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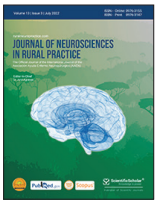

Original Article

Knowledge of stroke and the window period for thrombolytic therapy in ischemic stroke among South Indians: A hospital-based survey with educational intervention

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ABSTRACT

Objectives: The objective of this study was to determine the awareness of stroke in regards to the risk factors, warning symptoms, and knowledge of the therapeutic window period among varied strata of non-medical people attending a tertiary care center.

Materials and Methods: The interventional study involved the collection of data regarding awareness of stroke using a structured questionnaire with a total score of 16. Pre-intervention assessment was followed by intervention in the form of education regarding awareness of stroke administered one-on-one for personalized and effective comprehension by subjects. Then, subjects were asked to recall the information that was delivered to them and were scored accordingly.

Results: Among the 500 subjects included, 51% were female. About 76.8% of participants were young (age <50 years), and 83.4% were literate. Only 25.4% of participants were aware of the brain as the site of stroke. About 32.2% of candidates were aware of a few risk factors for stroke. Among them, the majority of participants were aware of hypertension (24%) as a risk factor. The most known warning symptom was "Numbness" or weakness of arm. The majority of the subjects (97.8%) were unaware of a therapeutic window period for stroke being 4.5 h or below. The mean pre-intervention score was 2.52 ± 1.65 while the mean post-intervention score was 15.10 ± 1.79 ($P < 0.0001$).

Conclusion: The study showed that even among literate participants, only a meager number of subjects were aware of the golden window period of intravenous thrombolysis. Educational intervention by means of an in-person and one-on-one explanation achieved significant levels of understanding of stroke. The study could be used to formulate large-scale educational programs that focus on spreading awareness of symptoms and risk factors while also instilling the importance of timely medical intervention for efficient thrombolytic therapy.

Keywords: Stroke, Warning symptoms, Thrombolysis, Risk factors

INTRODUCTION

Stroke is the second-leading cause of mortality and the third-leading cause of morbidity worldwide.[1] The ischemic type of stroke accounts for about 87% of cases worldwide. The incidence of stroke in India is higher when compared to the western world. Reasons for this trend are inadequate control of its risk factors, due to the lack of awareness.[2]

India's stroke-related disability-adjusted life years loss around the period of 2004 was 597.6/100,000 person-years, higher than that of many developed countries.[3] A crucial predictor of favorable outcomes after stroke is its prompt treatment within a narrow therapeutic window period.[4,5] Thrombolytic therapy comprises the use of recombinant tissue plasminogen activator drugs such as alteplase and tenecteplase. There is a provision for endovascular thrombolysis for ischemic stroke with an extended window period of 6–24 h.[6] Still there is a delay in seeking medical attention after a stroke, which may be due to lack of recognition of its warning symptoms and carers being unaware of the window period for obtaining treatment. The advantages of facial asymmetry, arm weakness, speech, and time (FAST) and balance, vision, and FAST (BE FAST)[7] for the recognition of warning symptoms of stroke have been seen, but there is a lack of studies that document awareness of the therapeutic window period of ischemic stroke in populations.

Objectives

The objective of the study was to determine the awareness of stroke in regards to the risk factors, warning symptoms,

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and knowledge of the therapeutic window period among varied strata of non-medical people attending a tertiary care hospital. This study will then aim to subsequently educate the people interviewed, imparting proper information regarding stroke, which will include its risk factors and symptoms, with special emphasis being given to convey that the disease is a medical emergency due to its narrow therapeutic timeframe.

MATERIALS AND METHODS

The study was conducted at our hospital from August 2022 to September 2022. Ethical clearance has been obtained from our institutional review. All participants provided informed consent. An observational cross-sectional study with interventions in the form of education was done in the outpatient department of the hospital with 500 randomly selected subjects of age 18 and above. The sample size was calculated using the mean proportions of the previous four studies. Participants were selected based on inclusion and exclusion criteria. All consenting adults of age 18 and above were included in the study. Persons below the age of 18 years, those with a linguistic or cognitive inability, medical employees, and people with a prior stroke history were excluded from the study. Data was collected using a structured questionnaire made to conduct the interview, and the answers were all face validated. The interview was done by a medical undergraduate trained in stroke assessment and able to communicate in the local language of the subject. The questionnaire starts with demographic data on the subject with the addition of a question about any vascular risk factors that may make them susceptible to stroke, namely, diabetes, hypertension, smoking, and alcohol consumption. The education status of subjects was also enquired about.

