentage close to 50%. These findings are in line with those of several surveys conducted in different countries. Although diabetes is a major risk factor for stroke,[41] it was the least reported in our study. Similarly, another study found that more than half of the sample did not recognize diabetes or hypercholesterolemia as risk factors for stroke.[42]

Also, our results showed a higher percentage of participants recalling at least one stroke early symptom compared to those studies in Portugal (74.2%),[43] Norway (70.7%),[44] Oman (68%),[45] Korea (65%),[46] and Jordan (95.5%).[23] Sudden loss of speech was the most frequently reported stroke symptom in our study compared to studies in Jordan (54.7%), Ireland (54%),[47] and Australia (60.1%).[7] However, other studies reported sudden weakening of one side of the body to be the most prevalent symptom, as in the Omani (65 %)[45] and Nigerian (55 %) populations.[48]

In our study, most of the sample was aware of the importance of going to a hospital emergency as early as possible after a stroke is identified, in agreement with previous findings showing that a high percentage of participants recognized the need for immediate medical care.[22] A study in Oman among 400 participants found that 73% would go immediately to the hospital if they knew they had a stroke.[45] However, the percentage found in international studies was lower, with only 47% claiming they would go to a hospital if they suspected they had a stroke.[38]

The adequate knowledge of stroke risk factors, symptoms, and consequences in our sample could be explained by the young age of the participants and the high level of education, which might be related to better awareness of these aspects of the stroke.

Our results showed that females had better knowledge about stroke risk factors than males, in agreement with other findings.[36,49,50] However, some studies did not detect any gender differences[51,52] in risk factors awareness, and others showed a better knowledge among men.[37,48] Women tend to be more knowledgeable and might be more interested in health topics than men and take more time to seek related information.[53] In this regard, the country of origin is an essential factor to consider because of cultural gaps in gender distribution, access to education, and information in each country.[39]

Moreover, our results revealed that being employed was significantly associated with better awareness of stroke risk factors, early symptoms, and consequences. Similarly, a study in Spain among 2,411 persons has found that actively employed individuals have a better knowledge of stroke than unemployed.[17] One possible explanation could be that employed people might have the financial capacity to access information or visit their physician more regularly for check-ups. Our results also showed that higher education levels were a significant factor associated with the need for immediate medical intervention and direct transfer to the hospital after warning signs of stroke. Expectedly, the more literate the participants, the more health-related knowledge they have, making them more ready to respond to any stroke condition.

Limitations

This study has several limitations. The results could not be representative of the entire Lebanese population as the majority of participants were females, well-educated with computer literacy and internet access; thus, less-educated people and those who did not have access to a computer or mobile or internet were not assessed. Additionally, its cross-sectional design cannot infer causality. Information bias could also exist as the study questionnaire was online and answers were self-reported. The answers to stroke awareness might be overestimated because the questionnaire used consisted of multiple-choice questions with limited options available; thus, the participants could have guessed the answers. Selection bias might have also occurred since the sample was not randomly selected but rather gathered using the snowball sampling technique. Residual confounding bias is also possible since there might be factors related to stroke awareness that were not measured in this study.

Conclusion

The evaluation of stroke knowledge among the general Lebanese population showed that well-educated, employed, and female participants were more knowledgeable about stroke. Tailored interventions focusing on individuals with inadequate stroke literacy are needed to improve stroke awareness.

Further studies, more representative of the general Lebanese population and with a larger sample size, are necessary to confirm our findings.

Data availability

Underlying data

OSF: Factors Associated with Knowledge and Awareness of Stroke Among the Lebanese Population: A Cross-Sectional Study. https://doi.org/10.17605/OSF.IO/Y2DAP.[25]

This project contains the following underlying data:

- Anonymous data_Stroke Education Article_Dr Diana Malaeb.sav

Extended data

OSF: Factors Associated with Knowledge and Awareness of Stroke Among the Lebanese Population: A Cross-Sectional Study. https://doi.org/10.17605/OSF.IO/Y2DAP.[25]

This project contains the following extended data:

- Questionnaire_Stroke Education Article_Dr Diana Malaeb.doc. (English version of the questionnaire).
- Questionnaire_Stroke Education Article_Dr Diana Malaeb.Arabic.doc. (Arabic version of the questionnaire).
- Data key_Stroke Education Article_Dr Diana Malaeb.docx.

