

Public Awareness of Stroke Recognition, Risk factors and Access to Appropriate Treatment: A Hospital-based Cross-sectional Survey from a Tertiary Referral Centre in Southern India

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ABSTRACT

Introduction : Despite recent advances in treatment, awareness regarding stroke remains low. Only a fraction of eligible patients reach hospital within the window period for thrombolysis.

Aim: To assess the public awareness of stroke symptoms, risk factors and access to treatment which will help to design effective and targeted stroke education programs.

Materials and Methods: This cross-sectional hospital-based survey was conducted in the neurology outpatient department in Government Medical College, Trivandrum, Kerala, India from October 2020 to March 2021. Adult relatives of patients, attending the Neurology Outpatient Department, were included in the study. Relatives of patients who had current or previous stroke and individuals who had a personal history of stroke were excluded. Participants had to fill out a structured study questionnaire adapted to local socio-cultural practices assessing awareness of organ involved in stroke, warning symptoms, risk factors and treatment seeking behaviour. Descriptive analysis, Chi-square tests and logistic regression were used to analyse awareness about organ involved in stroke, signs and symptoms, risk factors and treatment for stroke.

Results: A total of 700 completed questionnaires were collected from the respondents. More than 80% of respondents belonged to the low income group and were from rural areas. Overall, 43.3% of the subjects could not identify the brain as the organ identified in stroke, and 28.9% were able to identify only one symptom of stroke. The most common warning symptom of stroke recognised was difficulty in speaking (59.4%). Hypertension was the most common risk factor for stroke identified (77.7%). Total 31.6% were able to identify only one risk factor for stroke, and 82.4% patients were aware that stroke requires immediate treatment with majority preferring to consult the nearest doctor. Only 15.9% of respondents were aware of the stroke helpline. Only 55.9% of respondents were aware about ambulance services in their region.

Conclusion: This study demonstrated low awareness regarding common risk factors like diabetes and smoking on increasing stroke risk. Knowledge regarding stroke helplines, ambulance services and need to rush to hospital emergency department was low. Public stroke education programs should focus on reducing the knowledge gap in these areas.

Keywords: Ambulance services, Helpline, Stroke education, Thrombolysis, Warning signs

INTRODUCTION

Ischaemic stroke is one of the major causes of disability and death worldwide. About 85.5% of global stroke mortality occurs in developing countries [1]. Developing countries also have a higher prevalence of stroke in young individuals and significantly greater stroke-related disability [2,3]. In India, Indian Council of Medical Research (ICMR) data implicated stroke as the fifth most common cause for cause for Disability Adjusted Life Years (DALYs) in 2016. Number of DALYs for cerebrovascular disease increased by 52.9% from 1990 to 2016 [4,5]. In India, systematic reviews have shown that the prevalence of stroke varies from 45-487 per 100,000 populations in urban regions and 55-388.4 per 100,000 populations in rural population [4-6].

Intravenous thrombolysis and mechanical thrombectomy have been proven to improve ischaemic stroke outcomes, however due to the narrow therapeutic window (<4.5-6 hours) patients have to reach early to hospital to get the benefits of treatment [7]. In recent studies from India, it has been estimated that less than 20% of stroke patients reach a thrombolysis ready centre within the window period and only upto 3.5% of all stroke patients receive thrombolysis [8,9]. Studies have identified prehospital delay as one of the major obstacles to thrombolysis [8-10]. In contrast to door-to-needle time which has reduced considerably, onset-to-door times have not shown much improvement over the years even in developed countries [10]. In India, studies have found that the biggest hurdle

to thrombolysis was failure to recognise stroke by patients and relatives, accounting for three quarters of delayed arrival. Initial visit to family doctor/private clinic or primary care centre which lacked radiological facilities, transportation delays and financial constraints were other major reasons for under-usage of thrombolysis [8,9].

Public awareness of symptoms, risk factors, treatment and helpline availability are essential to increase utilisation of therapy [11,12]. This study aimed to assess the public awareness of stroke symptoms, risk factors and access to treatment which will help to design effective and targeted stroke education programs.

