https://doi.org/10.33472/AFJBS.6.3.2024.483-495

African Journal of Biological Sciences

Research Paper Open Access

Public Prospective Toward Prevalence of Stroke in Gezira GovernorateAmong Sudanese Population

***SaeedHameed Rami[1], Ahmed Awad ElKareem Adam[2], MurhafFouad Korani[3]**

[1*]Assistant professor of emergency medicine, Department of Emergency Medical Services, College of Health Sciences in Al-Qunfudhah, Umm Al-Qura University, Makkah Al-Mukaramah, Kingdom Saudi Arabia.
[2]Associate professor, Department of Medicine, Faculty of Medicine University of Gezira.
[3]Assistant professor of public health, Public Health Department, College of Health Sciences in Al-Qunfudhah, Umm Al-Qura University,MakkahAlmukaramah, Kingdom of Saudi Arabia.

***Correspondence**
Consultant & Assistant professor of emergency medicine,
Medical Emergency Services Department, College of Health Sciences Al- Qunfudhah,
Umm Al-Qura University, Al-Qunfudhah 214221 P.O Box 715 Kingdom of Saudi Arabia

Article History

Volume 6,Issue 3, 2024
Received:20 Feb 2024
Accepted : 28 Mar 2024
doi: 10.33472/AFJBS.6.3.2024.483-495

Abstract
Background:

Stroke is a life-threatening disease with various types influenced by different risk factors. This study aimed to identify the most common types of stroke in the Gezira governorate of Sudan and their associated risk factors.

Methods:

A cross sectional study was conducted among 234 stroke patients, who underwent history taking, physical examination, and CT brain scans. The patients were divided into two groups: ischemic and hemorrhagic stroke.

Results:

The findings showed that stroke was more common in males (65.8%) than females (34.2%), with the most affected age group being 60 – 79 years (50.6%). Thrombo-embolism was the most common types of stroke (77.4%). Hyper tension (34.2%) and diabetes (22.6%) were the most prevalent risk factors. CT brain scans revealed that 80.2% of patients had infraction, 18.1% had hemorrhage, and 1.6% had brain tumors.

Conclusion:

Male patients were more susceptible to stroke, and the common types observed were thrombo-embolism. Hypertension and diabetes were identified as significrisk factors. Further research is needed to manage these risk factors and prevent complications.

Keywords: Stroke, risk factors, ischemic, hemorrhagic, Sudan.

1. Introduction

Stroke is a significant global health concern and one of the leading causes of morbidity and mortality worldwide. According to the World Health Organization (WHO), stroke is defined as a rapidly developing clinical sign of focal disturbance of cerebral function that lasts for more than 24 hours or leads to death, with no apparent cause other than vascular origin (1). In 2011, stroke was the second most frequent cause of death globally, accounting for approximately 6.2 million deaths, which represented around 11% of the total deaths. By 2015, stroke remained the second most frequent cause of death, responsible for 6.3 million deaths, also accounting for 11% of the total deaths (2).

The majority of strokes occur in individuals aged 45 and older, with two-thirds of strokes occurring in those over the age of 65. Men have a higher risk of suffering from strokes compared to women, with a 25% higher incidence rate. Interestingly, 60% of stroke-related deaths occur in women. In India, a significant proportion of strokes, around 10-15%, occur in individuals below the age of 40 (3). It is believed that the average age of stroke patients in developing countries is 15 years younger than in developed countries. In India, nearly one-fifth of patients admitted to hospitals with first-ever strokes are aged below 40 years (4).

While subarachnoid hemorrhage and intracranial hemorrhage are more common in young adults, accounting for 40-55% of strokes in this population compared to 15-20% in the general stroke population, cerebral infarction remains the most common type of stroke. Risk factors for stroke in young adults are similar to those in the elderly population and include diabetes mellitus, hypertension, heart disease, current smoking, and long-term heavy alcohol consumption (5). Cyclic vomiting syndrome (CVS) has been linked to stroke (6).This study aims to investigate the different types of strokes and their associated risk factors in the Gezira governorate of Sudan. Additionally, the current study also aims to explore the potential correlation between vomiting status and the occurrence of stroke. The belief in ancient Arabian and Muslim medicine that weekly induced vomiting reduces the frequency of stroke, serves as a basis for this investigation (7).

