



RESEARCH ARTICLE

REVISED Factors Associated with Knowledge and Awareness of Stroke Among the Jordanian Population: A Cross-Sectional Study [version 2; peer review: 3 approved]

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Abstract

Background and objective: Stroke is the second leading cause of death in Jordan and over the world. Knowledge and awareness towards stroke play a crucial role in the management and prevention of its complications. This study aims to assess the knowledge and awareness about stroke among the Jordanian population and determine factors associated with stroke awareness.

Methods: This cross-sectional study through a web-based anonymous questionnaire that needed 10 minutes to be completed. It examined sociodemographic characteristics and recognition of the risk factors, warning signs, stroke consequences, and early response to stroke symptoms. Logistic regression analysis identified the factors associated with poor knowledge of stroke.

Results: A total of 573 Jordanian adults participated in this study. The participant's ability to identify at least one early symptom of stroke and the proper response to the symptoms were significantly correlated with the educational level (OR of 3.4 and 2.5, respectively). At least one consequence of stroke was significantly associated with different demographic factors such as gender, socioeconomic income, females versus males and those with medium income versus low income had significantly higher odds (OR of 6.6 and 4.1, respectively).

Conclusion: This study revealed a good knowledge and awareness level about stroke among Jordanians correlated mainly with their

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educational level. Therefore, new strategies should be considered to decrease the prevalence of stroke in Jordan, including the need for engagement in enhanced awareness campaigns.

Keywords

Awareness, Factors, Knowledge, Jordan, Stroke

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

Summary for the applied changes:

1. Line 5, Introduction, this sentence has been deleted "due to several recent changes in the segment of countries."
2. Line 33, Introduction "to be investigated" was added.
3. Line 43-45, Introduction, this sentence has been added "The study will provide an overall insight towards importance of raising the level of knowledge and awareness towards stroke to minimize stroke development, to prevent stroke recurrence, and ensure early patient presentation."
4. Line 95-96, methods, has been re-written to be "According to the previous study by (Han et al., 2019), participants were awarded one point per correct answer to the above statements, however, it lacks a cutoff value that identifies the acceptable level of knowledge. Thus, our study summed up the total correct answers and considered a good level of knowledge above 50%."
5. Line 193-197, discussion, this sentence has been amended "Although Karasneh et al 2020 mentioned in their study that Jordanians have an inadequate level of health literacy, most of the participants in our study expressed good knowledge regarding stroke (Karasneh et al., 2020). Particularly."
6. Line 260-263, discussion, this sentence has been amended "Similar findings were revealed by Alluqmani 2021 in Saudi Arabia, as they also recommended for comprehensive investigation for stroke awareness, including large samples in rural populations."
7. At the end of the discussion, this sentence has been added "Although a similar study was previously conducted in Jordan by (Madae'en et al., 2013), which assessed the level of knowledge and awareness toward stroke among the general Jordanian population, this study did not evaluate the factors that exert an influential effect on stroke. Thus, our study provided insight into both the level of knowledge and awareness toward stroke and the factors associated with it."

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

Introduction

Stroke is the second cause of death worldwide, with approximately 11% of total deaths and is the leading cause of serious and permanent disability (WHO, 2020, Katan, 2018). Moreover, in the past decades, the prevalence of stroke has increased more in developing countries than in developed countries (Feigin et al., 2009, Roth et al., 2020). For instance, stroke represents a major cause of disability and death in the last three decades in Jordan as a large Middle Eastern country. This surge has been linked to the prevalence of behavioral risk factors such as smoking, insufficient physical activity, and an unhealthy diet (Vos et al., 2020, Ministry of Health, 2020).

Primary prevention of cerebrovascular accidents is essential to minimize stroke occurrence. It is achieved through different means, focusing on identifying associated risk factors, initiating prophylactic measures, and increasing patient awareness. Educational programs directed towards the community are among the best preventive measures; thus, an accurate assessment of comprehensive knowledge of stroke and its associated trigger factors is needed (Sug Yoon et al., 2001, Trobbiani et al., 2013, Hatzitolios et al., 2014, Morren and Salgado, 2013, Pandian et al., 2005). In addition to improving the patients' quality of life, knowledge will prevent healthcare professionals from being overwhelmed when stroke cases present to the emergency room at an early stage (Awad and Al-Nafisi, 2014). It is worth noting that 80% of stroke cases are preventable if necessary precautions and actions are taken (Vincent-Onabajo et al., 2015).

Globally, there is a lack of knowledge about stroke modifiable risk factors as unhealthy behaviors, obesity, smoking, and uncontrolled chronic diseases (Medeiros et al., 2012, Boehme et al., 2017, Farrag et al., 2018). The accurate identification of stroke early symptoms is critical for quick and efficient medical interventions and the reduction of neuro-deficit complications as well as mortality (Müller-Nordhorn et al., 2006, Stroebele et al., 2011a). Hence, in Low-Middle Income and developing countries, there is always a question about the public's understanding of stroke's risk factors and related issues in terms of the condition's risk, morbidity and mortality (Stroebele et al., 2011c, Romero et al., 2008). Therefore, it is important to screen public characteristics and traits regarding lifestyle, behavior (O'Donnell et al., 2016), educational level, smoking habits (Hosseininezhad et al., 2017), and socioeconomic status (Hawkes et al., 2015, Hosseininezhad et al., 2017).

Since stroke risk factors (i.e., history of hypertension or/and diabetes) are identifiable in individuals with low socioeconomic status, past medical history is also essential to be investigated. Educational level, personal history of smoking, and high-income status have been associated with increased stroke knowledge (Ramírez-Moreno et al., 2016). Gender is another factor to consider, as findings are contradictory. Indeed, several studies reported that women are more likely to present non-traditional stroke warning signs, develop stroke, and go late to the emergency department compared to males (Lisabeth et al., 2009, Mandelzweig et al., 2006, Roger et al., 2012); oppositely, others showed that women recognize all the five traditional warning signs and quickly call the emergency department (Focht et al., 2014).

Although the assessment of knowledge study deems simple, the outcomes of such research segment positively impact the design and implementation of highly effective interventions based on accurate population-based data. The study will provide an overall insight towards importance of raising the level of knowledge and awareness towards stroke to minimize stroke development, to prevent stroke recurrence, and ensure early patient presentation. Yet, no nationwide study has been conducted in Jordan to assess the public awareness towards stroke. This study aims to highlight public gaps in knowledge and to reveal practice-related misconceptions in Jordan as a Middle-Eastern Developing country.

Methods

Study design

This descriptive cross-sectional study was carried out on the Jordanian population across all regions, using an anonymous online survey. A snowball sampling method was applied to abide by the lockdown restrictions enforced by the Jordanian Government (2020). An electronic questionnaire was created on Google forms and distributed to the Jordanian internet users ($n=6.5$ million) via digital platforms (i.e., WhatsApp, LinkedIn, and Facebook) and made available online from February 2021 to April 2021. Participation in this study was voluntary and anonymous. Participants above 18 years of age were eligible; those with a history of stroke were excluded. The anonymity of the participants was guaranteed during the data collection process. A written participant consent statement “Your participation in completing this questionnaire is highly appreciated” was given to the participants at the beginning of the survey. If the participants were willing to proceed with the survey, they approved their consent. If not, they selected “disagree to participate” and did not continue with the survey questions. Potential participants who completed the survey were considered to have given informed consent for their participation in the study. Ethics approval for the study was obtained from the Faculty of Pharmacy, Applied Science Private University, Amman, Jordan (Approval Number: 2021-PHA-9).

