

# Awareness, Recognition, and Response to Stroke among the General Public—An Observational Study

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## Abstract

**Objective** To evaluate awareness and response to stroke among the general public.

**Materials and Methods** In this prospective, observational study, self-reported stroke awareness questionnaire was administered in 2000 consecutive participants who visited outpatient clinic of a tertiary care hospital. For data analysis, comparison included for awareness of stroke and response in case of stroke.

**Results** The average age of the study participants was  $39.64 \pm 15.55$  (17–85), with 651 (32.6%) women. Among the respondents, 786 (39.3%) participants mentioned stroke as blood clot in the brain; 268 (13.4%) stated it as brain hemorrhage. Awareness of stroke was higher in people in cities (71.0 vs. 8.5%;  $p < 0.001$ ) and graduates (75.3 vs. 60.9%;  $p < 0.001$ ) or knew a family member or friend who had stroke (42.7 vs. 30.4%;  $p < 0.001$ ). Most commonly recognized risk factors included stress (1,152; 57.6%) and hypertension (1,148; 57.4%). Most identified warning sign was weakness of one side of body (807; 40.4%) and speech impairment (658; 32.9%). Participants who were aware of stroke knew a greater number of risk factors ( $3.75 \pm 2.88$  vs.  $2.45 \pm 2.66$ ;  $p < 0.001$ ) and warning signs ( $2.85 \pm 2.25$  vs.  $1.49 \pm 1.41$ ;  $p < 0.001$ ). Among 1,138 participants who were aware of stroke, 166 (14.6%) participants knew one correct response in case of a stroke, either call a doctor (49.3 vs. 35.0%;  $p < 0.001$ ) or call an ambulance (41.1 vs. 34.9%;  $p = 0.055$ ). Participants who knew one correct response to stroke had at least a family member/friend who had stroke (44.1 vs. 34.3%;  $p < 0.022$ ).

**Conclusion** We report that among 56.9% of the participants who were aware of stroke most could not name more than four risk factors or three warning signs of stroke. Only 14.6% of those aware of stroke knew appropriate response to stroke.

## Keywords

- ▶ stroke
- ▶ awareness
- ▶ risk factors
- ▶ warning signs
- ▶ response

## Introduction

Stroke is a major neurological, noncommunicable disease, and the third most common cause of mortality and a significant

cause of adult disability across the globe.<sup>1</sup> In India, the incidence of stroke is ~1.5 persons per 1000 population and ranks third for mortality due to stroke.<sup>1</sup> Importantly, 12% of all strokes occur in population younger than 40 years of age.<sup>1</sup>

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Disability due to stroke is attributed to compromised functional abilities, cognitive impairment, mood changes, and resultant reduced efficiency at work.<sup>1-9</sup> Not only does stroke influence the patients; nearly 70% of care-giver of stroke patients report physical and mental stress.<sup>10</sup> Therefore, stroke is a disease of immense public health importance with economic and social consequences.<sup>11</sup>

The most crucial predictor of outcome of treatment of stroke is the time period (often called golden time) between ictus and onset of treatment. If recognized early and managed optimally, acute paralysis in stroke can be reversed.<sup>12,13</sup> Prompt access to medical services after noticing the initial symptoms may increase the chances of a favorable outcome.<sup>12,13</sup> According to a survey in Ireland, less than half of the older adults were able to recognize the symptoms and warning signs of stroke.<sup>14,15</sup> Studies from India reported poor awareness of stroke among the population, where the respondents could not even identify the organ affected in stroke.<sup>16</sup> 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.<sup>17</sup>

However, knowledge of immediate action that is necessary in dealing with a stroke patient can reduce both mortality and morbidity among stroke patients by preventing delay in hospitalization.<sup>18</sup> Low stroke awareness limits acute stroke care in high-risk populations and makes effective early treatment difficult.<sup>19</sup> The success of primary preventive measures and timely medical attention immediately following a stroke is influenced by the public knowledge and perception of stroke and its warning signs.<sup>14,20</sup> Few recent studies have demonstrated that awareness about stroke may not always translate into efficient response in case of a stroke.<sup>21,22</sup> Therefore, quantifying how many of those aware about stroke can respond to stroke may be essential to formulate public awareness programs.