Understanding the prevalence of stroke types and associated risk factors in the Gezira governorate of Sudan is crucial for developing effective prevention and management strategies. By identifying the specific types of strokes and their risk factors, healthcare professionals can implement targeted interventions to reduce the burden of stroke in the population. This study aims to contribute to the existing knowledge on stroke in Sudan and provide valuable insights for healthcare providers and policymakers.

2. Material & methods

A cross sectional hospital-based study of 243 patients randomly selected patients admitted as stroke to Wad Medani Teaching Hospital between 2016 & 2020. All patients were subjected to history, clinical

examination & CT brain among other investigations. The patients were separated into three groups: ischemic stroke, hemorrhagic stroke & brain tumors.

The methods of this cross-sectional hospital-based study can be outlined in the following steps:

1. Study population

The study included 243 stroke patients who were randomly selected from those admitted to Wad Medani Teaching Hospital in the Gezira governorate of Sudan between 2016 and 2020.

2. Inclusion criteria

Patients were included based on a clinical diagnosis of stroke and were aged 15 years and above.

3. Comprehensive evaluation

All patients underwent a comprehensive evaluation, which included the following:

a. Detailed medical history: A detailed medical history was obtained from each patient, including information about his or her symptoms, medical conditions, and previous medical treatments.

b. Clinical examination: A thorough clinical examination was conducted to assess the neurological status of the patients and identify any physical abnormalities.

c. CT brain scans: CT brain scans were performed on all patients to accurately diagnose and classify the types of strokes. This imaging technique helps in identifying the presence of ischemic stroke, hemorrhagic stroke, or brain tumors.

4. Categorization of patients:

Based on the CT scan findings and clinical evaluation, the patients were categorized into three groups: ischemic stroke, hemorrhagic stroke, and brain tumors.

5. Selection criteria:

The selection criteria for the study were based on age and clinical diagnosis. Only patients aged 15 years and above with a clinical diagnosis of stroke were included in the study.

6. Ethical consideration:

When conducting the current research on the prevalence of stroke in the Gezira governorate among the Sudanese population, several ethical considerations were taken into account. These include:

a. Informed consent: Informed consent obtained from all participants before their inclusion in the study. Participants provided with clear and comprehensive information about the study objectives, procedures, potential risks, benefits, and their right to withdraw from the study at any time without consequences.

b. Confidentiality: The privacy and confidentiality of participants' personal and medical information were strictly maintained. Data was anonymized and stored securely to prevent unauthorized access.

c. Voluntary participation: Participation in the study is voluntary, and participants is not face any coercion or pressure to participate. They have the freedom to decline participation or withdraw from the study at any stage without any negative consequences.

d. Research ethics approval: Authors hereby declare that this study was approved by the ethical committee. This ensures that the study adheres to ethical guidelines and regulations and protects the rights and welfare of the participants.

Statistical analysis

The results of the statistical analysis showed that there is a relationship between vomiting status and CT at a significant level of less than 0.05.

