

Perceived and Actual Risk Factors in Patients with Acute Stroke in South India

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Abstract

Risk perceptions are crucial in understanding people's thoughts about stroke risk and their preventive health behaviours. Management of risk factors plays a vital role in preventing stroke. This study aimed to identify the perceived and actual risk factors in patients with acute stroke. It was a cross-sectional descriptive study conducted in Sri Ramachandra University Hospital, India. A total of 210 in-patients of a stroke unit were included. Patients' data were obtained by interviewing the patient and /or accompanying family member and by reviewing their medical records using a standard questionnaire. Data were analysed using descriptive and inferential statistics. The patients with stroke had a median of four risk factors and 99.5 percent of them had at least one stroke risk factor. The key risk factor identified was hypertension (77.6%), followed by diabetes mellitus, hyperlipidaemia, and stress. The median self-perceived risk factor was three. The most commonly perceived risk factor was hypertension (53.8%), followed by stress, diabetes, hyperlipidaemia, alcohol intake, smoking and family history. The perception of risk was low when compared to actual risk ($p < 0.016$). The patients with coronary heart disease, family history of stroke and congestive heart failure have higher risk of having ischaemic stroke. There was a positive correlation between the actual risk and perceived risk. The perceived risk among stroke survivors was very low; 17 percent of the stroke patients did not know a single risk factor. Public education is needed to increase the awareness especially among high risk populations.

Key words: Actual and perceived risk factors, Acute stroke

Stroke remains the second leading cause of death and third leading cause of death and disability combined worldwide in 2019. Thus stroke is a disease of immense public health importance with serious economic and social consequences. Ischaemic stroke constituted 62.4 percent of all incident strokes, while intracerebral haemorrhage constituted 27.9 percent and subarachnoid haemorrhage constituted 9.7 percent. In 2019, the five leading risk factors for stroke were high systolic blood pressure (contributing 55.5% of total stroke DALYs), high body-mass index (24.3%), high fasting plasma glucose (20.2%), ambient particulate matter pollution (20.1%), and smoking (17.6%) (GBD, 2019). Data from the recent Inter-stroke study indicated that a list of 10 stroke risk factors including hypertension, high cholesterol, current smoking, alcohol consumption, diabetes, stress, obesity, heart disease, lack of physical activity, and poor diet were

responsible for 90 percent of all strokes (O'Donnell et al, 2016). The high burden of stroke is partly due to poor community knowledge of stroke risk factors and its warning signs. This is supported by the evidence that increased awareness of stroke risk factors leads to improved compliance with stroke prevention practices while lack of recognition of stroke warning signs is an important causal factor of delay in hospital reporting of stroke (Samsa et al, 1997). Greater exploration of perceived stroke risk is needed, especially in low- to middle-income countries where stroke rates are the highest (Feigin et al, 2010).

Stroke is a foremost cause of disability, with an increasing incidence in developing countries. Ischaemic stroke caused by arterial occlusion is responsible for the majority of strokes (Campbell et al, 2019).

The WHO advocates a combination of population-wide and high-risk approaches to prevent stroke and other types of cardiovascular diseases (CVDs). The population-wide prevention strategy targets several behavioural and lifestyle risk factors and this approach is essential because even small favourable changes in the distribution of risk fac-

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tors could lead to major reductions in stroke and CVD incidence in the population. Some other primary prevention strategies of stroke include community-based education programmes and digital health technology (Feigin et al, 2016).

Need for the Study

A systematic analysis (2016) with data on risk factors for stroke in 188 countries from 1990 to 2013 shows that more than 90 percent of the global stroke burden can be attributed to modifiable risk factors, including behavioural and metabolic factors that, if controlled, could reduce three-quarters of the stroke burden worldwide. 74.2 percent of the global stroke burden (measured in stroke-related disability-adjusted life years) was linked to behavioural factors (such as poor diet, smoking, and low physical activity), 72.4 percent to metabolic factors (such as high systolic blood pressure and high total cholesterol), and 29.2 percent to air pollution. In low- and middle-income countries, air pollution, environmental factors, high systolic blood pressure, and tobacco smoke were found to be significantly greater contributors than they were in high-income countries. On the other hand, low physical activity and metabolic factors emerged as more important factors in high-income countries (Sofer, 2016).