It is well established that other than genetic etiologies, stroke is a preventable disease.<sup>23,24</sup> Accurate knowledge of stroke risk factors and warning signs, right attitude, and proper practices of stroke prevention are shown to reduce the incidence of stroke.<sup>23</sup> In India and other developing countries, an alarming increase in the incidence of stroke has been observed owing to an increased life span with rising trends of hypertension, diabetes, smoking, and stress in daily life.<sup>25</sup> Prevention can be achieved through knowledge and awareness of risk factors and warning signs. However, very little is known about the awareness of risk factors of stroke in general population.

The present study was aimed to document the awareness and knowledge of stroke (risk factors, warning signs, and response to stroke) in patients and people who accompanied them to a tertiary care center.

## Materials and Methods

In this prospective observation study, self-reported stroke awareness questionnaire was administered in 2000 consecutive participants who visited the outpatient clinic of a tertiary care hospital from September 2018 to March 2019. All partic-

ipants aged 18 years and above who gave consent to participate in the study after being approached by the research team were included in the study. Persons below 18 years of age, those with linguistic or cognitive inability, and failure to obtain written consent formed exclusion criteria. The study was approved by the Institutional Ethics Committee.

The stroke awareness questionnaire developed by Hickey et al<sup>26</sup> was adapted after translation into local languages (Hindi, Telugu). The data collected through questionnaire included demographic information, and 13 multiple-choice questions pertaining to what is stroke & transient ischemic attack, risk factors of stroke, symptoms or warning signs of stroke, seriousness of stroke, did anyone of their near ones had stroke, first thing to do when you were having a stroke (call an ambulance or take to hospital or call a doctor was considered as appropriate response), and their idea of immediate response. The investigators intervened only to clarify a question, if required. No attempt was made to prompt the respondents by suggesting answers directly.

## Statistical analysis

After confirming the homogeneity of data, all categorical variables were expressed as percentages and all continuous variables were expressed as a mean  $\pm$  standard deviation. The study population was divided into groups based on awareness of stroke. In a subanalysis, all the participants who were aware of stroke were divided into groups based on awareness of response in case of stroke. In the univariate analysis, differences between groups for continuous variables were done using independent Students' *t*-tests, whereas chi-squared test was used for categorical variables. A  $p \leq 0.05$  was considered significant. Statistical Package for Social Sciences (SPSS, ver. 20.0, IBM computers, New York, United States) was used for all statistical analysis.

## Results

The average age of the study participants was  $39.64 \pm 15.55$  (17-85), with 651 (32.6%) women participants.

**Awareness about what stroke is:** Out of the whole cohort, 823(41.2%) participants thought stroke as heart attack, 239 (12.0%) reported that they do not know what stroke is. Among the respondents, 786 (39.3%) participants correctly mentioned stroke as blood clot in the brain; 268 (13.4%) stated it as brain hemorrhage, while 275 (13.75%) people mentioned it as some condition affecting brain. Additionally, 333 (16.65%) people mentioned it as a circulation problem in brain, whereas 165 (8.25%) people mentioned stroke as seizures. Significantly a greater number of people who reside in cities (71.0 vs. 58.5%;  $p < 0.001$ ) were aware about stroke (**Table 1**). Similarly, awareness of stroke was higher in participants who were graduates (75.3 vs. 60.9%;  $p < 0.001$ ) or knew a family member or friend who had stroke (42.7 vs. 30.4%;  $p < 0.001$ ). Importantly, awareness of the organ affected in stroke was also higher in those who were aware of stroke (**Table 2**).

**Awareness about risk factors for stroke:** A total of 1,928 (96.4%) participants spontaneously recalled at least one risk

**Table 1** Comparison between groups for sociodemographics ( $n = 2,000$ )

Variable	Not aware of stroke ( $n = 862$ )	Aware of stroke ( $n = 1,138$ )	$p$ -Value
Age (y)	39.65 ± 16.20	39.63 ± 15.12	0.983
Women (%)	278 (32.3%)	373 (32.8%)	0.810
Resides in city (%)	504 (58.5%)	808 (71.0%)	<0.001
Married (%)	590 (68.4%)	821 (72.1%)	0.075
Graduate (%)	525 (60.9%)	857 (75.3%)	<0.001
Employed (%)	480 (55.7%)	737 (64.8%)	<0.001
Family/friend with stroke (%)	262 (30.4%)	486 (42.7%)	<0.001
Seriousness of stroke			
Not very serious (%)	21 (2.4%)	29 (2.5%)	1.000
Quite serious (%)	90 (10.4%)	139 (12.2%)	0.229
Very serious (%)	294 (34.1%)	386 (33.9%)	0.962
Extremely serious (%)	327 (41.5%)	461 (40.5%)	0.951
Worst imaginable (%)	138 (16.0%)	181 (15.9%)	0.951