3. Results

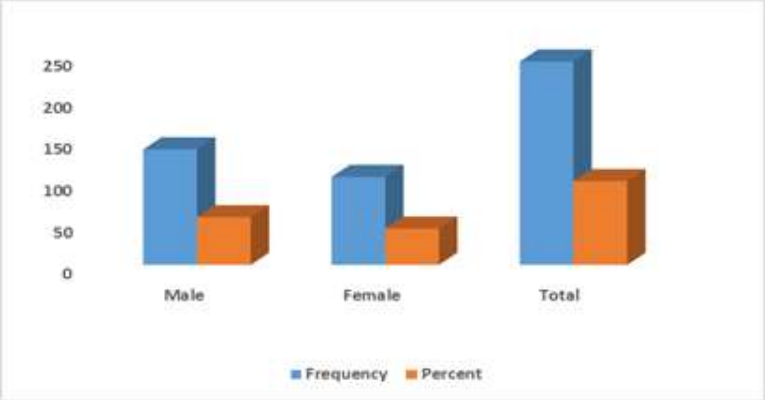
Based on the analysis of 243 incident stroke cases at Wad Medani Teaching Hospital between 2016 and 2020, the sex distribution of patients is presented in Table (1) and Figure (1). Out of the total cases, 56.8% were males and 43.2% were females, with a male-to-female ratio of 1.3 to 1. Additionally, Table (2) and Figure (2) provide information on the vomiting status of stroke patients, where 81.1% rarely vomit and 18.9% have a normal vomiting status. In the ischemic group, 168 patients rarely vomit, while 27 have a normal vomiting status. In the hemorrhagic group, 27 patients rarely vomit, while 17 have a normal vomiting status. Furthermore, Table (3) and Figure (3) reveal that 22.6% of the stroke patients are diabetics, while Table (4) and Figure (4) show that 34.2% of the patients are hypertensive. Lastly, Table (5) and Figure (5) indicate that 80.2% of the patients had infarction, 18.1% had hemorrhage, and 1.6% had brain tumors. The study aimed to evaluate the clinical profile, types, and risk factors of stroke in the Gezira governorate of Sudan. It was observed that the majority of stroke cases occurred in the age group of 60-79 years, with two-thirds of strokes occurring in individuals over 65 years old.

Sex Distribution

Out of 243 patients, 56.8% were males & 43.2% were females. Male to female ratio was 1.3 to 1. Men are 25% more likely to suffer strokes than women are. 62% patients were male and 38% were female male incidence is 24% higher than female (8) as shown in Table (1) Fig (1). The table and figure provide information on the higher percentage of stroke in male patients over females was in line with other previous studies (9, 10, 11, & 12). All diagnosed acute cerebral circulation disorder hemorrhagic type. Among them 38 men (75.0%) aged 20 to 72 years, 12 women (25.0%) aged 33 to 65 years (13).

Table(1) Sex distribution

Variable	Frequency	Percent
Male	138	56.8
Female	105	43.2
Total	243	100



Figure(1) Sex distribution

Vomiting status

From the 243 patients with stroke,197 (81.1%) rarely vomit while 46 (18.9%) have normal vomiting status as shown in Table (2) and Fig (2). The table and figure provide information on the ischemic group of 195, 27 patients have normal vomiting status while 168 rarely vomit. In the hemorrhagic group (44), 17 have normal vomiting status & 27 rarely vomit.

