

COMMON MODIFIABLE RISK FACTORS FOR STROKE

KHAN I^{*1}, CHAUDHRY FJ², NASEER MZ³, HAQ IU⁴, REHMAN AU⁴, ULLAH F⁵

¹Department of General Medicine, Kabir Medical College, Peshawar, Pakistan

²Department of Public Health, Community Medicine, King Edward Medical University, Lahore, Pakistan

³Department of Anesthesia, Avicenna Medical College & Hospital Lahore, Pakistan

⁴Department of Internal Medicine, DHQ Teaching Hospital (MTI) Dera Ismail Khan, KPK, Pakistan

⁵Department of Medicine, Khyber Teaching Hospital (MTI), Peshawar, Pakistan

*Corresponding author email address: imrankhattak589@gmail.com

(Received, 15th February 2025, Revised 10th March 2025, Accepted 16th May, Published 20th May 2025)

ABSTRACT

Background: Stroke remains a leading cause of morbidity and mortality worldwide. A substantial proportion of strokes are preventable through the management of modifiable risk factors. Early identification and control of these factors are essential for effective stroke prevention strategies. **Objective:** To assess the frequency of common modifiable risk factors among patients diagnosed with stroke. **Study Design:** Observational study. **Setting:** Department of Medicine at Khyber Teaching Hospital, Peshawar. **Duration of Study:** July 2024 to January 2025. **Methods:** A total of 120 stroke patients aged 45 years or older were included in the study. Stroke type was classified as ischemic or hemorrhagic based on clinical evaluation and confirmed via neuroimaging (CT or MRI). Data were collected on the presence of modifiable risk factors, including hypertension, diabetes mellitus, obesity, dyslipidemia, cardiovascular disease, smoking, and poor dietary habits. Descriptive statistics were used to report frequencies and percentages. **Results:** The mean age of patients was 57.95 ± 7.01 years. Of the total cases, 77.5% were ischemic strokes, and 22.5% were hemorrhagic. The most common modifiable risk factors identified were hypertension (53.3%), diabetes mellitus (38.3%), and obesity (20.0%). **Conclusion:** This study highlights a high prevalence of modifiable risk factors—particularly hypertension, diabetes, and obesity—among stroke patients. Targeted interventions aimed at controlling these factors may significantly reduce the burden of stroke in at-risk populations.

Keywords: Stroke, Ischemic Stroke, Hemorrhagic Stroke, Risk Factors, Hypertension, Diabetes, Obesity, Prevention, Modifiable Factors

INTRODUCTION

Acute stroke is commonly termed a cerebrovascular accident; nevertheless, it is essential to understand that a stroke is not merely an accidental occurrence. A more precise and important term to as brain attack," which maintains a comparable importance to "heart attack." Nonetheless, stroke encompasses a wider array of variations compared to heart disease. Strokes are primarily classified into two categories: ischemic as well as hemorrhagic. Hemorrhagic strokes can be categorized into intracerebral hemorrhage as well as subarachnoid hemorrhage (SAH), with an additional emphasis on nontraumatic ICH as well as nontraumatic SAH (1).

Ischemic stroke (IS) happens due to a blockage in a blood vessel leading to an inadequate blood supply to the brain. Conversely, hemorrhagic strokes happen when a blood vessel breaks, resulting in blood spilling into intracranial cavity. Stroke is essentially defined as an acute occurrence of localized neurological damage that lasts beyond a duration of 24 hours. Stroke is recognized as a second most common cause of death globally and significantly contributes to disability rates. Stroke is the second-leading cause of fatalities worldwide and significantly contributes to disability rates. Ischemic strokes represent approximately 62 percent of all reported strokes, with ICH at 28% as well as subarachnoid hemorrhage (SAH) at 10% (2-4).

The financial implications of stroke are significant, stemming from the expenses related to prehospital, hospital, as well as posthospital care (5-7). Recognizing that the opportunity for attaining full neurological recovery decreases with each passing minute for untreated acute stroke has become crucial. This establishes the foundation of "time is brain" concept, highlighting the essential need for prompt evaluation and treatment in cases of acute stroke. Timely as well as focused interventions, along with rehabilitation initiatives

along with sustained lifestyle changes, can greatly improve clinical results for those experiencing an acute stroke. This aims to achieve optimal clinical recovery for every patient while decreasing the overall burden of stroke on society (8).