Pre-intervention assessment

The questionnaire consists of a few preliminary questions (question numbers 1 and 2) assessing basic knowledge regarding stroke, and then closed and open-ended questions were asked to assess the subject's knowledge about the disease. Subjects were asked if they were aware of the thrombolysis window period of stroke and if they thought stroke required emergency medical attention. Subjects were then scored on their knowledge of risk factors (Question number 4) with a score of 10, warning symptoms (Question number 6) with a score of 5, and window periods of thrombolysis (Question number 8) with a score of 1 point. Scoring was done out of a total of 16 points and graded as good (≥75%), average (50–75%), and poor (<50%).

Intervention (Education)

Intervention in the form of education was administered one-on-one for personalized and effective comprehension by subjects. The subjects were educated on ten risk factors for stroke , namely diabetes, hypertension, smoking, alcohol, obesity, dyslipidemia, obstructive sleep apnea (OSA), migraine, use of oral contraceptive pills, and consumption of organ meat and red meat. A minimum of three repetitions of these risk factors were done in a steady manner with explanations given for migraine and obstructive sleep apnea to all subjects and any other risk factor when enquired upon by interested subjects. Warning symptoms and signs were also educated to the participants. All the components of BE FAST[7] were included while imparting knowledge to raise awareness of the warning symptoms of stroke in this study, although with the usage of a novel and creative demonstrative technique for better comprehension and recall. The novel demonstrative technique was the pointing out of parts of the body in serial order beginning from the cranial end and going towards the caudal end while the symptoms associated with these parts were explained simultaneously. The parts of the body shown are the head, eyes, mouth, face, and limbs successively. The importance of receiving emergency medical attention after a stroke as well as obtaining said services within the golden hour of 4.5 h for intravenous thrombolysis in cases of acute ischemic stroke was strongly emphasized.

Post-intervention assessment

Subjects were asked to recall the information that was delivered to them and were scored accordingly. The scoring system was the same as the pre-intervention system [Supplementary File: Pro forma]. Scores before and after the educational intervention were compared to evaluate the intervention's efficacy.

Statistical analysis

All the data obtained was analyzed using SPSS version 18.0 statistical software. Mean, standard deviation, and proportions were calculated for various values. A Chi-square test was used to assess the univariate relationship between components of stroke knowledge. Multivariate logistic regression was used to assess the predictors of knowing a single correct response to various questions. $P < 0.05$ was considered significant, and a 95% confidence interval was set for analysis.

RESULTS

Baseline characteristics

Among 500 subjects, 245 (49%) were male while 255 (51%) were female. The baseline characteristics of participants are provided in Table 1. Of the 417 literate subjects, the level of education was enquired about, the data for which is provided in Table 2. Two introductory questions (Question 1 and 2) were posed to the subject to determine whether to move

Table 1: Baseline data.

Baseline data	
Age range (in years)	18–85
Mean age (in years)	38.148±14.6
Variables	**Frequency (*n*)**
Age<50 years	76.8 (384)
Age≥50 years	23.2 (116)
Male	49 (245)
Female	51 (255)
Unemployed	55.8 (279)
Employed	44.2 (221)
Literate	83.4 (417)
Illiterate	16.6 (83)
Subjects with no vascular risk factors	65.8 (329)
Subjects with vascular risk factors	34.2 (171)

Table 2: Education level.

Educated up to	**Frequency (*n*)**
Elementary	4.6 (23)
Graduate	14.8 (74)
High school	37.6 (188)
Middle school	16.6 (83)
Postgraduate	3 (15)
Professional degree	6.8 (34)

forward with the stroke knowledge assessment or to directly begin with the educational intervention. Question 1 was "Do you know what a stroke is?," 99.6% (498) subjects responded in affirmative, while 0.4% (2) subjects responded in negative, the latter of which were directly given educational intervention. Question 2 asked, "Where in the body does a stroke occur?," of which 25.4 (n = 127) participants replied with "brain," 74.4% (n = 372) were not aware of the site of the stroke, and 0.2% (n = 1) subjects responded with "heart."

Awareness of risk factors for stroke

Pre-intervention, 32.2% of subjects (n = 161) answered "Yes" when asked if they were aware of any risk factors for stroke in the manner of a yes/no close-ended question. When asked an open-ended question about elaborating known risk factors, it was found that the risk factor most commonly known by subjects was "Hypertension" at 24% (n = 120). The least known risk factor was "obstructive sleep apnea" at 0% (n = 0). Post-intervention, only an open-ended question was asked in relation to risk factors to assess recall. Pre- and post-intervention awareness of risk factors is given in Table 3.

