

Prevalence of Types of Stroke and Associated Risk Factors in the Department of Neurology: A Retrospective Observational Study

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ABSTRACT

Aim: The aim of the study is to evaluate the prevalence of types of stroke and associated risk factors.

Material And Method: This is a retrospective observational study conducted over a period of 6 months in a tertiary care hospital. A total of 277 patients satisfying the inclusion and exclusion criteria were analysed. Case records of patients from the MRD were retrospectively reviewed for demographic data, past medical and medication history, habits, clinical presentation, investigations, management, outcome from the year of 2017 to 2021 June. Data analysed using SPSS and Microsoft Excel 2010.

Result: The most prevalent type of stroke was found to be Ischemic stroke (IS). The highest prevalence of stroke was found in the age group above 70 years. Most contributable risk factors of stroke were found to be the patients with both hypertension and diabetes mellitus. Out of 277 patients, 223 patients had hypertension and 160 patients had hypertension either as a single risk factor or as a combination with other risk factors. Men were more prone to stroke with the risk factors of hypertension with diabetes mellitus.

Conclusion: Adults aged ≥ 70 years had a high prevalence of stroke and a high-risk stroke population, with ischemic stroke being the most common form in our study. These results indicate that individual-level and population-level treatments for these major risk factors are required to prevent stroke because hypertension and diabetes mellitus were stronger contributors to stroke. These results have the conclusion that when establishing preventative methods, these risk factors should be considered while decision making.

KEYWORDS: Haemorrhagic stroke, Ischemic stroke, Prevalence, Risk factors of stroke, Transient Ischemic attack.

ARTICLE DETAILS

Published On:
12 September 2022

Available on:
<https://ijmscr.org/>

INTRODUCTION

Stroke is an acute clinical event of focal or global neurological disturbance related to impairment of cerebral circulation, which lasts longer than 24 hours resulting in death with no known cause other than vascular origin.¹ In 2013, stroke ranked second behind heart disease as the leading cause of mortality worldwide and was a significant contributor to long-term impairment. In terms of death, morbidity, and disability, the prevalence of stroke is currently rising globally.² Risk factors of stroke can be classified as modifiable and nonmodifiable risk factors. Age, sex, family history and racial / ethnicity are non-modifiable risk factors; while hypertension, diabetes mellitus, dyslipidaemia are among some of identified modifiable risk

factors.³ In the past several decades in developed countries, a greater reduction in the age standardized stroke incidence has taken place because of good health services and effective strategies for cerebrovascular risk factor prevention. For emerging nations, the opposite has been demonstrated, nevertheless.⁴

The best approach for lowering the occurrence of stroke is effective prevention, particularly primary prevention. Based on the various studies during the literature review this study is designed to look into the prevalence of types of stroke, to analyse the various risk factors for stroke and assess the correlation.

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MATERIALS AND METHODS

Study Site: Neurology Department

Study Design: Retrospective observational study

Study Duration: 6 Months

Sample Size Required: 277

METHOD

This is a retrospective observational study conducted over a period of 6 months in a tertiary care hospital. A total of 277 patients satisfying the inclusion and exclusion criteria were analysed. Case records of patients from the MRD were retrospectively reviewed for demographic data, past medical and medication history, habits, clinical presentation, investigations, management, outcome from the year of 2017 to 2021 June. Data analysed using SPSS and Microsoft Excel 2010.

STATISTIAL ANALYSIS

Data analysed using SPSS version 21 and Microsoft Excel 2013. Mean and standard deviation were calculated for continuous variables, number and percentage for categorical variables. Chi square test was used for analyzing the 'p' value to check the significance. Binary logistic regression was performed for risk factors of different types of stroke and were used to compute their odds ratio and 95% confidence interval (CI).

RESULTS

In this study 83.03% of patients had ischemic stroke followed by 12.27 % of hemorrhagic stroke and 4.69 % of TIA. Out of

277 patients, the most prevalent type of stroke was ischemic stroke 83.07 % (n=230) (Table 1).

Our study shows that stroke most commonly occurred in age group ≥ 70 . Men were more prone to have ischemic stroke among all the age category except age group ≥ 70 when compared to women (Table 2).