Sample size calculation

Based on another study, which concluded that around 71.8% of the participants were able to identify at least 3 out of 5 stroke risk factors (Sadighi et al., 2018a), and in the absence of similar studies in Jordan, the Epi Info software version 7.2 (population survey) calculated a minimum sample of 312 participants at a confidence level of 95%. The reason for oversampling is to take into account patients’ refusal.

Questionnaire

The questionnaire was in Arabic, the native language of Jordan and designed in a plain Arabic language. The expected filling time of the questionnaire is 20 minutes. This survey was developed based on previous literature (Sadighi et al., 2018b, Han et al., 2019b). Participants filled it out without the help of investigators to avoid any potential influence when answering the questions.

The first section of the questionnaire covered the sociodemographic and socioeconomic factors, including age, smoking status, marital status (married versus others), employment status (employed versus not employed), family income, residence (urban versus rural), educational level, past medical history (e.g., hypertension, diabetes mellitus, dyslipidemia). Age was categorized into four groups (18-29, 30-49, 50-70, and above 70 years). The family income per month was divided into three financial categories: low (<400 JOD), intermediate (400-1000 JOD), and high (>1000 JOD), as 1 JOD equals 1.4 US Dollars (Ahmed et al., 2019).

The second section assessed the general knowledge about stroke. Respondents answered the following statements: stroke 1) affects the brain, 2) is common among the elderly, 3) is contagious, 4) is hereditary, and 5) and can be prevented. This section also evaluated awareness about stroke risk factors, including hypertension, smoking, alcohol consumption, dyslipidemia, diabetes, physical inactivity, heart disorders, obesity, old age, and psychosocial stress. Moreover, it examined knowledge of early warning signs: 1) sudden numbness or weakness of the face, arms, or legs, especially on one side of the body; 2) sudden confusion or difficulty speaking or understanding speech; 3) sudden visual impairment in one or both eyes; 4) sudden difficulty walking, dizziness, or loss of balance or coordination; and 5) sudden severe headache with no known cause. According to the previous study by Han et al. (2019a), participants were awarded one point per correct answer to the above statements, however, it lacks a cutoff value that identifies the acceptable level of knowledge. Thus, our study summed up the total correct answers and considered a good level of knowledge above 50%.

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences version (SPSS) 25.0. All continuous variables were presented as mean and standard deviation (SD), and categorical variables were presented as frequencies (n) and percentages (%). Binary logistic regression was performed to determine the factors associated with the ability to spontaneously answer at least one or more stroke risk factors, one or more warning signs, one or more consequences, and seeking an emergency room as soon as stroke develops. Variables with a $p<0.2$ in the bivariate analysis were included in

the regression analysis. Results were presented as odds ratios (OR) and 95% CI. Statistical tests were two-tailed and reported statistically significant at $p < 0.05$.

Results

Sociodemographic characteristics of the participants

A total of 573 participants completed the questionnaire. Of which, 65.1% are females and 59.2% are married, [Table 1](#). A total of 93.4% of participants had finished their third-level education, and 85.9% were living in urban areas. Regarding the medical history, the most reported concomitant diseases were dyslipidemia (21%), obesity (18%) and Hypertension (15.7%). 94.8% of the participants reported their familiarity with the term stroke, while 31.4% just knew the term when a family member had it.

Stroke knowledge

The sample showed a satisfactory overall level of knowledge about stroke ([Figure 1](#) and [Table 2](#)). Nearly 95% of the participants mentioned that the brain is the primary organ of the body affected by stroke and 81% were aware of its

Table 1. Participants' sociodemographic characteristics, past medical history and familiarity with stroke.

| Variables (N = 573) | | Frequency (%) |
|---|-------------------------------------|---------------|
| Sociodemographic characteristics | | |
| Gender | Male | 200 (34.9) |
| | Female | 373 (65.1) |
| Age (years) | <30 | 183 (31.9) |
| | 30-49 | 270 (47.1) |
| | >50 | 120 (21) |
| Residence area | Urban | 492 (85.9) |
| | Rural | 81 (14.1) |
| Marital status | Single | 206 (36) |
| | Married | 339 (59.2) |
| | Divorced | 20 (3.5) |
| | Widowed | 8 (1.3) |
| Educational level | Scholar level | 38 (6.6) |
| | University level | 536 (93.4) |
| Employment status | Unemployed | 227 (39.6) |
| | Employed | 346 (60.4) |
| Income level | Low | 149 (26) |
| | Medium | 302 (52.7) |
| | High | 122 (21.3) |
| Smoking (≥ 1 year) | Yes | 190 (33.2) |
| Past medical history | Hypertension | 92 (15.7) |
| | Diabetes Mellitus | 47 (8) |
| | Dyslipidemia | 123 (21) |
| | Arrhythmia | 86 (14.7) |
| | Kidney disease | 27 (4.6) |
| | Peptic ulcer | 59 (10) |
| | Depression | 46 (8) |
| | Obesity | 105 (18) |
| Familiarity with stroke | Ever heard of stroke | 543 (94.8) |
| | History of stroke in the family | 180 (31.4) |
| | Personally know someone with stroke | 441 (77) |

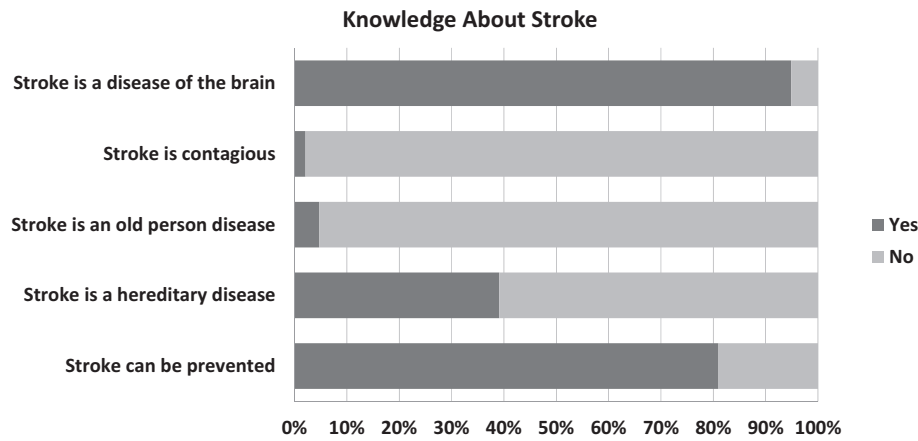


Figure 1. Assessment of stroke knowledge.

