

# Stroke Risk Factor Awareness Among Populations in Saudi Arabia

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**Background:** Stroke is considered the second leading cause of death and the third leading cause of disability in the world. The incidence of stroke in Saudi Arabia is 43.8 per 100,000, due to the lack of knowledge and awareness of the population. This study intends to determine the level of stroke risk factor awareness among the Saudi population.

**Methods:** A cross-sectional study was conducted in Saudi Arabia on 898 participants older than 18 years old. The validated online survey was randomly distributed and consisted of 20 questions in both English and Arabic languages to evaluate the level of awareness of stroke risk factors among the population.

**Results:** A total of 898 participants completed the survey. The results showed that the median risk factor score was 5 (IQ 3–8) out of 14. A total of 2.2% could recognize all 14 risk factors. Personal history of hypertension was chosen as a risk factor by the majority of the participants (81.7%) followed by personal history of stroke (74.1%) and personal history of dyslipidemia (57.2%).

**Conclusion:** This study showed that there is an insufficient level of stroke risk factor awareness in Saudi Arabia. More than half of the participants identified the term (stroke), while only 2.2% could recognize all 14 risk factors. Hence, public education is needed to identify people with stroke risk factors.

**Keywords:** stroke, awareness, risk factors, public education, Saudi Arabia

## Introduction

Stroke is the second leading cause of death and the third leading cause of disability in the world.<sup>1</sup> According to the recent statistics, nearly 15 million people experience a stroke each year, which resulted in more than 5 million deaths.<sup>2</sup> Saudi Arabia is a rapidly developing country that evolved drastically in the past two decades, major lifestyle and environmental factors changed and increased the risk and incidence of stroke.<sup>3</sup> The prevalence of stroke in the Kingdom of Saudi Arabia is 43.8 per 100,000 in which poor knowledge and awareness of the general public are contributing factors.<sup>4</sup> Moreover, it is estimated that stroke constitutes 14,000 of total deaths in Saudi Arabia in 2012.<sup>2</sup> A number of studies stated that the major risk factors for stroke are hypertension, diabetes mellitus, hyperlipidemia, smoking, ischemic heart diseases and obesity.<sup>3</sup> It is well known that sedentary lifestyle including prolonged TV watching is also considered a risk factor that could lead to stroke.<sup>5</sup> It is believed that stroke is a preventable disease if lifestyle and other modifiable risk factors were targeted by the community or on individual level.<sup>6</sup>

Globally, the incidence and prevalence of ischemic and hemorrhagic stroke events in 2013 were significantly greater in men than in women.<sup>7</sup> In addition,

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a study conducted in Asser in 2018 reported a significant difference in the incidence of stroke among both males and females. The incidence of stroke in male is dominant in all age groups except in age group from 45 to 49, where females showed a higher incidence.<sup>8</sup> Globally, individuals aged 25 years and above have approximately 25% tendency to develop a stroke.<sup>9</sup> A study in the United States declared that there is a direct relationship between age and stroke, where the incidence of stroke doubles each decade after the age of 55 years.<sup>10</sup> Moreover, a study in Asser stated that the incidence of stroke is 851.81 per 100,000 for patients aged 70 years or more.<sup>8</sup> However, the level of stroke awareness in the community could potentially improve stroke outcome and improve public behavior.

There are many stroke risk factors known and reported in the literature. However, some of them are related to our daily life routine which is modifiable by increasing the knowledge about these practices. Due to the high prevalence of stroke in Saudi Arabia, there could be a lack of awareness among the community about the risk factors of stroke. This study aims to investigate the level of stroke risk factor awareness among the Saudi population.

## Methods

A cross-sectional study was carried out at King Abdulaziz University Hospital. Ethical approval was obtained from the Institutional Review Board (IRB) at King Abdulaziz University Hospital, Jeddah, Saudi Arabia in accordance with the Declaration of Helsinki. The questionnaire was adopted from a previous study and validated on 12 people randomly.<sup>11</sup> The study was conducted by distributing an online survey consisting of 20 questions in both English and Arabic languages to all individuals who were 18 years and older with no sex restriction, during a period of one week. Participants were selected through volunteer sampling. Information about the survey purpose and the expected time to finish was provided for each participant and an informed consent was signed before taking the survey. A contact email was provided for the participants in case any inquiries were needed regarding the survey. The questionnaire consisted of two sections: one to collect demographic characteristics and another for assessment of stroke risk factor awareness.