In age category, the mean age was found to be 68.32 ± 12.79 years (Table 3). Out of 277 patients, the most contributable risk factor for stroke was found to be hypertension, patients had a past medical history of hypertension with DM was found to be the most common risk factor for stroke, followed by hypertension with DM and DLP (Table 4). A significant association of Ischemic Heart Diseases to cause stroke was observed in males when compared with females (Table 5). The most vulnerable age group for stroke was found to be ≥ 70 years. HTN was the major risk factor for stroke in all the age groups especially in the age group above 70 years. In age group 30-39, the only risk factors lead to stroke were HTN/DM. Age group above 50 years were prone to stroke by various risk factors (Table 6). Binary logistic regression model indicated the risk factors for ischemic stroke and comparison of risk factors with OR(referent)of same class. Men were more likely to have ischemic stroke than women (85.99%) (Table 7). Study shows that patients with other combinations of risk factors which include smoking were associated risk factor for TIA. While comparing with those who were not smoking, 5.71 times greater the chance of getting TIA for smoking patients (Table 8). From our study, it was observed that women were highly prone to HS (Table 9).

Table 1: Prevalence of types of stroke

TYPES (n=277)	N	%
Ischemic Stroke (IS)	230	83.03
Transient Ischemic Attack (TIA)	13	4.69
Hemorrhagic Stroke (HS)	34	12.27

Table 2: Prevalence of types of stroke with respect to age and gender

N=277	IS(n=230)		P value	TIA (n=15)		P value	HS (n=37)		P value
	Males (n=135)	Females (n=95)		Males (n=9)	Females (n=4)		Males (n=13)	Females (n=21)	
30-39	2 (66.67%)	1 (33.33%)	0.080	-	-	0.119	-	-	0.155
40-49	9 (64.29%)	5 (35.71%)		0 (0.00)	1 (100.00%)		1 (50.00%)	1 (50.00%)	
50-59	28 (71.79%)	11 (28.21%)		0 (0.00)	1 (100.00%)		4 (66.67%)	2 (33.33%)	
60-69	41 (65.08%)	22 (34.92%)		2 (66.67%)	1 (33.33%)		4 (50.00%)	4 (50.00%)	

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≥70	55 (49.55%)	56 (50.45%)		7 (87.50%)	1 (12.50%)		4 (22.22%)	14 (77.78%)	
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Table 3- Mean age of stroke attack

N=277	Overall	Males(n=157)	Females(n=120)	P value
Age (years)	68.32(12.79)	66.68(12.02)	70.46(13.49)	0.014*

Table 4: Prevalence of risk factors of stroke

Risk factors (N=277)	n	%
HTN/ DM	63	22.74
HTN	50	18.05
HTN/DM/DLP	21	7.58
DM	21	7.58
HTN/DLP	18	6.50
DM/DLP	11	3.97
HTN/DM/IHD	8	2.89
Other combinations*	79	28.52
No risk factors	6	2.17

* other combinations include

- 1.HTN/IHD 2.HTN/Alcohol intake 3.DM/Smoking 4.DM/IHD 5.DLP/IHD 6.IHD/Smoking
7.DLP/Alcohol intake 8. DM/HTN/IHD 9.HTN/IHD/Smoking 10.HTN/DLP/Alcohol intake
11.HTN/Smoking/Alcohol intake 12.HTN/DLP/Smoking 13.HTN/DM/Smoking 14.HTN/DM/Alcohol
15.HTN/DM/IHD/Alcohol intake 16.HTN/DM/IHD Smoking 17.HTN/DM/DLP/IHD/Alcohol intake
18.HTN/DM/DLP/Alcohol intake 19.HTN/DM/DLP/IHD 20.HTN/DM/Alcohol intake/Smoking
21.HTN/DM/DLP/Smoking/Alcohol intake 22.IHD 23. DLP/Smoke 23.DM/DLP/Smoke

Table 5: Gender wise distribution of risk factors of stroke

Risk factors N=277	Gender		P value
	Males (n=157)	Females (n=120)	
HTN/DM	34 (53.97%)	29 (46.03%)	<0.001
HTN	21 (42.00%)	29 (58.00%)	
HTN/DM/DLP	9 (42.86%)	12 (57.14%)	
DM	11 (52.38%)	10 (47.62%)	
HTN/DLP	5 (27.78%)	13 (72.22%)	
DM/DLP	9 (81.82%)	2 (18.18%)	
HTN/DM/IHD	4 (50.00%)	4 (50.00%)	
Other combinations	61 (77.22%)	18 (22.78%)	
No risk factors	3 (50.00%)	3 (50.00%)	