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

| Variables (n = 573) | | Frequency (%) | Cumulative, Frequency (%) |
|---|---------------|---------------|---------------------------|
| Number of correct responses in the general knowledge | Less than two | 4 (0.7) | 4 (0.7) |
| | Two | 7 (1.2) | 11 (1.9) |
| | Three | 63 (11) | 74 (12.9) |
| | Four | 236 (41.2) | 310 (54.1) |
| | Five | 263 (45.9) | 573 (100) |
| Number of risk factors identified | Zero | 11 (1.9) | 11 (1.9) |
| | One | 1 (0.2) | 12 (2.1) |
| | Two | 14 (2.4) | 26 (4.5) |
| | Three | 17 (3) | 43 (7.5) |
| | Four | 23 (4) | 66 (11.5) |
| | Five | 28 (4.9) | 94 (16.4) |
| | Six | 48 (8.4) | 142 (24.8) |
| | Seven | 42 (7.3) | 184 (32.1) |
| | Eight | 79 (13.8) | 263 (45.9) |
| | Nine | 97 (16.9) | 360 (62.8) |
| Ten | 213 (37.2) | 573 (100) | |
| Number of early symptoms identified | Zero | 26 (4.5) | 26 (4.5) |
| | One | 7 (1.2) | 33 (5.8) |
| | Two | 24 (4.2) | 57 (9.9) |
| | Three | 23 (4) | 80 (14) |
| | Four | 52 (9.1) | 132 (23) |
| | Five | 106 (18.5) | 238 (41.5) |
| | Six | 129 (22.5) | 367 (64) |
| | Seven | 206 (36) | 573 (100) |
| Number of consequences identified | Zero | 11 (1.9) | 11 (1.9) |
| | One | 12 (2.1) | 23 (4) |
| | Two | 15 (2.6) | 38 (6.6) |
| | Three | 53 (9.2) | 91 (15.9) |
| | Four | 123 (21.5) | 214 (37.3) |
| | Five | 359 (62.7) | 573 (100) |

possible prevention. In the question about risk factors, 92.1% believed that high blood pressure is the most common risk factor of stroke, followed by psychosocial stress (90.1%) and dyslipidemia (86%), **Figure 2**. The most identified warning signs were “Sudden difficulty in speaking or understanding speech” as 92.3% and “Sudden weakness/numbness/tingling” as 88%, **Figure 3**.

Internet/social media was the primary source of information about stroke as described by 24.4% of the respondents, followed by healthcare professionals as reported by 20.9% and family/relatives as 15.2%, **Figure 4**.

Bivariate analysis

A total of 37.2 % identified all the risk factors appropriately, 36% recognized all the symptoms, and 62.7% stated all possible consequences of stroke. A significantly higher proportion of participants who are residents of the urban areas versus rural (86.5% vs. 13.5%) correctly identified the risk factors. Moreover, a significantly higher proportion of participants with university level of education compared to scholar level (94% vs. 6%) and those with no history of diabetes compared to having diabetes (92.3% vs. 7.7%) recognized at least one warning symptom of stroke. A significantly higher proportion of females versus males (65.8% vs. 34.2%) and those residing in urban areas vs. rural areas (86.7% vs. 13.3%) correctly identified the consequences emerging from stroke (**Table 3**).

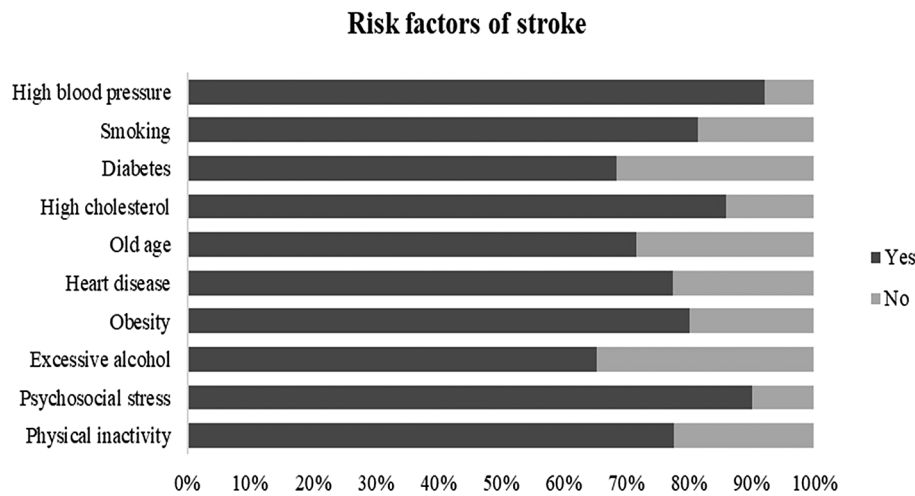


Figure 2. Identification of stroke risk factors.

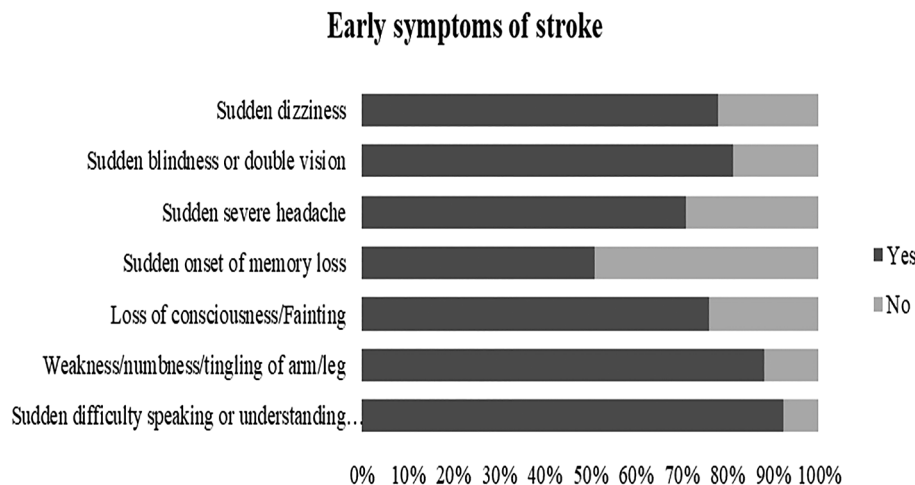


Figure 3. Awareness of stroke early symptoms.

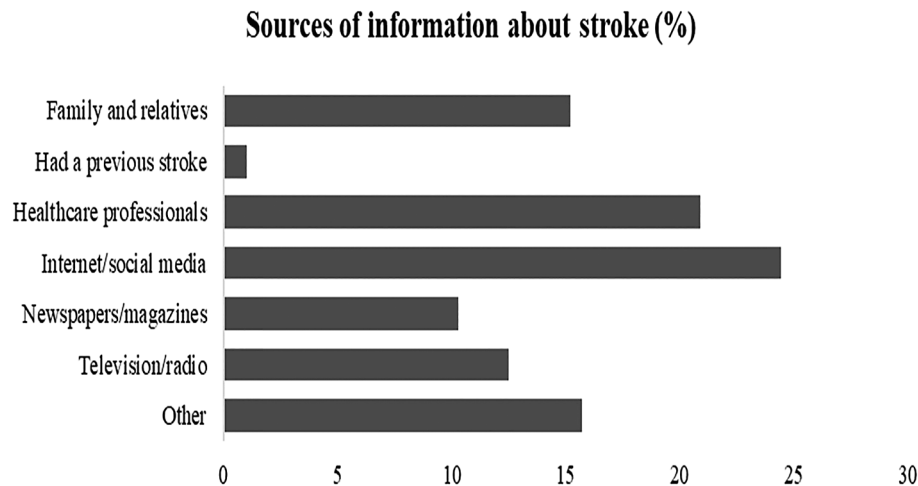


Figure 4. Evaluation of sources of information about stroke.