The risk factors associated with hemorrhagic as well as ischemic stroke exhibit similarities, yet there currently are significant distinctions; additionally, deviations in risk factors can be noticed across the different etiologic classifications for ischemic stroke. Hypertension serves as a significant risk factor for hemorrhagic stroke, while also playing a role in atherosclerotic disease, which may result in ischemic stroke. Hyperlipidemia is a significant risk factor for strokes, primarily due to atherosclerosis affecting both extracranial as well as intracranial blood vessels, comparable to its contribution to coronary atherosclerosis. With advancements in identification and management of hypertension in various countries, there is a noticeable decline in the incidence of hemorrhagic strokes. On the contrary, rates of ischemic strokes, along with cardiovascular diseases overall, are on the rise (9, 10).

Stroke continues to be a major contributor to mortality and long-term disability globally, but a significant number of strokes can be prevented by recognizing and addressing modifiable risk factors. This study seeks to assess the most common modifiable risk factors linked to stroke, to inform clinical practices and shape health policies that encourage lifestyle changes and timely medical interventions ultimately aiming to lessen the worldwide impact of stroke.

METHODOLOGY

The observational study was conducted at the Department of Medicine at Khyber Teaching Hospital, Peshawar from July 2024 to January 2025 after securing ethical clearance from the hospital. One hundred and twenty stroke patients age 45 years or greater were selected for

this study. The patients were diagnosed with either ischemic or hemorrhagic stroke which was identified through clinical assessment and confirmed using neuroimaging techniques. Each participant underwent a detailed medical assessment, which included a detailed review of their medical history along with lifestyle factors and clinical conditions. Blood pressure measurements were taken to evaluate hypertension and tests for blood sugar levels were conducted to identify diabetes. Cholesterol levels were checked to detect dyslipidemia, and body mass index (BMI) was calculated to assess the obesity status. Various modifiable risk factors were assessed for each patient.

Data gathered was analyzed with SPSS 24. Age was assessed using the mean and SD. Demographics and modifiable risk factors were assessed using frequency and percentages.

RESULTS

Mean age was 57.95 ± 7.008 years. Gender distribution showed that 68 (56.7%) cases were male and 52 (43.3%) were female. The socioeconomic status, residence, and history of stroke are presented in Table 1. Regarding the type of stroke, around 93 (77.5%) of the participants experienced ischemic stroke whereas 27 (22.5%) had a hemorrhagic stroke (Figure 1).

Modifiable risk factors showed that obesity was found in 24 (20.0%) cases. Hypertension was present in 64 (53.3%) cases. Diabetes was present in 46 (38.3%) cases. Dyslipidemia was present in 29 (24.2%) cases. Cardiovascular diseases were observed in 16 (13.3%) cases. Smoking was reported by 22 (18.3%) cases. Poor dietary habits were reported in 11 (9.2%) cases.

Table 1: Demographics

Demographics		N	%
Gender	Male	68	56.7%
	Female	52	43.3%
Socioeconomic status	Low	25	20.8%
	Middle	61	50.8%
	High	34	28.3%
Residence	Rural	63	52.5%
	Urban	57	47.5%
History of stroke	Yes	17	14.2%
	No	103	85.8%