Awareness of warning symptoms or signs of stroke

Pre-intervention, when asked if subjects were aware of any symptoms, 99% (n = 495) replied "Yes." Of which the most commonly known warning symptom was "Numbness or weakness of arm" at 97.8% (n = 489), followed by "uneven face or facial asymmetry" at 39.4% (n = 197), "loss of balance" at 31.6% (n = 158), "difficulty speaking" at 19.6% (n = 98), and "loss of vision in one or both eyes" at 7.2% (n = 36). Post-intervention, an open-ended question assessing knowledge of warning symptoms was posed. In descending order of ability to recall, the most known warning symptom was "Numbness or weakness of arm" at 99.8% (n = 499), followed by "Difficulty speaking" at 98.6% (493), "Uneven face/facial asymmetry" at 97.4% (n = 487), "Loss of vision in one or both eyes" at 96.4% (n = 482), and "Loss of balance" at 95.4% (n = 477). Pre- and post-education values of warning symptoms and signs are given in Table 4A.

Awareness of the thrombolysis window period for acute ischemic stroke

Pre-intervention, a question was posed to the subjects asking if they thought a stroke warranted emergency medical attention; 63.2% (n = 316) answered with a "Yes." Subsequently, they were asked if they were aware of a therapeutic window period for stroke and to elaborate if yes. About 2.2% (n = 11) of the subjects answered with knowledge of the window period being 4.5 h or below. Post-intervention, 100% (n = 500) subjects said that they now know that stroke warrants emergency medical attention, and 99.4% (n = 497) were able to recall the thrombolysis window period of acute ischemic stroke. The data for pre- and post-education awareness of the thrombolysis window period of acute ischemic stroke is given in Table 4B.

Pre- and post-education total scores and remarks

The average of the pre-intervention total scores is 2.52 ± 1.65 while the average of the post-intervention total scores is 15.10 ± 1.79. t-value of the total scores pre- and post-intervention is 115.54, and $P < 0.0001$, which is extremely statistically significant [Table 5]. Remarks for the subjects total scores pre-education were "poor" for 98.6% (n = 493), "average" for 1.4% (n = 7), and "good" for none of the subjects. Remarks for the subjects total scores post-education were "poor" for 0.6% (n = 3), "average" for 4.6% (n = 23), and "good" for 94.8% (n = 474).

DISCUSSION

Study showed that 99.6% of participants are aware of a stroke, but the majority were unaware about the risk factors, warning symptoms, and thrombolysis window period of ischemic stroke. Post-education, the scores significantly improved indicating the efficacy of our educational intervention.

Hickey *et al.*[8] reported that 71% of participants could correctly list two or more risk factors for stroke, typically generic lifestyle

Table 3: Pre- and post-education values of awareness of risk factors of stroke.

Awareness of risk factors	Pre-education frequency	Post education frequency	Chi square	DF	*P*-value
Diabetes	14.2	98.4	719.68	1	<0.0001
Hypertension	24	99.6	604.64	1	<0.0001
Smoking	8.2	98.6	820.19	1	<0.0001
Alcohol consumption	2	98	920.67	1	<0.0001
Obesity	3.6	96.2	856.62	1	<0.0001
Dyslipidemia	0.6	88.8	785.97	1	<0.0001
Obstructive sleep apnea	0	79.6	660.46	1	<0.0001
Migraine	0.2	85	734.47	1	<0.0001
Oral contraceptives	0.2	88.2	784.17	1	<0.0001
Consumption of organ meat and red meat	1.8	93.6	843.66	1	<0.0001

DF: Degree of freedom

Table 4A: Pre- and post-education values of warning symptoms/signs of stroke.

Awareness of warning signs/symptoms	Pre-education frequency	Post education frequency	Chi square	DF	*P* value
Loss of balance	31.6	95.4	438.61	1	<0.0001
Loss of vision in one or both eyes	7.2	96.4	795.9	1	<0.0001
Uneven face	39.4	97.4	388.7	1	<0.0001
Numbness or weakness of arm	97.8	99.8	8.42	1	0.0037
Difficulty speaking	19.6	98.6	644.83	1	<0.0001

Table 4B: Pre- and post-education data for awareness of thrombolysis window period of acute ischemic stroke.

Awareness of thrombolysis window period of stroke	Pre-education frequency	Post-education frequency	Chi-square	DF	*P* value
Yes	2.2	99.4	944.08	1	<0.0001
No	97.8	0.6	944.08	1	<0.0001

DF: Degree of freedom

Table 5: Pre- and post-education total scores and data for various subgroups.