Patients who survive after an initial stroke are known to be at a significantly increased risk for stroke in the future (Amarenco et al, 2018). Fortunately, 80 percent of recurrent strokes can be prevented by addressing the modifiable risk factors; therefore, secondary prevention after the first stroke is very important (Sherazi & Elkind, 2015). For secondary prevention of stroke, awareness of the risk factors for recurrent stroke and the appropriate lifestyle modification is necessary to minimise risk is essential among stroke survivors.

An understanding of patients' awareness of the risk is essential for translating the perception and knowledge of recurrent stroke risk and individual risk factors into appropriate behavioural changes. Likelihood of taking recommended preventive health action is influenced by perceived seriousness of disease. Many researches conducted elsewhere found that patients showed inadequate perceptions of their absolute risk of cerebrovascular events and they underestimate the risk of developing stroke. Limited data are available on how well acute stroke patients know their own risk factors against their actual risk factors in India. The purpose of the study was to assess the self-perceived and actual risk factors of stroke in patients with acute stroke.

Review of Literature

Annually, 15 million people worldwide suffer a stroke. Of these, 5 million die and another 5 million

are left permanently disabled, placing a burden on family and community. The public health burden of stroke tends to rise in future due to demographic transitions of populations, particularly in developing countries (WHO, 2022; Donkor, 2018).

Risk Factors of Stroke

A systematic analysis (2016) of risk factors for stroke shows that more than 90 percent of the global stroke burden can be attributed to modifiable risk factors, including behavioural and metabolic factors that, if controlled, could reduce three-quarters of the stroke burden worldwide (Sofer, 2016).

A study (2013) conducted in Australia found the strongest baseline predictors of ischaemic or unknown stroke were age (60-65 years, HR 1.98; >65 years, HR 2.35) and a history of stroke or transient ischaemic attack (TIA) (HR 2.06). Other independent baseline predictors were male sex, smoking, history of hypertension, ischaemic heart disease, nephropathy, systolic blood pressure and blood low density lipoprotein (LDL) cholesterol, HbA(1c) and fibrinogen (Hankey et al, 2013).

A study conducted among 1794 recurrent stroke patients found that patients with cardioembolic stroke, who were unwilling or unable to take oral anticoagulants, had the greatest risk of stroke recurrence. Predictors of stroke recurrence in multivariable analysis were: older age and previous stroke among large artery atherothrombosis strokes; older age, male sex, previous stroke, previous transient ischaemic attack, hypertension, diabetes, and tobacco use among small artery occlusion strokes; older age among cardioembolic strokes; atrial fibrillation and anti-diabetic medications among other aetiology strokes; older age, previous stroke and atrial fibrillation among undetermined aetiology strokes (Toni et al, 2014).

Perceived Risk Factors

Risk perception is an individual's capability to acknowledge the presence of a certain degree of risk. It refers to people's subjective judgements about the likelihood of negative occurrences such as injury, illness, disease and death (Fischhoff, 1995).

A qualitative thematic analysis showed that the perceptions of recurrence risk and healthy behavioural changes differed between first-ever and recurrent stroke survivors. Three themes were generated from the data of first-ever stroke survivors: indifference to and unawareness of the risk of stroke recurrence, the need for professional information support and different awareness of the importance of different healthy behaviours. For first-relapse stroke patients: worry, but feel powerless towards recurrent event, accurate information is still warranted, regrets of unhealthy behaviour patterns.

For the survivors suffered two or more times recurrences: perceived severity of recurrences, increased psychological care need, incorrect perceptions of healthy behaviour. The need for information related to warning signs, recurrence risk and risk factors remained consistently unmet (Lin et al, 2021).

A descriptive cross-sectional study done in Egypt reported low level of awareness of stroke with median percent score of 35.7 and interquartile range (IQR) of 17.86 among 1154 general public. Higher income, level of education, having risk factors and knowing someone with stroke were significant predictors of a higher level of stroke awareness (Farrag et al, 2018).

A study conducted in Telangana State, South India (2015) reported that out of 100 patients, risk factors found were: hypertension (70%), diabetes (28%), alcoholics (27%), and smoking (24%). The incidents of cardiovascular disorders were coronary artery disease in 10 percent patients, congestive heart failure in 1 percent patient, and myocardial infarction in 4 percent patients. The knowledge of the risk factors for stroke in stroke survivors was also very low (Shravani et al, 2015).

Methods and Materials

This cross-sectional descriptive study was conducted from the year 2017 to 2019 in Sri Ramachandra University Hospital, a large tertiary care hospital and referral centre for all kinds of diseases and conditions in South India. The Institutional Ethical Clearance was obtained. The study setting included neurology intensive care unit and neurology units. The sample size in our study was 210 patients with acute stroke.