Table(2) Vomiting status

Variable	Frequency	Percent
Rare	197	81.1
Normal	46	18.9
Total	243	100

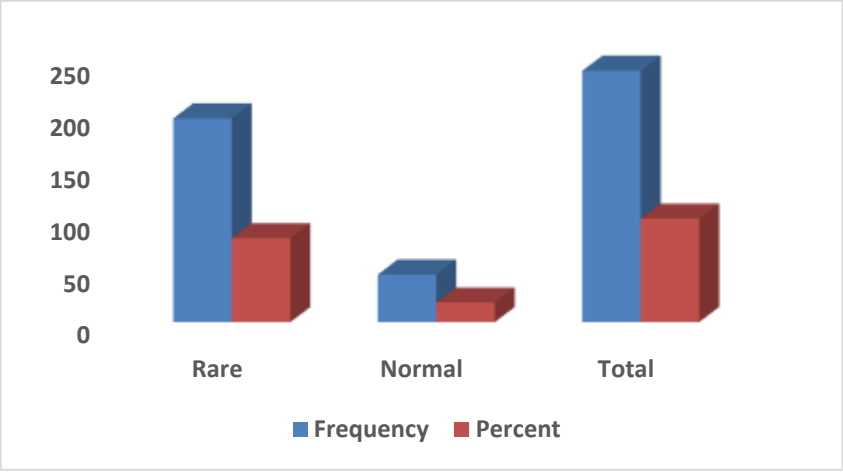


Figure (2) Vomiting Status

Diabetes mellitus (DM) and hypertension

The prevalence of diabetes and hypertension among the 243 patients included in the study as shown in table (3) and fig (3). The table and figure provide information on the total, 55 patients (22.6%) were diagnosed with diabetes, while 188 patients (77.4%) were non-diabetic. In terms of hypertension, 83 patients (34.2%) were hypertensive, while 160 patients (65.8%) were non-hypertensive.

Table (3) Diabetes

Group	Frequency	Percent
Non-diabetic	188	77.4
Diabetic	55	22.6
Total	243	100

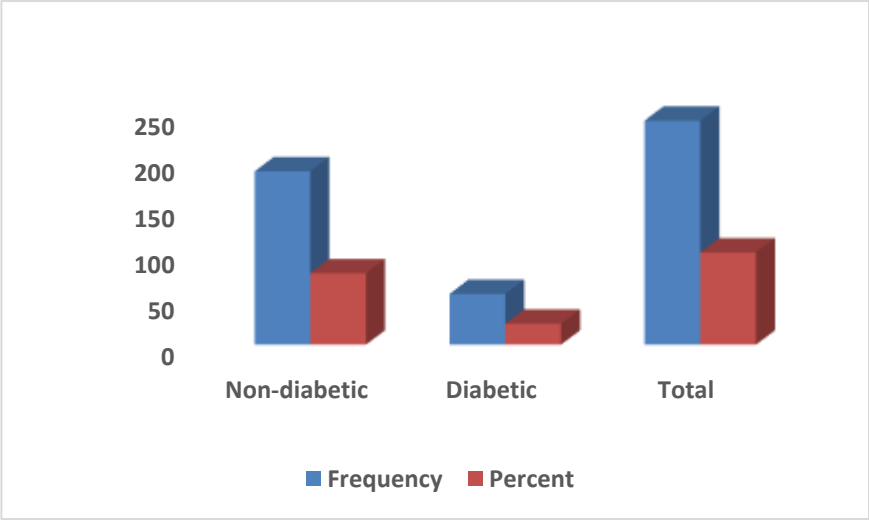


Figure (3) Diabetes

Table (4) Hypertension

Group	Frequency	Percent
Non-hypertensive	160	65.8
Hypertensive	83	34.2
Total	243	100

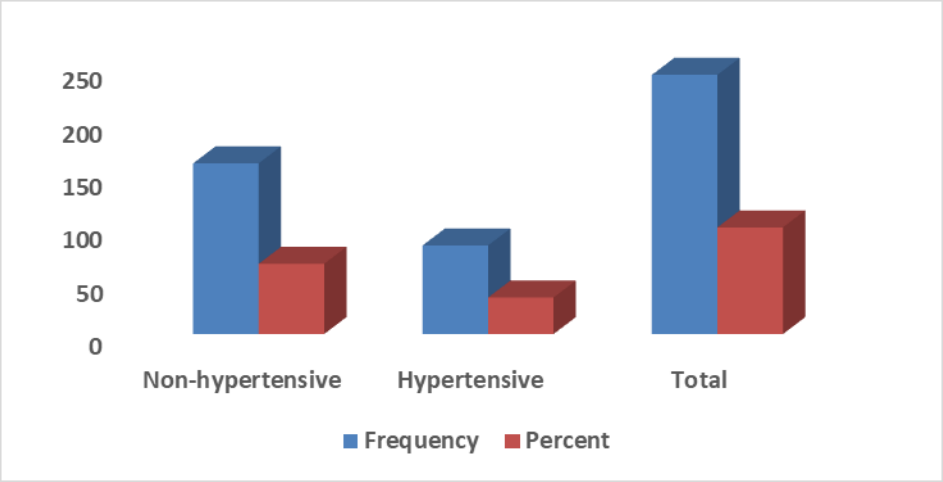


Figure (4) Hypertension

CT scan findings

Of the 243 patients, 195(80.2%) patients have infarction, 44 (18.1%) have hemorrhage & 4 patients (1.6%) have brain tumors.