Table 6: Age wise distribution of risk factors of stroke

Risk factors (N=277)	Age category					p value
	30-39	40-49	50-59	60-69	≥70	
HTN/DM (63)	2(3.17%)	4(6.35%)	9(14.29%)	18(28.57%)	30(47.62%)	0.116
HTN(50)	0(0.00)	7(14.00%)	7(14.00%)	7(14.00%)	29(58.00%)	
HTN/DM/DLP(21)	0(0.00)	0(0.00)	5 (23.81%)	6 (28.57%)	10(47.62%)	
DM(21)	0(0.00)	1 (4.76)	2 (9.52%)	6 (28.57%)	12(57.14%)	
HTN/DLP(18)	0(0.00)	0(0.00)	5 (27.78%)	5 (27.78%)	8 (44.44%)	
DM/DLP(11)	0(0.00)	0(0.00)	2 (18.18%)	5 (45.45%)	4 (36.60%)	
HTN/DM/IHD(8)	0(0.00)	0(0.00)	0(0.00)	3 (37.50%)	5 (62.50%)	
Other combinations(79)	0(0.00)	5 (6.33%)	14(17.72%)	24(30.38%)	36(45.57%)	
No risk factors(6)	1 (16.67%)	0(0.00)	2 (33.33%)	0(0.00)	3 (50.00%)	

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Table 7: Patients diagnosed as Ischemic stroke with its risk factors

N=277	IS (n=230)		OR(95% CI)	P value
	NO (n,%)	YES (n,%)		
Age category				
30-39	0(0.00)	3(100.00)	1	
40-49	3(17.65)	14(82.35)	0.59(0.02-14.30)	0.747
50-59	7(15.22)	39(84.78)	0.75(0.03-16.11)	0.856
60-69	11(14.86)	63(85.14)	0.78(0.04-16.31)	0.878
>=70	26(18.98)	111(81.02)	0.60(0.03-11.99)	0.739
Gender				
Male	22(14.01)	135(85.99)	1.61(0.85-3.03)	0.136
Female	25(20.83)	95(79.17)	1	
HTN/DM (63)	12 (19.05)	51 (80.95)	0.317(0.16-6.00)	0.44
HTN(50)	9 (18.00)	41 (80.95)	0.336(0.17-6.49)	0.470
HTN/DM/DLP(21)	5(23.81)	16 (76.19)	0.230(0.011-4.79)	0.344
DM(21)	5 (23.81)	16 (76.19)	0.230(0.011-4.79)	0.344
HTN/DLP(18)	1 (5.56)	17 (94.44)	0.897(0.03-24.94)	0.949
DM/DLP(11)	0 (0.00)	11 (100.00)	1.76(0.031-100.15)	0.782
HTN/DM/IHD(8)	0 (0.00)	8 (100.00)	1.30(0.022-75.11)	0.897
Other combinations(79)	15 (18.99)	64 (81.01)	0.320(0.17-5.99)	0.446
No risk factors(6)	0	6 (100.00)	1	

Table 8: Patients diagnosed as TIA with its risk factors

Characteristics	TIA (n=13)		OR (95% CI)	P value
	NO	YES		
Age category				
30-39	3(100.00)	0(0.00)	1	
40-49	16(94.12)	1(5.88)	0.63(0.02-19.11)	0.795
50-59	45(97.83)	1(2.17)	0.23(0.01-6.77)	0.395
60-69	71(95.95)	3(4.05)	0.34(0.01-8.01)	0.505
>=70	129(94.16)	8(5.84)	0.46(0.02-9.64)	0.616
Gender				
Male	148(94.27)	9(5.73)	1.76(0.53-5.87)	0.355
Female	116(96.67)	4(3.33)	1	
HTN/DM (63)	59 (93.65)	4 (6.35)	0.98(0.047-20.38)	0.991
HTN (50)	50 (100.00)	0 (0.00)	0.129(0.002-7.05)	0.316
HTN/DM/DLP(21)	19 (90.48)	2 (9.52)	1.67(0.07-39.42)	0.752
DM(21)	20 (95.24)	1 (4.76)	0.95(0.034-26.31)	0.976
HTN/DLP(18)	18 (100.00)	0 (0.00)	0.35(0.006-19.58)	0.610
DM/DLP(11)	11 (100.00)	0 (0.00)	0.56(0.009-31.99)	0.782
HTN/DM/IHD(8)	8 (100.00)	0 (0.00)	0.76(0.013-43.92)	0.897
Other combinations(79)	73 (92.41)	6 (7.59)	1.14(0.058-22.77)	0.927
No risk factors(6)	6 (100.00)	0 (0.00)	1	