Sample size: Estimation of prevalence

Sample size was calculated based on the sample size equation for estimation of proportion as given below:

$$n = \frac{(Z_{1-\alpha/2})^2 pq}{(pd)^2}$$

Here,

$Z_{1-\alpha/2} = 1.96$ [at 5% alpha]

p = anticipated proportion of event (reference-10 in the proposal) =75%

q=1-p

d = margin of error (precision) = 8%

The minimum required sample size, n=200

The inclusion criteria were patients above the age of 19 years, both male and female with neurologic symptoms who were hospitalised in the study hospital and diagnosed with non-traumatic ischaemic

Table 1: Actual risk and self-perceived factors (n=210)

Number of factors	Actual risk		Self-perceived risk	
	n	%	n	%
0	1	0.48	37	17.6
1 - 2	50	23.8	49	23.3
3 - 4	105	50	71	33.8
5 - 6	50	23.8	32	15.2
7 - 8	3	1.4	8	3.8
9 - 10	1	0.48	9	4.3
11 - 13	0	0.0	3	1.4

stroke and/or haemorrhagic stroke by diffusion magnetic resonance imaging (MRI) or computerised tomography (CT) scan.

Patients were informed of the purpose of the study and the informed consent was obtained from all patients and / or family member before enrolment in the study. The data pertaining to actual risk factors and demographic variables were collected by interviewing every stroke patient and / or accompanying family member and by reviewing their medical records. The perceived risk factors were collected from the patients.

Perceived risk refers to patient's knowledge about 13 stroke risk factors. Actual risk refers to presence of 13 risk factors in patients with acute stroke which are identified by the research investigators (Table 1). The questionnaire included: socio-demographic variables (age, sex, marital status, education, living status, place of residence, medical insurance coverage and type of stroke, history of stroke (first time or recurrent stroke) and 13 self-perceived and actual stroke risk factors with Yes or No options (Table 2).

Statistical Analysis

All the categorical variables were summarised using frequency and percentage. Quantitative variables were summarised using median and interquartile range (IQR) as data violates the normality assumptions. Wilcoxon matched-pairs signed rank test was used to find out difference between the average number of actual and self-perceived risk factors. Chi square test was used to find out the difference between each self-perceived risk and actual risk factor.

Robust Poisson regression was performed to identify the association between the actual risk factors and ischaemic stroke. The independent t-test, and ANOVA were used to find out the association between perceived risk, actual risk factors and the demographic variables. Spearman's correlation coefficient was performed to study the relationship between actual risk factors and perceived risk fac-

Table 2: Comparison of actual and perceived risk factors of acute stroke (n=210)

Risk Factors	Actual (Yes)		Perceived (Yes)		† p value
	n	%	n	%	
Hypertension	163	77.6	113	53.8	0.000***
Previous stroke	26	12.4	50	23.8	0.001***
Transient- ischaemic attack	2	1.0	12	5.7	0.111
Diabetes	138	65.7	83	39.5	0.000***
Hyperlipidaemia	129	61.4	74	35.2	0.025*
Smoking	52	24.8	58	27.6	0.000***
Alcohol intake	54	25.7	62	29.5	0.000***
Atrial fibrillation	3	1.4	11	5.2	0.007**
Coronary heart disease	5	2.4	15	7.1	0.042*
Family history of stroke	32	15.2	58	27.6	0.000***
Valvular heart disease	9	4.3	28	13.3	0.000***
Congestive heart failure	5	2.4	15	7.1	0.042*
Stress	114	54.3	85	40.5	0.000***

*p<0.05; **p<0.01; ***p<0.001; † Chi-square / Fisher's Exact test p-value

Table 3: actual risk factors associated with ischaemic stroke in poison regression (n=210)

Actual risk factors	n (%)	PR	95% CI	p value
Hypertension	163 (77.6)	0.8955	0.74 - 1.09	0.2656
Previous stroke	26 (12.4)	1.1910	0.98 - 1.45	0.0858
TIA	2 (1.0)	0.7255	0.18 - 2.99	0.6571
DM	138 (65.7)	0.9474	0.79 - 1.14	0.5661
Hyperlipidemia	129 (61.4)	0.9892	0.83 - 1.18	0.9026
Smoking	52 (24.8)	0.9904	0.81 - 1.21	0.9259
Alcohol intake	54 (25.7)	0.9226	0.75 - 1.14	0.4473
Atrial fibrillation	3 (1.4)	0.6226	0.29 - 1.32	0.2178
Coronary heart disease	5 (2.4)	1.2065	1.01 - 1.44	0.0339*
Family history of stroke	32 (15.2)	0.7260	0.53 - 0.99	0.0487*
Valvular heart disease	9 (4.3)	1.1637	0.93 - 1.45	0.1804
Congestive heart failure	5 (2.4)	1.4771	1.06 - 2.06	0.0214*
Stress	114 (54.3)	1.0116	0.85 - 1.20	0.8966

