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ORIGINAL ARTICLE

**Study on the public awareness of stroke risk factors, symptoms, treatment and rehabilitation: A community based cross sectional survey from a tertiary referral centre in South India**

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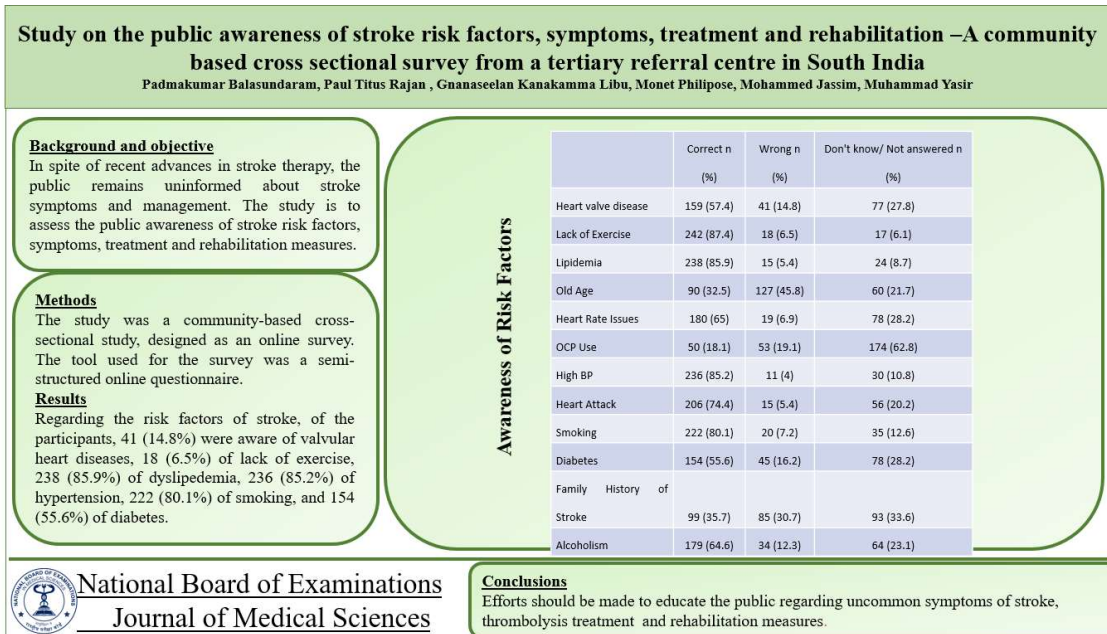
**Abstract**

**Background:** The incidence of Non communicable diseases (NCDs) including stroke is increasing in India over the past few years. Thrombolysis therapy has revolutionized management of acute ischemic stroke. In spite of such recent advances in stroke therapy, the public remains uninformed about stroke symptoms and management. **Objective:** To assess the public awareness of stroke risk factors, symptoms, treatment and rehabilitation measures. **Methods:** The study was a community-based cross-sectional study, designed as an online survey. The tool used for the survey was a semi-structured online questionnaire. **Results:** Regarding the risk factors of stroke, of the participants, 41 (14.8%) were aware of valvular heart diseases, 18 (6.5%) of lack of exercise, 238 (85.9%) of dyslipidemia, 236 (85.2%) of hypertension, 222 (80.1%) of smoking, and 154 (55.6%) of diabetes. Regarding symptoms of stroke, of the participants, 209 (75.5%) were aware of loss of balance, 240 (86.6%) of speech abnormalities, 261 (94.2%) of facial weakness, and 234 (84.5%) of weakness. **Conclusion:** Efforts should be made to educate the public regarding uncommon symptoms of stroke, thrombolysis treatment and rehabilitation measures, so that people make beneficial health care decisions in stroke management.

**Keywords:** Stroke; Window period; Thrombolysis

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## Graphical Abstract



## Introduction

Global Burden of Disease (GBD) 2019 stroke burden estimates showed that stroke remains the second leading cause of death and the third leading cause of death and disability combined (as expressed by disability-adjusted life-years lost—DALYs) in the world [1]. The burden of stroke will grow mostly in developing countries rather than in developed countries [2]. The incidence of Non communicable diseases (NCDs) is increasing in India over the past few years and stroke is India's fourth leading cause of death and fifth leading cause of disability [3].

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 up to 3.5% of all stroke patients receive thrombolysis [4,5].

