Knowledge of stroke among stroke patients and their relatives in Northwest India

Jeyaraj Durai Pandian, Guneet Kalra, Ashish Jaison, Sukh binder Singh Deepak, Shivali Shamsher, Yashpal Singh, George Abraham*

Stroke Unit, Department of Neurology, Christian Medical College, Ludhiana, Punjab - 141 008, India, *Saint Vincent Hospital at Worcester Medical Centre, Worcester, MA 01608-1320, USA

Background: The knowledge of warning symptoms and risk factors for stroke has not been studied among patients with stroke in developing countries. Aims: We aimed to assess the knowledge of stroke among patients with stroke and their relatives. Settings and Design: Prospective tertiary referral hospital-based study in Northwest India. Materials and Methods: Trained nurses and medical interns interviewed patients with stroke and transient ischemic attack and their relatives about their knowledge of stroke symptoms and risk factors. Statistical Analysis: Univariable and multivariable logistic regression were used. Results: Of the 147 subjects interviewed, 102 (69%) were patients and 45 (31%) were relatives. There were 99 (67%) men and 48 (33%) women and the mean age was 59.7±14.1 years. Sixty-two percent of respondents recognized paralysis of one side as a warning symptom and 54% recognized hypertension as a risk factor for stroke. In the multivariable logistic regression analysis, higher education was associated with the knowledge of correct organ involvement in stroke (OR 2.6, CI 1.1– 6.1, P=0.02), whereas younger age (OR 2.7, CI 1.1–7.0, P=0.04) and higher education (OR 4.1, CI 1.5–10.9, P=0.005) correlated with a better knowledge regarding warning symptoms of stroke. Conclusions: In this study cohort, in general, there is lack of awareness of major warning symptoms, risk factors, organ involvement and self-recognition of stroke. However younger age and education status were associated with better knowledge. There is an urgent need for awareness programs about stroke in this study cohort. Key words: Stroke, awareness, patients, knowledge, risk factor, India.

Materials and Methods

The Stroke section, Department of Neurology in a tertiary referral centre in Northwest India, conducted this study and the study period was 15 months, from June 2002 to September 2003. Stroke and transient ischemic attack (TIA) patients admitted through emergency department and their relatives formed the subjects. Trained nurses and medical interns conducted a standardized structured interview with open-ended questions. The questionnaire was adapted and modified from a previous survey among general public conducted in Northwest India. The first section of the questionnaire gathered demographic information. Education was categorized into illiterates, primary (below 5th standard), secondary (6th standard to 12th standard) and college education. Income was classified into upper (Indian National Rupees > 5000 per month) and lower (Indian National Rupees ≤ 5000 per month) income groups. In section two, the time of onset of stroke, patients or relatives’ initial reaction to stroke symptoms, onset to arrival time to the hospital, were noted. The patients do not seek immediate medical attention. Even in developed countries like USA, UK and France there is a lack of knowledge among stroke patients about warning symptoms and risk factors. In a multi-centre survey in USA, over one-half of patients at increased risk for stroke were unaware of their risk factors. Intravenous (IV) recombinant tissue plasminogen activator (rt-PA) is being used for acute ischemic stroke in India. Knowledge about stroke warning symptoms and risk factors are essential for the patients to effectively utilize the thrombolytic therapy for acute stroke. There are no studies from India and other developing countries regarding stroke patients’ knowledge about warning symptoms and risk factors. We aimed to assess the knowledge of stroke warning symptoms and risk factors among stroke patients and their relatives.

Introduction

Despite recent advances in stroke therapy, the majority of stroke
time of onset of stroke was defined as the time neurological deficit was first noticed by the patient or a relative or caregiver. When the symptoms were first noted on awakening, the time of awakening was recorded as the time of onset because it represents the time when medical help could be sought.\textsuperscript{[13-12]} The third section consisted of questions to explore the knowledge of organ affected in stroke, warning symptoms and risk factors for stroke. There were options for multiple responses, in questions concerning warning symptoms and risk factors for stroke. The type of stroke (ischemic or hemorrhagic), neurological findings and patients’ risk factors were documented in the fourth section of the questionnaire. When the stroke patients were unable to participate because of speech and language involvement or altered sensorium, one of the relative was interviewed. The questions were asked during a one-to-one interview in the local vernacular language (either Punjabi or Hindi). No attempt was made to prompt the respondents by suggesting answers directly. The questionnaire was pretested using a sample of 25 patients. Changes were made in the questionnaire to various terms that are used for “stroke” in the local languages Punjabi and Hindi. This was done entirely to differentiate heart attack and stroke in the local language. To minimize the in-hospital stroke education, all subjects were interviewed within 48 hours of admission.