**Table 2** Comparison between groups for understanding of what is stroke ( $n = 2,000$ )

Variable	Not aware of stroke ( $n = 862$ )	Aware of stroke ( $n = 1,138$ )	$p$ -Value
Blood clot in brain (%)	3 (0.3%)	765 (67.2%)	<0.001
Brain hemorrhage (%)	0 (0.0%)	268 (23.6%)	<0.001
Condition that affects brain (%)	1 (0.1%)	274 (24.1%)	<0.001
Circulation problem in Brain (%)	1 (0.1%)	332 (29.2%)	<0.001
Heart attack (%)	577 (66.9%)	246 (21.6%)	<0.001
Seizures (%)	68 (7.9%)	97 (8.5%)	0.623
Don't know (%)	235 (27.3%)	0 (0.0%)	<0.001

Note: Majority of the not aware people think that it is heart attack or they don't know at all.

factor for stroke, most frequently stress (1,152; 57.6%) and hypertension (1,148; 57.4%). Among the other risk factors identified, 727 participants (36.35) considered high cholesterol as a risk factor, 530 (26.5%) participants considered smoking, and 544 participants (27.2%) reported diabetes as a risk factor. Among other factors, 647 (32.35) participants responded obesity, and 566 (28.3%) participants thought alcohol consumption as a risk factor for stroke. However, 430 (21.5%) participants reported lack of exercise and 317 participants (15.85%) considered increasing age as a risk factor for stroke. On the contrary, 177 (8.85%) participants did not know a risk factor for stroke. Participants who were aware of stroke knew a greater number of risk factors of stroke ( $3.75 \pm 2.88$  vs.  $2.45 \pm 2.66$ ;  $p < 0.001$ ; ► **Table 3**).

**Warning signs of stroke and response in case of stroke:** Among all, 1,710 (85.5%) participants spontaneously named at least one warning sign, most frequently weakness of one side of body (807; 40.4%), followed by speech impairment (658; 32.9%), and dizziness (486; 24.3%). Out of entire study population, 748 people knew someone with stroke. Participants who were aware of stroke knew a greater number of

warning signs than those who were not aware ( $2.85 \pm 2.25$  vs.  $1.49 \pm 1.41$ ;  $p < 0.001$ ; ► **Table 4**).

Among those interviewed, 163 (8.2%) participants did not know how to respond in case a person had stroke. A greater number of participants who were aware of stroke knew how to respond in case of a stroke, call a doctor (49.3 vs. 35.0%;  $p < 0.001$ ), or take / drive the person to a hospital (33.6 vs. 23.2%;  $p < 0.001$ ) or call an ambulance (41.1 vs. 34.9%;  $p = 0.055$ ; ► **Fig. 1**).

Among the 1138 participants who had awareness of stroke, only 166 (14.6%) knew appropriate response in case of a stroke. On comparison between these 166 participants (who knew at least one correct response) to the rest of the group, knowing one correct response to stroke was related to having at least a family member/friend who had stroke (44.1 vs. 34.3%;  $p < 0.022$ ; ► **Table 5**).

