

# Knowledge, attitude, and practice in relation to stroke: A community-based study from Kolkata, West Bengal, India

Sujata Das, Avijit Hazra<sup>1</sup>, Biman Kanti Ray<sup>2</sup>, Malay Ghosal<sup>3</sup>, Arijit Chaudhury<sup>4</sup>, Tapas Kumar Banerjee<sup>5</sup>, Shyamal Kumar Das<sup>6</sup>

Neuropsychologist, Fortis Hospitals, <sup>1</sup>Department of Pharmacology, Institute of Post Graduate Medical Education and Research, <sup>2</sup>Department of Neurology, RG Kar Medical College, <sup>3</sup>Department of Psychiatry, Medical College and Hospital, <sup>4</sup>Department of Applied Statistics, Applied Sampling Unit, Indian Statistical Institute, <sup>5</sup>Department of Neurology, National Neuroscience Centre, <sup>6</sup>Department of Neurology, Bangur Institute of Neurosciences, Kolkata, West Bengal, India

## Abstract

**Background:** The rising incidence of stroke in India indicates the importance of evaluating the existing knowledge, attitude, and practice (KAP) in the community, which is essential for stroke control. **Objective:** To explore and compare stroke-related KAP among participants from stroke-affected families (SAFs) and nonstroke-affected families (NSFs). **Design:** Using stratified random sampling, a three-phase house-to-house survey was conducted in Kolkata, West Bengal, India. First, field investigators screened subjects of stroke; second, the neurologist confirmed positive cases; and third, under supervision of the neuropsychologist, a validated questionnaire on KAP was administered to participants from SAFs and age-matched NSAFs from the same neighborhood. **Results:** The KAP questionnaire was administered to 282 participants each from both groups. Knowledge about stroke prevailed in 97% participants and was significantly higher in the SAF group. Both SAF and NSAF groups had better knowledge about prominent symptoms of stroke (loss of consciousness and paralysis) and admitted it as emergency situation requiring hospitalization and that it was potentially preventable. Those persons belonging to the SAF group, however, had lesser knowledge of the risk factors such as diabetes ( $P < 0.001$ ), smoking ( $P < 0.014$ ), alcoholism ( $P < .0.0001$ ), family history ( $P < .0.0001$ ) and mild stroke symptoms such as headache, ( $P < 0.001$ ), vomiting ( $P < 0.001$ ), and fits ( $P 0.003$ ) as compared to the NSAF group. **Conclusions:** Persons from both SAF and non-SAF groups are aware about stroke but possess lesser knowledge about the many symptoms of stroke and risk factors, indicating the necessity of enhancement of existence knowledge on symptoms for better diagnosis and of risk factors for better prevention.

## Key Words

Attitude, India, knowledge, practice, stroke

## For correspondence:

Dr. Shyamal Kumar Das, Quarter No. 74, Minto Park Government Housing Estate, 247/1 Acharya Jagadish Chandra Bose Road, Kolkata - 700 027, West Bengal, India.  
E-mail: das\_sk70@hotmail.com

*Ann Indian Acad Neurol* 2016;19:221-227

## Introduction

Stroke is a major public health problem worldwide. The stroke burden in India has been rising over the past few decades<sup>[1,2]</sup> in comparison to the developed countries where it has reached a plateau or is decreasing.<sup>[3]</sup> It is estimated that at present, approximately 1.8 million Indians out of a population of 1.2

billion suffer from stroke every year and about one-third of them die annually while another one-third are left with some permanent disability. These statistics underscore the urgency with which the phenomenon of stroke needs to be studied in

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

**For reprints contact:** reprints@medknow.com

**How to cite this article:** Das S, Hazra A, Ray BK, Ghosal M, Chaudhury A, Banerjee TK, *et al.* Knowledge, attitude, and practice in relation to stroke: A community-based study from Kolkata, West Bengal, India. *Ann Indian Acad Neurol* 2016;19:221-7.

