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Original Research Article

Frequency of Stroke and Factors Leading to It in Old Age Patients With Hypertension

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Abstract: *Stroke is a major cause of disability and mortality among hypertensive elderly patients. Understanding its frequency and associated risk factors is crucial for prevention and management.* ***Objective:*** *This study aimed to determine the frequency of stroke and identify associated risk factors among hypertensive old aged patients.* ***Methodology:*** *A cross-sectional study was conducted at a tertiary care hospital over six months. Participants included 150 hypertensive patients (86 males, 64 females) with a mean age of 57.4 ± 7.1 years. Data were collected through structured interviews and medical record reviews, capturing sociodemographic details, behavioural factors (smoking), clinical history (diabetes, cardiovascular disease, dyslipidemia, prior stroke), and physical measurements (BMI, blood pressure). Stroke diagnosis was confirmed using WHO criteria, supported by clinical and imaging evidence. Descriptive statistics and logistic regression were used for analysis, with significance set at $p < 0.05$.* ***Results:*** *The frequency of stroke was 10.7% (n=16). Stroke cases were more prevalent in individuals over 60 years (81.2%), males (75.0%), smokers (56.2%), and those with obesity (56.2%). Comorbid conditions such as diabetes (50.0%) and dyslipidemia (50.0%) were significantly higher in stroke patients compared to non-stroke cases (20.1% and 23.1%, respectively). A family history of stroke was reported in 43.8% of stroke patients, compared to 8.2% in non-stroke participants.* ***Conclusion:*** *Stroke remains a significant health concern among hypertensive patients, with a prevalence of 10.7%. Key risk factors include advanced age, male gender, smoking, obesity, and comorbid conditions such as diabetes and dyslipidemia. These findings underscore the need for targeted interventions, including smoking cessation programs, weight management strategies, and stricter control of metabolic conditions. Routine screening and public health education should be prioritized to mitigate stroke risk in this vulnerable population.*

Keywords: Stroke, hypertension, risk factors, obesity, diabetes, smoking, cross-sectional study

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Introduction

Systemic arterial hypertension, commonly known as hypertension, is defined by consistently elevated blood pressure in systemic arteries. Blood pressure is typically represented as the ratio of systolic pressure, which is the force exerted by blood on arterial walls during contractions of the heart, to diastolic pressure, the force when the heart is at rest. Multiple causes can lead to hypertension. (1) Most patients, around 90-95%, exhibit various kinds of 'essential' or primary hypertension, driven by a complex interplay of environmental and genetic variables. Positive family history often appears among individuals with hypertension, with heritability—an indication of the extent to which genetic factors contribute to variance in a trait estimated to be between 35% and 50% in most studies. (1, 2) Genome-wide association studies have pinpointed approximately 120 loci linked to blood pressure regulation, collectively making up 3.5% of the variance in this trait. (3-5)

People with high blood pressure face a significant risk of experiencing a stroke. Stroke is the primary cause of illness and mortality in individuals with hypertension. (6) Globally, stroke has emerged as the leading cause of death and illness in older people population. A stroke occurs when the major arteries in the brain become blocked, leading to a lack of oxygen supply, which can result in disability or death. (7) There are various types of stroke, such as ischemic stroke, hemorrhagic stroke, as well as transient ischemic attack. Among them, the most prevalent type is hemorrhagic stroke. (8) In recent years, there has been a rise in the occurrence of stroke in nations with low or middle incomes. (9) Nonetheless, the occurrence of stroke has notably decreased in advanced nations. In 2013, stroke was responsible for the deaths of 6.5 million individuals, leading to a staggering 113 million life years adjusted for disability loss. A significant 75.2% of stroke fatalities and 81.0% of stroke-related life years adjusted for disability happen in developing countries. (10) Pakistan is facing a rising rate of stroke due to various risk factors such as obesity, and hypertension, along with lifestyle choices. A significant portion of individuals who experience a stroke go on to face cognitive challenges afterwards. (11)

The occurrence of stroke and the contributing factors in older patients with hypertension is an important area of study, especially given the rising global rates of both issues as populations continue to age. The findings of this study will be helpful to evaluate how often strokes occur within this group and to pinpoint significant factors, both changeable and unchangeable, that influence their occurrence. This information will help develop focused strategies to lower stroke risk and enhance the management of hypertension among older individuals.