## Discussion

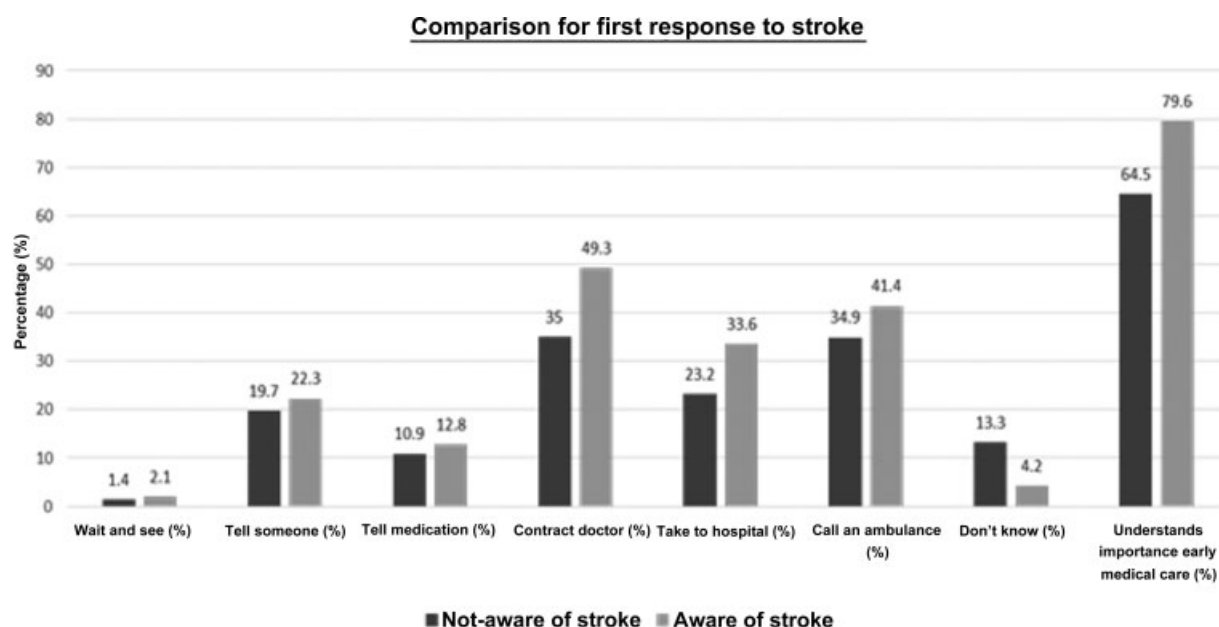
In the current study, we evaluated the awareness of what stroke is, risk factors, and warning signs of stroke in a

**Table 3** Comparison between groups for risk factors of stroke ( $n = 2,000$ )

Variable	Not aware of stroke ( $n = 862$ )	Aware of stroke ( $n = 1,138$ )	$p$ -Value
Stress (%)	419 (48.6%)	729 (64.1%)	<0.001
Hypertension (%)	384 (44.5%)	768 (67.5%)	<0.001
Dyslipidemia (%)	292 (33.9%)	435 (38.2%)	0.049
Smoking (%)	155 (18.0%)	375 (33.0%)	<0.001
Diabetes (%)	158 (18.3%)	386 (33.9%)	<0.001
Obesity (%)	238 (27.6%)	409 (35.9%)	<0.001
Alcoholism (%)	176 (20.4%)	380 (33.4%)	<0.001
Physical inactivity (%)	137 (15.9%)	293 (25.7%)	<0.001
Aging (%)	74 (8.6%)	243 (21.4%)	<0.001
Family history (%)	78 (9.0%)	245 (21.5%)	<0.001
Don't know (%)	135 (15.7%)	42 (3.7%)	<0.001
No. of risk factors known	2.45 $\pm$ 2.26	3.75 $\pm$ 2.88	<0.001

**Table 4** Comparison between groups for warning signs of stroke ( $n = 2,000$ )

Variable	Not aware of stroke ( $n = 862$ )	Aware of stroke ( $n = 1,138$ )	$p$ -Value
Dizziness (%)	141 (16.4%)	348 (30.6%)	<0.001
Sudden confusion (%)	89 (10.3%)	286 (25.1%)	<0.001
Severe headache (%)	83 (9.6%)	294 (25.8%)	<0.001
Vision problem (%)	38 (4.4%)	213 (18.7%)	<0.001
Slurred speech (%)	181 (21.0%)	477 (41.9%)	<0.001
Weakness of one-side of body (%)	262 (30.4%)	545 (47.9%)	<0.001
Facial weakness (%)	55 (6.4%)	258 (22.7%)	<0.001
Numbness (%)	236 (27.4%)	504 (44.3%)	<0.001
Do not know (%)	211 (24.5%)	79 (6.9%)	<0.001
No. of warning signs known	1.49 $\pm$ 1.41	2.85 $\pm$ 2.25	<0.001