In terms of attitude, a significantly higher number of correct answers was associated with university compared to scholar level of education (94.3 % vs. 5.7%), who had a job versus unemployed (62.2% vs. 37.8%) and those with no history of diabetes compared to having diabetes (92.7% vs. 7.3%) (Table 4).

Multivariable analysis

When considering the identification of at least a risk factor as the dependent variable, the multivariable analysis showed that those residing in rural areas were less likely to identify a risk factor than those living in urban areas (OR = 0.2, p-value of 0.011).

The participant's ability to identify at least one early symptom of stroke as the dependent variable, university compared to the scholar level of education had significantly higher odds (OR = 3.4, p-value of 0.023), and diabetes was inversely associated with early symptoms identification (OR = 0.2, p-value of 0.008).

When considering the identification of at least one consequence of stroke as the dependent variable, females versus males and those with medium income versus low income had significantly higher odds (OR of 6.6 and 4.1 respectively). Moreover, residents of rural areas were less likely to identify stroke consequences compared to urban residents (OR = 0.1, p-value of 0.005).

Concerning the response to stroke symptoms (by taking the patient to the hospital) as the dependent variable, university compared to scholar level of education and employed versus unemployed had significantly higher odds (OR of 2.5 and 1.8 respectively) whereas, having diabetes was associated with lower odds compared to no diabetes history (OR = 0.4) (Table 5, Figure 5).

Discussion

Public health literacy is a strong asset for a healthier community. As of August 2020, The U.S. Department of Health and Human Services (HHS) released Healthy People 2030, introducing an updated definition of personal health literacy as “the degree to which individuals can find, understand, and use information and services to inform health-related decisions and actions for themselves and others,” while organizational health literacy describes the degree to which organizations equitably enable individuals to pursue personal health literacy (Services, 2020, Ancker et al., 2020). This study describes the levels of knowledge and awareness related to stroke among individuals from the general Jordanian population.

Although Karasneh et al., mentioned in their study that Jordanians have an inadequate level of health literacy, most of the participants in our study expressed good knowledge regarding stroke (Karasneh et al., 2020). Particularly being related to the brain, not contagious, not old-age specific, not hereditary, and being preventable. Additionally, most participants identified at least one risk factor, one consequence, and one symptom related to stroke. Compared to similar literature (Sug Yoon et al., 2001, Pancioli et al., 1998, Croquelois and Bogousslavsky, 2006, Reeves et al., 2008), our outcome measures of stroke health literacy are higher, mainly that all knowledge, risk factors, symptoms, and consequences related to stroke were identified by more than 50% of the study sample.

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

| Variables (n = 573) | | Risk factor(s) identified (≥1) | | Early symptom(s) identified (≥1) | | Consequence(s) identified (≥1) | | P-value | |
|---|------------|--------------------------------|----------------------|----------------------------------|------------------------|--------------------------------|------------------------|----------|----------------------|
| | | Yes (n = 562) n (%) | No (n = 11) n (%) | P-value | Yes (n = 547) n (%) | No (n = 26) n (%) | Yes (n = 562) n (%) | | No (n = 11) n (%) |
| Sociodemographic characteristics | | | | | | | | | |
| Gender | Male | 194 (34.5) | 6 (54.5) | 0.204 | 187 (34.2) | 13 (50) | 192 (34.2) | 8 (72.7) | 0.020 |
| | Female | 368 (65.5) | 5 (45.5) | | 360 (65.8) | 13 (50) | 370 (65.8) | 3 (27.3) | |
| Age (years) | <30 | 178 (31.7) | 5 (45.5) | 0.614 | 176 (32.2) | 7 (27) | 176 (31.3) | 7 (63.6) | 0.190 |
| | 30-49 | 265 (47.1) | 5 (45.5) | | 255 (46.6) | 15 (57.7) | 267 (47.5) | 3 (27.4) | |
| | 50-70 | 114 (20.3) | 1 (9) | | 111 (20.3) | 4 (15.3) | 114 (20.3) | 1 (9.1) | |
| | >70 | 5 (0.9) | 0 (0) | | 5 (0.9) | 0 (0) | 5 (0.9) | 0 (0) | |
| Residence area | Urban | 486 (86.5) | 6 (54.5) | 0.012 | 473 (86.5) | 19 | 487 (86.7) | 5 (45.5) | 0.002 |
| | Rural | 76 (13.5) | 5 (45.5) | | 74 (13.5) | 7 (27) | 75 (13.3) | 6 (54.5) | |
| Marital status | Single | 201 (35.8) | 5 (45.5) | 0.859 | 201 (36.7) | 5 (19.2) | 201 (35.8) | 5 (45.5) | 0.859 |
| | Married | 333 (59.2) | 6 (54.5) | | 320 (58.5) | 19 (73) | 333 (59.2) | 6 (54.5) | |
| | Divorced | 20 (3.6) | 0 (0) | | 19 (3.5) | 1 (3.9) | 20 (3.6) | 0 (0) | |
| | Widowed | 8 (1.4) | 0 (0) | | 7 (1.3) | 1 (3.9) | 8 (1.4) | 0 (0) | |
| | Scholar | 36 (6.4) | 2 (18.2) | 0.161 | 33 (6) | 5 (19.2) | 36 (6.4) | 2 (18.2) | 0.161 |
| Educational level | University | 526 (93.6) | 9 (81.8) | | 514 (94) | 21 (80.8) | 526 (93.6) | 9 (81.8) | |
| | Unemployed | 220 (39.1) | 7 (63.6) | 0.123 | 215 (39.3) | 12 (46.2) | 221 (39.3) | 6 (54.5) | 0.358 |
| Employment status | Employed | 342 (60.9) | 4 (36.4) | | 332 (60.7) | 14 (53.8) | 341 (60.7) | 5 (45.5) | |
| | Low | 145 (25.8) | 4 (36.4) | 0.211 | 139 (25.4) | 10 (38.5) | 143 (25.5) | 6 (54.5) | 0.123 |
| | Medium | 295 (52.5) | 7 (63.6) | | 289 (52.8) | 13 (50) | 298 (53) | 4 (36.4) | |
| Income level | High | 122 (21.7) | 0 (0) | | 119 (21.8) | 3 (11.5) | 121 (21.5) | 1 (9.1) | |
| | No | 374 (66.5) | 9 (81.8) | 0.355 | 366 (67) | 17 (65.4) | 376 (67) | 7 (63.6) | 0.759 |
| Smoking (≥1 year) | Yes | 188 (33.5) | 2 (18.2) | | 181 (33) | 9 (34.6) | 186 (33) | 4 (36.4) | |