Methodology

The study employed a cross-sectional design among hypertensive patients aged 40 years and above. Data were collected from 150 patients from June 2024 to December 2024 attending the outpatient clinic at the medicine department of MTI DHQTH/Gomal Medical College, Dera Ismail Khan after obtaining ethical approval from the hospital. Participants included both male and female individuals diagnosed with hypertension, as per clinical guidelines defining systolic blood pressure ≥140 mmHg diastolic blood pressure ≥90 mmHg, or those on antihypertensive medication.

Data collection involved structured interviews and medical record reviews. Trained healthcare professionals administered questionnaires covering sociodemographic details (age, gender, residence), behavioural factors (smoking status), and clinical history (diabetes, cardiovascular disease, dyslipidemia, prior stroke). Physical measurements included weight and height using calibrated scales and stadiometer to calculate BMI, categorized as normal (18–24.9 kg/m²), overweight (25–29.9 kg/m²), or obese (≥30 kg/m²). Blood pressure readings were taken using standardized sphygmomanometers, with participants seated after a five-minute rest. Stroke diagnosis was confirmed through medical records, adhering to WHO criteria requiring clinical signs of cerebral dysfunction lasting over 24 hours, supported by imaging where available.

Data were entered into SPSS 24. Descriptive statistics summarized continuous variables as means ± standard deviations and categorical variables as frequencies. Chi-square tests compared proportions between stroke and risk factors with significance set at $p < 0.05$.

Results

The study included 150 participants with a mean age of 57.4 ±7.1 years and an average BMI of 26.2 ±3.1. Males constituted the majority of the cohort (86 (57.3%)), while females accounted for 64 (42.7%) participants (Figure 1). Comorbidities were prevalent, with diabetes reported in 35 (23.3%) individuals, stroke history in 16 (10.7%), and smoking in 32 (21.3%). A history of cardiovascular disease was noted in 34 (22.7%), dyslipidemia in 39 (26.0%), and a family history of stroke in 18 (12.0%). BMI categorization revealed 53 (35.3%) participants within the normal range (18–24.9 kg/m²), 72 (48.0%) classified as overweight (25–29.9 kg/m²), and 25 (16.7%) as obese (≥30 kg/m²) (Table 1).

Among the cohort, 16 (10.7%) experienced a stroke (Table 2). The risk factors were notably associated with stroke ($p < 0.05$). Age stratification showed a higher incidence in those over 60 years 13 (81.2%) compared to younger participants aged 45–60 years 3 (18.8%). Diabetes was equally prevalent in stroke and non-stroke groups 8 (50.0%) vs. 27 (20.1%), whereas smoking was more frequent among stroke patients 9 (56.2%) compared to non-stroke individuals 23 (17.2%). A history of cardiovascular disease was reported in 7 (43.8%) stroke patients versus 27 (20.1%) non-stroke participants. Dyslipidemia was present in 8 (50.0%) stroke cases and 31 (23.1%) non-stroke cases. Family history of stroke was noted in 7 (43.8%) stroke patients, contrasting with 11 (8.2%) in the non-stroke group. Obesity (BMI ≥30 kg/m²) was more common among stroke patients 9 (56.2%) compared to non-stroke participants 16 (11.9%), while normal BMI was less frequent in the stroke group 5 (31.2%) versus non-stroke individuals 48 (35.8%) (Table 3).