**Received:** 29-06-15, **Revised:** 08-09-15, **Accepted:** 24-09-15

### Access this article online

Quick Response Code:



Website:

www.annalsofian.org

DOI:

10.4103/0972-2327.176857

India with the goal of reducing the huge stroke burden that the country is facing.<sup>[4]</sup>

Without public knowledge and the right attitude and practices, stroke burden cannot be reduced. For instance, it is important to know that therapeutic opportunities in stroke are limited. Thrombolytics can be used only within the window period, for which early identification of the signs and symptoms of stroke is essential. Delay in hospitalization contributes to high mortality and morbidity in stroke but ignorance about stroke symptoms, poor infrastructure, and hesitancy about hospital admission even when infrastructure and access are available often leads to delay.<sup>[5]</sup> Further, there is a lack of knowledge and indifference about that timely treatment of hypertension and appropriate lifestyle changes that may help to decrease the incidence of stroke and morbidity among stroke-survivors in the long run.<sup>[6]</sup>

Studies on the knowledge, attitude, and practice (KAP) of stroke have mostly been undertaken in developed countries over the last two decades.<sup>[7-14]</sup> Studies from Asia have been undertaken in developed countries such as South Korea and Hong Kong in China<sup>[13,14]</sup> and in some developing countries such as Brazil, Myanmar, Iran, Oman, Pakistan, and India.<sup>[15-21]</sup> The salient characteristics of these studies have been summarized in Table 1.

This study attempts to explore and compare the KAP of stroke among members in stroke-affected families (SAFs) and nonstroke-affected families (NSAFs) in an urban setting in Kolkata, West Bengal, India. The results are intended to help in the planning of community-based stroke prevention and management strategies.

## Materials and Methods

The study was conducted between November 2006 and September 2007 as a house-to-house, cross-sectional study in Kolkata, West Bengal, India — the largest metropolitan city in eastern India. The municipal limits of Kolkata cover a heterogeneous population of 4.58 million<sup>[22]</sup> with Bengali as the predominant language spoken followed by Hindi. The literacy rate is 85%. Hindus (74.7%) comprise the predominant religious group followed by Muslims (23.6%), Sikhs (0.08%), Christians (0.56%), and others. The study protocol was approved by the Institutional Ethics Committee of the Institute of Postgraduate Medical Education and Research (IPGME&R), Kolkata, West Bengal, India. Written informed consent was obtained from each study subject before collecting data.

The municipal area of Kolkata has been demarcated into 5,200 blocks by the National Sample Survey Organization (NSSO) of the Government of India. The NSSO database provides complete information regarding the geographical location, boundaries, type of housing, and slum areas in each block. For sampling purposes, the city was divided into six strata based on the geographical location and presence of slum areas. We deliberately studied the slum or disadvantaged population since this segment constitutes 30-40% of the urban population in India. The dwellers in these areas are socioeconomically disadvantaged with respect to relatively affordable dwellers. A total of 282 blocks were randomly selected from the six strata and 50% of households in each block were surveyed by visiting alternate houses. This allowed a screening of urban individuals from diverse ethnic and educational backgrounds. This study was part of a larger study of stroke (issue of KAP is being reported here) and the principles of sampling strategy have been reported earlier.<sup>[1]</sup>

**Table 1: Summary of previous studies undertaken in different nations to explore the knowledge, attitude, and practice in relation to stroke**