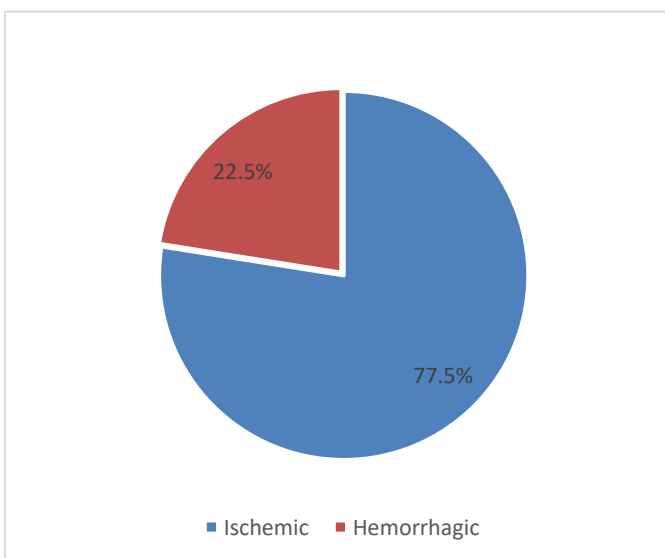


Figure 1: Type of stroke

Table 2: Modifiable risk factors

Modifiable risk factors		N	%
Obesity	Yes	24	20.0%
	No	96	80.0%
Hypertension	Yes	64	53.3%
	No	56	46.7%
Diabetes	Yes	46	38.3%
	No	74	61.7%
Dyslipidemia	Yes	29	24.2%
	No	91	75.8%
Cardiovascular diseases	Yes	16	13.3%
	No	104	86.7%
Smoking	Yes	22	18.3%
	No	98	81.7%
Poor dietary habits	Yes	11	9.2%
	No	109	90.8%

DISCUSSION

A comparison of the findings from our study with similar studies highlighted some interesting consistencies. Zuhaid et al evaluated modifiable risk factors in stroke patients in Pakistan. Their study found that hypertension was the most frequent risk factor, which affected around 84.7% of stroke patients (11). Similarly, hypertension was frequently observed risk factor for stroke, 53.3%. Chobanian et al and Lewington et al reported in their study a direct link between increasing blood pressure and stroke (12, 13). Increasing blood pressure is a common problem in people with advance age, hence this likely increases the risk for developing stroke.

The relationship between obesity and stroke risk is well-documented in research literature. In our study obesity was observed in around 20.0% of cases. Johansson et al reported that the lack of physical activity was a key factor for stroke (14), obesity often leads to lack of physical activity due to restricted body movement.

Regarding diabetes, our results found 38.3% of cases reporting diabetes which resonates closely with the global findings that diabetes notably increases the ischemic stroke risk. Johansson et al explained in their study that diabetes increases the risk of mortality in stroke patients; they reported a strong link between diabetes and stroke (14). Dyslipidemia in our cohort was reported in 24.2% of cases. Boehme et al. who reported that lipid disorders are a major modifiable risk factor for ischemic stroke (15). These risk factors are important as they are often interrelated with other metabolic conditions and can be managed through early intervention. In countries like Pakistan, where people love deep-fried food items, cholesterol levels are likely to increase in such cases. Dyslipidemia can be managed effectively with a better lifestyle.

Cardiovascular diseases (CVD) were observed in 13.3% of our sample. Cardiac issues are a notable risk factor for stroke, especially for ischemic strokes, due to factors such as atrial fibrillation and heart disease (16). Zuhaid et al found a notable relation between stroke and cardiac issues in their study (11).

The association of smoking with stroke is well-established, with studies consistently reporting its significant impact, especially in ischemic stroke. In our cohort, smoking was reported by 18.3% of cases. Studies showed that smoking is notably linked with ischemic stroke (16, 17). The finding from our study underscores the importance of smoking cessation programs and other public health efforts to reduce smoking rates.

Around 9.2% patients in our study reported to have poor dietary habits. Poor diet can lead to several diseases, such as diabetes and hypertension along with dyslipidemia. These diseases are directly linked with stroke (15).

From our discussion, we infer that the factors identified in our study can be modified to lower the incidence of stroke. Glycemic control, blood pressure monitoring, quitting smoking and shifting to a healthy diet and proper physical activities can potentially minimize the risks of stroke to a large extent.

CONCLUSION

In conclusion, our study underscores the notable prevalence of modifiable risk factors such as hypertension, along with diabetes and obesity, in patients with stroke. Our findings highlight the importance of targeted interventions, especially in middle-aged adults, for mitigating stroke risk.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRBE-LMCAD-94-24)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

IMRAN KHAN (Senior Registrar)

Conception of the study, development of research methodology, study design, critical revision of the manuscript, and final approval of the manuscript.