Acknowledgments

We thank all the participants for their participation and contribution to this study.

References

1. Adams HP Jr, Bendixen BH, Kappelle LJ, *et al.*: **Classification of subtype of acute ischemic stroke. Definitions for use in a multicenter clinical trial. TOAST. Trial of Org 10172 in Acute Stroke Treatment.** *Stroke.* 1993; **24**(1): 35–41.
PubMed Abstract | Publisher Full Text

2. Sacco RL, Kasner SE, Broderick JP, *et al.*: **An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association.** *Stroke.* 2013; **44**(7): 2064–2089.
PubMed Abstract | Publisher Full Text

3. Rosamond W, Flegal K, Furie K, *et al.*: **Heart disease and stroke statistics--2008 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee.** *Circulation.* 2008; **117**(4): e25–e146.
PubMed Abstract | Publisher Full Text

4. Feigin VL, Forouzanfar MH, Krishnamurthi R, *et al.*: **Global and regional burden of stroke during 1990-2010: findings from the Global Burden of Disease Study 2010.** *Lancet.* 2014; **383**(9913): 245–255.
PubMed Abstract | Publisher Full Text | Free Full Text

5. Lahoud N, Salameh P, Saleh N, *et al.*: **Prevalence of Lebanese stroke survivors: A comparative pilot study.** *J Epidemiol Glob Health.* 2016; **6**(3): 169–176.
PubMed Abstract | Publisher Full Text

6. Abdo R, Abboud H, Salameh P, *et al.*: **Mortality and Predictors of Death Poststroke: Data from a Multicenter Prospective Cohort of Lebanese Stroke Patients.** *J. Stroke Cerebrovasc. Dis.* 2019; **28**(4): 859–868.
PubMed Abstract | Publisher Full Text

7. Sug Yoon S, Heller RF, Levi C, *et al.*: **Knowledge of stroke risk factors, warning symptoms, and treatment among an Australian urban population.** *Stroke.* 2001; **32**(8): 1926–1930.
PubMed Abstract | Publisher Full Text

8. Trobbiani K, Freeman K, Arango M, *et al.*: **Comparison of stroke warning sign campaigns in Australia, England, and Canada.** *Int. J. Stroke.* 2013; **8 Suppl A100**: 28–31.
PubMed Abstract | Publisher Full Text

9. Hatzitolios AI, Spanou M, Dambali R, *et al.*: **Public awareness of stroke symptoms and risk factors and response to acute stroke in Northern Greece.** *Int. J. Stroke.* 2014; **9**(4): E15.
PubMed Abstract | Publisher Full Text

10. Morren JA, Salgado ED: **Stroke literacy, behavior, and proficiency in a South Florida population.** *J. Stroke Cerebrovasc. Dis.* 2013; **22**(7): 962–968.
PubMed Abstract | Publisher Full Text

11. Pandian JD, Jaison A, Deepak SS, *et al.*: **Public awareness of warning symptoms, risk factors, and treatment of stroke in northwest India.** *Stroke.* 2005; **36**(3): 644–648.
PubMed Abstract | Publisher Full Text

12. Awad A, Al-Nafisi H: **Public knowledge of cardiovascular disease and its risk factors in Kuwait: a cross-sectional survey.** *BMC Public Health.* 2014; **14**: 1131.
PubMed Abstract | Publisher Full Text

13. Vincent-Onabajo G, Mshelia JY, Abubakar U, *et al.*: **Knowledge of stroke risk factors among individuals diagnosed with hypertension and diabetes: a hospital-based survey.** *J. Adv. Med. Med. Res.* 2015; **10**: 1–8.
Publisher Full Text

14. O'Donnell MJ, Chin SL, Rangarajan S, *et al.*: **Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (INTERSTROKE): a case-control study.** *Lancet.* 2016; **388**(10046): 761–775.
PubMed Abstract | Publisher Full Text

15. Hosseininezhad M, Ebrahimi H, Seyedsaadat SM, *et al.*: **Awareness toward stroke in a population-based sample of Iranian adults.** *Iran. J. Neurol.* 2017; **16**(1): 7–14.
PubMed Abstract

16. Hawkes MA, Ameriso SF, Willey JZ: **Stroke knowledge in Spanish-speaking populations.** *Neuroepidemiology.* 2015; **44**(3): 121–129.
PubMed Abstract | Publisher Full Text