We compared the knowledge of stroke between different groups; early arrivers (who arrived in hospital less than 26 hours after the onset of stroke) versus late arrivers (who arrived in hospital more than ≥6 hours of the onset of stroke) and between patients and relatives.

**Statistical analysis**

All statistical analysis was performed using SPSS software version 10.05 (SPSS Inc. Chicago, Illinois). $\chi^2$ tests were used to assess the univariable relationship between components of stroke knowledge, warning symptoms, risk factors and demographic variables. Multivariable logistic regression was used to assess the predictors of knowing a single correct response to various questions. Variables included in the model were age (less or more than 60 years), gender, religion (Hindus vs. others), education (lower [illiterates and primary] vs. higher [secondary and college education]), income (upper vs. lower) and place of residence (urban vs. rural). Variables were eliminated in a stepwise backward fashion if they failed to reach significance ($P<0.05$) until a final model resulted. Finally, odds ratios (OR) and 95% CI were generated for all the terms in the final models. $\chi^2$ test and Fisher’s exact tests were used to compare the knowledge of stroke between different groups. The hospital research committee had approved this study and informed consent was obtained from the patient or the relative.

**Results**

Of the 173 subjects contacted, 147 subjects consented to participate in the study. One hundred and two (69%) men and 48 (33%) women. The mean age was 59.7 ± 14.1 years (range 23-95 years). The demographic characteristics of the study cohort was similar to that of the population of Punjab,\textsuperscript{[14]} except for the elderly age group (>60 yrs) and the place of domicile [Table 1]. The proportion of elderly subjects was higher (52%) than the population of Punjab (9%).\textsuperscript{[14]} Sixty-two percent of the study cohort were from urban area as compared to the population of Punjab (34%).\textsuperscript{[14]}

**Subjects’ initial reaction to stroke symptoms**

One-hundred and seven subjects (73%) were not aware that the initial symptoms were due to stroke. Fifty-six (38%) subjects reached the hospital immediately. The rest consulted a private doctor 86 (59%) or called a relative 5 (3%).

**Organ affected in stroke**

Only one third of the subjects interviewed recognized that the organ injured in stroke is brain [Figure 1]. In the univariable analysis higher education (OR 2.3, CI 0.16–3.1, $P=0.02$) was associated with a better knowledge about the organ injured in stroke [Table 2]. In the multivariable logistic regression analysis,
higher education remained a significant factor of knowing the correct organ involved in stroke [Table 3].

**Warning symptoms**

The most common warning symptom described by the subjects was paralysis of one side of the body 91 (62%) [Figure 2]. Fifty (34%) subjects correctly identified one symptom, 42 (29%) identified two symptoms, only 12 (8%) knew three or more symptoms, while 43 (29%) did not know even a single warning symptom. In univariable analysis, younger age (OR 2.4, CI 1.1–5.1, \(P=0.04\)) and higher education (OR 3.3, CI 1.5–6.9, \(P=0.006\)) correlated with knowing at least one warning symptom [Table 2]. In multivariable logistic regression, both younger age and higher education remained significant [Table 3].

**Risk factors**

Hypertension 79 (54%) and diabetes 45 (31%) were the two most common risk factors identified by the study cohort [Figure 3]. Only 55 (37%) of the subjects could identify one risk factor correctly; 31 (21%) subjects two risk factors and only 19 (13%) 3 or more risk factors. In the univariable analysis, higher education (OR 2.0, CI 0.98–4.1, \(P=0.03\)) correlated with better knowledge of at least one risk factor [Table 2]. However, in the multivariable logistic regression analysis, none of the variables reached any statistical significance.

**Risk factor recognition among high risk individuals**

There were 120 (82%) subjects who had various risk factors for stroke. A high proportion of subjects with hypertension 64/93 (69%) and diabetes 36/50 (72%) were able to correctly identify their risk factors for stroke. However, a very low proportion of cohort who had other risk factors such as heart disease 4/18 (22%), dyslipidemia 11/38 (29%) and smoking 13/36 (36%) could recognize their own risk factors for stroke.