Subgroups	Pre-education mean and SD	Post-education mean and SD	*t*-value	*P*-value
Age < 50	2.56 ± 1.62	15.26 ± 1.544	111.3	<0.0001
Age ≥ 50	2.39 ± 1.74	14.69 ± 2.01	49.83	<0.0001
Male	2.61 ± 1.64	15.29 ± 1.54	88.22	<0.0001
Female	2.43 ± 1.66	14.97 ± 1.78	82.27	<0.0001
Unemployed	2.28 ± 1.52	15.05 ± 1.52	99.22	<0.0001
Employed	2.82 ± 1.76	15.23 ± 1.59	77.78	<0.0001
Literate	2.61 ± 1.68	15.21 ± 1.55	112.56	<0.0001
Illiterate	2.09 ± 1.52	15.6 ± 0.77	72.23	<0.0001
Elementary educated	1.52 ± 0.99	14.13 ± 2.05	26.56	<0.0001
Graduate	2.89 ± 1.8	15.04 ± 1.77	41.4	<0.0001
High school educated	2.34 ± 1.37	15.27 ± 1.5	87.27	<0.0001
Middle school educated	2.32 ± 1.35	15.37 ± 1.28	63.9	<0.0001
Postgraduate	4.33 ± 2.76	14.66 ± 2.12	11.49	<0.0001
Professional degree	4.14 ± 1.98	15.82 ± 0.62	32.82	<0.0001
No vascular risk factors	2.46 ± 1.59	15.28 ± 1.5	131.14	<0.0001
With vascular risk factors	2.63 ± 1.77	14.82 ± 1.93	104.08	<0.0001

SD: Standard deviation

risk factors in Ireland and that less than 50% would call for an ambulance in the event of a stroke. Studies by Pandian *et al.* from Northwest India[9,10] conveyed that 45% of the subjects did not recognize the brain as the affected organ in stroke, and a higher education correlated with a better knowledge of the organ affected. Participants who had received higher

education did show a better awareness of stroke understanding in our study. Postgraduates and professional degree holders had the highest pre-intervention scores while subjects, who had no formal education or were illiterate and those educated up to elementary school had lower scores, indicating the role of education in raising awareness of stroke.

Awareness of risk factors improved significantly post-intervention (education). Hypertension was the major risk factor most known to participants; similar findings were reported from South India.[11] Hypertension was also the most known risk factor in an interventional study conducted in Saudi Arabia.[12] Pre-education, numbness or weakness of a part of the body was the most recognized symptom of stroke in the present study. Similar findings were observed in previous studies,[10,11,13] but the percentage was much higher. This may be attributed to the fact that the present study was conducted in a tertiary care hospital in a metropolitan city, and hence, it is to be expected that the majority of the participants are living in urban areas with comparatively higher levels of education due to the abundance of educational institutions. It may also be due to the fact that patients and their relatives coming to the hospital, especially those who have come to seek a neurology opinion, are more aware.

A previous study[14] reported that public awareness campaigns significantly increased awareness of symptoms but did not increase the need for emergency response in people. It is also known that knowledge of stroke symptoms may not be associated with the intention to seek emergency services.[15] We explained to the subjects the necessity of calling an ambulance, but the problem they faced was the difficulties in transportation to the hospital in the event of an emergency, which is consistent with prior studies.[16]

The present study added data to the literature about stroke disease awareness, which focuses on the lack of knowledge regarding stroke and its window period among these subsets of Hyderabad population. The study is the first of its kind in India and is novel in its effort to not utilize any audio-visual or multimedia aids to impart education. Thus, making stroke educational programs accessible to all areas of the country including the impoverished and rural regions. Long-term studies will need to be conducted to ensure continued effectiveness.

Limitations

The results represented only a subset of population from South India, who arrived at the hospital. The study was a single center-based cross-sectional study. Information bias could also exist. Selection bias might have also happened since the sample was not randomly chosen but rather gathered from the outpatient department.

CONCLUSION

The study showed that even among literate participants only a meager number of subjects were aware of the golden window period of intravenous thrombolysis. Educational intervention by means of an in-person and one-on-one explanation by a trained educator utilizing demonstrative and coupling techniques to aid recall and without the use of any multimedia devices or audio-visual aids achieved a significant degree of understanding of stroke, risk factors, warning symptoms, and the narrow thrombolysis window period. The long-term efficacy of such a model of educational intervention should be reviewed. This study could be used to formulate educational programs that focus on spreading awareness of symptoms and risk factors while also instilling the importance of timely medical intervention for efficient thrombolytic therapy.

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Ethical approval

The research/study approved by the Institutional Review Board at Deccan College of Medical sciences, number 2022/36/007, dated 23/7/2022.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the

writing or editing of the manuscript and no images were manipulated using AI.

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