Table (5) CT scan

Group	Frequency	Percent
Brain tumor	4	1.6
Hemorrhage	44	18.1
Infarction	195	80.2
Total	243	100

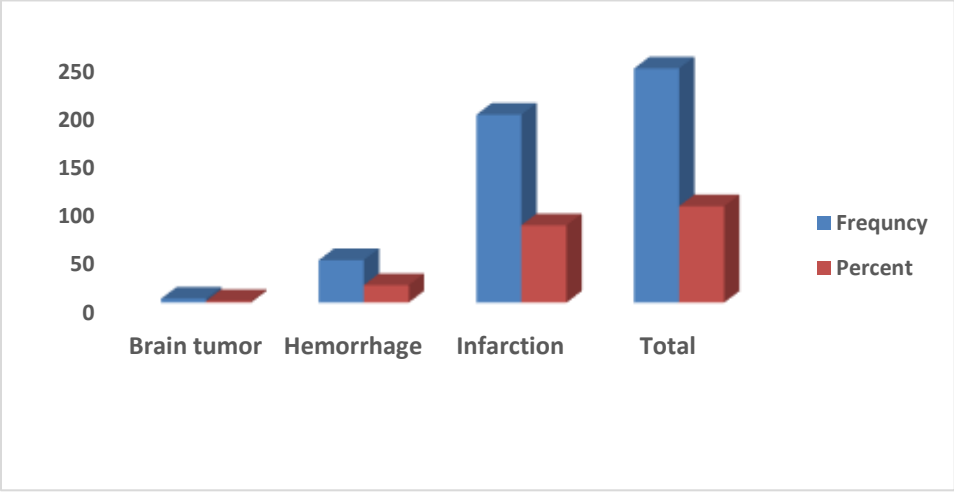


Figure (5) CT scan

Cerebral infarction and cerebral hemorrhage

Out of the 243 patients, 195 (80.2%) had infarction & 44 (18.1%) had hemorrhage. In a study done in Malaysia, Neelamegam et al found that 66% of patients had ischemic stroke. In a single center prospective study, among all stroke patients admitted to Penang Hospital over one-year period, 74.8% were ischemic and 25.2% hemorrhagic in origin (14). Similar studies were conducted in Pakistan and North India. In Pakistan, findings revealed that 45%of cases had cerebral infarction, 48% had intracerebral hemorrhage and 7.1% had Subarachnoid hemorrhage (SAH) (15). Whereas in North India 59.3% of cases had cerebral infarction, 28.1% had intracerebral hemorrhage and 12.5% had SAH (16). Although, epidemiologic studies indicate that only 8-18% of strokes are hemorrhagic (17).

Table (6) Vomiting status * CT Cross-tabulation

Group		CT			Total
		Brain tumor	Hemorrhage	Infarction	
Vomiting Status	Rare	2	27	168	197
	Normal	2	17	27	46
Total		4	44	195	243

Table (7) Chi-Square Tests

Chi-Square Tests			
Variable	**Value**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	16.934[a]	2	.000
Likelihood Ratio	14.718	2	.001
Linear-by-Linear Association	16.862	1	.000
N of Valid Cases	243		

Cerebral tumors

In this study, four patients were administered with stroke, but the CT images revealed the presence of brain tumors. These cases highlight the complexities surrounding of stroke and cerebral tumors, which can complicate the diagnosis and management of these patients.

The first patient was a 75-year-old man with pituitary adenoma. Pituitary adenomas are typically benign tumors that arise from the pituitary gland. The presence of this tumor in a patient presenting with stroke emphasizes the importance of considering underlying pathologies when evaluating stroke cases.The second patient was a 22-year-old female with HIV and astrocytoma. Astrocytomasare a type of brain tumor that

originates from astrocytes, a type of glial cell. The combination of HIV infection and the presence of a brain tumor adds complexity to the patient's condition and requires a comprehensive approach to their management.