Table 3. Continued

| Variables (n = 573) | | Risk factor(s) identified (≥1) | | | Early symptom(s) identified (≥1) | | | Consequence(s) identified (≥1) | | |
|-----------------------------|-----|--------------------------------|----------------------|---------|----------------------------------|----------------------|--------------|--------------------------------|----------------------|---------|
| | | Yes (n = 562) n (%) | No (n = 11) n (%) | P-value | Yes (n = 547) n (%) | No (n = 26) n (%) | P-value | Yes (n = 562) n (%) | No (n = 11) n (%) | P-value |
| Past medical history | | | | | | | | | | |
| Hypertension | No | 472 (84) | 9 (81.8) | 0.692 | 462 (84.5) | 19 (73) | 0.165 | 472 (84) | 9 (81.8) | 0.692 |
| | Yes | 90 (16) | 2 (18.2) | | 85 (15.5) | 7 (27) | | 90 (16) | 2 (18.2) | |
| Diabetes Mellitus | No | 516 (91.8) | 10 (91) | 1.000 | 505 (92.3) | 21 (80.8) | 0.053 | 516 (91.8) | 10 (91) | 1.000 |
| | Yes | 46 (8.2) | 1 (9) | | 42 (7.7) | 5 (19.2) | | 46 (8.2) | 1 (9) | |
| Dyslipidemia | No | 440 (78.3) | 10 (91) | 0.471 | 430 (78.6) | 20 (77) | 0.838 | 440 (78.3) | 10 (91) | 0.471 |
| | Yes | 122 (21.7) | 1 (9) | | 117 (21.4) | 6 (23) | | 122 (21.7) | 1 (9) | |
| Arrhythmia | No | 478 (85) | 9 (81.8) | 0.674 | 467 (85.4) | 20 (77) | 0.258 | 479 (85.2) | 8 (72.7) | 0.220 |
| | Yes | 84 (15) | 2 (18.2) | | 80 (14.6) | 6 (23) | | 83 (14.8) | 3 (27.3) | |
| Kidney disease | No | 536 (95.4) | 10 (91) | 0.415 | 522 (95.4) | 24 (92.3) | 0.350 | 536 (95.4) | 10 (91) | 0.415 |
| | Yes | 26 (4.6) | 1 (9) | | 25 (4.6) | 2 (7.7) | | 26 (4.6) | 1 (9) | |
| Peptic ulcer | No | 504 (89.7) | 10 (91) | 1.000 | 489 (89.4) | 25 (96.1) | 0.504 | 504 (89.7) | 10 (91) | 1.000 |
| | Yes | 58 (10.3) | 1 (9) | | 58 (10.6) | 1 (3.9) | | 58 (10.3) | 1 (9) | |
| Depression | No | 518 (92.2) | 9 (81.8) | 0.219 | 504 (92) | 23 (88.5) | 0.456 | 518 (92.2) | 9 (81.8) | 0.219 |
| | Yes | 44 (7.8) | 2 (18.2) | | 43 (8) | 3 (11.5) | | 44 (7.8) | 2 (18.2) | |
| Obesity | No | 458 (81.5) | 10 (91) | 0.698 | 444 (81) | 24 (92.3) | 0.198 | 458 (81.5) | 10 (91) | 0.698 |
| | Yes | 104 (18.5) | 1 (9) | | 103 (19) | 2 (7.7) | | 104 (18.5) | 1 (9) | |

Numbers in **bold** indicate significant p-values.

Table 4. Association of response in case of facing somebody with acute symptoms of a stroke (identified by taking the patient to the hospital) and with sociodemographic characteristics, and past medical history

| Variables (n = 573) | | Response in case of facing somebody with acute symptoms of stroke identified by taking the patient to the hospital | | |
|---|------------|--|--------------------|--------------|
| | | Yes (n = 510), n(%) | No (n = 63), n (%) | P-value |
| Sociodemographic characteristics | | | | |
| Gender | Male | 180 (35.3) | 20 (31.7) | 0.577 |
| | Female | 330 (64.7) | 43 (68.3) | |
| Age (years) | <30 | 163 (32) | 20 (31.7) | 0.957 |
| | 30-49 | 241 (47.2) | 29 (46) | |
| | 50-70 | 101(19.8) | 14 (22.3) | |
| | >70 | 5 (1) | 0 (0) | |
| Residence area | Urban | 440 (86.3) | 52 (82.5) | 0.422 |
| | Rural | 70 (13.7) | 11 (17.5) | |
| Marital status | Single | 186 (36.5) | 20 (31.7) | 0.472 |
| | Married | 300 (58.8) | 39 (61.9) | |
| | Divorced | 18 (3.5) | 2 (3.2) | |
| | Widowed | 6 (1.2) | 2 (3.2) | |
| Educational level | School | 29 (5.7) | 9 (14.3) | 0.026 |
| | University | 481 (94.3) | 54 (85.7) | |
| Employment status | Unemployed | 193 (37.8) | 34 (54) | 0.014 |
| | Employed | 317 (62.2) | 29 (46) | |
| Income level | Low | 128 (25.1) | 21 (33.3) | 0.213 |
| | Medium | 269 (52.7) | 33 (52.4) | |
| | High | 113 (22.2) | 9 (14.3) | |
| History of smoking (≥ 1 year) | No | 340 (66.7) | 43 (68.3) | 0.801 |
| | Yes | 170 (33.3) | 20 (31.7) | |
| Past medical history | | | | |
| Hypertension | No | 430 (84.3) | 51 (81) | 0.493 |
| | Yes | 80 (15.7) | 12 (19) | |
| Diabetes Mellitus | No | 473 (92.7) | 53 (84.1) | 0.019 |
| | Yes | 37 (7.3) | 10 (15.9) | |
| Dyslipidemia | No | 402 (78.8) | 48 (76.2) | 0.631 |
| | Yes | 108 (21.2) | 15 (23.8) | |
| Arrhythmia | No | 437 (85.7) | 50 (79.4) | 0.185 |
| | Yes | 73 (14.3) | 13 (20.6) | |
| Kidney disease | No | 485 (95) | 61 (96.8) | 0.757 |
| | Yes | 25 (5) | 2 (3.2) | |
| Peptic ulcer | No | 455 (89.2) | 59 (93.7) | 0.274 |
| | Yes | 55 (10.8) | 4 (6.3) | |
| Depression | No | 470 (92.2) | 57 (90.5) | 0.643 |
| | Yes | 40 (7.8) | 6 (9.5) | |
| Obesity | No | 417 (81.8) | 51 (81) | 0.875 |
| | Yes | 93 (18.2) | 12 (19) | |

Numbers in **bold** indicate significant p-values.