FATIMA JALAL CHAUDHRY (Postgraduate Resident)

Data entry, data analysis, and initial drafting of the article. Assisted in manuscript drafting and reference management.

MUHAMMAD ZUBAIR NASEER (Medical Officer)

Study Design, Review of Literature.

Participated in Critical Guidance, and Manuscript Revision.

IJAZ UL HAQ (Postgraduate Resident)

Conception of Study, Development of Research Methodology Design, and Study Design

ATTA UR REHMAN (Postgraduate Resident)

Conception of Study, Critical input in approval of manuscript.

FARID ULLAH (Postgraduate Resident)

Literature search, Participated in Critical Guidance, and Final approval of the draft

REFERENCES

1. Sacco RL, Kasner SE, Broderick JP, Caplan LR, Connors JJ, Culebras A, et al. American Heart Association Stroke Council, Council on Cardiovascular Surgery and Anesthesia. Stroke. 2013;44(7):2064-89.
2. George MG, Fischer L, Koroshetz W, Bushnell C, Frankel M, Foltz J, et al. CDC Grand Rounds: Public Health Strategies to

Prevent and Treat Strokes. MMWR Morb Mortal Wkly Rep. 2017;66(18):479-81.

3. Katan M, Luft A. Global Burden of Stroke. Semin Neurol. 2018;38(2):208-211.

4. Ding C, Wu Y, Chen X, Chen Y, Wu Z, Lin Z, et al. Global, regional, and national burden and attributable risk factors of neurological disorders: The Global Burden of Disease study 1990-2019. Front Public Health. 2022;10:952161

5. Tu WJ, Wang LD. China Stroke Surveillance Report 2021. Military Med Res. 2023;10(1):33.

6. Rochmah TN, Rahmawati IT, Dahlui M, Budiarto W, Bilqis N. Economic burden of stroke disease: a systematic review. Environ Res Public Health. 2021;18(14):7552.

7. Rochmah TN, Rahmawati IT, Dahlui M, Budiarto W, Bilqis N. Economic Burden of Stroke Disease: A Systematic Review. Int J Environ Res Public Health. 2021;18(14)

8. Hankey GJ. Stroke. Lancet. 2017;389(10069):641-654.

9. Tirschwell DL, Smith NL, Heckbert SR, Lemaitre RN, Longstreth Jr WT, Psaty BM. Association of cholesterol with stroke risk varies in stroke subtypes and patient subgroups. Neurology. 2004;63(10):1868-75.

10. Zhao D, Liu J, Wang W, Zeng Z, Cheng J, Liu J, et al. Epidemiological transition of stroke in China: twenty-one-year observational study from the Sino-MONICA-Beijing Project. Stroke. 2008;39(6):1668-74.

11. Zuhaid M, Chawla JA, Farooq U, Khan S, Asfandiyar M. Frequency of Modifiable Risk Factors in Stroke Patients. J Ayub Med Coll Abbottabad. 2014;26(2):235-8.

12. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr. et al. The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure: The jnc 7 report. JAMA. 2003; 289:2560-2572.

13. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R. Age-specific relevance of usual blood pressure to vascular mortality: A meta-analysis of individual data for one million adults in 61 prospective studies. Lancet. 2002; 360:1903-1913.

14. Johansson A, Drake I, Engström G, Acosta S. Modifiable and Non-Modifiable Risk Factors for Atherothrombotic Ischemic Stroke among Subjects in the Malmö Diet and Cancer Study. Nutrients. 2021;13(6):1952.

15. Boehme AK, Esenwa C, Elkind MS. Stroke Risk Factors, Genetics, and Prevention. Circ Res. 2017;120(3):472-495.

16. Hankey GJ. Population impact of potentially modifiable risk factors for stroke. Stroke. 2020;51(3):719-28.

17. Di Legge S, Koch G, Diomedes M, Stanzione P, Sallustio F. Stroke Prevention: Managing Modifiable Risk Factors. Stroke Res Treat. 2012;2012(1):391538.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons licence unless indicated otherwise in a credit line to the material. Suppose material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use. In that case, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2025