Table 9: Patients diagnosed as HS with its risk factors

Characteristics	HS (n=34)		OR(95% CI)	P value
	NO	YES		
Age category				
30-39	3(100.00)	0(0.00)	1	
40-49	15(88.24)	2(11.76)	1.12(0.04-29.13)	0.942

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50-59	40(86.96)	6(13.04)	1.12(0.05-24.36)	0.941
60-69	66(89.19)	8(10.81)	0.89(0.04-18.85)	0.943
>=70	119(86.86)	18(13.14)	1.08(0.05-21.84)	0.958
Gender				
Male	144(91.72)	13(8.28)	0.42(0.21-0.88)	0.023*
Female	99(82.50)	21(17.50)	1	
HTN/DM (63)	55 (87.30)	8 (12.70)	1.99(0.102-38.63)	0.649
HTN(50)	41(82.00)	9 (18.00)	2.97(0.153-57.51)	0.470
HTN/DM/DLP(21)	18 (85.71)	3 (14.29)	2.45(0.111-54.32)	0.569
DM(21)	17 (80.95)	4 (19.05)	3.34(0.157-71.10)	0.439
HTN/DLP(18)	17 (94.44)	1 (5.56)	1.11(0.04-30.97)	0.949
DM/DLP(11)	11 (100.00)	0 (0.00)	0.56(0.009-31.99)	0.782
HTN/DM/IHD(8)	8 (100.00)	0 (0.00)	0.76(0.013-43.92)	0.897
Other combinations(79)	70 (88.61)	9 (11.39)	1.75(0.091-33.64)	0.710
No risk factors(6)	6 (100.00)	0 (0.00)	1	