MATERIALS AND METHODS

This cross-sectional hospital-based survey was conducted in the Neurology outpatient department in Government Medical College, Thiruvananthapuram, Kerala, India from October 2020 to March 2021. The hospital is a tertiary referral centre catering to both urban and rural population situated in Thiruvananthapuram District in Kerala state in the Southern part of India. The study population was formed by the relatives of patients attending the neurology outpatient department.

Inclusion criteria: Relatives, aged more than 16 years, accompanying patients attending the neurology outpatient department were included in the study.

Exclusion criteria: Relatives of patients who had current or previous stroke were excluded from the study. Respondents with a personal

history of stroke and those with cognitive or physical disability that interferes with filling the questionnaire were also excluded.

Only one member was included from each family. Individuals more than 16 years of age who consented to the study were asked to fill a questionnaire in Malayalam. Trained medical students were available to explain the questions and answer any queries. Illiterate subjects had the questionnaire read out and explained to them.

Questionnaire

The survey questionnaire was adapted from previous studies [13] and modified to suit local socio-cultural conditions and translated into the vernacular language Malayalam. It was pretested and validated in 30 subjects. The Cronbach's alpha was 0.7. It was divided into four sections:

1. The first section gathered demographic information- age, gender, education, income and place of residence. Education was categorised into lower, which included illiterates and primary (below 5th standard) and high school (6th standard to 10th standard), and higher, which included plus two and above. Income was classified into upper (\geq Rupees 5000 per month), and lower ($<$ Rupees 5000 per month) income groups and place of residence into rural and urban.
2. The next section assessed knowledge of the organ involved in stroke and the signs and symptoms of stroke. Knowledge regarding organ involved in stroke was assessed in a single question with four options and no multiple responses were allowed. Six questions assessing the main signs and symptoms of stroke were included with option for multiple responses.
3. The third section assessed knowledge regarding risk factors for stroke. It included nine risk factors with options for multiple responses.
4. The last section of the survey was aimed at finding out the respondents' response to stroke symptoms, awareness regarding the stroke helpline offered by medical college, Thiruvananthapuram and availability of ambulance services.

STATISTICAL ANALYSIS

Data were entered and analysed using Statistical Package for the Social Sciences (SPSS) software, version 16.0. Descriptive analysis was carried out. Chi-square tests were used to analyse awareness about organ involved in stroke, signs and symptoms and risk factors for stroke in accordance to age, gender, educational level, income and place of residence. For determination of the independent risk factors of poor knowledge, present study used logistic regression. A level of significance of 0.05 was used.

RESULTS

A total of 700 completed questionnaires were collected from the respondents. Males and females were almost equally represented (males 51%, female 49%). About 60% of patients were more than 40 years of age. The mean age was 45 ± 15.1 years. Overall, 52% had studied up to plus two and above. More than 80% of respondents belonged to the low income group and were from rural areas. Demographic details are shown in [Table/Fig-1].

Variables	Number (%)
Age (yrs)	
≤ 20	46 (6.6)
20-40	237 (33.8)
41-60	289 (41.3)
> 60	128 (18.3)
Relation to patient	
Spouse	289 (41.3)
Children/children-in-law	253 (36.1)

Siblings	107 (15.3)
Other family members	51 (7.3)
Gender	
Male	357 (51)
Female	343 (49)
Education*	
Low	337 (48)
High	363 (52)
Income (Rs)	
≤ 5000 (lower)	609 (87)
> 5000 (upper)	91 (13)
Place of residence	
Rural	562 (80.3)
Urban	138 (19.7)

[Table/Fig-1]: Demographic data (n=700).

*Education: Low: Tenth standard or below; High: Plus two and above

Knowledge regarding organ involved in stroke: As shown in [Table/Fig-2], 43.3% of the subjects could not identify the brain as the organ identified in stroke. About 32% thought that heart was the organ involved in stroke. In univariate analysis, higher knowledge about the knowledge of brain as the organ involved in stroke was associated with with age > 45 years ($p < 0.001$) and higher education level (plus two and above) ($p < 0.001$).