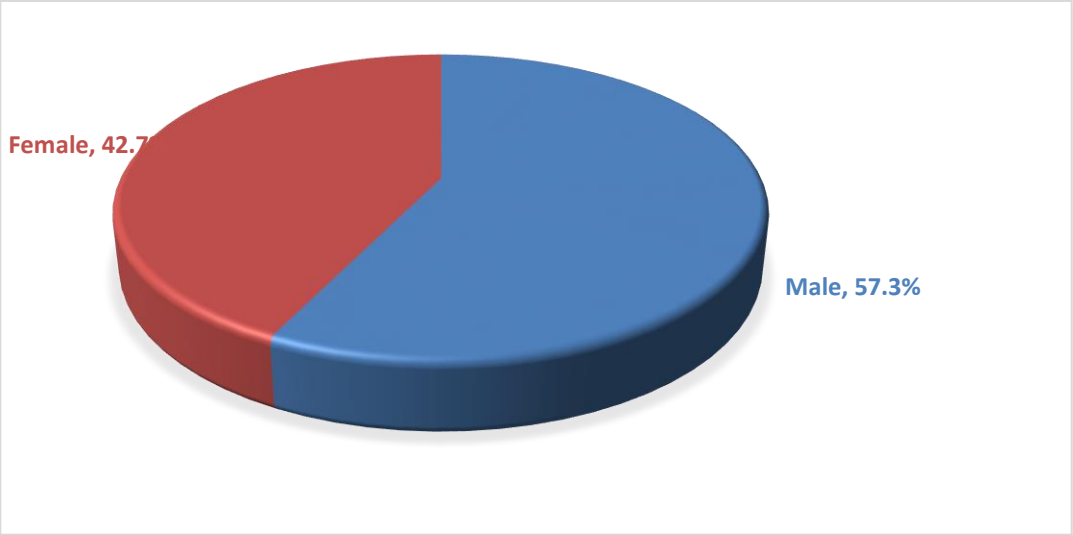

Figure 1 Gender distribution

Table 1 Comorbidities

Comorbidities		N	%
Diabetes	Yes	35	23.3%
	No	115	76.7%
Stroke	Yes	16	10.7%
	No	134	89.3%
Smoking	Yes	32	21.3%
	No	118	78.7%
History of CVD	Yes	34	22.7%
	No	116	77.3%
Dyslipidemia	Yes	39	26.0%
	No	111	74.0%
Family history of stroke	Yes	18	12.0%
	No	132	88.0%
BMI (Kg/m2)	18 to 24.9 (Normal)	53	35.3%
	25 to 29.9 (Overweight)	72	48.0%

	= > 30 (Obese)	25	16.7%

Table 2 Frequency of stroke

Stroke	Frequency	Per cent
Yes	16	10.7
No	134	89.3
Total	150	100.0

Table 3 Association of stroke with risk factors

Risk factors		Stroke				P value
		Yes		No		
		N	%	N	%	
Age distribution (Years)	45 to 60	3	18.8%	98	73.1%	0.0001
	> 60	13	81.2%	36	26.9%	
Diabetes	Yes	8	50.0%	27	20.1%	0.008
	No	8	50.0%	107	79.9%	
Smoking	Yes	9	56.2%	23	17.2%	0.0001
	No	7	43.8%	111	82.8%	
History of CVD	Yes	7	43.8%	27	20.1%	0.03
	No	9	56.2%	107	79.9%	
Dyslipidemia	Yes	8	50.0%	31	23.1%	0.02
	No	8	50.0%	103	76.9%	
Family history of stroke	Yes	7	43.8%	11	8.2%	0.0001
	No	9	56.2%	123	91.8%	
BMI (Kg/m2)	18 to 24.9 (Normal)	5	31.2%	48	35.8%	0.0001
	25 to 29.9 (Overweight)	2	12.5%	70	52.2%	
	= > 30 (Obese)	9	56.2%	16	11.9%	

