



ORIGINAL ARTICLE

Demographic and Risk Factor Profile of Stroke Among Women in the Kingdom of Bahrain

Raisa Minhas^{1*}, Zara Turk², Firas Al-Nidawi³

¹⁻²Senior House Officer, Internal Medicine, King Hamad University Hospital, Bahrain.

³Consultant (Neurology & Internal Medicine), King Hamad University Hospital, Bahrain.

*Corresponding author:

Raisa Minhas, Senior House Officer, Internal Medicine, King Hamad University Hospital, Bahrain.

ORCID: 0000-0002-6533-1754. Tel: 0044-7584950541. [Postal address: Flat 21, Building 13, Road 701, Block 207, Muharraq, Bahrain. Email ID: raisaminhas09@gmail.com]

Received date: April 11, 2021; **Accepted date:** July 11, 2021; **Published date:** September 30, 2021

Abstract

Background and Objectives: Stroke has increasingly become a major health problem worldwide and shows an increasing incidence amongst the Arab population in recent years. A study held in the Middle East (ME) revealed that with the increasing number of Stroke cases amongst the Arab population, the mortality rates secondary to stroke is expected to double by the year 2030. The aim of this study was to conduct a descriptive analysis of stroke in the Bahraini female population and assess the associated risk factors leading to stroke.

Methods: This retrospective study at a tertiary setting was carried out in Bahrain from the year 2016-2019 with a sample size of 108 female stroke patients.

Results: Ischemic stroke was the most reported form of stroke, with the large artery being the most prevalent underlying etiology. Diabetes Mellitus, Hypertension, Dyslipidemia, Coronary Artery disease/atrial fibrillation ($p= 0.003$) were the associated risk factors. Amongst the mentioned risk factors, the most prevalent factor was seen to be Hypertension, with an overall mortality rate of 10%.

Conclusion: The study emphasizes the contribution of metabolic syndrome in the causation of stroke cases in the female Bahraini population.

Keywords: Female, Hypertension, Quality of life, Risk factor, Stroke

Introduction

Stroke has increasingly become a global health concern. It is the sixth main cause of disease burden and the second commonest cause leading to death globally. Previously seen to be affecting the elderly population, however, presently, researchers have revealed that the frequency of Stroke in younger

individuals has increased significantly.¹An outcome of a systematic review anticipates that Stroke will become a burden in the Middle East as the younger population is increasingly suffering from it.

In recent years, the incidence of Stroke in women between the age of 45-54 years has increased, in addition to various studies, affirming that the

recurrence of Stroke within five years (from the first episode) is more commonly seen amongst women than men.

Amongst the Arab population, Stroke has emerged recently as a growing health problem. Due to the rising number of stroke cases annually, it is expected that the mortality rate due to Stroke will be doubled by the year 2030, as per a study held in the Middle East.²

A high occurrence of risk factors such as Hypertension, Diabetes, and Dyslipidemia in the Bahraini population is believed to be the cause of rising stroke cases. Therefore, this needs to be properly identified, and understood.³ According to a report published in 2015, the incidence of Stroke has nearly doubled among the Bahraini population during the last 16 years.⁴

A high prevalence of the aforementioned risk factors amongst the elderly Bahraini population also is indicative of a disturbing outcome inevitably leading to a continuing rise in Stroke cases.² It has also been noted that the incidence of Stroke in the younger Bahraini population is about ten times higher than their western counterparts.

The aim of this study was to perform a descriptive analysis of female stroke patients, understanding the risk factors contributing to its development. The study included all the female patients diagnosed with Stroke in a tertiary medical center in Bahrain during 2016-2019. It assessed sex-specific risk factors linked with Stroke in the female population and discussed how to avoid these in the future.

Methods

This retrospective study was conducted at a tertiary setting in Bahrain. Specific data on all stroke cases (Total number of cases 108) was collected *via* Convenience sampling from the hospital electronic medical records system with the below-mentioned criteria from 2016 to 2019. The study was approved by the Institutional review board at King Hamad University Hospital. Patients signed an informed consent form prior to voluntary participation in the study.

Inclusion Criteria included women, 18 years and above with or without co-morbidities, diagnosed

with Stroke. Exclusion Criteria included unclear data/missing data and stroke mimics, e.g., Hypoglycemia, Seizures.