**Comparison of knowledge of stroke between different subgroups**

We compared the knowledge of stroke between early (n=61, 41%) and late arrivers (n=86, 59%) to the hospital and also between the patients (n=102, 69%) and the relatives (n=45, 31%). We did not find any differences between the two groups with regards to knowledge about organ involved in stroke, warning

### Table 2: Responses to major stroke awareness questions

<table>
<thead>
<tr>
<th>Age</th>
<th>(%)</th>
<th>Organ affected</th>
<th>Aware</th>
<th>Not aware</th>
<th>%</th>
<th>Symptoms</th>
<th>Aware</th>
<th>Not aware</th>
<th>%</th>
<th>Risk factors</th>
<th>Aware</th>
<th>Not aware</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\leq)60  (n=70)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;60 (n=77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men (n=99)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women (n=48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher (n=72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower (n=75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper (n=60)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower (n=87)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religion‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindus (n=82)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (n=65)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban (n=91)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural (n=56)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Education- lower (Illiterate and primary), higher (secondary and college), †Income-lower (<Rupees 5000), upper (>Rupees 5000), ‡Religion- Others (Sikhs, Muslims and Christians), \(*P<0.05, \(*P=0.006\)

### Table 3: Final model in multivariable logistic regression analysis

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Odds ratio</th>
<th>Confidence interval</th>
<th>(P) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organ involved in stroke</td>
<td>Higher education</td>
<td>2.6</td>
<td>1.1–6.1</td>
</tr>
<tr>
<td>Warning symptoms</td>
<td>Younger age</td>
<td>2.7</td>
<td>1.1–7.0</td>
</tr>
<tr>
<td>Higher education</td>
<td>4.1</td>
<td>1.5–10.9</td>
<td>0.005</td>
</tr>
</tbody>
</table>

![Figure 2: Responses to the question warning symptoms of stroke](image-url)
Patients' awareness about stroke

Williams LS, Bruno A, Rouch D, Marriott DJ. Stroke patient's knowledge of stroke: 
es in patients admitted to a French Stroke Unit. J Neurol Neurosurg Psychiat 1997; 54 | Issue 2

Carroll C, Hobart J, Fe, ev Neurol K

Neurology India | June 2006 | V

tures. However educational opportunities are more in the urban than in the rural 
(62%) of our patients were from urban area and in India 
higher education. The plausible explanation is that, majority 
of our subjects were able to identify other warning 
symptoms and risk factors.

Cincinnati (26% and 27%, respectively).

21% in the F

study 
and 40% in the UK study, but was similar to other studies, 21% in the France study[4] and 25% in the Indianapolis study.[1]

The knowledge regarding the organ injured in stroke in our 
cohort was less (33%) when compared to the study in Cincinnati (49%).[2] A small proportion of our subjects (2%) were unable to 
differentiate heart attack from stroke. In a recent survey conducted 
among the general public in Northwestern India,[9] 10% of the 
respondents had difficulty in differentiating heart attack and 
stroke. Recognizing symptoms of stroke in the community is more 
difficult than recognizing heart attack, because stroke symptoms 
are more heterogeneous.[1]

The majority of our respondents correctly answered paralysis 
of one side (62%) as a warning symptom and hypertension (54%) 
as a risk factor for stroke as compared with the study from 
Cincinnati (26% and 27%, respectively).[2] However, only a 
minority of our subjects were able to identify other warning 
symptoms and risk factors.

We found a positive relationship between stroke knowledge and 
higher education. The plausible explanation is that, majority 
(62%) of our patients were from urban area and in India 
educational opportunities are more in the urban than in the rural 
areas. However, Kothari et al[2] did not find any correlation between 
better awareness and education. Most studies on public awareness 
of stroke from developed countries have found that knowledge 
about stroke varies positively with education.[16-18]