*p <0.05; PR: Prevalence ratio; CI: Confidence interval

tors. A p-value below 0.05 was considered as statistically significant and the analysis was performed using SPSS 16 software.

Results

The results are arranged under following headings: patient characteristics; actual stroke risk factors; Perceived stroke risk factors; difference between the actual and perceived risk factors; relationship between the actual and perceived risk factors; association between the actual risk factors and ischaemic stroke; association between the actual and perceived risk factors and demographic variables.

Patient characteristics: There were 210 patients included in our study, 151 (71.9%) patients had ischaemic stroke and 59 (28.1%) patients had haemorrhagic stroke; 182 (86.7 %) patients had stroke for the first time; 60 (28.6 %) patients were in the age group between 51-60, 91 (43.3%) patients were above 60 years and 154 (73.3%) patients were male. The frequency, percentages of demographic variables, is given in Table 3.

Actual risk factors in patients with acute stroke: Almost, all of the patients (209, 99.5%) had at least one stroke risk factor. The median actual stroke risk factor was four out of 13 (IQR- Interquartile range 3 -5). Maximum of 9 -10 risk factors were identified in one patient. The common stroke risk factors found were: hypertension (77.6%), diabetes mellitus (65.7%), hyperlipidaemia (61.4%), stress (54.3%), alcohol (25.7%), smoking (24.8%), and family history of stroke (15.2%) (Tables 1 & 2).

Self-perceived risk factors by the patients: The median self-perceived risk factors was three out of 13 (IQR 1-5). The maximum patients (71, 33.8%) perceived 3-4 risk factors; 49 patients (23.3%) perceived 2- 3 risk factors and 37 (17.6 %) patients did not perceive any of the risk factors. The common self-perceived risk factors found were: hypertension (53.8%), stress (40.5%), diabetes (39.5%), hyperlipidaemia (35.2%), alcohol intake (29.5%); 27.6% of them perceived smoking and family history of stroke as risk factors (Table 1 & 2).

Difference between the actual and perceived risk factors: Wilcoxon Signed Ranks matched pair test reveals that there is a significant difference between the average number of actual and perceived risk (p < 0.016). Also, there was a significant difference between each of the 12 self-perceived and actual risk factors except TIA (Table 2).

Relationship between the actual and perceived risk factors: The Spearman's rank correlation test revealed, there was a significant positive correlation between the actual risk factors and perceived risk factors (r=0.23; p<0.01).

Association between the actual risk factors and ischaemic stroke: The Robust Poisson regression revealed coronary heart disease (p < 0.05, prevalence ratio (PR) 1.2065; 95% confidence interval (CI) 1.01- 1.43), family history of stroke (p <0.05; PR 0.7260; 95% CI 0.53- 1.0), congestive heart failure (p < 0.05; PR 1.4771; 95% CI 1.06 - 2.06) were significantly associated with ischaemic stroke and

Table 4: Association between demographic variables and actual and perceived risk factors (n=210)