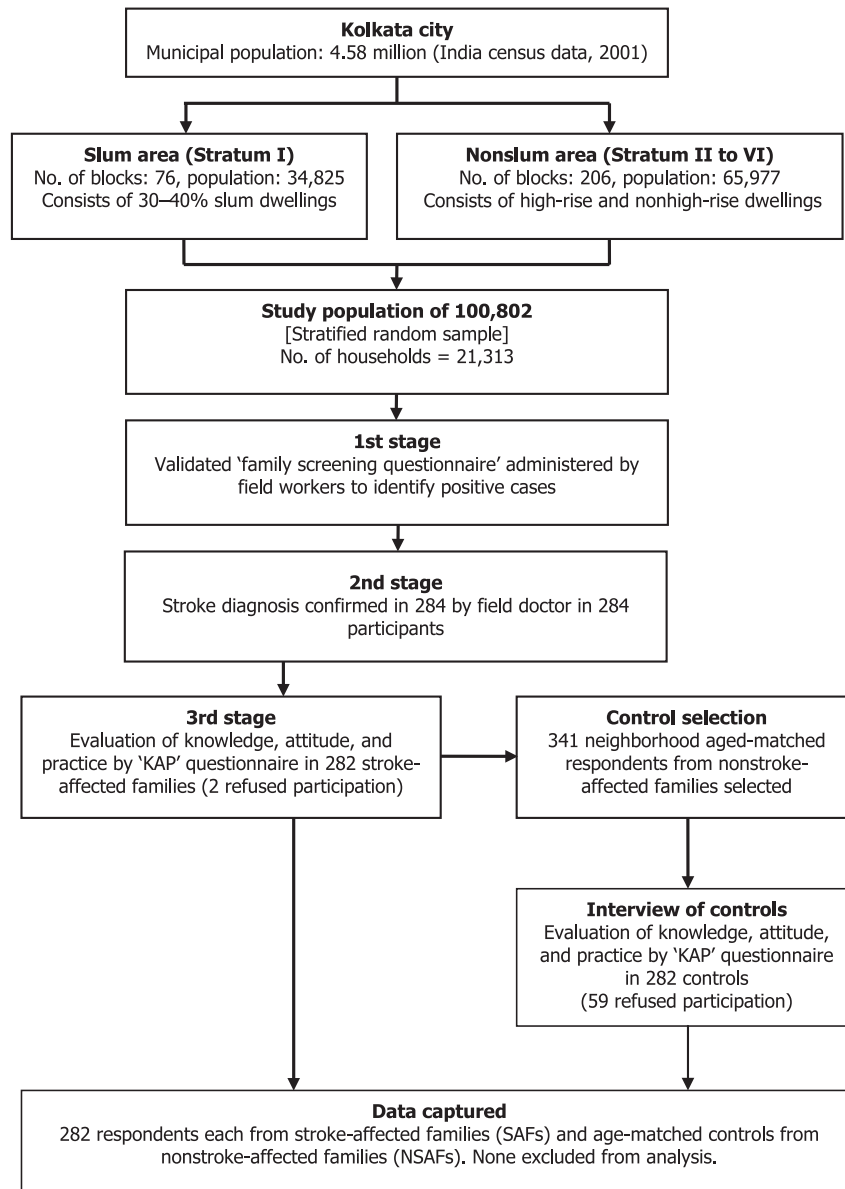
Author & year	Location	Study design	Rural/ urban	Participants	Type of interview
Sloma <i>et al.</i> , 2010 <sup>[7]</sup>	Sweden	Community medical registry	Urban	Transient ischemic attack cases or stroke survivors	Postal
Neau <i>et al.</i> , 2009 <sup>[8]</sup>	France	Population based	Both	General population	Face-to-face
Schneider <i>et al.</i> , 2003 <sup>[9]</sup>	USA	Population-based	Urban	Nonstroke members	Telephonic
Yoon <i>et al.</i> , 2001 <sup>[10]</sup>	Australia	Population-based	Urban	General population	Telephonic
Weltermann <i>et al.</i> , 2000 <sup>[11]</sup>	Germany	C/S survey	Urban	Stroke patients; family members	Face-to-face
Pancioli <i>et al.</i> , 1998 <sup>[12]</sup>	USA	Population-based	Urban	General population	Telephonic
Cheung <i>et al.</i> , 1999 <sup>[13]</sup>	Hong Kong	Population-based	Urban	General population	Telephonic
Kim <i>et al.</i> , 1997 <sup>[14]</sup>	South Korea	Population-based	Urban	General population	Telephonic
Campos-Sousa <i>et al.</i> , 2007 <sup>[15]</sup>	Brazil	Community-based, door-to-door	Urban	General population	Face-to-face
Kyaw and Thu, 2011 <sup>[16]</sup>	Myanmar	Teaching and nonteaching hospitals	Urban	Doctors (internal medicine)	Face-to-face
Haghighi <i>et al.</i> , 2010 <sup>[17]</sup>	Iran	Clinic-based	Urban	Stroke victims and accomplices	Face-to-face
Al Shafae <i>et al.</i> 2006 <sup>[18]</sup>	Oman	Hospital-based	Urban	Subjects with risk factors of stroke	Face-to-face
Aly <i>et al.</i> 2009 <sup>[19]</sup>	Pakistan	Hospital-based	Urban	Nonstroke subjects	Face-to-face
Pandian <i>et al.</i> , 2005 <sup>[20]</sup>	India	Hospital-based	Urban	Relatives of stroke survivors	Face-to-face
Das <i>et al.</i> , 2007 <sup>[21]</sup>	India	Hospital-based	Rural	Stroke survivors and patient accomplices	Face-to-face