We acknowledge the limitations of our study. Firstly, we 
terviewed the family members when the patients were unable to 
participate, because of dysphasia or altered sensorium. The sample 
may not fully reflect the knowledge of stroke among stroke 
population. In India, the structure of the family is different from 
the developed world. Approximately 26% of the population in 
Punjab lives in a joint family system i.e. two or three families live 
together in a single house, with their parents.[19] It is highly 
essential in an Indian family setup, for the relatives of stroke 
patients to be aware of the warning symptoms and risk factors. 
This is one principal reason why we included the relatives of stroke 
patients in our study. Moreover, knowledge of stroke did not differ 
between patients and relatives. Secondly, this is a hospital-based 
study with a small sample size and may not exactly represent the 
entire population of Punjab, hence the findings limits 
generalisability. Moreover, India is a vast country with diverse 
socio-cultural and linguistic practices. Our findings can not be 
extrapolated to other states in the country. Thirdly, the observations 
in the present study is not different from a previous study of 
awareness of stroke among the general public in Northwestern 
India.[9] The added value of this study is that it provides new 
information for the first time, regarding the knowledge of stroke 
among stroke patients in a developing country. Moreover, this 
study would enable us to develop appropriate educational 
campaigns for the stroke patients and their relatives to improve 
the prevention and early treatment of stroke.

In conclusion, we observed a better knowledge in our study cohort, 
to some of the warning symptoms and risk factors. However, the 
awareness of other major warning symptoms, risk factors, organ 
involved in stroke and self-recognition of stroke symptoms were 
poor: Community based studies are required in the future including 
both urban and rural populations to confirm our findings. There is 
an urgent need to educate our patients and their relatives and such 
educational programs should also target high risk groups.

Acknowledgements

We sincerely thank Mrs. Soosamma Vergeshe and Ms. Devinder Kaur for their assistance 
in data collection. We are grateful to Mr. Douglas J Lincoln MBiostat, Royal Brisbane and 
Women’s Hospital Research Foundation, Brisbane, for his help in the statistical analysis.

References

1. Williams LS, Bruner A, Ronch D, Marriott DJ. Stroke patient’s knowledge of stroke: 

Accepted on 20-03-2006

Invited Comments

This is the first study to assess knowledge of stroke warning symptoms and risk factors in Northwestern India stroke and transient ischemic attack (TIA) patients and their relatives. This is obviously a crucial issue as increased awareness may lead to improved acute management and better prevention of cerebrovascular diseases.

The present paper demonstrates an urgent need for public education, similar to what has been observed in the Western countries; lower educational status was associated with poor stroke awareness, only 33% of individuals could correctly identify brain as the involved organ in stroke and the majority of patients did not realize that they were experiencing symptoms of stroke.

Reducing delays in patient response to stroke symptoms may have the greatest impact on emergency treatment rates (thrombolysis for ischemic stroke and ultra-early hemostatic therapy for intracerebral hemorrhage in the future). The California Acute Stroke Pilot Registry Investigators have recently shown that if all ischemic stroke patients whose strokes did not occur overnight had attributed their symptoms to stroke and had made an immediate call to Emergency Medical Services (EMS), the rate of thrombolytic treatment would have been as high as 29%. Potential strategies for increasing the rate of thrombolysis for stroke include educating people at risk of stroke and the general public about the stroke warning signs and the immediate proper response, improving emergency responses to calls and improving in-hospital management of stroke.

However, optimizing patient response and reducing delays in seeking help may be difficult. The discontinuity between knowledge, attitude and behaviour change has long been disconcerted by health educators. More important than stroke awareness is probably behaviour in the event of a stroke. Indeed, knowledge of stroke symptoms has not been consistently associated with early admission and it has recently been shown that perceptual, social and behavioral factors are associated with delays in seeking medical care in patients with symptoms of acute stroke. The patient’s perception of the severity of his symptoms and the extent of perceived control over them influence “reaction times”. In the setting of TIA, despite the high risk of stroke in the hours and days after TIA, an English study has demonstrated that patients delay seeking medical attention irrespective of correct recognition of symptoms.

Educational programs should not only increase awareness about the recognition of stroke symptoms but also about the appropriate response. We are facing a communication challenge to develop simple and repetitive messages in order to change behaviours related to stroke. In particular, the benefits associated with behaviour change must be clearly presented. Mass media is most frequently named as a source of information about stroke. However, health education programs should be adapted to population social and cultural characteristics. They should focus on population groups at risk for lack of knowledge about stroke, such as older people or those from an impaired socioeconomic background, who are also at an increased risk of stroke. Patience is required as public education tends to work slowly and behaviour changes are often the result of consistent campaigns over many years.

Laurent Derex
Unité Neurovasculaire, Hôpital Neurologique, 59 boulevard Pinel, 69003 Lyon, France. E-mail: laurent.dereix@chu-lyon.fr

References