17. Ramírez-Moreno JM, Alonso-González R, Peral Pacheco D, *et al.*: **Effect of socioeconomic level on knowledge of stroke in the general population: A social inequality gradient.** *Neurologia (Barcelona, Spain).* 2016; **31**(1): 24–32.
PubMed Abstract | Publisher Full Text

18. Lisabeth LD, Brown DL, Hughes R, *et al.*: **Acute stroke symptoms: comparing women and men.** *Stroke.* 2009; **40**(6): 2031–2036.
Publisher Full Text

19. Mandelzweig L, Goldbourt U, Boyko V, *et al.*: **Perceptual, social, and behavioral factors associated with delays in seeking medical care in patients with symptoms of acute stroke.** *Stroke.* 2006; **37**(5): 1248–1253.
PubMed Abstract | Publisher Full Text

20. Roger VL, Go AS, Lloyd-Jones DM, *et al.*: **AHA statistical update. Heart disease and stroke statistics–2012 Update A report from the American Heart Association.** *Circulation.* 2012; **125**(1): e2–e20.
PubMed Abstract | Publisher Full Text

21. Focht KL, Gogue AM, White BM, *et al.*: **Gender differences in stroke recognition among stroke survivors.** *J. Neurosci. Nurs.* 2014; **46**(1): 18–22.
PubMed Abstract | Publisher Full Text

22. Khalil HM, Lahoud N: **Knowledge of Stroke Warning Signs, Risk Factors, and Response to Stroke among Lebanese Older Adults in Beirut.** *J. Stroke Cerebrovasc. Dis.* 2020; **29**(5): 104716.
PubMed Abstract | Publisher Full Text

23. Barakat M, AlSalamat HA, Jirjees F, *et al.*: **Factors Associated with Knowledge and Awareness of Stroke Among the Jordanian Population: A Cross-Sectional Study.** *F1000Res.* 2021; **10**: 1242.
Publisher Full Text

24. Sadighi A, Groody A, Wasko L, *et al.*: **Recognition of Stroke Warning Signs and Risk Factors Among Rural Population in Central Pennsylvania.** *J. Vasc. Interv. Neurol.* 2018; **10**(2): 4–10.
PubMed Abstract

25. Dia N: **Factors Associated with Knowledge and Awareness of Stroke Among the Lebanese Population: A Cross-Sectional Study.** *Open Science Framework (OSF).* 16 Jan. 2022.
Publisher Full Text

26. Han CH, Kim H, Lee S, *et al.*: **Knowledge and Poor Understanding Factors of Stroke and Heart Attack Symptoms.** *Int. J. Environ. Res. Public Health.* 2019; **16**(19).
PubMed Abstract | Publisher Full Text

27. Krishnamurthi RV, Barker-Collo S, Barber PA, *et al.*: **Community Knowledge and Awareness of Stroke in New Zealand.** *J. Stroke Cerebrovasc. Dis.* 2020; **29**(3): 104589.
PubMed Abstract | Publisher Full Text

28. Arnett DK, Blumenthal RS, Albert MA, *et al.*: **2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines.** *Circulation.* 2019; **140**(11): e596–e646.
PubMed Abstract | Publisher Full Text

29. Zafar A, Albakr AI, Shahid R, *et al.*: **Stroke literacy in the population of the Eastern Province of Saudi Arabia; immediate steps are essential to bridge the gap.** *Journal of stroke and cerebrovascular diseases: the official journal of National Stroke Association.* 2020; **29**(10): 105088.
Publisher Full Text

30. Ahmed AAA, Al-Shami AM, Jamshed S, *et al.*: **Development of questionnaire on awareness and action towards symptoms and risk factors of heart attack and stroke among a Malaysian population.** *BMC Public Health.* 2019; **19**(1): 1300.
PubMed Abstract | Publisher Full Text

31. Dar NZ, Khan SA, Ahmad A, *et al.*: **Awareness of Stroke and Health-seeking Practices among Hypertensive Patients in a Tertiary Care Hospital: A Cross-sectional Survey.** *Cureus.* 2019; **11**(5): e4774.
PubMed Abstract | Publisher Full Text

32. Chang T, Ibrahim S, Ranasinghe HM, *et al.*: **Knowledge of Stroke, Its Warning Symptoms, Risk Factors and Treatment among the General Public and General Practitioners in a South Asian Population.** *J. Stroke Cerebrovasc. Dis.* 2020; **29**(5): 104760.
PubMed Abstract | Publisher Full Text

33. Madae'en SS, Bulatova NR, Al-Qhewii A, *et al.*: **Stroke awareness in the general population: A study from Jordan.** *Trop. J. Pharm. Res.* 2013; **12**(6): 1071–1076.