Organ involved in stroke	Number (%)
Don't know	27 (3.9)
Brain	397 (56.7)
Heart	224 (32)
Kidney	52 (7.4)

[Table/Fig-2]: Knowledge regarding organ involved in stroke (n=700).

Symptoms and signs of stroke: The three most common warning signs of stroke recognised were difficulty in speaking (59.4%), followed by weakness of one side of the body, and numbness of one side of face or body [Table/Fig-3].

Stroke signs and symptoms	Number (%)
Weakness of one side of face or body	377 (54)
Visual symptoms	178 (25.4)
Difficulty in speaking	416 (59.4)
Headache/vertigo	270 (38.6)
Difficulty walking	314 (45)
Numbness of one side of face or body	361 (52)

[Table/Fig-3]: Knowledge regarding stroke signs and symptoms.

About 3% of respondents could not identify any symptoms of stroke and 28.9% were able to identify only one symptom of stroke. Only 9% could identify all the six stroke symptoms listed [Table/Fig-4].

Number of symptoms identified	Number (%)
0	21 (3)
1	202 (28.9)
2	101 (14.4)
3	122 (17.4)
4	135 (19.3)
5	56 (8)
6	63 (9)

[Table/Fig-4]: Number of symptoms identified (n=700).

On univariate analysis, knowledge regarding stroke symptoms was associated with with higher income ($p = 0.01$) and residence in urban areas ($p = 0.02$) [Table/Fig-5]. However, none reached significance in multiple logistic regression.

Variables	Identified brain as organ involved (%)	p-value	Identified more than 1 symptom of stroke (%)	p-value	Identified more than 1 risk factor for stroke (%)	p-value
Age (yrs)						
≤45	31.1	<0.001	68.6	0.75	57.6	0.02
>45	92.5		67.5		66.4	
Gender						
Male	58	0.49	69.7	0.35	61.9	0.73
Female	55.4		66.5		60.6	
Education						
High school or below	27	<0.001	71.5	0.07	60.5	0.69
Plus 2 or above	84.3		65		62	
Income						
<5000	58.8	0.49	67.2	0.01	60.4	<0.001
≥5000	54.9		74.7		67	
Place of residence						
Rural	58.4	0.08	66	0.02	58.9	0.009
Urban	50		76		71	

[Table/Fig-5]: Univariate analysis of variables influencing awareness regarding organ involved, signs and symptoms and risk factors for stroke. Chi-square was used for univariate analysis

Stroke risk factors: Hypertension was the most common risk factor for stroke identified (77.7%) and high cholesterol level (32.4%) was the second most common [Table/Fig-6]. About 7.1% respondents were not able to identify a single risk factor for stroke and 31.6% were able to identify only one risk factor for stroke [Table/Fig-7]. On univariate analysis, identification of more than one risk factor for stroke was associated with age >45 years ($p=0.02$), higher income ($p<0.001$) and residence in urban area ($p=0.009$) [Table/Fig-5].

Risk factors for stroke	Frequency (%)
Hypertension	544 (77.7)
Diabetes	152 (21.7)
Smoking	146 (20.9)
Heart disease	111 (15.9)
High cholesterol level	227 (32.4)
Alcoholism	130 (18.6)
Lack of exercise	189 (27)
Obesity	179 (25.6)
Poor dietary habits	188 (26.9)

[Table/Fig-6]: Knowledge regarding risk factors for stroke.

No. of risk factors identified	Frequency (%)
None	50 (7.1)
1	221 (31.6)
2	114 (16.3)
3	105 (15)
4	96 (13.7)
5	50 (7.1)
6	26 (3.7)
7	13 (1.9)
8	4 (0.6)
9	21 (3)

[Table/Fig-7]: Number of risk factors identified (n=700).

Response to identification of stroke symptom: About 82.4% patients were aware that stroke requires immediate treatment. The most preferred response was to go to the nearest doctor (38.6%) and the second most common to attend the nearest government

hospital (34.1%). About 30.9% chose to visit the nearest neurologist. 25.3% preferred to attend the nearest medical college and only 4.7% preferred to go to a private hospital [Table/Fig-8].