The third patient was a 42-year-old male with a brain mass of unknown nature. The nature of the mass was still undetermined, indicating the need for further investigation and diagnostic procedures to determine the type of tumor and guide appropriate treatment strategies. The last patient was a 65-year-old male with a meningioma. Meningiomas are typically benign tumors that arise from the meninges, the protective membranes surrounding the brain and spinal cord. The presence of a meningioma in a patient presenting with stroke highlights the importance of considering different etiologies when evaluating stroke cases.

These cases underscore the importance of thorough diagnostic evaluation in stroke patients, as the presence of cerebral tumors can mimic stroke symptoms and require specific management strategies. The coexistence of stroke and cerebral tumors necessitates a multidisciplinary approach involving neurologists, neurosurgeons, and oncologists to ensure optimal patient care.

Risk factors

The analysis of risk factors in the study population revealed that out of the 243 patients, 83 (34.2%) had hypertension (HTN). This finding is consistent with previous studies conducted in Pakistan, where hypertension was identified as a major individual risk factor for stroke in 29.4% of patients (18). Similarly, a study conducted in Bharatpur, Nepal, reported that multiple infarcts were present in 9.1% of patients, with a significant proportion of them having hypertension (42.4%) and diabetes mellitus (18.2%) (19). These findings highlight the importance of managing hypertension as a key risk factor for stroke and emphasize the need for effective prevention and control strategies to reduce the burden of stroke in the population.

Other risk factors

The analysis of other risk factors in the study population revealed the following percentages: ischemic heart disease (IHD) 8%, congestive heart failure (CHF) 9%, atrial fibrillation (AF) 7%, valve disease 8%, smoking 8%, gastrointestinal malignancy (GME) 5%, thyroid disease 5%, brain tumors 4%, renal failure 4%, and alcoholism 3%. Among these risk factors, hypertension was the most common, identified in 75.9% of the patients, followed by family history (33.6%), alcohol intake (22.4%), smoking (17.2%), and heart failure (17.2%). The most common clinical presentations reported by the patients were headache (75.0%), aphasia (60.3%), and hemiparesis (53.4%). Atrial fibrillation was found to be an independent predictor of hemorrhagic stroke (AOR: 0.08, 95% CI: 0.01–0.68) (20). These findings highlight the diverse range of risk factors associated with stroke and emphasize the importance of identifying and managing these factors to prevent and control the occurrence of stroke in the population.

4. Discussion

This study conducted in the Gezira governorate of Sudan examined the clinical profile, types, and risk factors of stroke based on 243 cases. The findings revealed that individuals aged 60-79 years were the most affected group, with a prevalence of 50.6%. The current study also confirmed a higher incidence of stroke in males compared to females, consistent with previous research (21). Thrombo-embolism was identified as the most common type of stroke, aligning with existing studies. The analysis of vomiting status indicated that the majority of stroke patients rarely experienced vomiting. The prevalence of diabetes mellitus among stroke patients was 22.6%. CT findings demonstrated that infarction was the most prevalent type of stroke, followed by hemorrhage and brain tumors. Hypertension emerged as a major risk factor for stroke, alongside other factors such as family history, alcohol intake, smoking, and heart failure. The most common clinical presentations among stroke patients were headache, aphasia, and hemiparesis. Atrial fibrillation was identified as an independent predictor of hemorrhagic stroke.

These findings contribute to the understanding of stroke in the Gezira governorate of Sudan, providing insights into its clinical profile, types, and associated risk factors. The implications of this study are significant for healthcare professionals and policymakers, as they can inform the development of targeted prevention and management strategies. Effective hypertension control programs are crucial in reducing the burden of stroke, and comprehensive risk factor management approaches should be implemented to address other factors such as family history, alcohol intake, smoking, and heart failure. Recognizing the common clinical presentations of stroke, such as headache, aphasia, and hemiparesis, can facilitate early detection and prompt treatment (20).