The primary outcome was to look into the risk factors leading to Stroke in the female population of all ages, including Diabetes mellitus, Hypertension, Dyslipidemia, Coronary artery disease, Smoking, Hormonal therapies, Peripheral arterial disease, and previous stroke/transient ischemic attack.

The following data was also collected: demographic data such as age, sex, and co-morbidities, clinical data such as the severity of symptoms, stroke type, and underlying etiology, radiographic imaging data, and patient outcome.

The statistical analysis formula used was $Z_{(1-\alpha/2)}^2 p(1-p)/d^2$

Statistical Package for Social Sciences (SPSS) Version 25 was used to analyze the data.

Results

A total of 108 female Stroke patients were identified. The study population's mean age was 67.89 ± 13.12 years, Table 1.

The study revealed that the majority (94%) of the stroke patients were diagnosed to have an ischemic stroke, with only 6% having had suffered from intracranial hemorrhage (Figure 1).

Table 1: Prevalence of risk factors

Risk factors	Sub-categories	Values [mean \pm Standard deviation; N (frequency)]
	Age (years)	67.89 \pm 13.12
	Diabetes mellitus	
	Yes	76 (70.4%)
	No	32 (29.6%)
	Hypertension	
	Yes	87 (80.6%)
	No	21 (19.4%)
	Dyslipidemia	
	Yes	46 (42.6%)
	No	62 (57.4%)
	Coronary artery disease/Atrial Fibrillation	
	Yes	33 (30.6%)
	No	75 (69.4%)
	Smoking	
	Yes	1 (0.9%)
	No	107 (99.1%)

	Hormonal	
	Yes	1 (0.9%)
	No	107 (99.1%)
	Peripheral arterial disease	
	Yes	-
	No	108 (100 %)
	Previous Stroke/ Transient ischemic attack	
	Yes	27 (25.5%)
	No	79 (74.5%)
Main Diagnosis	Ischemic	
	Intracranial hemorrhage	98 (90.7%)
		8 (7.4%)
Underlying Etiology	Cardioembolic	11 (10.2%)
	Atherothrombotic	23 (21.3%)
	Large artery	23 (21.3%)
	Small artery	25 (23.1%)
	Atherothrombotic & large artery	13 (12.0%)
	Atherothrombotic & small artery	1 (0.9%)
	Dissection	4
	Undetermined origin	
Condition prior to the event	Independent	84 (77.8%)
	Special care	23 (21.3%)
Outcome after discharge	Outpatient Rehab	18 (16.7%)
	Death	10 (9.3%)
	Home	75 (69.4%)

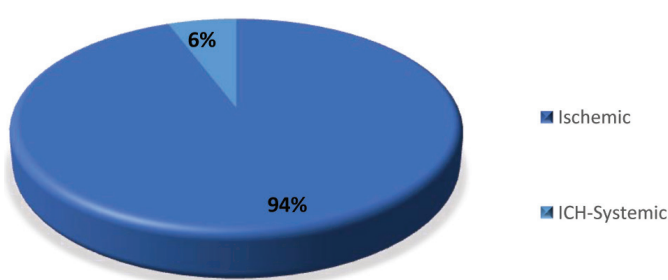


Figure1: Main diagnosis of female stroke patients ICH, intracerebral hemorrhage.

Atherothrombotic and large artery disease was the most prevalent underlying etiologies (n= 36, 33.3 %), with 13 (12.0%) patients having both Artherothrombotic & large arteries.

Nine out of thirteen patients who had all four risk factors (Diabetes mellitus, Hypertension, Dyslipidemia, coronary artery disease/atrial fibrillation) had underlying etiology of “large artery.” “Sixteen

out of thirty-six patients who had all the three risk factors (Diabetes mellitus, Hypertension, Dyslipidemia) had underlying etiology of “large artery.” Sixteen out of twenty-three patients who had diabetes mellitus and Hypertension had underlying etiology of “large artery,” thereby indicating that large artery was the most prevalent underlying etiology associated with the risk factors ($p= 0.003$).