The demographic variables included were age, gender, nationality, province, marital status, level of education, occupation, and total income. Participants were asked regarding their health problems which included high blood pressure, cardiovascular disorder, diabetes mellitus,

high cholesterol level and current smoking. Awareness of stroke risk factors was assessed by giving 14 risk factors to choose from. One point was assigned for awareness of each of the 14 previously mentioned risk factors; thus, the total score ranged from 0 to 14, with 0 being the lowest and 14 being the highest score. The 14 risk factors were smoking, lack of physical activity at least 3 minutes of walking 5 days per week, fast-food intake, soft drink intake, watching TV 4 hours or more per day, using computer devices for 4 hours or more per day, personal history of diabetes, personal history of stroke, personal history of heart attack diagnosed by a physician, family history of diabetes, personal history of hypertension, family history of hypertension, family history of hyperlipidemia, high cholesterol or triglyceride level, family history of coronary artery disease diagnosed by a physician. Participants were asked which gender and age groups are more susceptible to develop a stroke.

## Data Analysis

Data were entered and analyzed using SPSS version 21. The analysis included qualitative data that were presented as frequency and percentage. The total risk factor score presented as median and interquartile range.

## Results

A total of 898 participants completed the questionnaire. The demographic variables of the population surveyed are presented in (Table 1). Most of the respondents were females representing 69.3% of the total participants and 30.7% were males. Nearly half of the respondents aged between 20 and 30 years, represented by (48.8%), other participants were divided into 18–19 years (7.2%), 31–40 years (17.7%), 41–50 years (17.6%), 51–65 years (8.5%) and 66 years and above (0.1%). The majority of the participants were Saudi Arabian (93.0%), and only (7.0%) were non-Saudi. Most of the participants were from Makkah, Riyadh and Al-Sharqiyah regions (60.2%, 16.2%, and 8.9%), respectively, and the remaining were from Al-Madinah (8.8%), Al-Bahah (1.3%), Asser (1.3%), Tabuk (1.3%), Qassim (0.9%), Hail (0.3%), Northern borders (0.2%), Jizan (0.2%) and Al-Jouf (0.2%). Regarding the marital status of the study population, 49.8% were married, 46.8% were single, and 3.3% were separated or divorced. The majority of the participants has a bachelor's degree (65.3%), and the minority had a primary level of education (0.2%). Others had secondary level (16.8%), Masters or PhD (10.5%), and intermediate level (1.1%). The greater part of the participants was students

**Table 1** Demographic Characteristics of Participants

Variable		N (%)
Age	18–30 years	503 (56.0%)
	31–40 years	159 (17.7%)
	41–50 years	158 (17.6%)
	51–65 years	77 (8.5%)
	66 years and above	1 (0.1%)
Gender	Male	276 (30.7%)
Nationality	Saudi Arabian	835 (93.0%)
Province	Makkah	541 (60.2%)
	Riyadh	145 (16.2%)
	Al-Sharqiya	80 (8.9%)
	Al-Madinah	79 (8.8%)
	Al-Bahah	12 (1.3%)
	Aseer	12 (1.3%)
	Tabuk	12 (1.3%)
	Other	17 (1.9%)
Marital status	Married	448 (49.8%)
	Single	420 (46.8%)
	Other	30 (3.3%)
Level of education	Less than High school	13 (1.4%)
	High school	151 (16.8%)
	Diploma	54 (6.0%)
	University	586 (65.3%)
	Higher education master's or PhD	94 (10.5%)
	Occupation	Student
Not working		195 (21.7%)
Education sector		139 (15.5%)
Administrative sector		87 (9.7%)
Health care sector		76 (8.5%)
Business sector		35 (3.9%)
Engineering and industry sector		23 (2.6%)
Army and police sector		23 (2.6%)
Technical and computer sector		15 (1.6%)
Total income per month in SAR		Less than 3000
	3000–5000	88 (9.8%)
	5000–10,000	173 (19.2%)
	More than 10,000	321 (35.8%)

representing (34.0%) of the total sample, followed by housewife (14.8%), education sector (14.8%), administrative sector (9.7%), health care sector (8.5%), retired not working (6.9%), engineering and industry sector (2.6%), business sector (2.6%), army and police sector (2.6%), technical and computer sector (1.6%), commerce sector (1.3%),

research sector (0.7%). Participants total income was as follows: 35.8% receive >10,000 Saudi Riyals, almost equivalent to the participants who receive <3000 Saudi Riyals (35.2%), and 19.2% receive 5000–10,000 Saudi Riyals, while 9.8% of the participants receive 3000–5000 Saudi Riyals (Table 1).