Studies from India reported poor awareness of stroke among the population, where the respondents could not even identify the organ affected in stroke [6]. Lack of knowledge of warning signs of

stroke and inadequate emergency response often lead to delays in delivery medical/emergency care within the golden hour [7]. Distance from hospital, contact with a local doctor and low threat perception of symptoms of stroke were independent factors associated with delay in arrival [8].

## Methodology

The study was a community-based cross-sectional study, designed as an online survey and the study setting was entire State of Kerala.

Inclusion criteria were people aged more than 18 years who could access the online questionnaire through smart phone or computer and were willing to participate in the study. People who were not willing to participate in the study were excluded from the study.

The study duration was 3 months. The tool used for the survey was a semi-structured online questionnaire that included consent and questions regarding risk factors, symptoms and treatment of

stroke. The questionnaire questions were direct, simple and precise.

KoBo Toolbox, a free, open-source tool for mobile data collection, were used in the survey. Those who gave consent could finish the online survey and submit to the principal investigator's account on a real-time basis. The gathered data was exported from the database to IBM SPSSv. 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) and was analyzed.

### Results

277 persons took part in the survey and 140 (50.5%) were males and 137 were (49.5%) females. 139 (50.9%) persons belongs to 18-45 age group, 109 (39.9%), 46-65, and 25 (9.2%) above 66 years. Regarding the educational status among the 271 respondents 25 (9.2%) had school education, 147 (54.2%) college education and 99 (36.5%) were professionally qualified. Among the respondents 53 (19.5%) were students, 8 (2.9%) were manual labourers, 127 (46.7%) were office workers, 46 (16.9%) were retired from service, 38 (14%) had no job and 5 (1.8%) persons did not respond to the question.

Regarding awareness about transient ischemic attack, 231 (83.4%) answered that such patients require prolonged treatment and 2 (0.7%) answered that no need of it and for 44 (15.9%) persons, they do not know the answer. 153 (55.2%) answered that transient ischemic attack is a predictor of future stroke and 18 (6.5%) answered that it is not a predictor and 106 (38.3%) answered that they do not know the answer.

Questions were asked regarding steps to be taken if we suspect stroke. Of the participants, 264 (95.3%) responded that we should carefully observe the symptoms,

3 (1.1%) answered that there is no need, and 10 (3.6%) responded that they do not know the answer. Regarding first aid, 226 (81.6%) of the participants responded that first aid should be given to patients who have developed stroke, 9 (3.2%) responded that there is no need for it, and 42 (15.2%) responded that they do not know the answer. Of the participants, 83 (30%) responded that food and drinks can be given to a patient who has developed a stroke, 64 (23.1%) responded that food should not be given, and 130 (46.9%) responded that they do not know the answer. Of the participants, 270 (97.5%) answered that immediately we should call an ambulance, 2 (0.7%) answered that there was no need for it, and 5 (1.8%) responded that they did not know the answer. Of the participants, 256 (92.4%) responded that immediate care is necessary for a patient who has developed a stroke, and 21 (7.6%) responded that they do not know it [4,5].

Regarding awareness about the complications of stroke, 173 (62.5%) responded that venous thrombosis of the legs can occur, 100 (36.1%) answered that they did not know it, and 4 (1.4%) did not know the answer. Of the participants, 188 (67.9%) answered that they knew about muscle contracture following stroke, 83 (30%) answered that they did not know it, and 6 (2.2%) answered that they did not know the answer. Of the participants, 158 (57%) responded that they knew about the aspiration of food contents producing pneumonia as a complication of stroke, 117 (42.2%) responded that they did not know about it, and 2 (0.7%) responded that they did not know the answer. Of the participants, 160 (57.8%) responded that depression can occur as a complication of stroke, 114 (41.2%) do not know about it, and 3 (1.1%) do not know the answer.