**Fig. 1** Comparison for first response to stroke.

**Table 5** Comparison for response to stroke among those aware of stroke ( $n = 1,138$ )

Variable	Appropriate response ( $n = 166$ )	Inappropriate response ( $n = 972$ )	$p$ -Value
Age (y)	39.21 $\pm$ 14.73	39.70 $\pm$ 15.20	0.699
Women (%)	52 (31.3%)	321 (33.0%)	0.721
Type of residence			
City (%)	116 (69.9%)	692 (71.2%)	0.921
Town (%)	33 (19.9%)	189 (19.4%)	
Village (%)	17 (10.2%)	91 (9.4%)	
Education			
Uneducated (%)	3 (1.8%)	32 (3.3%)	0.605
Matriculation (%)	20 (12.0%)	110 (11.3%)	
Intermediate (%)	20 (12.0%)	96 (9.9%)	
Graduate (%)	78 (47.0%)	431 (44.3%)	
Postgraduate (%)	45 (27.1%)	303 (31.2%)	
Occupation			
Unemployed (%)	52 (31.3%)	243 (25.0%)	0.324
Self-employed (%)	32 (19.3%)	191 (19.7%)	
Employed (%)	66 (39.8%)	448 (46.1%)	
Retired (%)	16 (9.6%)	90 (9.3%)	
Friend/family who had stroke (%)	57 (34.3%)	429 (44.1%)	0.022

relatively large cohort of general population visiting a tertiary care center. We report that 56.9% of the participants were aware of what stroke is. Among those who are aware of stroke, most of the participants could not name more than four risk factors and three warning signs of stroke. Importantly, only 14.6% of those aware of stroke knew appropriate response to in case of a stroke. Knowing a friend or family person who had stroke is associated with appropriate response to stroke.

Awareness of stroke among 56.9% in the current study is marginally higher than the awareness reported in previous studies from India and Western population.<sup>15,16,22,26–33</sup> This is probably because of the participants of the current study constituted those who visited a tertiary referral center or those from urban/city population and therefore perhaps have a better understanding of stroke. Similarly, nearly two-thirds of participants in our study identified stress and hypertension as the leading risk factors of stroke; this awareness of risk factors is higher than the 50% reported by previous studies.<sup>15,16,26,29,32,34–37</sup> However, the mean number of risk factors identified in our study did not differ from existing literature.

The proportion of awareness of warning signs of stroke (like weakness of one side of the body, slurring of speech, deviation of mouth) in the current study is similar to those reported previously.<sup>29,33</sup> In previous studies, the response to stroke was evaluated in the entire cohort of participants who were aware and those not aware of stroke. One of the novelties of the current study was to evaluate factors affecting response in case of stroke only among participants aware of stroke. We observed that only 14.6% of those aware of

stroke knew appropriate response in case of stroke and knowing a friend or family member who had a stroke increases the odds that the response is appropriate. Perhaps, awareness programs should not only aim at improving knowledge about what stroke is but also educate people about what to do in case of a stroke.

On reviewing the literature about effectiveness of public awareness programs, Lecouturier et al<sup>38</sup> reported that public awareness campaigns significantly increase awareness of symptoms, but not emergency response, as evaluated by reduced time of presentation to hospital. Moreover, it is previously known that knowledge of stroke symptoms may not be associated with the intention to seek emergency services.<sup>14,36,39</sup> These observations are probably because of a “belief that symptoms will subside.”<sup>40</sup> Therefore, a robust awareness program should also educate population about importance of seeking medical services at the earliest. Mass media interventions although have the potential to reach large populations in health-related areas, the impact on behavior change has been small to moderate.<sup>41</sup> Perhaps, the role of physicians and health personnel is, therefore, of enormous importance. In an enormous mismatch of doctor-patient ratio in developing countries, robust studies are required to ascertain the extent of involvement of healthcare personnel needed in spreading the awareness.

**Strengths and limitations:** The current study is one of the largest of its kind, conducted in South India. With a reported prevalence of awareness of stroke at nearly 51.2%, our study required only 1512 participants at a confidence level of 99.99%, but 500 additional participants were recruited to account for design effect. However, a potential limitation



could be that this is a single-center study where the participants were consecutive visitors to a tertiary referral care center and were not picked from a door-to-door community survey. However, to neutralize this bias, the participants were not just patients or their care-givers but also included visitors on other purposes to the hospital and were enrolled among outpatient visitors across all the departments with an aim to make the study sample representative of general public.

## Conclusion

In this study, in a relatively large cohort of general population visiting a tertiary care center, we report that 56.9% of the participants were aware of what stroke is. Importantly, only 14.6% of those aware of stroke knew appropriate response to in case of a stroke. Knowing a friend or family person who had stroke is associated with appropriate response to stroke. Future research could study the role of robust and well-planned awareness programs that emphasize stroke, its warning signs, response, and sequelae.

### Funding

None.

### Conflict of Interest

None declared.

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