Upon investigating the underlying risk factors, Hypertension was found to be the predominant cause (80.6%) either alone or in association with other factors. On the other hand, 65 patients (60.18 %) out of the total 108 had both, Diabetes mellitus and Hypertension.

Interestingly 31 out of 36 patients (86.11%) with large arteries and 30 out of 36 patients (83.33%) with the atherothrombotic condition were Hypertensive.

Discussion

This is the first study to our knowledge focusing on the risk factor profiling and demographic contribution for stroke cases amongst the female population in the kingdom of Bahrain.

In many studies prior, it was observed that stroke incidence was higher amongst the male population. However, a certain meta-analysis showed a 1:1 female to male ratio in the middle east.⁵ Whereas, on the other hand, some studies have revealed increased stroke incidence amongst the female population.^{6,7}

In recent years, the incidence of Stroke in women between the age of 45-54 years has increased, in addition to various studies, affirming that the recurrence of Stroke within five years (from the first Stroke) is more commonly seen amongst women than men, both; in younger ages (40–69 years old, 22% vs. 33%), as well as in elderly (>70 years old, 28% vs. 33%) patients.⁸

A multitude of risk factors lead to a high occurrence of Stroke in women, including Hypertension (75%), Diabetes (54%), and Hyperlipidemia (34%).⁹ Although both diabetes and metabolic syndrome are recognized causes of ischemic stroke in both sexes; a meta-analysis revealed that women are affected more than men due to these risk factors.¹⁰ Framingham cohort study concluded that compared

to men, women had an increased lifetime risk of Stroke.¹⁰Few risk factors specifically affect women, for example, Migraine.¹¹

The range of age for patients who developed Stroke was from 54 to 80 years, similar to a study showing an average age between 59 and 63 years.¹²⁻¹⁴The increased incidence in advanced age is believed to be secondary to multiple risk factors and atherothrombotic changes in vessels that progress with older age.

A study in Korea showed increased stroke prevalence amongst women between the age of 75 to 84 years.¹⁵

The majority of stroke cases were ischemic in nature (98 out of 108 = 94%), resembling other studies conducted in the middle east.^{16,17} While intracerebral hemorrhage was found to be affecting only eight patients (4.6%), subarachnoid hemorrhage (0.9%) being the least common form of Stroke. In the current study, atherothrombosis was the main underlying etiology leading to ischemic Stroke either alone (21.3%) or in association with the large artery (12.0%) followed by cardioembolic cause (11.2%). This was in concordance with other retrospective analytical studies.¹⁸

We also found a significant correlation between large artery disease with nearly all risk factors, including Diabetes mellitus, Hypertension, Dyslipidemia, Coronary artery disease/atrial fibrillation ($p=0.003$).

The study revealed that Hypertension was a predominant risk factor in all types of strokes. About 86.9% of patients with atherothrombotic conditions, 82.6% patients with underlying large artery disease, and 69.2% with both atherothrombotic and large artery were hypertensive. This factor was consistent with studies conducted on the general population (irrespective of gender differences followed by diabetes (76%) and dyslipidemia (46%).¹⁹

About 30.6% of the total sample size had atrial fibrillation with or without coronary artery disease contributing to cardioembolic Stroke. Moreover, 26 patients (24.7%) with coronary artery disease/atrial fibrillation had associated Hypertension.

A study conducted in Turkey on the gender difference in stroke patients suggested a higher number of atrial fibrillation and hypertension cases

amongst the female population.²⁰A study revealed females as an independent predictor of a negative outcome in the form of disability or death at the time of discharge for patients with Ischemic stroke.²¹

A meta-analysis included a few other relevant causes which are common to both male and female populations, for example, hypercoagulable states like acquired hyperhomocysteinemia, which is the most common abnormality (18%), followed by protein C or S deficiency (8%), methyl-tetrahydro-folate-reductase C677T mutation (5%) and factor V Leiden mutation (5%). Other findings included the positive anticardiolipin antibodies (3%), presence of lupus anticoagulant (2%), thrombocytosis (3%), and G20210A prothrombin gene mutation (3%).

Stroke incidence is also seen to be high in sickle cell patients secondary to vaso-occlusive crises.²² Another case-control study revealed low magnesium levels linked with a high risk of ischemic Stroke among women.²³ Although these factors were not looked into in our study, however, future studies could focus on other possible parameters to be considered with Stroke.