Table 1. Awareness of Risk Factors

	<b>Correct <i>n</i> (%)</b>	<b>Wrong <i>n</i> (%)</b>	<b>Don't know/ Not answered <i>n</i> (%)</b>
Heart valve disease	159 (57.4)	41 (14.8)	77 (27.8)
Lack of Exercise	242 (87.4)	18 (6.5)	17 (6.1)
Lipidemia	238 (85.9)	15 (5.4)	24 (8.7)
Old Age	90 (32.5)	127 (45.8)	60 (21.7)
Heart Rate Issues	180 (65)	19 (6.9)	78 (28.2)
OCP Use	50 (18.1)	53 (19.1)	174 (62.8)
High BP	236 (85.2)	11 (4)	30 (10.8)
Heart Attack	206 (74.4)	15 (5.4)	56 (20.2)
Smoking	222 (80.1)	20 (7.2)	35 (12.6)
Diabetes	154 (55.6)	45 (16.2)	78 (28.2)
Family History of Stroke	99 (35.7)	85 (30.7)	93 (33.6)
Alcoholism	179 (64.6)	34 (12.3)	64 (23.1)

Table 2. Awareness of Stroke Symptoms

	<b>Correct <i>n</i> (%)</b>	<b>Wrong <i>n</i> (%)</b>	<b>Don't know/ Not answered <i>n</i> (%)</b>
Loss of Balance	209 (75.5)	16 (5.8)	52 (18.8)
Symptoms of Vision	148 (53.4)	39 (14.1)	90 (32.5)
Speech Disturbance	240 (86.6)	8 (2.9)	29 (10.5)
Facial Palsy	261 (94.2)	1 (0.4)	15 (5.4)
Weakness of Limbs	234 (84.5)	7 (2.5)	36 (13)
Time	172 (62.1)	105 (37.9)	

Table 3. Awareness about Hospital Selection, Thrombolysis and Ideal Time for Thrombolysis

	<b>Correct <i>n</i> (%)</b>	<b>Wrong <i>n</i> (%)</b>	<b>Don't know/ Not answered <i>n</i> (%)</b>
Hospital Selection	159 (57.4)	117 (42.2)	1 (0.4)
Awareness of Thrombolysis	159 (57.4)	117 (42.2)	1 (0.4)
Time Interval for Thrombolysis from Stroke Onset	263 (94.9)	7 (2.5)	7 (2.5)

Table 4. Awareness about Rehabilitation and home care

	<b>Correct <i>n</i> (%)</b>	<b>Wrong <i>n</i> (%)</b>	<b>Don't know/ Not answered <i>n</i> (%)</b>
Need for Rehabilitation	183 (66.1)	93 (33.6)	1 (0.4)
Speech Therapy	249 (89.9)	25 (9)	3 (1.1)
Long Term treatment	184 (66.4)	90 (32.5)	3 (1.1)
Rehabilitation Useful	167 (60.3)	108 (39)	2 (0.7)
Palliative Care	228 (82.3)	46 (16.6)	3 (1.1)
	Correct <i>n</i> (%)	Wrong <i>n</i> (%)	Don't know/ Not answered <i>n</i> (%)
Sitting Feeding	217 (78.3)	56 (20.2)	4 (1.4)
Ryles Tube Feeding	246 (88.8)	28 (10.1)	3 (1.1)
Prevention of Bedsore	247 (89.2)	27 (9.7)	3 (1.1)
Urine Catheter	244 (88.1)	28 (10.1)	5 (1.8)
Catheter Change	238 (85.9)	32 (11.6)	7 (2.5)

## Discussion

Awareness about risk factors of stroke were found to be satisfactory among the participants of the study. More than fifty percent of the participants were aware that valvular heart disease (57%), lack of exercise (87%), dyslipidemia (86%), arrhythmias (65%), alcohol consumption (65%), hypertension (85%), smoking (80%) and diabetes (56%) can lead to stroke and this awareness of risk factors is higher than the 50% reported by previous studies from India and abroad [9–12]. This is probably because Kerala has the highest literacy rate in India and the health education activities by the government and non-governmental organizations at the community level were commendable. Hypertension was identified by 85 % as a risk factor for stroke and this finding is consistent with studies from India and other countries where Hypertension was the best recognised risk factor [13–21].

Regarding the awareness about stroke symptoms, more than 50 percent of the participants were aware of the popular FAST acronym regarding stroke which includes face weakness, arm weakness, speech problems and time to call ambulance. Most common symptom identified was facial weakness (94%) followed by speech disturbances (86%), weakness of arms and legs (84%) and loss of balance (75%). Even though awareness about the common symptoms of stroke were good among the participants, uncommon symptoms like visual symptoms were less recognized (53%). Awareness about such uncommon warning signs of stroke should be included in the stroke awareness programmes [22,23].