Demographic variables		n	Actual				Perceived			
			M value	SD value	T or f	P value	M	SD	T or f	P value
Age (in years)	20-30	5	2.80	2.05	1.054	0.387	4.00	2.92	1.485	0.196
	31-40	12	3.58	1.24			3.25	2.60		
	41-50	42	3.83	1.48			3.55	2.50		
	51-60	60	3.77	1.42			3.90	3.14		
	61-70	53	3.43	1.49			2.72	2.74		
	>70	38	3.32	1.58			2.76	2.27		
Sex	Male	154	3.79	1.50	3.395	0.001* **	3.25	2.79	-0.381	0.704
	Female	56	3.02	1.29			3.41	2.66		
Marital status	Married	207	3.61	1.47	2.271	0.024*	3.31	2.77	0.817	0.415
	Unmarried	3	1.67	1.16			2.00	1.00		
Education	No education	26	2.88	1.51	2.166	0.074	2.04	1.97	2.862	0.024*
	Primary	48	3.52	1.61			3.56	2.92		
	Secondary	72	3.68	1.32			2.94	2.36		
	Hr Secondary	15	4.13	1.60			4.00	2.24		
	Graduate & PG†	49	3.69	1.48			3.98	3.35		
Occupation	Unskilled	24	3.33	1.58	2.940	0.014*	3.25	2.99	0.838	0.524
	†Agri. farmers	20	3.80	2.09			3.30	2.68		
	Skilled	43	4.09	1.38			3.63	2.86		
	Professional	22	3.36	1.22			2.73	2.62		
	Business	32	3.97	1.23			2.63	2.20		
	†Unemployed	69	3.17	1.39			3.58	2.90		
Type of family	Nuclear	121	3.58	1.50	0.251	0.779	3.51	2.83	0.938	0.393
	Joint	83	3.55	1.47			3.00	2.67		
	Living alone	6	4.00	1.55			2.83	2.14		
Medical insurance	Yes	97	3.89	1.43	2.808	0.005* *	3.40	2.74	0.543	0.587
	No	113	3.32	1.49			3.19	2.77		
Place of residence	Rural	84	3.64	1.68	0.489	0.614	3.35	2.43	0.110	0.896
	Urban	52	3.40	1.23			3.13	2.18		
	Suburban	74	3.64	1.42			3.34	3.41		
Type of stroke	Ischaemic	151	3.57	1.45	-0.178	0.859	3.17	2.67	-0.996	0.320
	Haemorrhagic	59	3.61	1.58			3.59	2.95		
History of stroke	First time	182	3.50	1.50	-2.028	0.044*	3.23	2.74	-0.801	0.424
	Recurrent	28	4.11	1.26			3.68	2.84		

*p<0.05; **p < 0.01; ***p< 0.001; †Unemployed: retired & homemaker; PG: Postgraduate

have higher risk of having ischemic stroke (Table 3). None of the self-perceived risk factors were associated with ischaemic stroke.

Association between the actual and perceived risk factors and demographic variables: Significant associations were found between the mean scores of actual risk factors and sex, marital status, occupation of the patients, health insurance and history

of stroke (first time or recurrent). Only educational level of the patients was found to be associated with the perceived risk factors (Table 4).

Discussion

The identification and appropriate modification of these stroke risk factors are the targets of both primary and secondary preventive strategies. In our study, majority of the patients (71.9%) had

ischaemic stroke. There was a high prevalence of hypertension (77.6%) among the patients with acute stroke followed by diabetes (65.7) and hyperlipidaemia (61.4). Half of them expressed that they were under stress and one-fourth of them were smokers and taking alcohol. These results are consistent with studies done in India and Ghana (Shravani et al, 2015; Sarfo et al, 2014).

The present study showed that the stroke survivors have low awareness about the stroke risk factors. Only 23 (11%) patients identified one risk factor and less than one-fifth of the patients (19%) knew three risk factors and 17.6 percent patients had no knowledge about risk factors. The best known risk factor identified was hypertension (53.8%) followed by stress (40.5%), diabetes (39.5) and hyperlipidaemia (35.2%). Similar findings were reported in a study conducted in India, stroke survivors have very poor knowledge of the risk factors of stroke. Some patients could identify hypertension, smoking, and excessive alcohol consumption as risk factors of the stroke, but had little idea about other risk factors (Shravani et al, 2015). Patients' knowledge about important risk factors (e.g. atrial fibrillation, diabetes, metabolic syndrome, etc.) was very poor (<30%) in China (Zeng et al, 2012).

Similarly, a study conducted in Nigeria reported that 49.3 percent of the participants could mention at least one correct stroke risk factor and 24.6 percent of them could not identify any risk factor and the hypertension was the most (39.1%) known risk factor (Vincent-Onabajo & Moses, 2016). A study done in Thailand reported hypertension (35%), dyslipidaemia (28.6%), and diabetes (22.9%) as the commonly recognised risk factors (Saengsuwan et al, 2017). A study done in Luxemburg reported that known risk factors by the patients were smoking (40%), hypertension (32%), alcohol (32%), poor nutrition (28%), high cholesterol (26%), stress (23%), and lack of exercise (19%) (Droste et al, 2014). The most recognised stroke factors in patients in Poland were: arterial hypertension, carotid artery stenosis and atrial fibrillation (Pruszyńska et al, 2015). A study done in Estonia reported diabetes to be the best known risk factor (89%) followed by hypertension (80%), atrial fibrillation (78%), previous stroke (77%), and heart failure and/or ischaemic heart disease (66%) (Soomann et al, 2016).