High blood pressure was determined as the major health problem of the participant representing (17.9%), followed by high cholesterol level (16.5%), diabetes mellitus (9.9%), cardiovascular disorder (4.9%) (Table 2). Concerning regular smoking for more than one year 83.5% of the participants did not smoke regularly, while 16.5% smoked regularly. The majority of the respondents (69.8%) had no family history of stroke, while only 20.2% of the respondents know a family member who has had a stroke, and 10.0% did not know if a family member has suffered a stroke before.

A large number of respondents thought that the risk of stroke was higher in individuals who are older than 50 years old (54.1%), while the rest chose the following: 30–50 years old (23.2%), did not know (18.7%), and older than 20 years old (4.0%). When asked which gender is more prone to stroke, 42.8% did not know which gender is more prone to develop stroke, 39.4% chose males as the higher risk group, 4.3% chose females and 13.5% thought that the risk is equal in both genders (Table 3). The participants were asked about 14 risk factors that could lead to stroke, personal history of hypertension was the most chosen factor (81.7%) followed by personal history of stroke (74.1%), family history of hyperlipidemia, high cholesterol or triglyceride level (57.2%), smoking (55.1%) (Table 4). The median (interquartile) of the total risk factor score was 5 (3–8) out of 14 (Figure 1).

## Discussion

The results of this study showed that the Saudi Arabian population had limited information about the risk factors that could lead to a stroke. Although a larger number of the respondents were from either younger age and educated or students, the most health condition reported among them was hypertension. Importantly, the majority of participants were aware about hypertension as a risk factor to develop stroke.

More than half of the participants confirmed the US study results by declaring that the risk of stroke was higher in individuals who are older than 50 years old.<sup>10</sup> This article found that 39.4% of the participants chose males as being more susceptible to having a stroke, while 4.3%

**Table 2** Health Problems Among the Participants

		N (%)
Health Problem	Hypertension	161 (17.9%)
	Cardiovascular disorder	44 (4.9%)
	Diabetes mellitus	89 (9.9%)
	High cholesterol level	148 (16.5%)
	Smoking	148 (16.5%)

**Table 3** Age and Gender Group at High Risk of Stroke

		N (%)	
Risk factor	Age	More than 50 years	486 (54.1%)
		30–50 years	208 (23.2%)
		18–30 years	36 (4.0%)
		They Do not Know	168 (18.7%)
	Gender	Male	354 (39.4%)
		Female	39 (4.3%)
		Risk is equal in both gender	121 (13.5%)
		They Do not Know	384 (42.8%)

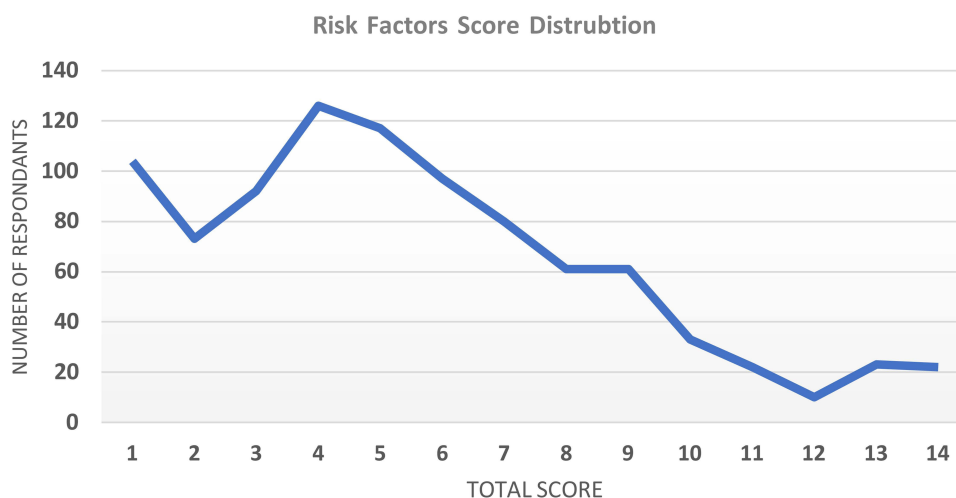
chose females as being more susceptible. Notably, the majority of the participants in this study were females. Likewise, a study in Asser investigated the incidence of stroke and found that it was dominant in males.<sup>8</sup> Unfortunately, the greater percentage of the participants (42.8%) did not know which gender is more prone to develop a stroke.