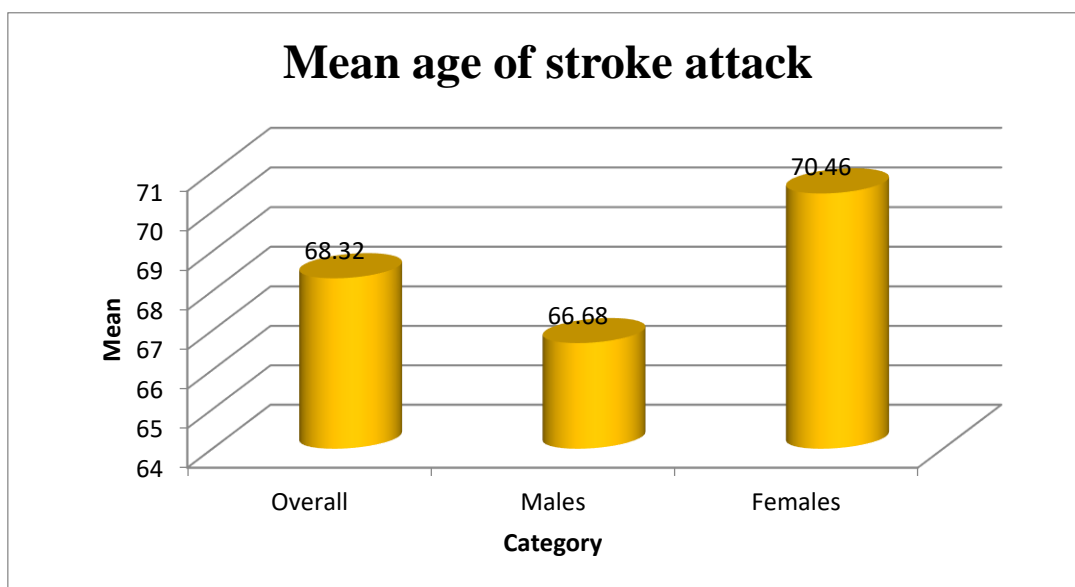


Figure 1: Mean age of stroke attack

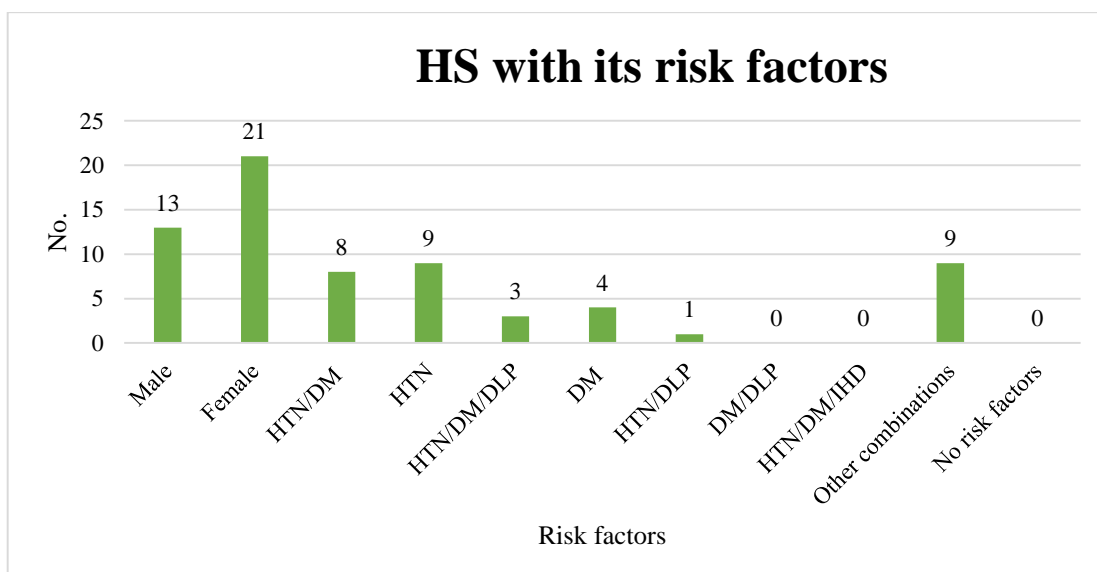


Figure 2: Patients diagnosed as HS with its risk factors

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DISCUSSION

In this study, out of 277 patients the most prevalent type of stroke was ischemic stroke (83.03%) followed by haemorrhagic stroke (12.27 %) and TIA (4.69 %). A similar study was conducted by Punna S et al⁵ also shows that out of 155 stroke cases, the majority had an ischemic stroke (91.61%) and the rest had haemorrhagic stroke (8.39%).

The stroke (Ischemic stroke, Haemorrhagic stroke and TIA) were most commonly occurred in the age group ≥ 70 years. Men were more prone to have ischemic stroke among all the age category except age group ≥ 70 when compared to women. A similar study conducted by Yao XY et al⁶ shows that the incidence of ischemic stroke in patients < 80 years of age was higher in men than in women. In age group ≥ 70 years, 87.50 % males had TIA when compared to females (12.50%). In case of haemorrhagic stroke, 77.78 % of females had affected followed by males 22.22%. A similar study conducted by Ojha P T et al⁷, shows that the incidence of stroke increases with age. Females above 65 year had a significantly greater risk of infarct ($P < 0.005$). Overall proportion of patients with ischemic stroke higher than those with hemorrhagic stroke (9.5%).

In age category, the mean age was found to be 68.32 ± 12.79 years. The mean age of 66.68 ± 12.02 years in men and 70.46 ± 13.49 years in women were the most susceptible mean age prone to stroke attacks. A similar study conducted by Fekadu G et al², shows that the mean age of patient was found to be 55.1 ± 14.0 years and 65 (56.0%) were in age group of 45-65 years.

The risk factors of stroke were categorized as hypertension, diabetes mellitus, dyslipidaemia, ischemic heart disease, smoking, alcohol intake. The risk factors were grouped according to the past medical history of the patients. The highly prevalent groups were grouped into seven categories and other combinations as one category. Out of 277 patients, 6 patients had no noted risk factors, 79 patients had other combinations of risk factors. In our study, the most contributable risk factor for stroke was found to be hypertension, hypertension with DM followed by hypertension with DM and DLP. A similar study conducted by Fekadu G et al² the most common risk factor was identified as HTN (75.9%), followed by alcohol intake (22.4%), smoking (17.2%) and heart disease (17.2%).