In the current study, the perception of risk was low when compared to actual risk in 12 out of 13 risk factors ($p < 0.05$), hypertension (77.6% vs 53.8%), diabetes (65.7% vs 39.5), hyperlipidemia (61.4% vs 35.2%), and stress (54.3 vs 40.5%). Comparable results were reported by a study (Amarenco et al, 2018) done in India and China (Yang et al, 2013). Similarly, patients with stroke in Ghana who had a median of 3 traditional risk factors were unaware of

the presence of these risk factors (Sarfo, 2014).

In the present study, there is a positive relationship ($p < 0.05$) between the actual and perceived risk factors, indicating that as the number of actual risk factors increase the perceived risk factors also increase. A systematic review done in 2016 reported the most common predictors of higher stroke risk perceptions were having risk factors for stroke (hypertension, diabetes, heart disease, high cholesterol, and prior stroke) and a higher number of risk factors. Having established risk factors for stroke and a higher number of these risk factors were the most common predictors of higher perceived stroke risk. This is not surprising, as risk factors typically help to shape people's perceptions of risk (Aycock et al, 2019). In our study, the ischaemic stroke was significantly associated with three actual risk factors like, coronary heart disease, family history of stroke and congestive heart failure. A study done in Poland reported the most common risk factors of ischaemic stroke as hypertension and atrial fibrillation (Pastuszak et al, 2018).

Of the "shared" risk factors in patients with atrial fibrillation and acute stroke in Canada, age (OR, 1.19; 95% CI, 1.06-1.34 per decade) and prior stroke/transient ischaemic attack (OR, 1.45; 95% CI, 1.12-1.87) were more associated with ischaemic stroke than intracerebral haemorrhage (McGrath et al, 2012). A study done in Norway showed prior ischaemic stroke to be associated with the leukoaraiosis, hypertension, atrial fibrillation, and atherosclerosis in Logistic regression analyses (Mørch-Rasmussen et al, 2016).

In the current study, the actual risk factors were influenced by sex, marital status, occupation, health insurance and history of stroke (first time or recurrent). The mean score of the actual stroke risk was high among those who were male, married, had medical insurance, had recurrent stroke and patients who had occupation like skilled labourers, business and farmers. The perception was varied according to the educational status of the patients, indicating as the educational level increases, the risk awareness also increases. These results are consistent with the studies done in other countries reporting perceived risk was associated with age, education, and family history of cardiovascular diseases.

Limitations

Our study was conducted in a large private tertiary care hospital in a Metropolitan city in South India, thus excluding patients dependent on public health care. Further studies are needed in the public sector to establish overall population characteristics. However, our study findings are similar and consistent with the studies done all over the world. Multi-

centre studies are required to reflect the experience of patients with stroke in other cities and rural areas of our country. It is a single-centred study with a small sample size. Also, patients' memory may be hampered by stroke-related cognitive impairment and consciousness disturbances.

Actual risk factors, stress, smoking and alcohol intake were assessed by 'yes' or 'no' option and the responses were subjective.

Recommendations

Further research on methods to translate the perception and knowledge personal risk factors into appropriate behavioural changes that may prevent stroke recurrence is essential. A multicentre study can be conducted with a large sample including both public and private health facilities.

The individual and family counselling during hospitalisation for stroke survivors is highly recommended to improve information acceptance and could culminate in health-promoting behaviours and prevent recurrence. Public health efforts are required to improve awareness and management of the prevailing modifiable risk factors of stroke.

It is strongly recommended that a specific recurrence risk communication tool and related health education plan be explored on the basis of the number of times patients have experienced stroke recurrence to inform secondary prevention of stroke in the future.

Conclusions

The risk perception towards stroke risk factors by the patients with acute stroke is grossly inadequate when compared to actual risk. Hypertension is the most common risk factor followed by diabetes mellitus, hyperlipidaemia and stress. The patients with coronary heart disease, family history of stroke and congestive heart failure have higher risk of having ischaemic stroke. The perceived risk factors are influenced by educational level of the patients. Patients with recurrent stroke have more risk factors compared to first-time stroke, indicating the need for intervention on modifiable risk factors.

Nurses are the first line of defense for the population at risk for stroke. Knowing how to assess and care for patients with presumed stroke can significantly help improve patient outcomes.

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