Discussion

The frequency of stroke and its associated factors among elderly hypertensive patients remain critical public health concerns, as evidenced by multiple studies across diverse populations. In the present study, which included 150 participants with a mean age of 57.4 years, the incidence of stroke was 10.7%, with notable associations observed with age over 60, male gender, smoking, obesity, and family history of stroke. These findings align with and diverge from other research in nuanced ways, highlighting both universal and context-specific risk patterns. For instance, the study by Rupasinghe et al., identified age, smoking, lack of physical activity, and dyslipidemia as significant predictors of stroke among hypertensive patients over 60 years, corroborating the role of age and smoking observed here. However, physical activity and medication adherence key factors in their analysis were not explicitly addressed in our study, suggesting potential gaps in variable selection or measurement. (12) Similarly, Liu et al., reported a 10.8% stroke prevalence among elderly hypertensive patients, emphasizing dyslipidemia, lack of exercise, and family history as critical determinants. While our study also identified family history and dyslipidemia as significant, the absence of data on physical activity limits direct comparability. (13)

Age emerged as a consistent risk factor across studies, though with variations in cutoff points. Our study found that 81.2% of stroke cases occurred in patients over 60, whereas Mekonen et al., in Ethiopia, highlighted a higher hazard ratio for stroke in the 45–65 age group. (14) This discrepancy may reflect differences in population demographics or healthcare access, as younger cohorts in low-resource settings might experience accelerated vascular ageing due to unmanaged risk factors.

Comorbid conditions such as diabetes and dyslipidemia were strongly associated with stroke in our study, with 50% of stroke patients having diabetes compared to 20.1% in non-stroke cases. This mirrors findings from Liu et al., where dyslipidemia increased stroke risk by 31%, and Misgana et al., who identified comorbidities as doubling the hazard of stroke. (13-15) Misgana et al. further emphasized uncontrolled blood pressure as a critical factor, which our study did not explicitly measure but implied through the inclusion of hypertensive patients. (16) Obesity, particularly a BMI ≥30 kg/m², was prevalent in 56.2% of our stroke cases, consistent with Rupasinghe et al., who linked obesity to a 1.92-fold higher stroke risk. (12) However, Xia et al., noted no significant BMI-stroke association, possibly due to differing obesity thresholds or population-specific metabolic profiles. (16)

Behavioural factors like smoking were prominent in our cohort, with 56.2% of stroke patients being smokers—a finding echoed in all referenced studies. Rupasinghe et al., reported an adjusted odds ratio of 1.76 for smoking, while Misgana et al., found smokers had a 1.46-fold higher hazard. (12-15) Family history of stroke, present in 43.8% of our stroke cases, was similarly significant in Liu et al., who noted a 2.18-fold increased risk, underscoring genetic or shared environmental influences. (13)

The cumulative evidence underscores the multifactorial nature of stroke in hypertensive elderly populations. While age, smoking, obesity, and familial predisposition are recurrent themes, regional differences in risk factor prominence such as physical inactivity in urbanized settings versus drug non-adherence in resource-limited areas highlight the need for tailored interventions. For instance, our study's emphasis on obesity and family history aligns with global trends but may require integrating physical activity promotion and medication adherence strategies, as evidenced by other studies, to form a comprehensive prevention framework.

Conclusion

The study found that approximately 10.7% of hypertensive patients aged 40 years and above experienced a stroke, highlighting its significant burden in this population. Key factors associated with stroke included advanced age (particularly over 60 years), male gender, smoking, obesity, diabetes, dyslipidemia, and a family history of stroke. To reduce stroke incidence, targeted interventions focusing on smoking cessation, weight management, and stricter control of diabetes and dyslipidemia are recommended. Public health initiatives should prioritize routine screening for these modifiable risks in hypertensive populations, alongside community education to address lifestyle factors. Further studies incorporating physical activity and treatment adherence metrics could strengthen preventive strategies.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-FAIH-099/23)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

SW (Post Graduate Resident), SU (Post Graduate Resident)
Manuscript drafting, Study Design, Review of Literature, Data entry, Data analysis, drafting article.
AK (Post Graduate Resident), MIK (Post Graduate Resident), SM (Head Nurse).
Manuscript review, Manuscript revisions, critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