C/S = Cross-sectional survey

The survey procedure is depicted in Figure 1. In the first stage, households were screened for stroke cases by four field investigators who had been adequately trained by doctors in the understanding of stroke and administration of “family screening questionnaire” for stroke. Our operational definition of stroke was “rapidly developing clinical signs of focal or global disturbance of cerebral function, with symptoms lasting 24 hours or more or leading to death, with no apparent cause other than vascular origin.”<sup>[23]</sup> The family screening questionnaire is a validated tool that was reported earlier.<sup>[24]</sup> In the second stage, a doctor confirmed screen-positive cases through clinical examination and recorded further clinical details. For inclusion, all sampled individuals had to be residents of Kolkata, West Bengal, India for at least 1 year and with at least one reliable family informant to provide relevant information. Subjects with transient ischemic attacks were excluded. The doctor also randomly examined 10% of screened-negative households in each block to unearth false

negative cases. In the third stage, the field investigators, under supervision of the neuropsychologist, administered the KAP questionnaire. The instrument was administered to caregiver respondents from stroke families as well as age-matched ( $\pm 3$  years) individuals from nonstroke families from the same block who served as controls. “Knowledge” implied general awareness regarding stroke and information about the signs and symptoms of stroke and its risk factors; “attitude” indicated the outlook toward stroke; and “practice” related to behavior in the face of potential stroke events. The frequency of caregivers who responded to the above questionnaires was recorded.

Considering a neurologist’s diagnosis as the gold standard, the “family screening questionnaire” used for detecting stroke cases had a sensitivity of 83.3% and specificity of 99.9%. The KAP questionnaire consisted of 16 main questions out of which 6 had subquestions varying from numbers 2 to 8 [Table 2]. The participants were expected to answer options of “yes,” “no,” or



**Figure 1: Flowchart depicting sampling and data collection in the study**

**Table 2: Comparison of knowledge, attitude, and practice in relation to stroke between participants in stroke-affected families (SAFs) and nonstroke-affected families (NSAFs)**

Question	Response	Stroke-affected family (SAF) [n = 282] (%)	Nonstroke-affected family (NSAF) [n = 282] (%)	P value
<b>Knowledge</b>				
Have you ever heard or read about the disease called stroke?	Yes	98.94	94.68	0.004
If subject does not understand stroke, does he know about brain stroke or paralysis or "ardhanga"?	Yes	95.74	89.36	0.007
Did you ever know anyone who had stroke?	Yes	94.33	70.57	<0.001
Have you ever witnessed a cerebral attack or stroke?	Yes	85.46	45.04	<0.001
Do you have knowledge about the following symptoms of stroke?				
Loss of consciousness	Yes	74.11	74.11	0.171
Paralysis of one half of the body or part of the body	Yes	91.49	86.52	0.165
Headache	Yes	59.22	67.02	<0.001
Vomiting	Yes	40.78	52.84	<0.001
Fits	Yes	23.76	33.33	0.003
Is cerebral stroke an emergency requiring medical management as is the case for cardiac attack?	Yes	85.11	79.43	0.210
Is there any urgent period in the treatment of stroke when it can be reversed?	Yes	81.21	82.27	0.856
Are you aware of factors that predispose to stroke:				
Age	Yes	26.95	44.68	<0.001
Sex	Yes	14.54	27.30	<0.001
Hypertension	Yes	83.33	83.69	0.233
Diabetes	Yes	61.70	74.47	<0.001
Obesity	Yes	34.04	39.36	0.269
Smoking	Yes	33.33	43.26	0.014
Alcoholism	Yes	27.30	41.99	<0.001
Family history	Yes	28.37	40.43	<0.001
Is stroke a familial disease?	Yes	17.73	40.78	<0.001
Is stroke an infectious disease?	No	79.79	65.25	<0.001
<b>Attitude</b>				
Do you think people with stroke can be reemployed in their job?	Yes	59.22	48.94	<0.001
Can stroke be prevented?	Yes	68.09	66.67	0.556
What will be your advice to a person who has no stroke earlier?				
Control of risk factors before stroke	Yes	71.99	76.95	0.398
Only take precaution after stroke occurrence	No	43.26	53.55	0.008
<b>Practice</b>				
What should you do if you see a patient just getting an attack?				
Advise to take rest	Yes	10.28	17.73	0.033
Get him to local hospital immediately	Yes	85.82	82.62	0.002
Call a doctor	Yes	46.45	40.07	0.027
Take time to allow him to recover spontaneously	No	79.43	75.18	0.384
Are you aware about the best option for stroke?				
Prevention	Yes	66.31	70.21	0.116
Treatment	Yes	39.72	41.13	0.345
Are you aware of the most useful method for recovery?				
Medication	Both	78.72	63.83	<0.001
Physiotherapy				
Both				