Table 5. Multivariate analysis.

| Variables (n = 573) | β (SE) | OR (95% CI) | P-value |
|--|--------------|-------------------|--------------|
| Risk factor(s) identified (≥ 1) | | | |
| Gender (female versus male*) | 1.1 (0.6) | 2.9 (0.8-10.2) | 0.098 |
| Residence area (rural versus urban*) | -1.5 (0.6) | 0.2 (0.060-0.697) | 0.011 |
| Employment status (employed versus unemployed*) | 1.2 (0.6) | 3.4 (0.9-12.6) | 0.062 |
| Early symptom(s) identified (≥ 1) | | | |
| Educational level (university versus scholar*) | 1.2 (0.5) | 3.4 (1.1-9.8) | 0.023 |
| Residence area (rural versus urban*) | -0.8 (0.4) | 0.4 (0.1-1.04) | 0.063 |
| Diabetes (yes versus no*) | -1.4 (0.5) | 0.2 (0.07-0.68) | 0.008 |
| Obesity (yes versus no*) | 1.3 (0.7) | 3.7 (0.8-17.2) | 0.093 |
| Consequence(s) identified (≥ 1) | | | |
| Gender (female versus male*) | 1.8 (0.7) | 6.6 (1.6-26.9) | 0.008 |
| Residence area (rural versus urban*) | -1.8 (0.6) | 0.1 (0.04-0.5) | 0.005 |
| Income level (medium versus low*) | 1.4 (0.6) | 4.1 (1.04-15.7) | 0.043 |
| Income level high versus low*) | 1.7 (1.1) | 5.5 (0.58-52.03) | 0.137 |
| Taking a patient to a hospital | | | |
| Educational level (university versus school*) | 0.9 (0.4) | 2.5 (1.1-5.5) | 0.030 |
| Employment status (employed versus unemployed*) | 0.6 (0.2) | 1.8 (1.1-3.1) | 0.028 |
| Diabetes (yes versus no*) | -0.9 (-0.3) | 0.4 (0.18-0.85) | 0.018 |

β , Beta; SE, standard error; OR; adjusted ratio; CI, confidence interval. Logistic regression taking identification of stroke risk factors, stroke early symptoms, stroke consequences, response if faced with stroke as the dependent variables and sociodemographic factors (gender, residence area, educational level, employment status, and income level) as independent variables.

Attitude and reactions towards stroke

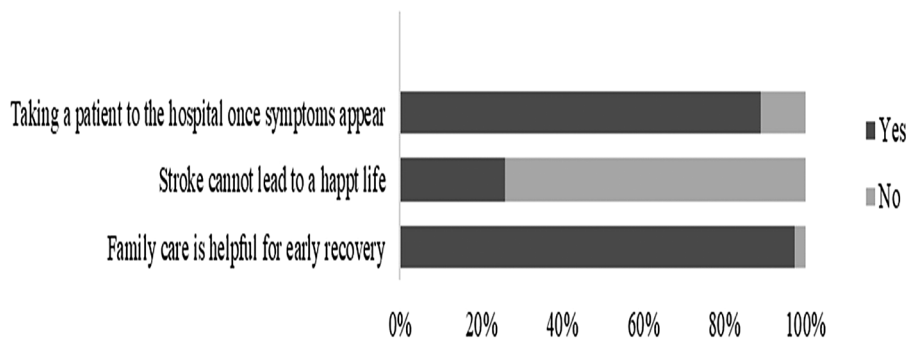


Figure 5. Knowledge, attitude, and reactions of the participants towards stroke.

In our study, 98.1% of participants identified at least one risk factor related to stroke. In comparison, previous studies have reported 85.4% among 390 participants in Lebanon (Khalil and Lahoud, 2020), 76.2% among 822 participants in Australia (Sug Yoon et al., 2001), and 59.6% among 2884 participants in Spain (Segura et al., 2003). Conversely, other previous studies have demonstrated poor knowledge of stroke risk factors and symptoms in the general population (Jones et al., 2010, Stroebele et al., 2011b, Nicol and Thrift, 2005). According to the latest 2021 update from the American Heart Association, risk factors related to stroke are high blood pressure, hyperglycemia, obesity, renal dysfunction, and hyperlipidemia, in addition to 47% being attributed to behavioral risk factors such as sedentary lifestyle, smoking, and an

unhealthy diet (Alonso et al., 2021). At the same time, 30% were attributed to air pollution worldwide (Collaborators and Ärnlöv, 2020). Most identified risk factors related to stroke in our study were hypertension, psychological stress, hypercholesterolemia, smoking, and obesity, with percentages exceeding 80%. Unlike a previous 2014 Jordanian study of 1854 participants, which reported getting older (58.8%), previous stroke (56.6%), and hypertension (56.0%) as most commonly identified risk factors in their study (Madae'en et al., 2013). This shows a more confident trend in identifying risk factors related to stroke among our study participants. Moreover, hypertension (48.2%), followed by stress (43.1%), were identified as risk factors among participants in a study from Lebanon (43.1%) (Khalil and Lahoud, 2020). Similarly, among 469 participants in a study from Morocco, hypertension (55.7%), followed by stress (48.8%), were identified as risk factors for stroke (Kharbach et al., 2020b). Despite being one of the most common modifiable risk factors for stroke, Diabetes Mellitus was relatively less identifiable by our study participants (68.4%). This finding has been reported elsewhere in previous studies (Kharbach et al., 2020a).

Also, participants in our study expressed a higher percentage recalling at least one stroke symptom (95.5%) compared to studies in Portugal (74.2%) (Duque et al., 2015), Norway (70.7%) (Sundseth et al., 2014), Oman (68.0%) (Al Shafae et al., 2006), Korea (65%) (Kim and Yoon, 1997), and Lebanon (68.2%) (Khalil and Lahoud, 2020). Similarly, in a previous 2014 study from Jordan, (87.3%) of participants identified at least one sign and symptom related to stroke, which is still relatively high. (Madae'en et al., 2013). Sudden difficulty speaking or understanding speech was the most frequently reported stroke symptom in our study (92.3%) compared to a previous study in Jordan (85.1%) (Madae'en et al., 2013), and Australia (14.2%) (Sug Yoon et al., 2001), and Ireland (54%) (Hickey et al., 2009). However, sudden weakening of one side of the body was reported as relatively the most prevalent stroke symptom, as among Omani (65 %) (Al Shafae et al., 2006) and Nigerian (24.4%) populations (Wahab et al., 2008).

Regarding their attitude toward stroke, participants in our study were encouraged to go to a hospital as soon as possible after a stroke is identified (89.0%), like a previous study that emphasized the need for immediate medical care for stroke patients (Khalil and Lahoud, 2020). Among 400 participants in an earlier study from Oman, 73% of participants reported they would immediately go to the hospital emergency if they suspected a stroke (Al Shafae et al., 2006). However, percentages from international studies may vary, with only 47% claiming they would go to a hospital if they were suspicious of a stroke (Jones et al., 2010). Adequate knowledge about risk factors, symptoms, and consequences related to stroke in our study could be attributed to the younger age and high level of education of the participants.

Our study findings showed that the female gender was attributed to better knowledge about stroke consequences than males, with no gender-specific difference in knowledge about risk factors and symptoms related to stroke. In a systematic review until 2008, the female gender was attributed to the better overall understanding of risk factors and symptoms related to stroke (Stroebele et al., 2011b). Another study explained the male gender as a predictor of enhanced knowledge (Wahab et al., 2008). Whether there are gender-specific variations in knowledge remains controversial and would need further in-depth causality assessments, as previous studies provide no consistent gender correlations in favor of such differences about stroke's risk factors, symptoms, or consequences (Park et al., 2006, Koçer et al., 2006, Pontes-Neto et al., 2008). Nevertheless, women tend to be more knowledgeable, express greater interest in health topics, and even spend more time seeking information than men do (Horch and Wirz, 2005).