1. Brouwers S, Sudano I, Kokubo Y, Sulaica EM. Arterial hypertension. The Lancet. 2021;398(10296):249-61.
2. Fagard R, Brguljan J, Staessen J, Thijs L, Derom C, Thomis M, et al. Heritability of conventional and ambulatory blood pressures: a study in twins. Hypertension. 1995;26(6):919-24.
3. Surendran P, Drenos F, Young R, Warren H, Cook JP, Manning AK, et al. Trans-ancestry meta-analyses identify rare and common variants associated with blood pressure and hypertension. Nature genetics. 2016;48(10):1151-61.
4. Ehret GB, Ferreira T, Chasman DI, Jackson AU, Schmidt EM, Johnson T, et al. The genetics of blood pressure regulation and its target organs from association studies in 342,415 individuals. Nature genetics. 2016;48(10):1171-84.
5. Liu C, Kraja AT, Smith JA, Brody JA, Franceschini N, Bis JC, et al. Meta-analysis identifies common and rare variants influencing blood pressure and overlapping with metabolic trait loci. Nature genetics. 2016;48(10):1162-70.
6. Furie K. Epidemiology and primary prevention of stroke. CONTINUUM: Lifelong Learning in Neurology. 2020;26(2):260-7.
7. Adams AG, Schweitzer D, Molenberghs P, Henry JD. A meta-analytic review of social cognitive function following stroke. Neuroscience & Biobehavioral Reviews. 2019;102:400-16.
8. Khan MI, Khan JI, Ahmed SI, Ali S. Retracted: The epidemiology of stroke In a developing country (Pakistan). Pakistan Journal of Neurological Sciences (PJNS). 2019;13(3):30-44.
9. Feigin VL, Krishnamurthi RV, Parmar P, Norrving B, Mensah GA, Bennett DA, et al. Update on the global burden of ischemic and hemorrhagic stroke in 1990-2013: the GBD 2013 study. Neuroepidemiology. 2015;45(3):161-76.
10. Benjamin EJ, Blaha MJ, Chiuve SE, Cushman M, Das SR, Deo R, et al. Heart disease and stroke statistics—2017 update: a report from the American Heart Association. Circulation. 2017;135(10):e146-e603.
11. Nomani AZ, Nabi S, Badshah M, Ahmed S. Review of acute ischaemic stroke in Pakistan: progress in management and future perspectives. Stroke and vascular neurology. 2017;2(1).
12. Rupasinghe CD, Bokhari SA, Lutfi I, Noureen M, Islam F, Khan M, et al. Frequency of stroke and factors associated with it among old age hypertensive patients in Karachi, Pakistan: a cross-sectional study. Cureus. 2022;14(3).
13. Liu J, Chen Y, Jin C, Chen D, Gao G, Li F. Analysis of prevalence and influencing factors of stroke in elderly hypertensive patients: Based on the screening plan for the high-risk population of stroke in Jiading District, Shanghai. Plos one. 2021;16(8):e0255279.
14. Mekonen HH, Birhanu MM, Mossie TB, Gebreslassie HT. Factors associated with stroke among adult patients with hypertension in Ayder Comprehensive Specialized Hospital, Tigray, Ethiopia, 2018: A case-control study. PLoS One. 2020;15(2):e0228650.
15. Misgana S, Asemahagn MA, Atnafu DD, Anagaw TF. Incidence of stroke and its predictors among hypertensive patients in Felege Hiwot Comprehensive Specialized Hospital, Bahir Dar, Ethiopia, a retrospective follow-up study. European Journal of Medical Research. 2023;28(1):227.
16. Xia X, Yue W, Chao B, Li M, Cao L, Wang L, et al. Prevalence and risk factors of stroke in the elderly in Northern China: data from the National Stroke Screening Survey. Journal of Neurology. 2019;266:1449-58.