"uncertain." Out of these questions, four had strong intrarater agreement [intraclass correlation coefficient (ICC) > 0.7], nine had good agreement (ICC 0.6–0.7), and the remaining three had ICC < 0.6. The latter were modified appropriately. One question that was related to sexual activities was omitted. Regarding interrater agreement, all questions had strong agreement (ICC values > 0.9) barring two that had good agreement (ICC = 0.644).

The data have been summarized by routine descriptive statistics, namely, the mean and standard deviation for numerical variables and counts and percentages for categorical variables. Numerical variables have been compared between groups by Student's independent samples *t* test. Chi-square test or Fisher's exact test has been applied for intergroup comparison of categorical variables. Comparisons have been

two-tailed and  $P < 0.05$  has been considered to be statistically significant. Intrarater and interrater validations of the KAP questionnaire was done on 50 respondents (25 from SAFs by two raters). ICC was calculated by appropriate coding of responses. In order to be acceptable, the minimum ICC value had to be 0.6.

## Results

Over the 1-year period of the study, 284 SAFs were identified out of whom 282 consented to participate in the KAP survey. The corresponding 282 neighborhood NSAFs were interviewed as controls after approaching 341 such families. The participants from the NSF group were age-matched with the participants of the SAF group (mean  $\pm$  standard deviation:  $42.5 \pm 14.03$  years in the SAF group;  $43.2 \pm 14.04$  years in the NSF group;  $P = 0.549$ ) but were not matched in terms of gender. There were 217 female respondents (76.95%) in the SAF families compared to 148 females (52.48%) in the NSAF families ( $P < 0.001$ ). There was a significant difference in the number of years of formal education between respondents from the two groups ( $7.8 \pm 4.73$  years in SAFs;  $10.1 \pm 4.06$  years in NSFs;  $P = 0.004$ ).

The different groups who provided care and responded to questionnaires were as follows: Wife-32.9%, son-19.2%, daughter-16.7%, daughter-in-law-16.7%, mother-2.1%, husband-3.19%, sister-4.8%, niece-1.41, mother in law-0.7%, and sister-in-law-1.77%.

Differences in the KAP of stroke between the SAFs and NSAFs are presented in Table 2. Knowledge about stroke was high among both participating groups but was significantly higher among SAF participants. More participants in the SAF group reported to have heard or read about stroke ( $P = 0.004$ ), were aware about stroke paralysis ( $P = 0.007$ ), knew people who have had stroke ( $P < 0.001$ ), and had even witnessed cerebral attack ( $P < 0.001$ ).

A varied picture emerged about the knowledge of signs, symptoms, and risk factors of stroke among the study participants. A large percentage of both cohorts were aware about the loss of consciousness or paralysis being associated with stroke and they did not differ in this respect. However, there was less knowledge regarding headache, vomiting, and fits being associated with stroke; moreover, knowledge of these risk factors was even poorer in SAFs. However, both SAFs and NSAFs had a substantial and similar amount of knowledge in that stroke was an emergency and that there was an urgent period within which medical attention was necessary so as to improve the prognosis. A substantial fraction in both the cohorts agreed that hypertension and diabetes mellitus were important factors that predispose to stroke but most were unaware of other important risk factors such as age, obesity, smoking, alcoholism, and family history. The knowledge level was significantly better in NSAFs for most of these risk factors. Interestingly, about 80% of SAF participants considered stroke to be noninfectious in contrast to about 65% in the NSAF group ( $P < 0.001$ ).

The data revealed close similarity regarding the attitude toward stroke among the two groups. About 70% of the participants

in both groups generally agreed that stroke was preventable through control of risk factors but affected families were more optimistic that return to work was possible for stroke survivors. They were also more inclined to agree that precautions were necessary only after a primary stroke event.