Moreover, our results revealed that living in an urban area was significantly associated with better awareness of stroke risk factors and consequences; this could be attributed to better access to information resources and health services than rural ones (Joubert et al., 2008). Similar findings were revealed by Alluqmani in Saudi Arabia, as they also recommended for comprehensive investigation for stroke awareness, including large samples in rural populations (Alluqmani et al., 2021). In addition, participants who were well educated, employed, or diagnosed with diabetes in our study expressed willingness to promptly take a patient to hospital if they were suspicious of a stroke, which is somewhat expected, as better knowledge of consequences of a stroke would warrant prompt care. Furthermore, employment can warrant accessibility to seek medical help through insurance. While for diabetic patients, this might be attributed to their better knowledge of their disease status and consequences, as they often visit a healthcare provider for chronic medical care (Bogoshi, 2003, Chukwuocha et al., 2018).

Concerning stroke information resources, no particular resource was regarded as major by the participants in our study, but rather relatively, the internet and social media (24.4%) were the most frequently used resource of information, followed by healthcare professionals (20.9%), and family or relatives (15.2%). This is rather alarming since publicly available health information across social media might not be evidence-based and often misinterpreted by the general public (Suarez-Lledo and Alvarez-Galvez, 2021, Waszak et al., 2018). Although a similar study was previously conducted in Jordan by Madae'en et al. (2013), which assessed the level of knowledge and awareness toward stroke among the general Jordanian population, this study did not evaluate the factors that exert an influential effect on stroke.

Thus, our study provided insight into both the level of knowledge and awareness toward stroke and the factors associated with it.

Limitations

Several limitations can be identified for this study. First, an online Google survey is subject to a security breach, yet password protection for editing privileges was implemented and accessible by the research team. Second, representation of the Jordanian population could be compromised, as the study tool warrants computer literacy, internet availability, an enhanced level of education to access and complete the online survey. Third, information bias related to the accessibility of resources on-demand can compromise response credibility. Fourth, selection bias related to the snowball collection technique might be an issue, with no random selection warranted. Residual confounding bias could arise from possible un-measured variables or responses to variables directly or indirectly related to stroke. Moreover, an online survey instead of a face-to-face meeting poses reliability and authenticity risks to the study data. The online survey included country-specific questions for Jordanians to complete, with a full description of the target population and inclusion criteria in the title and the invitation message. Considering the restriction measures during the COVID-19 pandemic, such a methodology was the best option.

Conclusion

The general Jordanian population expresses good overall personal health literacy about risk factors, symptoms, and consequences related to stroke. Higher education levels, living in an urban residential area, and being employed were attributed to better knowledge about various aspects of the stroke. Through structured, reliable, evidence-based, and accessible health awareness resources, organizational health literacy is warranted to target individuals with inadequate personal health literacy related to stroke among the Jordanian population. Further nationwide studies could affirm more representative findings to the general Jordanian population.

Data availability

Open Science Framework. Assessment of Knowledge, Awareness of Stroke, and the Factors Associated with Among Jordanian Population: A Cross-Sectional Study. DOI: <https://doi.org/10.17605/OSF.IO/QZTV3>.

This project contains the following data.

- Raw Data spss.sav
- STROBE_checklist_cross-sectional score.doc
- Stroke Awareness Questionnaire Final.docx

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

Authors' contributions

All authors were involved in all parts of the study and manuscript preparation, including literature search, study design, analysis of data, manuscript preparation, and review of the manuscript.

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Nadeen Anabtawi 

Department of Pharmacology and Toxicology, Wright State University Boonshoft School of Medicine, Dayton, OH, USA

Previous comments were properly addressed. I have no further comments, and I see the revised version is fit for publication.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Pharmaceutical Science

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.

Reviewer Report 13 January 2022

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Abdelrahim Alqudah

Department of clinical pharmacy and pharmacy practice, Faculty of pharmaceutical sciences, The Hashemite University, Zarqa, Jordan

I have no further comments to make.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Diabetes and cardiovascular disease

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.

Reviewer Report 13 January 2022

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Taher Hatahet 

School of Pharmacy, Queen's University Belfast, Belfast, UK

Approved

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: pharmacy education, community pharmacy, drug delivery and nanotechnology

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.

Version 1

Reviewer Report 15 December 2021

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Abdelrahim Alqudah

Department of clinical pharmacy and pharmacy practice, Faculty of pharmaceutical sciences, The Hashemite University, Zarqa, Jordan

This paper discusses factors associated with knowledge and awareness of stroke among the Jordanian population which is an important topic that gives new insight about this serious complication.

I would like to thank the authors for the great flow of their introduction. They started their introduction by giving information about stroke and its prevalence worldwide, then they focused on the effect of good knowledge and awareness of the population on the prevention of cerebrovascular events resulting from stroke. After that, they raised the issue of lack of knowledge and awareness among the population and how this can increase the risk of this serious event which supports the aim of their research.

The study design was very good. The snowball method is a good technique to increase the response rate. The authors followed the ethical considerations in their data collection procedure. The response rate (573) is considered very good and above the required number. The used instrument was very good and well-prepared to cover the sociodemographic and knowledge levels. Their statistical model was good which used frequencies, descriptive stats and logistic regression to predict the factors affecting population knowledge about stroke. The figures and tables represented the results in a great way which makes the results clear and easy to understand. The discussion was well-structured and concise and explained all the related points mentioned in the results section.

This study concluded that the knowledge was affected by education level, living in urban areas, and being employed, therefore, targeting a population with inadequate knowledge about stroke could reduce the risk of stroke and its complications.

I think the results of this study will give new insights for the government to focus more on the awareness campaigns about stroke. So, I would recommend the publication of this study.

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: Diabetes and cardiovascular disease

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 20 Dec 2021

Muna Barakat, Applied Science Private University, Amman, Jordan

Dear Dr Abdlarahim

Thank you for your great feedback and review. It was a pleasure to get your attention to our work.

Competing Interests: No competing interests were disclosed.

Reviewer Report 14 December 2021

<https://doi.org/10.5256/f1000research.78255.r102102>

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Taher Hatahet 

School of Pharmacy, Queen's University Belfast, Belfast, UK

Factors Associated with Knowledge and Awareness of Stroke Among the Jordanian Population: A Cross-Sectional Study

Overview:

The article investigates the awareness associated with stroke in Jordan.

In Key words

I suggest adding other key words like 'cross sectional study'.

In the introduction

Paragraph 1: there 2 refs not inserted as hyperlinks

"recent changes in the segment of countries" should be further explained what happened exactly and are these changes seen in Jordanian context?

"noting that 80% of stroke cases are preventable if necessary precautions and actions are taken" It is better to write it as a separate sentence: "It is worth noting that..."

"past medical history is also essential to **be investigated**"

Paragraph 4: the talk about gender covered females but did not cover males.

Paragraph 5: please add the impact of the work in the scope of the region not only the country to

highlight the article value to wider readers.

Method section

Study design

It is not clear to how many people the survey was sent to in total and what the method of contact through social media was. This should be made clearer - I don't think the survey reached to all internet users in the country!

Sample size calculation

I can see the relationship between being able to identify 3 out of 5 factors to sample size calculations?

Results

Figure 1 resolution is low, the figure should be inserted as a high resolution figure.

Discussion

I think some of the limitation mentioned at the limitation section should be also introduced to the discussion of results especially when presenting much higher awareness of stroke in the sample population in Jordan compared to other countries.