However, it is important to acknowledge the limitations of this study, including its specific geographic focus, reliance on retrospective data analysis, and lack of exploration of certain potential risk factors. Future research should aim to address these limitations through prospective studies with larger sample sizes, inclusion of a wider range of risk factors, and longitudinal assessments of long-term outcomes and prognosis. Additionally, interventions targeting modifiable risk factors like hypertension control and smoking cessation should be implemented and evaluated for their effectiveness in reducing the incidence and burden of stroke in the Gezira population.

5. Conclusion

This study provides valuable insights into the clinical profile, types, and risk factors associated with stroke in the Gezira governorate of Sudan. The findings highlight the higher incidence of stroke in males, the prevalence of thrombo-embolism, and the significance of hypertension and diabetes as risk factors. These findings have important implications for healthcare professionals and policymakers in developing targeted prevention and management strategies for stroke in this population. Further research is needed to better understand and manage these risk factors and prevent stroke-related complications.

6. Limitations

It is important to acknowledge the limitations of the study on the prevalence of stroke in the Gezira governorate among the Sudanese population. Some potential limitations may include:

1. Sample size: The study may have a limited sample size, which could affect the generalizability of the findings to the entire population. A larger sample size would provide more robust and representative results.

2. Selection bias: The study may be subject to selection bias if the participants are not randomly selected or if certain groups are overrepresented or underrepresented in the sample. This could affect the accuracy and representativeness of the prevalence estimates.

3. Recall bias: The study may rely on self-reported information from participants, which could be subject to recall bias. Participants may have difficulty accurately recalling past medical events or risk factors, leading to potential inaccuracies in the data.

4. Cross-sectional design: The study's cross-sectional design may limit the ability to establish causal relationships between risk factors and stroke prevalence. Longitudinal studies or other study designs would be needed to explore causal associations more effectively.

5. Generalizability: The findings of the study may be specific to the Gezira governorate and may not be generalizable to other regions or populations. Factors such as cultural, socioeconomic, and environmental differences could influence the prevalence and risk factors of stroke.

6. Data collection methods: The study's reliance on specific data collection methods, such as medical records or self-reporting, may introduce measurement errors or limitations in data accuracy.

Conflict of interest

The authors declare no conflict of interest

Acknowledgment

The successful completion of this experimental cross-sectional study was made possible through the concerted efforts and dedication of various individuals and departments. The authors extend their heartfelt appreciation to the laboratory technician. Lastly, we would like to thank all the individuals involved in the data collection, analysis, and interpretation processes. Their dedication and hard work have been crucial in producing meaningful results and recommendations.

Researchers also would like to acknowledge the support and assistance of the local community leaders, healthcare professionals, and policymakers who facilitated the data collection process. Their guidance and collaboration have been invaluable in ensuring the success of this study.

References

1. Sacco, R. L., Kasner, S. E., Broderick, J. P., Caplan, L. R., Connors, J. J., Culebras, A., &Vinters, H. V. (2013). An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*, *44*(7), 2064-2089.

2. Feigin, V. L., Stark, B. A., Johnson, C. O., Roth, G. A., Bisignano, C., Abady, G. G.,&Hamidi, S. (2021). Global, regional, and national burden of stroke and its risk factors, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Neurology*, *20*(10), 795-820.

3. Griffiths, D.,& Sturm, J.(2011). Epidemiology and Etiology of Young Stroke. *Stroke Research and Treatment*, 2011.

4. Tripathi, M.,&Vibha, D. (2011). Stroke in Young in India. *Stroke Research and Treatment*, 2011.

5. Hassan, K.M., Verma, A., Praksh, S., Chandran, V., Kumar., S., &Banerji, A. (2013). Prevalence and association of lifestyle factors with extracranial carotid atherosclerosis in non-cardioembolic anterior circulation strokes in adult males less than 50 years: One year cross-sectional study. *Ann Indian AcadNeurol*, 2013.