Variables	Frequency (%)
When to seek treatment	
Immediately	577 (82.4)
If symptoms don't improve in 24 hours	123 (17.6)
Stroke helpline awareness	
No	589 (84.1)
Yes	111 (15.9)
Ambulance availability	
No	309 (44.1)
Yes	391 (55.9)
Where to seek treatment*	
Go to nearest doctor	270 (38.6)
Go to nearest neurologist	216 (30.9)
Go to nearest government hospital	239 (34.1)
Go to nearest private hospital	33 (4.7)
Go to nearest medical college	177 (25.3)

[Table/Fig-8]: Response to stroke symptoms (n=700).

*Multiple responses allowed

DISCUSSION

This study reports the awareness regarding stroke, its symptoms, risk factors and treatment in Thiruvananthapuram district from the southern part of Kerala, India. According to data from the India State-Level Disease Burden Initiative, stroke was the second most common cause of Years of Life Lost (YLL) among both males and females in Kerala [6]. It was the 4th most common cause of DALY in Kerala (4.2%) and the burden has increased over the years [6]. Trivandrum stroke registry, which is based on a community study in Thiruvananthapuram district, in South India found the age-adjusted incidence rates per 100,000 per year were 135 for total, and 135 (122-148) for urban and 138 (112-164) for rural populations [14].

In this study, 56.7% patients identified the brain as organ involved in stroke which is higher than reported from several other studies from India [Table/Fig-9] [15-20]. In contrast, in a hospital-based study from Jammu and Haryana 81% of patients were able to identify brain as organ involved in stroke [18]. However, this study included 20% respondents who had history of stroke in the family. History of stroke in family has been associated with higher awareness of stroke in several studies [15,21]. In developed nations, awareness of brain as organ involved in stroke ranged from 56% in Italy to 87% in Sweden [21,22]. In present study, 32% of the respondents thought that the heart was the organ involved. Similarly, in a study from Telangana 41% of patients thought stroke as heart attack [15]. This finding has also been reported from developed countries such as New Zealand where 18% respondents misregarded stroke as heart attack [23].

In this study, 97% respondents could identify atleast one warning symptom of stroke and 93% could identify atleast one risk factor which was higher than reported from other Indian studies [Table/Fig-9]. This can be attributed to the high literacy level of the population. The findings in the present study are comparable to those from developed countries, where studies have shown that 67-97% respondents can identify at least one warning sign for stroke [21,23-25] and 59-89% patients could identify atleast one risk factor for stroke [24,26]. In this study 68% could identify more than 1 warning symptom which was higher than reported from Sweden (56%) and Italy (44%) [21,22]. However 28.9% were able to identify only one warning symptom and only 9% could identify all six warning symptoms. In contrast in the United States, 69% were able to identify all five stroke warning signs [25]. In this study,

Variables	This study, 2022	Sirisha S et al., [15] 2021, Telangana	Kurmi S et al., [16] 2020, Assam	Chhabra M et al., [17], 2019, North India (Punjab, Haryana, Himachal Pradesh)	Gupta A et al., [18], 2021, Haryana	Menon B et al., [19], 2014, Andhra Pradesh	Das S et al., [20], West Bengal 2016
Brain involved	56.7	47	36	NA	81	35	NA
Stroke signs and symptoms							
Weakness of one side of face or body	54	56	64	6	67	43	90
Visual symptoms	25.4	13	1	3	36	0	
Difficulty in speaking	59.4	33	2	23	41	3	
Headache/Dizziness	38.6	43	32	3	43	0	63
Difficulty walking	45	NA	64	2	70	0	
Numbness of one side of face or body	52	37	NA	NA	Included with weakness	0	
Don't know	3	15	46	46		66	
Risk factors for stroke							
Hypertension	77.7	58	39	59	75	52	83
Diabetes	21.7	27	4	5	57	41	68
Smoking	20.9	27	3	13	55	38	38
Heart disease	15.9		8		29	7	NA
High cholesterol level	32.4	36	1	27	26	30	NA
Alcoholism	18.6	28	.3	14	NA	40	35
Lack of exercise	27	22		NA	NA	28	NA
Obesity	25.6	32	.3	NA	NA	27	NA
Poor dietary habits	26.9	NA	NA	44	NA	NA	NA
None	7.1	9	49	29	5	50	

[Table/Fig-9]: Comparison with other studies from India* [15-20].