Yet another prospective - observational analysis revealed an increased risk of Stroke (27% to 39%) amongst postmenopausal women who were regular users of oral estrogens with or without progestin, compared with nonusers.²⁴In our study, 0.9% of patients used hormonal therapy and had cerebrovascular accident, whereas 99.1% were not users of any hormonal therapies.

It has been studied that non-communicable diseases are quite prevalent in the Middle East, with 30% of our total population being hypertensive and 11% diabetic.²⁵

In addition to the above-mentioned risk factors, lack of self-awareness, sedentary lifestyle, and poor control of non-communicable diseases, dispose our elder and the younger population at risk of developing stroke.²⁶Additionally, the middle eastern population lacks the awareness of cerebrovascular events; their leading risk factors, causes, and symptoms, as seen in a survey study conducted in Oman which concluded that intensive health education is required to improve understanding of Stroke, especially among the most vulnerable groups.²⁷

Smoking is yet another strong risk factor contributing highly to Stroke and is a leading cause of death in both genders. A study including 10,382 male and female participants revealed a larger absolute risk difference of Stroke, attributable to smoking in women than in men.²⁸

In this study, 0.9% of patients who had Stroke were smokers, whereas the remaining 99.1% didn't have a smoking history.

Outcome

In our study, 75% of patients went home, and 10% mortality was observed. This could be attributed to timely presentation resulting in intervention done and the role played by physical therapy.

Conclusion

The study emphasizes the contribution of metabolic syndrome in the causation of stroke cases in the female Bahraini population. This implies an increased need for public awareness regarding risk factors with an understanding of their impact on the quality of life, and therefore, measures should be taken to prevent it. It is worth conducting future studies on a larger scale and possibly in comparison with the male population.

Acknowledgment

The authors would like to thank the patients who participated in this study and would like to acknowledge the support by the Research department of King Hamad University Hospital. Funding for the study was done by King Hamad University Hospital.

Conflicts of Interest

Nil.

References

- Menken M, Munsat TL, Toole JF. The global burden of disease study: implications for neurology. *Archives of Neurology*. 2000; 57(3): 418-20.
- Banna MA, Baldawi H, Kadhim A, Humaidan H, Whitford DL. Stroke in Bahrain: rising incidence, multiple risk factors, and suboptimal care. *International Journal of Stroke*. 2015; 10(4): 615-8.
- Tran J, Mirzaei M, Anderson L, Leeder SR. The epidemiology of Stroke in the Middle East and North Africa. *Journal of the Neurological Sciences*. 2010;295(1-2):38-40.
- El-Hajj M, Salameh P, Rachidi S, Hosseini H. The epidemiology of Stroke in the Middle East. *European Stroke Journal*. 2016;1(3):180-98.
- El Sayed MM, Adeuja AO, El-Nahrawy E, Olaish MA. Characteristics of Stroke in Hofuf, Saudi Arabia. *Annals of Saudi Medicine*. 1999;19(1):27-31.
- Sweileh, W, Sawalha, A, Al-Aqad, S. The epidemiology of Stroke in northern Palestine: a 1-year, hospital-based study. *J Stroke Cerebrovasc Dis*. 2008;17:406-411.
- Sawalha AF. Characterization of hospitalized ischemic stroke patients in Palestine. *Libyan Journal of Medicine*. 2009;4(1):39-44.
- Turtzo LC, McCullough LD. Sex differences in Stroke. *Cerebrovascular diseases*. 2008; 26(5): 462-74.
- Towfighi A, Saver JL, Engelhardt R, Ovbiagele B. A midlife stroke surge among women in the United States. *Neurology*. 2007;69(20):1898-904.
- Seshadri S, Beiser A, Kelly-Hayes M, Kase CS, Au R, Kannel WB, et al. The lifetime risk of Stroke: estimates from the Framingham Study. *Stroke*. 2006 ;37(2):345-50.
- Petrea RE, Beiser AS, Seshadri S, Kelly-Hayes M, Kase CS, Wolf PA. Gender differences in stroke incidence and poststroke disability in the Framingham heart study. *Stroke*. 2009; 40(4): 1032-7.
- Fahimfar N, Khalili D, Mohebi R, Azizi F, Hadaegh F. Risk factors for ischemic Stroke; results from 9 years of follow-up in a population based cohort of Iran. *BMC Neurology*. 2012;12(1):1-7.
- Azarpazhooh MR, Etemadi MM, Donnan GA, Mokhber N, Majdi MR, Ghayour-Mobarhan M, et al. Excessive incidence of Stroke in Iran: evidence from the Mashhad Stroke