Regarding the question to which hospital, you will take a patient with stroke, 159 (57.4%) answered medical college

hospital. Comparable responses were seen in other studies [24,25] except in Korean subjects [26] where only 46% of them mentioned that they would visit a hospital. 25% of the respondents answered that they will take the stroke suspected patient to a nearby clinic and proper awareness is required in this matter to highlight the importance of taking the patient to a centre where facility for thrombolysis is available.

81% participants responded that first aid should be given to patients who developed stroke and 30% responded that food and drinks can be given to a patient who developed stroke. Proper health education is necessary, as unnecessary first aid attempts will produce further delay in taking the patient to the hospital for optimum treatment. Also trying to feed a semi-conscious or un-conscious patient may lead to development of aspiration pneumonia as silent aspiration is common in acute stroke patients [27].

98% of participants responded that they will call an ambulance immediately if they come across a patient with stroke. This awareness is better than many developed nations where 60-94% reported that they would call EMS (Emergency Medical Services) [28,29] and (92%) responded that immediate care is necessary for a patient who developed stroke and this knowledge is higher than other Indian studies [30,31].

Regarding thrombolysis treatment, 57% persons answered that they are aware of thrombolysis treatment for stroke. Regarding the time interval from onset of stroke for thrombolysis treatment, 94 % answered that within 4.5 hours and this shows that adequate knowledge about receiving immediate treatment is present in the participants. Knowledge regarding thrombolysis treatment is better than other Indian studies where only 10% is aware of

clot lysis treatment and only 5% is aware of the golden hour to rush to the hospital [32]. Even though 57 % of the participants are aware of thrombolysis treatment remaining 42% are unaware of this modality of treatment and hence proper public health education activities are necessary in this matter.

Regarding transient ischemic attacks, even though 55% answered that it is a predictor of stroke, 45% does not have any idea about it and hence proper awareness programme in this is also necessary.

Most of the studies in literature did not address the issue of knowledge about the rehabilitation. 66% of the respondents were aware of rehabilitation in stroke and 60% answered that it hastens recovery. Findings of our study are similar to a study from Iran where 60% were aware of the effectiveness of rehabilitation methods such as speech therapy and physio-therapy in improving stroke complications [33].

This response is better than many other studies from abroad where only 50% were aware of the necessity of chronic disease management and 37% were aware of the importance of physiotherapy [34]. A study from Malaysia states that rehabilitation was an important part of stroke management [35]. Physical therapy (73%) and traditional treatments (43%) were the most frequently selected rehabilitation preferences in the high school students and college students in an Indian study [36]. Higher level of education may be the reason for better awareness among the public about the importance of rehabilitation in stroke.

There are not much studies in the literature about the awareness of the public regarding home care of stroke patients. Home care is an integral part of primary

health care (Freeman, 2016) [37]. Our study shows that the respondents have good awareness about home care of bed ridden stroke patients like knowledge about Ryles tube feeding (89%), keeping the patient in sitting position while feeding (78%), frequent change of posture to prevent bed sores (89%), catheterisation in patients with difficulty in passing urine (88%) and that urinary catheter should be changed every month (86%).

Many studies did not address knowledge of public about complications after stroke. Respondents of our study has good knowledge about various complications like venous thrombosis of legs (62%), muscle contracture (68%), aspiration pneumonia (57%), keratitis (50%) and depression (58%). As per the best of our knowledge, this is very first study of its kind, which addressed the community's awareness of complications of stroke and home care of stroke patients.

Respondents have good knowledge regarding risk factors, common symptoms of stroke and thrombolysis treatment. But more awareness is necessary in certain areas like uncommon symptoms and TIA, necessity of taking the patient to a tertiary care centre immediately without any attempt for first aid.

### **Limitations**

1. The sample size was small, and the results do not reflect the overall situation of the country.
2. Using the "don't know" option in open-ended questions may have caused more respondents to choose it without thinking about the right answer.
3. Leading questions like time interval for thrombolysis from stroke onset may have caused more respondents to give correct answer.

## Conclusion

This review highlights the importance of increasing public awareness about uncommon stroke symptoms, risk factors and the emergency response that is required. Efforts should be made to educate the public regarding thrombolysis treatment which has radically changed the perception and management of stroke patients and rehabilitation so that people make more rational and beneficial health care decisions. Continued, and intensified educational efforts to promote knowledge of stroke, particularly among high-risk groups, should be encouraged and promoted.

## Statements and Declarations

### Conflicts of interest

The authors declares that they do not have conflict of interest.

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