NA: Not assessed; *Data in percentage

60% could identify more than one risk factor and 30% could identify more than two. This was similar to studies from Sweden, where 60% recognised more than one risk factor and 46% correctly listed three or more [22].

The most common warning sign of stroke identified was difficulty speaking followed by one-sided weakness of face and/or body and numbness of one side. In other studies from India, weakness was most commonly recognised warning sign [15-21]. Compared to other studies from India, trouble speaking was identified by more patients and other warning signs were similar [Table/Fig-9]. World-wide one sided weakness and numbness, facial weakness and trouble speaking are the most commonly identified stroke signs indicating that lesser recognised stroke symptoms such as visual symptoms and headache and vertigo should be emphasised in awareness studies [21-26].

Hypertension followed by dyslipidaemia were the two most commonly identified risk factors and lack of exercise, poor diet and obesity were identified by a quarter of patients. Hypertension is the best recognised risk factor in studies from India as well as from other countries [15-23]. World-wide hypertension, smoking, stress and obesity were the most frequently identified risk factors [22,24,26]. Only one-fifth were able to identify diabetes and smoking as risk factors for stroke in spite of its high prevalence in Kerala. In the Trivandrum registry, nearly 85% of population had hypertension and half had diabetes mellitus and a quarter were smokers [14].

Higher awareness regarding stroke was associated with higher age, higher income, higher education and residence in urban area. Higher education, higher income and residence in urban areas have been reported to be the major factor influencing stroke awareness in several studies from India as well as developed countries [16,19,22,26,27]. Male gender has been associated with higher [17,18] as well as lower [23,28] awareness in previous studies but gender was not significantly associated with awareness in this study.

About 82.4% of patients were aware that stroke requires immediate treatment which is higher than from other Indian studies [16,18-20] and similar to studies from Spain and New Zealand [24,25].

However, majority were not aware of the need to rush to hospital with 70% of respondents choosing to go to a nearby doctor in response to the development of symptoms. About 44.1% respondents were not aware regarding ambulance services in their region. This differs markedly from developed nations where 60-94% reported that they would call EMS (Emergency Medical Services) or would go to the hospital [22,26,27].

Various studies have revealed that knowledge about stroke symptoms and thrombolysis, use of EMS and ambulance services, perception of initial symptoms as serious and presence of major deficits such as haemiparesis are important determinants of early arrival to hospital whereas visiting family doctor or primary care centre first, referral from another hospital and private transport to hospital are associated with delayed arrival [9, 10, 19]. Due to hospital prenotification, EMS use is further associated with reduction in door to needle time [10].

Of those deciding to go to hospital, majority chose a nearby government hospital, followed by medical college. This shows the importance of providing emergency stroke care and thrombolysis services at the level of local government hospitals. Local healthcare providers other than neurologists should also be educated regarding thrombolysis and made aware of hospitals offering thrombolysis in their locality. Awareness regarding the stroke helpline operated by the medical college was low with 84% being unaware indicating the need for dissemination of information through multiple channels. A state/national level helpline may help to streamline the process [28].

Limitation(s)

The results on stroke awareness may have been overestimated and may not be extrapolated to the general population as it was conducted in a hospital setting and the population that attends a hospital is likely to be more aware regarding health-related issues. The questionnaire used multiple choice questions with limited options which may have encouraged guessing. Identification of stroke symptoms and risk factors are poorer in open ended questionnaires [29].

CONCLUSION(S)

This study demonstrated awareness regarding warning signs symptoms and risk factors for stroke, while being much below desired levels, were comparable to developed countries. However, effects of common risk factors like diabetes and smoking on increasing stroke risk were not understood. Knowledge regarding stroke helplines, importance of ambulance services and need to reach hospital emergency department was low and stroke education programs should target these areas. The respondents, who were largely from rural areas and lower income groups depended on local physicians and local government hospitals for emergency stroke care and policy makers should target improving stroke care resources at this level.

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