34. Pancioli AM, Broderick J, Kothari R, *et al.*: **Public perception of stroke warning signs and knowledge of potential risk factors.** *JAMA.* 1998; **279**(16): 1288–1292.
PubMed Abstract | Publisher Full Text

35. Croquelois A, Bogousslavsky J: **Risk awareness and knowledge of patients with stroke: results of a questionnaire survey 3 months after stroke.** *J. Neurol. Neurosurg. Psychiatry.* 2006; **77**(6): 726–728.
PubMed Abstract | Publisher Full Text

36. Reeves MJ, Rafferty AP, Aranha AA, *et al.*: **Changes in knowledge of stroke risk factors and warning signs among Michigan adults.** *Cerebrovasc. Dis.* 2008; **25**(5): 385–391.
PubMed Abstract | Publisher Full Text

37. Segura T, Vega G, López S, *et al.*: **Public perception of stroke in Spain.** *Cerebrovasc. Dis.* 2003; **16**(1): 21–26.
PubMed Abstract | Publisher Full Text

38. Jones SP, Jenkinson AJ, Leathley MJ, *et al.*: **Stroke knowledge and awareness: an integrative review of the evidence.** *Age Ageing.* 2010; **39**(1): 11–22.
Publisher Full Text

39. Stroebele N, Mueller-Riemenschneider F, Nolte CH, *et al.*: **Knowledge of risk factors, and warning signs of stroke: a systematic review from a gender perspective.** *Int. J. Stroke.* 2011; **6**(1): 60–66.
PubMed Abstract | Publisher Full Text

40. Nicol MB, Thrift AG: **Knowledge of risk factors and warning signs of stroke.** *Vasc. Health Risk Manag.* 2005; **1**(2): 137–147.
PubMed Abstract | Publisher Full Text | Free Full Text

41. Tun NN, Arunagirinathan G, Munshi SK, *et al.*: **Diabetes mellitus and stroke: A clinical update.** *World J. Diabetes.* 2017; **8**(6): 235–248.
PubMed Abstract | Publisher Full Text

42. Kharbach A, Obtel M, Achbani A, *et al.*: **Level of Knowledge on Stroke and Associated Factors: A Cross-Sectional Study at Primary Health Care Centers in Morocco.** *Ann. Glob. Health.* 2020; **86**(1): 83.
PubMed Abstract | Publisher Full Text

43. Duque AS, Fernandes L, Correia AF, *et al.*: **Awareness of stroke risk factors and warning signs and attitude to acute stroke.** *Int. Arch. Med.* 2015; **8**.
Publisher Full Text

44. Sundseth A, Faiz KW, Rønning OM, *et al.*: **Factors related to knowledge of stroke symptoms and risk factors in a Norwegian stroke population.** *J. Stroke Cerebrovasc. Dis.* 2014; **23**(7): 1849–1855.
PubMed Abstract | Publisher Full Text

45. Al Shafaee MA, Ganguly SS, Al Asmi AR: **Perception of stroke and knowledge of potential risk factors among Omani patients at increased risk for stroke.** *BMC Neurol.* 2006; **6**: 38.
PubMed Abstract | Publisher Full Text

46. Kim JS, Yoon SS: **Perspectives of stroke in persons living in Seoul, South Korea. A survey of 1000 subjects.** *Stroke.* 1997; **28**(6): 1165–1169.
PubMed Abstract | Publisher Full Text

47. Hickey A, O'Hanlon A, McGee H, *et al.*: **Stroke awareness in the general population: knowledge of stroke risk factors and warning signs in older adults.** *BMC Geriatr.* 2009; **9**: 35.
PubMed Abstract | Publisher Full Text

48. Wahab KW, Okokhere PO, Ugheoke AJ, *et al.*: **Awareness of warning signs among suburban Nigerians at high risk for stroke is poor: a cross-sectional study.** *BMC Neurol.* 2008; **8**: 18.
PubMed Abstract | Publisher Full Text