The participants were asked about 14 risk factors that could lead to stroke, personal history of hypertension was the most chosen factor (81.7%) which confirmed studies in Egypt and Italy that found hypertension was the most common risk factor recognized (73.0%) and (67.6%),

**Table 4** Stroke Risk Factor Frequency

Risk Factors	N (%)
Personal history of hypertension	734 (81.7%)
Personal history of stroke	665 (74.1%)
Family history of hyperlipidemia, high cholesterol or triglyceride level	514 (57.2%)
Smoking	495 (55.1%)
Lack of physical activity at least 3 minutes of walking 5 day per week	456 (50.8%)
Family history of hypertension	427 (47.5%)
Personal history of heart attack diagnosed by a physician	417 (46.4%)
Family history of coronary artery disease diagnosed by a physician	411 (45.8%)
Fast food intake	405 (45.1%)
Personal history of diabetes	273 (30.4%)
Using computer devices for 4 hours or more per day	205 (22.8%)
Soft drinks intake	196 (21.8%)
Family history of diabetes	172 (19.1%)
Watching TV 4 hours or more per day	145 (16.2%)

respectively,<sup>7</sup> whereas a study in Jeddah about coronary artery disease awareness used the same risk factors and the most chosen risk factor was fast-food intake (74.8%).<sup>12</sup> However, the variation between the two results might be



**Figure 1** Frequency of risk factor score.

due to the difference between the two topics. Most of the participants (12.6%) recognized 5 out of 14 risk factors, while only 2.2% recognized all the 14 risk factors. This indicates an alarmingly low level of stroke risk factor knowledge. This is an unfortunate outcome due to the fact that almost all the risk factors of stroke are preventable. In a study done in New Zealand, both Asian and Pacific Island respondents were less likely to consider smoking as a risk factor, while in this study smoking was well recognized as a risk factor.<sup>11</sup> Surprisingly, only (16.5%) of the participants smoked regularly for more than one year which was not expected, this could be due to the confusing character of the term “smoking”, since some individuals do not consider shisha/hookah and the newly emerged vaping devices (electronic cigarettes) as smoking.

The recognition of stroke risk factors is equally important to the knowledge of unified emergency number. This is to ensure rapid assessment and to reduce the delay in patient transportation time. Currently, Saudi Arabia has established unified emergency number 911 only in Makkah region.

The main limitations of this article were the inadequacy of the sample size, unequal distribution of the online survey across Saudi Arabia’s province, age groups and education levels, since the participants were not equal among the variables (age group, education level). As well as the predominance of female participants and students. Another limitation could be the fact that the data collection was conducted in a very short period of time. Moreover, no similar countrywide studies have been conducted in Saudi Arabia in terms of stroke risk factor knowledge. Hence, the results cannot be generalized to the entire population. Furthermore, the association between the level of education, income or occupation and the stroke risk factor awareness was not investigated in this paper.

The recommendation for future papers should include a well-distributed survey across both genders, age groups, provinces and different occupations. It is important to mention that the sample was small for the fact that it was a countrywide paper. Therefore, it should have included a larger group that is distributed among different provinces. There is a seemingly shortage in level of knowledge about stroke risk factors. Participants must be empowered with suitable education programs, campaigns, organization of national stroke training programs could improve the level of awareness. This article wishes to mention the urgent need to conduct more studies on stroke to determine a more recent percentage occurrence.

## Conclusion

This study highlights the insufficient level of stroke risk factor awareness in Saudi Arabia. Limited number of participants could identify all the 14 risk factors. Stroke awareness should be implemented in our country due to its alarming level of incidence and preventable behavior.

## Author Contributions

MAIshibani and SA designed the study. RB, RA, MB, SB, MA and RBajaba collected the data. MAIshibani, and SA double-checked the data collection. All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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## Disclosure

All authors declare no conflicts of interest for this work.

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