It is advisable to discuss not simply the questions of the survey but also the type of sample taken. Like when talking about identification of at least one risk factor. We can see the very high % in Jordan compared to Spain which I think is coming for the type of sample and this should be added to discussion. The same applies to recalling at least one stroke symptom.

In paragraph 7: there should be more comparison to literature from the same geographic area to see if the same findings were reported, like in Lebanon or Saudi Arabia, do people living in rural areas score lower in stroke questionnaires than in urban ones? etc.

I hope that the author would improve on the comments but keeping in mind that the paper is of good quality. I consider **Approved with Reservations** to be too much for my comments.

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?

Partly

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?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: pharmacy education, community pharmacy, drug delivery and nanotechnology

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 20 Dec 2021

Muna Barakat, Applied Science Private University, Amman, Jordan

Dear Dr Taher:

Thank you for your great feedback and review. We appreciate your efforts and comments and we tried to address them carefully.

In Key words

I suggest adding other key words like 'cross sectional study'.

R: Done

In the introduction

Paragraph 1: there 2 refs not inserted as hyperlinks

R: Done

"recent changes in the segment of countries" should be further explained what happened exactly and are these changes seen in Jordanian context?

R: This sentence has been removed

"noting that 80% of stroke cases are preventable if necessary precautions and actions are taken"

It is better to write it as a separate sentence: "It is worth noting that..."

R: Done

"past medical history is also essential to **be** investigated"

R: Done

Paragraph 4: the talk about gender covered females but did not cover males.

R:

he discussion was tailored to the influence of female gender as the results were significant for the influence of female rather than male.

Paragraph 5: please add the impact of the work in the scope of the region not only the country to highlight the article value to wider readers.

R: The following was added

". The study will provide an overall insight towards importance of raising the level of knowledge and awareness towards stroke to minimize stroke development, to prevent stroke recurrence, and ensure early patient presentation"

Method section

Study design

It is not clear to how many people the survey was sent to in total and what the method of contact through social media was. This should be made clearer - I don't think the survey reached to all internet users in the country!

R: The questionnaire link was sent through social media networks to gather the largest number of responses, however, through this means of communication we are not able to know the exact number of received invitations.

Sample size calculation

I can see the relationship between being able to identify 3 out of 5 factors to sample size calculations?

R:

Based on a search that was performed to identify the highly related study to be able to calculate the target sample size, we identified the study conducted by (Sadighi et al., 2018a).

Results

Figure 1 resolution is low, the figure should be inserted as a high resolution figure.

R: A new Figure will be uploaded.

Discussion

I think some of the limitation mentioned at the limitation section should be also introduced to the discussion of results especially when presenting much higher awareness of stroke in the sample population in Jordan compared to other countries.

R: The discussion section has been modified

" Although Karasneh et al 2020 mentioned in their study that Jordanians have an inadequate level of health literacy, most of the participants in our study expressed good knowledge regarding stroke (Karasneh et al., 2020)."

It is advisable to discuss not simply the questions of the survey but also the type of sample taken. Like when talking about identification of at least one risk factor. We can see the very high % in Jordan compared to Spain which I think is coming for the type of sample and this should be added to discussion. The same applies to recalling at least one stroke symptom.

R: It is mentioned in the discussion

" In our study, 98.1% of participants identified at least one risk factor related to stroke. In comparison, previous studies have reported 85.4% among 390 participants in Lebanon (Khalil and Lahoud, 2020), 76.2% among 822 participants in Australia (Sug Yoon et al., 2001), and 59.6% among 2884 participants in Spain (Segura et al., 2003). Conversely, other previous studies have demonstrated poor knowledge of stroke risk factors and symptoms in the general population (Jones et al., 2010, Stroebele et al., 2011a, Nicol and Thrift, 2005)."

In paragraph 7: there should be more comparison to literature from the same geographic

area to see if the same findings were reported, like in Lebanon or Saudi Arabia, do people living in rural areas score lower in stroke questionnaires than in urban ones? etc.

R: In the discussion section

"Moreover, our results revealed that living in an urban area was significantly associated with better awareness of stroke risk factors and consequences; this could be attributed to better access to information resources and health services than rural ones (Joubert et al., 2008). Similar findings were revealed by Alluqmani 2021 in Saudi Arabia, as they also recommended for comprehensive investigation for stroke awareness, including large samples in rural populations (Alluqmani et al., 2021)."

Competing Interests: No competing interests were disclosed.

Reviewer Report 13 December 2021

<https://doi.org/10.5256/f1000research.78255.r102098>

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Nadeen Anabtawi 

Department of Pharmacology and Toxicology, Wright State University Boonshoft School of Medicine, Dayton, OH, USA

A well-written manuscript that assessed the knowledge and awareness of stroke among the Jordanian population. Despite the limitations, which have already been addressed by the authors, this manuscript gets to a great conclusion that is well supported by extensively analyzed data. I have some minor comments below that won't affect the robustness of the manuscript, but they are just opportunities for improvement.

Comments:

1. The novelty of this research is not clearly stated. Earlier research (Madae'en et al., 2013) with the same purpose, which is referenced by the author and results were compared. However, I suggest explaining what are the main points that this research will add to the previous knowledge about stroke awareness in the Jordanian population and emphasizing the meaningful contribution of this manuscript to the field.
2. The study revealed a good knowledge and awareness level about stroke among Jordanians. However, "good" could be a vague term to use without further explanation. I suggest adding a description of what "good or satisfactory" exactly means and emphasizing the rating scale that resulted in such a conclusion. Is it compared to previous research and the percentage was improved, or there were specific criteria for rating the good and the bad knowledge?
3. I assumed that the American Heart Associated stroke definition was used to generate the assessment criteria used for stroke knowledge. However, it would be more reasonable to clearly state the rationale behind choosing the assessment criteria used throughout the manuscript.

Overall, this is an interesting study and the authors have collected and analyzed a good dataset using appropriate methodology. The paper is generally well written and structured, and I recommend it for publication.

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: Pharmaceutical Science

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 20 Dec 2021

Muna Barakat, Applied Science Private University, Amman, Jordan

Dear Dr. Nadeen

Thank you for your great feedback and review. It was a pleasure to get your attention and we tried to address your fruitful comments carefully as the following:

1- The discussion section has been amended as requested.

"Although a similar study was previously conducted in Jordan by (Madae'en et al., 2013), which assessed the level of knowledge and awareness toward stroke among the general Jordanian population, this study did not evaluate the factors that exert an influential effect on stroke. Thus; our study provided insight into both the level of knowledge and awareness toward stroke and the factors associated with it."

2- The method section has been amended as required.

"According to the previous study by (Han et al., 2019a), participants were awarded one point per correct answer to the above statements, however, it lacks a cutoff value that identifies the acceptable level of knowledge. Thus, our study summed up the total correct answers and considered a good level of knowledge above 50%."

3. The definition that was utilized through the manuscript was in accordance with the definition set by the American heart association and it was applied among all manuscript sections.

Competing Interests: No competing interests were disclosed.

Reviewer Response 12 Jan 2022

Nadeen Anabtawi, Wright State University Boonshoft School of Medicine, Dayton, USA

Previous comments were properly addressed. I have no further comments and I see the final version is fit for publication.

Competing Interests: No competing interests were disclosed.

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