6. Lee, K. L., & Shin, J. I. (2012). Cyclic vomiting syndrome developed after stroke. *Annals of Rehabilitation Medicine*, *36*(1), 141-143.

7. Khuda, I., & Al-Shamrani, F. (2018). Stroke medicine in antiquity: The Greek and Muslim contribution. *Journal of family & community medicine*, *25*(3), 143.

8. Patne, S.V.&Chintale , K.N. (2016). Study of clinical profile of stroke patients in rural tertiary health care Centre. *Int J Adv Med*, 3(3), 666–70.

9.Owolabi, M.O.&Agunloye, A.M. (2013). Which risk factors are more associated with ischemic rather than hemorrhagic stroke in black Africans? *ClinNeurolNeurosurg*, 115(10), 2069–74.

10. Deresse, B.&Shaweno, D. (2015). Epidemiology and in-hospital outcome of stroke in South Ethiopia. *J NeurolSci*, 355(1–2), 138–42.

11. Nkoke, C., Lekoubou, A., Balti, E.,&Kengne, A.P. (2015). Stroke mortality and its determinants in a resource-limited setting: a prospective cohort study in Yaounde, Cameroon. *J NeurolSci*, 358(1–2),113–7.

12. Rashid, M. H. U., Kashem, M. A., Biswas, S., &Hoque, M. M. (2020). Risk factors in young stroke. *Journal of Medicine*, *21*(1), 26-30.

13. Ilkhomovna, K. M., Eriyigitovich, I. S., &Kadyrovich, K. N. (2020). Morphological Features of microvascular Tissue of the Brain at hemorrhagic stroke. *The American Journal of Medical Sciences and Pharmaceutical Research*, *2*(10), 53-59.

14. Kooi, C. W., Peng, H. C., Aziz, Z. A., &Looi, I. (2016). A review of stroke research in Malaysia from 2000–2014. *Med J Malaysia*, *71*(Supplement 1), 58-69.

15. Ali, S.Y., Khan, R.S., &Hassan M. (2013). Frequency of Risk Factors in Patients with Acute Stroke at Tertiary Care Hospital Bahawalpur. *Ann Pak Inst Med Sci*, 9(1), 8-11.

16. Kapoor, D., Dhiman, A., Sharma, R.,&Sundar, S. (2014). Clinical profile, risk factors and aetiology of young stroke: a tertiary care hospital based study from the Sub-Himalayan region in North India. I*nt J Res Med Sci*, 2,1355-9.

17. Feigin, V.L., Lawes, C.M., Bennett, D.A., &Anderson, C.S. (2003). Stroke epidemiology: a review of population-based studies of incidence, prevalence, and case fatality in the late 20 century. The lancet neurology, 2(1), 43-53.

18.Nomani, A. Z., Iqbal, M., Jamil, U., Nabi, S., Mughal, S., Badshah, M., &Majeed, H. (2015). Etiology of stroke in young Pakistani adults; results of a single center study. *Pakistan Journal of Neurological Sciences (PJNS)*, *10*(4), 18-22.

19.Pokharel, B. R., Kharel, G., Thapa, L. J., & Rana, P. V. S. (2015). Stroke in young patients-A new trend in nepalese perspective. *J Nutr Disorders Ther S*, *1*, 2161-0509.

20. Fekadu, G., Chelkeba, L., &Kebede, A. (2019). Risk factors, clinical presentations and predictors of stroke among adult patients admitted to stroke unit of Jimma university medical center, south west Ethiopia: prospective observational study.

21. Abdu, H., &Seyoum, G. (2022). Sex Differences in Stroke Risk Factors, Clinical Profiles, and In-Hospital Outcomes Among Stroke Patients Admitted to the Medical Ward of Dessie Comprehensive Specialized Hospital, Northeast Ethiopia. *Degenerative Neurological and Neuromuscular Disease*, 133-144.

22. Unnithan, A. K. A., & Mehta, P. (2020). Hemorrhagic stroke.