49. Park MH, Jo SA, Jo I, *et al.*: **No difference in stroke knowledge between Korean adherents to traditional and western medicine – the AGE study: an epidemiological study.** *BMC Public Health.* 2006; **6**(1): 153.
PubMed Abstract | Publisher Full Text

50. Rau R, Mensing M, Brand H: **[Community knowledge about stroke. A survey in the District of Wesel, Germany (2002)].** *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz.* 2006; **49**(5): 450–458.
Publisher Full Text

51. Koçer A, İnce N, Koçer E, *et al.*: **Factors influencing treatment compliance among Turkish people at risk for stroke.** *J. Prim. Prev.* 2006; **27**(1): 81–89.
PubMed Abstract | Publisher Full Text

52. Pontes-Neto OM, Silva GS, Feitosa MR, *et al.*: **Stroke awareness in Brazil: alarming results in a community-based study.** *Stroke.* 2008; **39**(2): 292–296.
Publisher Full Text

53. Horch K, Wirz J: **People's interest in health information.** *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz.* 2005; **48**(11): 1250–1255.
PubMed Abstract | Publisher Full Text

Open Peer Review

Current Peer Review Status: ✔ ✔

Version 1

Reviewer Report 01 June 2022

https://doi.org/10.5256/f1000research.120152.r135285

✔ **Ammar ali saleh Jaber**
Department of Clinical Pharmacy & Pharmacotherapeutics, Dubai Pharmacy College for Girls, Dubai, United Arab Emirates

This research assesses the knowledge and awareness of the Lebanese population regarding stroke in a cross-sectional study. The methodology is scientifically founded. The article is well-written and raises an interesting question. The results are represented adequately. The study paves the road for awareness campaigns about stroke. This article is of good quality, fit for indexing and citation.

However, I have some minor points for revision before final indexing:

1. State the objectives of the study in a clearer manner.

2. The real questionnaire should be attached as supplement material for reproducibility.

3. Some of the English writing in the intro needs to be revised before submission.

4. In the 4th paragraph of the intro, a very brief comparison of Lebanon people to a neighbouring country might be needed.

Overall, this manuscript will be very interesting after doing the above recommendations and insertion of the recommended citations.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 10 Jun 2022

Nada Dia, Lebanese International University, Beirut, Lebanon

Dear Prof. Ammar ali saleh Jaber,

Thank you for reviewing our article.

Our reply is stated below each question:

1. State the objectives of the study in a clearer manner.
   Thank you for pointing this out. We have stated the objectives clearly, as requested, in the second version.
2. The real questionnaire should be attached as supplement material for reproducibility.
   Thank you for this suggestion. Abiding by the policy of the journal, the questionnaire is accessible online via the link provided in the section on data availability.
3. Some of the English writing in the intro needs to be revised before submission.
   Thank you for pointing this out. English writing was revised and corrected.
4. In the 4th paragraph of the intro, a very brief comparison of Lebanon people to a neighboring country might be needed.
   Thank you for raising an important point here. The introduction was expanded to cover neighboring countries.

We look forward to hearing from you in due time regarding our second version and to respond to any further questions and comments you may have.

Sincerely,

Nada Dia

Competing Interests: No competing interests were disclosed.

Reviewer Report 22 April 2022

https://doi.org/10.5256/f1000research.120152.r135286

Mohammad Al-Shorbagy
Department of Pharmacology and Toxicology, Faculty of Pharmacy, Cairo University, Cairo, Egypt

The current cross-sectional study highlights the factors associated with the knowledge and awareness of stroke among a sample of the Lebanese population. Motives to initiate the study in that population seem logical and the stratification of the population groups serves the purpose of the study. Results are coherent and neatly described with appropriate statistical analysis. The conclusions drawn are not overly expressed and are matching with the obtained results and can drive action to population awareness as well as feed future research in that particular setup.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Neuropharmacology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 10 Jun 2022

Nada Dia, Lebanese International University, Beirut, Lebanon

Dear Prof. Mohammad Al-Shorbagy

Thank you for reviewing our article.

We look forward to hearing from you in due time regarding our second version and to responding to any further questions and comments you may have.

Sincerely,
Nada Dia

Competing Interests: No competing interests were disclosed.