Regarding practice, the large majority of the study participants agreed that it was important to get the patient to hospital as soon as possible rather than wait for a spontaneous recovery, and this view was stronger in stroke-affected families. Calling a doctor was also considered important by around 40% of the families. Prevention was considered a better option than treatment by both groups and they did not differ significantly in this regard. A large section (78.72%) of stroke-affected participants felt that medication and physiotherapy together were useful for managing the stroke event while this figure was 63.83% for nonaffected families ( $P < 0.001$ ).

## Discussion

This community-based survey utilized a sample selected through careful stratified random sampling to ensure that various sections of the city's large population were represented. People residing in urban disadvantaged areas belong to lower socioeconomic strata and we had adequate representation of both slum and non-slum dwellers in the sample studied. Affected families were identified using a reliable screening instrument backed up by expert neurological opinion. The KAP survey was conducted under the supervision of the neuropsychologist. These elements represent the strengths of our study and should enhance the validity of the findings.

The results indicate that in general, study participants from both stroke-affected and non-affected families were aware of the basic connotations of the term "stroke" and its association with paralysis. This may be an indirect indicator of the relatively high incidence and prevalence of stroke in the study population.<sup>[1]</sup> The knowledge regarding warning signs and symptoms of stroke and stroke risk factors was inadequate. In line with previous Indian reports,<sup>[20,21]</sup> comparatively better knowledge prevailed about stroke symptoms than risk factors. Generally, the attitudes toward stroke were in agreement between the SAF and NSAF groups. However, they differed on issues regarding poststroke reemployment and prestroke prevention strategies. Overall, the practice choices such as early hospitalization, therapeutic intervention in the window period, and a preference for combination of drug therapy and physical rehabilitation after stroke were encouraging.

Participants from both the SAF and NSAF groups could well-identify paralysis and loss of consciousness as related to stroke but not headache, vomiting, or fits. Unconsciousness and paralysis are usually dramatic, acute onset symptoms where the patient remains incapacitated for variable periods and therefore, are perceived as serious. On the other hand, headache and vomiting without other accompanying acute neurological signs may be events commonly experienced due to migraine and are hence, perceived as not so threatening and tend to be ignored. Fits, due to their association with epilepsy, which is also a common problem in India, are considered to be an accompaniment of stroke by only a minority.

Better knowledge about the signs and symptoms in comparison to the knowledge about multiplicity of risk factors is a matter of concern since it raises the possibility that the public attach more importance to firefighting the problem rather than its prevention. We stressed on the commonly understood risk factors such as high blood pressure, diabetes, smoking, alcoholism, and family history and did not even ask for factors such as atrial fibrillation and carotid stenosis, which would have been incomprehensible to the majority. Without knowledge of risk factors and the understanding that many of them can be favorably modified, stroke prevention will remain an unmet challenge in our community. This ignorance and lack of knowledge seemed to be greater in the stroke families and this, in fact, could be the contributory factor as to why stroke occurred in these families. Overall, the participants were well aware about hypertension and partially aware about diabetes as risk factors; the knowledge regarding diabetes was less in the SAF group, which is in contrast to a study from rural India.<sup>[21]</sup> Smoking was identified as a risk factor by only one-third of our participants, which is similar to other studies globally<sup>[7,14,17]</sup> although smoking was considered important by participants in the earlier Indian study.<sup>[21]</sup> A smaller proportion of respondents in our study identified alcoholism as a stroke risk factor, which is in consistence with an American study<sup>[9]</sup> and in contrast to a French one.<sup>[8]</sup> Overall, the general impression from this study would be that the level of knowledge regarding risk factors is moderate in relation to age, gender, diabetes, smoking, alcoholism, and family history that has been similarly observed in earlier studies in a few developed and developing nations.<sup>[25-27]</sup> This ignorance is not bliss and needs to be addressed urgently through public awareness campaigns if stroke prevention strategies are to be implemented.

Knowledge that stroke is an emergency demanding prompt medical management, and acknowledgement that a negative aftermath can be prevented through early hospitalization and therapeutic intervention in the window period in contrast to the belief that physical rest or spontaneous recovery could be the correct practice for stroke management is substantially present among respondents in the present observation. The speed of hospitalization after stroke depends on the level of knowledge about stroke.<sup>[28]</sup> However, inadequate knowledge regarding the presenting signs and symptoms of stroke can delay recognition and therefore, hospitalization. Knowledge that stroke demands immediate medical attention with proper medical facilities is voiced by people globally.<sup>[9,15,18]</sup> Strong advocacy for urgent hospitalization will not be effective in reducing mortality and morbidity if stroke knowledge, coupled with improvement in infrastructure and logistics for transporting patients to hospitals at odd hours, is improved.