- Incidence Study (MSIS), a population-based study of Stroke in the Middle East. *Stroke*. 2010;41(1):e3-10.
14. Janghorbani M, Hamzehee-Moghadam A, Kachoeie H. Epidemiology of non-fatal stroke in South-Eastern Iran. *Iranian Journal of Medical Sciences*. 1996;21(3&4).
 15. Borhani-Haghighi A, Safari R, Heydari ST, Soleimani F, Sharifian M, Kashkuli SY, *et al*. Hospital mortality associated with Stroke in southern Iran. *Iranian Journal of Medical Sciences*. 2013;38(4):314.
 16. Banna MA, Baldawi H, Kadhim A, Humaidan H, Whitford DL. Stroke in Bahrain: rising incidence, multiple risk factors, and suboptimal care. *International Journal of Stroke*. 2015; 10(4):615-8.
 17. Ashkanani A, Hassan KA, Lamdhade S. Risk factors of stroke patients admitted to a general hospital in Kuwait. *International Journal of Neuroscience*. 2012;123(2):89-92.
 18. Delbari A, Salman Roghani R, Tabatabaei SS, Rahgozar M, Lokk J. Stroke epidemiology and one-month fatality among an urban population in Iran. *International Journal of Stroke*. 2011; 6(3):195-200.
 19. Yesilot N, Koyuncu BA, Çoban O, Tuncay R, Bahar SZ. Gender differences in acute Stroke: Istanbul medical school stroke registry. *Neurology India*. 2011;59(2):174.
 20. World Health Organization. World health statistics 2012. WHO, 2012. Available at http://apps.who.int/iris/bitstream/10665/44844/1/9789241564441_eng.pdf (Accessed on May 25 2015).
 21. Boutayeb A, Derouich M, Boutayeb W, Lamlili ME. Cerebrovascular diseases and associated risk factors in WHO Eastern Mediterranean countries. *Cardiology and Angiology: An International Journal*. 2014:62-75.
 22. Mengnjo MK, Kamtchum-Tatuene J, Nicastro N, Noubiap JJ. Neurological complications of sickle cell disease in Africa: protocol for a systematic review. *BMJ open*. 2016;6(10).
 23. Adebamowo SN, Jiménez MC, Chiuve SE, Spiegelman D, Willett WC, Rexrode KM. Plasma magnesium and risk of ischemic Stroke among women. *Stroke*. 2014; 45(10):2881-6.
 24. Grodstein F, Manson JE, Stampfer MJ, Rexrode K. Postmenopausal hormone therapy and Stroke: role of time since menopause and age at initiation of hormone therapy. *Archives of Internal Medicine*. 2008;168(8):861-6.
 25. Matar D, Frangieh AH, Abouassi S, Bteich F, Saleh A, Salame E, *et al*. Prevalence, Awareness, Treatment, and Control of Hypertension in Lebanon. *The Journal of Clinical Hypertension*. 2015;17(5):381-8.
 26. Abou El Enein NY, Abolfotouh MA. An audit of diabetes care at 3 centres in Alexandria. *EMHJ-Eastern Mediterranean Health Journal*. 2008;14 (3): 636-646.
 27. Al Shafae MA, Ganguly SS, Al Asmi AR. Perception of Stroke and knowledge of potential risk factors among Omani patients at increased risk for Stroke. *BMC Neurology*. 2006;6(1):1-6.
 28. Ohsawa M, Ogasawara K, Omama S, Tanno K, Itai K, Yonekura Y, *et al*. Abstract P259: Smoking Increases Risks of Death and Stroke in Both Men and Women. Absolute Risk Difference of Stroke is Likely to be Larger in Women. *Circulation*. 2017;135.