The most significant risk factors to cause stroke in males were found to be HTN/DM (53.97%), HTN (42.00%), HTN/DM/DLP (42.86%), DM (52.38%), HTN/DLP (27.78%), DM/DLP (81.82%), HTN/DM/IHD (50.00%) and with other combinations (77.22%) while in females were HTN (58.00%), HTN/DM (46.03%), HTN/DM/DLP (57.14%), DM (47.62%), HTN/DLP (72.22%), DM/DLP (18.18%), HTN/DM/IHD (50.00%) and other combinations (22.78%).

A significant association of ischemic heart diseases to cause stroke was observed in males when compared with females.

This rarity of ischemic disease to cause stroke in females is due to the estrogenic effect. Until menopause women, vascular diseases including ischemic stroke was found in lower rate due to the protective effect of estrogen and for the prevention of cardiovascular disease, postmenopausal hormone therapy was found to be effective.⁸ A similar study conducted by Persky R et al⁹, the premenopausal women were less likely to suffer stroke due to the protective effect of estrogen.

The most vulnerable age group for stroke was found to be ≥ 70 years. HTN was the major risk factor for stroke in all the age groups especially in the age group above 70 years. In age group 30-39, the only risk factors lead to stroke were HTN/DM. Age group above 50 years were prone to stroke by various risk factors. A similar study conducted by Lavados P M et al¹⁰ shows that the mean age of patients with first ever stroke was 70.3 years and 443 (49.8%) were women. Higher incidence of ischemic stroke is due to increasing age and a high prevalence of cardiometabolic risk factors in the population studied.

Binary logistic regression model (**table 7**) indicated the risk factors for ischemic stroke and comparison of risk factors with OR (referent) of same class. Men were more likely to have ischemic stroke than women (85.99%). The patients with hypertension with diabetes mellitus (80.95%) were more likely to have ischemic stroke. In the study conducted by Zhang FL et al¹¹ they observed that men were more likely to have ischemic stroke than women (OR = 1.935, 95% CI 1.410 to 2.655). Patients with hypertension or DLP were more likely to have ischemic stroke. There was no significant difference with diabetes, AF, smoking.

Table 8 shows that patients with other combinations of risk factors which include smoking were associated risk factor for TIA. While comparing with those who were not smoking, 5.71 times greater the chance of getting TIA for smoking patients. ≥ 70 years of age group shows high prevalence for occurring TIA. A total percentage of alcohol intake (8.00%), DLP (7.23%), hypertension (4.73%), DM (4.38%) were risk factors of stroke in 13 patients with TIA. A similar study conducted by Unnikrishnan J et al¹² shows that hypertension (81.6%) was the prominent risk factor followed by diabetes mellitus (48.7%), smoking (22.8%) and dyslipidaemia (25.3%).

In table 9, it was observed that women were highly associated risk factor of HS. As a total, hypertension (14.247%) was the most contributable risk factor for HS followed by smoking (13.04%), DLP (12.05%), alcohol intake (12.00%), DM (10.63%) and IHD (9.52%). Women were more prone to haemorrhagic stroke than men. A similar study conducted by Areefulla HS et al¹³ shows that most of the subjects were hypertensives (62%) followed by alcoholics (41%), addicted to smoking (33%) and diabetes mellitus (24%). Severity of stroke was based on risk factors and symptoms.

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CONCLUSION

The current study was created to ascertain the prevalence of stroke subtypes and their correlations to risk factors based on hospital medical data. The prevalence of stroke incidence in the community of stroke patients under study was highly correlated with well-known comorbid risk factors as hypertension, diabetes, and dyslipidaemia. Adults aged 70 years had a high prevalence of stroke and a high-risk stroke population, with ischemic stroke being the most common form in our study. Men were more prone to ischemic stroke while women were more prone to haemorrhagic stroke. These results indicate that individual-level and population-level treatments for these major risk factors are required to prevent stroke because hypertension and diabetes mellitus were stronger contributors to stroke. These results have the implication that when developing preventive strategies, these risk factors should be considered when making decisions. For the prevention of stroke, control and treatment of hypertension and diabetes should be provided by dietary changes and medical care.

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