The current study reveals responders to be open to a scientific approach for recovery from stroke comprising both medication and physiotherapy in contrast to folk remedies such as oil massage, faith healing, and magic.<sup>[20]</sup> The improved attitude observed could be the consequence of greater exposure to stroke cases in the general population due to its increased prevalence and/or awareness of management strategies prescribed by doctors.

Overall, our participants show a conservative attitude regarding reemployment after stroke, where only the SAF

group is optimistic about it. This is an issue that merits deeper exploration since financial self-sufficiency is possible through reemployment and is strongly related to stroke rehabilitation. The optimism in the SAF group may be due to various factors such as the relief related to surviving from stroke and the realization and therefore, determination to seek reemployment to look after families, procure medicines, and continue physiotherapy. In contrast, NSAFs are possibly aware that stroke requires long-term, complex, multidisciplinary treatment and recovery may not be absolute after observing cases from the neighborhood. We did not find data to compare this issue with earlier studies.

The limitation of this study is that we had a small sample size. Increase in the sample size could possibly further establish our finding. Possibly, repeat data collection from the participants of both groups after proper training or educational intervention about enhancing stroke-related knowledge could be useful for field implementation. This needs a longitudinal design. The information may vary from the persons who have been interviewed depending on the level of closeness of the relationship with the stroke-related person and his/her level of intelligence.

In conclusion, we can say that this study shows better knowledge about stroke in both SAFs and NSAFs. The common symptoms identified for stroke were paralysis and loss of consciousness but other symptoms such as headache, vomiting, and fits were less recognized and this might contribute to delay in diagnosis and hospitalization. Knowledge about a few risk factors are present in both the groups, notably, hypertension followed by diabetes mellitus. However, knowledge about other risk factors such as smoking, obesity, age, and gender is poor. This emphasizes the need to increase knowledge regarding risk factors, which will benefit the community at large as well as SAFs since there is always a possibility of stroke recurrence. The importance of early hospitalization and the need for both medicines and physiotherapy can be reinforced and this needs to go hand-in-hand with improvement of hospitalization and transport facilities. Such community-based measures are likely to be as important as efficient in-hospital management toward reduction of the stroke burden in our setting.

#### Acknowledgment

This project has been financed by the Indian Council of Medical Research, New Delhi, Delhi, India vide grant no SWG/Neuro9/2001-NCD-I dated 09.24. 2002 and SWG/Neuro/20/2005/NCD-I dated 01.31.2006. We are also grateful to the participants of the study.

#### Financial support and sponsorship

Indian Council of Medical Research, New Delhi.

#### Conflicts of interest

There are no conflicts of interest.

#### References

1. Das SK, Banerjee TK, Biswas A, Roy T, Raut DK, Mukherjee CS, *et al.* A prospective community-based study of stroke in Kolkata, India. *Stroke* 2007;38:906-10.
2. Kaul S. Stroke in India: Are we different from the world? *Pak J Neurol Sci* 2007;2:158-64.

3. Feigin VL, Lawes CM, Bennet DA, Barker Cello SL, Parag V. Worldwide stroke incidence and early case fatality in 56 population-based studies: A systematic review. *Lancet Neurol* 2009;8:355-69.
4. Dalal PM, Bhattacharjee M. Stroke epidemic in India: Hypertension-stroke control programme is urgently needed. *J Assoc Physicians India* 2007;55:689-91.
5. Srivastava AK, Prasad K. A study of factors delaying hospital arrival of patients with acute stroke. *Neurol India* 2001;49:272-6.
6. Das S, Banerjee T. Stroke: Indian Scenario. *Circulation* 2008;118:2719-24.
7. Sloma A, Backlund LG, Strender LE, Sskånér Y. Knowledge of stroke risk factors among primary care patients with previous stroke or TIA: A questionnaire study. *BMC Fam Pract* 2010;11:47.
8. Neau JP, Ingrand P, Godeneche G. Awareness within the French population concerning stroke signs, symptoms, and risk factors. *Clin Neurol Neurosurg* 2009;111:659-64.
9. Schneider AT, Pancioli AM, Khoury JC, Rademacher E, Tuchfarber A, Miller R, *et al.* Trends in community knowledge of the warning signs and risk factors for stroke. *JAMA* 2003;289:343-6.
10. Yoon SS, Heller RF, Levi C, Wiggers J, Fitzgerald PE. Knowledge of stroke risk factors, warning symptoms, and treatment among an Australian urban population. *Stroke* 2001;32:1926-30.
11. Welterman BM, Homman J, Rogalewski A, Brach S, Voss S, Ringelstein EB. Stroke knowledge among stroke support group members. *Stroke* 2000;31:1230-3.
12. Pancioli AM, Broderick J, Kothari R, Brott T, Tuchfarber A, Miller R, *et al.* Public perception of stroke warning signs and knowledge of potential risk factors. *JAMA* 1998;279:1288-92.
13. Cheung RT, Li LS, Mak W, Tsang KL, Lauder IJ, Chan KH, *et al.* Knowledge of stroke in Hong Kong Chinese. *Cerebrovasc Dis* 1999;9:119-23.
14. Kim JS, Yoon SS. Perspectives of stroke in persons living in Seoul, South Korea. A survey of 1000 subjects. *Stroke* 1997;28:1165-9.
15. Campos-Sousa RN, Soares VY, Almeida KJ, Carvalho LI, Jacobina KS, Athayde Netto AE, *et al.* Knowledge of stroke among a Brazilian urban population. *Arq Neuropsiquiatr* 2007;65:587-91.
16. Kyaw KM, Thu PP. Stroke in Myanmar: Attitudes and treatment. *Int J Stroke* 2011;6:241-3.
17. Haghghi AB, Karimi AA, Amiri A, Ghaffarpasand F. Knowledge and attitude towards stroke risk factors, warning symptoms and treatment in an Iranian population. *Med Princ Pract* 2010;19:468-72.
18. Al Shafae MA, Ganguly SS, Al Asmi AR. Perception of stroke and knowledge of potential risk factors among Omani patients at increased risk for stroke. *BMC Neurol* 2006;6:38.
19. Aly Z, Abbas K, Kazim SF, Taj F, Aziz F, Irfan A, *et al.* Awareness of stroke risk factors, signs and treatment in a Pakistani population. *J Pak Med Assoc* 2009;59:495-9.
20. Pandian JD, Jaison A, Deepak SS, Kalra G, Shamsher S, Lincoln DJ, *et al.* Public awareness of warning symptoms, risk factors, and treatment of stroke in northwest India. *Stroke* 2005;36:644-8.
21. Das K, Mondal GP, Dutta AK, Mukherjee B, Mukherjee BB. Awareness of warning symptoms and risk factors of stroke in the general population and in survivors stroke. *J Clin Neurosci* 2007;14:12-6.
22. Sen V. Census of India, 2001. Series 20, West Bengal: Provisional Population Totals (Paper 2, 2001). New Delhi: Census Operations, Government of India; 2002.
23. Hatano S. Experience from a multicentre stroke register: A preliminary report. *Bull World Health Organ* 1976;54:541-53.
24. Das S, Paul N, Hazra A, Ghosal M, Ray BK, Banerjee TK, *et al.* Cognitive Dysfunction in stroke survivors: A community-based prospective study from Kolkata, India. *J Stroke Cerebrovasc Dis* 2013;22:1233-42.
25. Croquelois A, Bogousslavsky J. Risk awareness and knowledge of patients with stroke: Results of a questionnaire survey 3 months after stroke. *J Neurol Neurosurg Psychiatry* 2006;77:726-8.
26. Stein J, Shafqat S, Doherty D, Frates EP, Furie KL. Patient knowledge and expectations for functional recovery after stroke. *Am J Phys Med Rehabil* 2003;82:591-6.
27. Madsen TE, Baird KA, Silver B, Gjelsvik A. Analysis of gender differences in knowledge of stroke warning signs. *J Stroke Cerebrovasc Dis* 2015;24:1540-7.
28. Williams LS, Eckert GJ, L'italien GJ, Lapuerta P, Weinberger M. Regional variation in health care utilization and outcomes in ischemic stroke. *J Stroke Cerebrovasc Dis* 2003;12:259-65.