Original Research Article

Risk factors of stroke in coastal villages of Uttara Kannada district, Karnataka, India: a case control study

George P. Jacob, Muralidhar M. Kulkarni*

Department of Community Medicine, Kasturba Medical College, Manipal, Udupi District, Karnataka, India

Received: 11 July 2017

Revised: 26 July 2017

Accepted: 28 July 2017

*Correspondence:

Dr. Muralidhar M. Kulkarni,

E-mail: murali.kulkarni@manipal.edu

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The prevalence of stroke was reportedly higher in four coastal villages as compared to the neighbouring villages. Hence the study was conducted to identify the risk factors for stroke cases in the four villages of Mavinakurve Gram Panchayath, Bhatkal Taluk, Karnataka, India.

Methods: 53 stroke patients were compared with 106 age and locality matched controls. Data was obtained using a predesigned, pretested questionnaire for socio-demographic variables, sources of water, palm oil and milk powder consumption, smoking and alcohol usage, stress score, history of hypertension, BMI and Waist Hip ratio. The data was entered in the SPSS version 15.0 and analysed. Results were expressed as proportions. Associations were analyzed using Chi-square test. A p-value less than 0.05 was considered significant.

Results: Most of the cases (53%) and controls (45%) belonged to the age group of 60-69 years. 62.2% of the cases were males and 37.8% were females. 45.3% of the cases and 34.0% of the controls were involved in fishing. 15% of the cases and 2.8% of the controls had high stress. Statistically significant association was found between high stress and stroke. 86.8% of cases and 72.6% of controls were hypertensive (p value of 0.04).

Conclusions: The prevalence of stroke in this area is higher than the state/national average. Hypertension and stress are important risk factors for stroke. Periodic screening for early detection of hypertension, health education, appropriate lifestyle modification and prompt treatment for hypertension are very important.

Keywords: Stroke, Hypertension, Salt consumption, Stress

INTRODUCTION

Stroke is a major cause of mortality and morbidity. The incidence of stroke is on the rise in the developing countries unlike the developed countries.¹ Worldwide, 15 million people suffer stroke in a year. Among them, 5 million people die and another 5 million become permanently disabled.² Stroke is the second leading cause of mortality in people above 60 years of age, and the fifth leading cause in those in the age group of 15 to 59 years. In developed countries, stroke is the third most common cause of death, following coronary heart disease and cancer.³

The most important modifiable risk factors for stroke are hypertension and tobacco use.² Other modifiable risk factors include unhealthy diet, high salt intake, underlying heart disease, diabetes and high cholesterol levels.³

Better control of hypertension and reduced levels of smoking have resulted in declining incidence of stroke in many developed countries. Control of hypertension can decrease the risk of stroke by up to 40%. However, the absolute number of stroke cases continues to increase because of the growing elderly population. The burden of

stroke is projected to rise from around 38 million DALYs worldwide in 1990 to 61 million DALYs in 2020.²

In India also, stroke is one of the major causes of death and disability. The estimated adjusted prevalence rate of stroke ranges from 84-262/100,000 in rural areas and 334-424/100,000 in urban areas of the country.⁴

Currently, the stroke incidence in India is much higher than the Western industrialized countries.⁵ Population based studies have reported the incidence rate of stroke as 119-145/100,000. A wide variation in case fatality rates have been reported with the highest being 42% in Kolkata.⁴

Preventive strategies like control and/or avoiding risk factors of stroke should be given high priority because of the high morbidity and mortality involved and the high cost of treatment of this condition.³

This study was undertaken to study the risk factors for stroke cases reported in the four villages of Mavinakurve Gram Panchayath, Bhatkal Taluk, Uttara Kannada District and to suggest suitable recommendations for preventing the event among at the risk individuals. This research was supported by the Health and Family Welfare Department of Government of Karnataka to ascertain the causes of stroke in this region.

METHODS

Study design

Case control study

Cases

Comprised of individuals with a history of stroke.

Controls

Comprised of neighbourhood population without history of paralysis matched for age. Case to control ratio was 1:2.

Prior to the data collection, faculty from the Department of Community Medicine visited Mavinakurve and had meetings with health officials and village leaders. As per the inputs, a questionnaire was designed, field tested and necessary modifications were made. The study was conducted during October, 2012 to April, 2013 in the four coastal villages of Mavinakurve Gram Panchayath, Bhatkal Taluk, Karnataka, India.

Inclusion criteria

All the stroke patients identified by the District Health Office, Uttara Kannada district, willing to participate in the study.

Exclusion criteria

Exclusion criteria was patients unwilling to participate.

There were a total of 53 cases identified in a population of 6190. The health workers from the Government health facility accompanied the postgraduates from the Department of Community Medicine for carrying out the survey. Details were collected from the notified/ reported stroke cases as furnished by the Health Department and 106 age matched controls. Data was collected regarding the socio-demographic variables that included age, gender, religion occupation, education, income and type of family. Data regarding drinking water source was collected as the area is close to the sea and water used for drinking may have high salinity, raising the possibility that the consumers were exposed to the risk factor of high salt intake. Palm oil consumption was enquired as palm oil is high in saturated fatty acids. Milk powder consumption was looked into as the initial survey revealed that the people use a locally available milk powder. Smoking and alcohol status that are known risk factors for cardiovascular diseases were elicited. Stress score and history of hypertension and diabetes that are known risk factors for cerebrovascular accidents was recorded. Anthropometry included Body Mass Index and Waist Hip ratio. After getting the details from each case, two individuals from the neighbourhood were included who were willing to participate in the study as the controls.

Data analysis

The data was entered in the SPSS version 15.0 and analysed. The results were expressed as proportions. Chi-square test was applied to study the association and the p-value obtained. The risk factor was considered to be associated with stroke if the p value was found to be less than 0.05. The p-value of less than 0.05 was considered statistically significant.

RESULTS

According to the data shared by the Health Department there were 53 stroke cases identified in a population of 6190 in an area comprising of 4 villages namely Mavinkurve, Belni, Talgod and Karikal in Mavinkurve Gram Panchayath area. This gives a prevalence of 8.6 per thousand populations in this coastal locality.

A total of 159 subjects were surveyed in an age and locality matched case-control study, constituting 53 cases and 106 controls. The demographic details are shown in Table 1.

IN Table 2, most of the cases and controls belonged to the elderly age group of 60-69 years i.e. 53% of cases and 45% of controls. 62.2% (33) of the cases were males and 20(37.8%) were females. Almost all the cases (98.1%) and controls (97.1%) residing in the locality were Hindus.

Of the total subjects surveyed, 30 (56.6%) cases and 56 (53.8%) controls were illiterate.

Table 1: Distribution of cases and controls with respect to socio-demographic details.

	Cases (%)	Controls (%)	P value	OR
Age group				
<40 years	4 (7.4)	7 (6.7)	0.831	0.8
40-49 years	7 (13.2)	13 (12.3)		
50–59 years	7 (13.2)	20 (18.8)		
60-69 years	28 (52.8)	48 (45.3)		
≥70 years	7 (13.2)	18 (16.9)		
Gender				
Male	33 (62.2)	46 (43.3)	0.025	2.1
Female	20 (37.8)	60 (56.7)		
Religion				
Hindu	52 (98.1)	103 (97.1)	0.720	1.5
Christian	1 (1.9)	3 (2.9)		
Educational status				
Illiterate	30 (56.6)	56 (53.8)	0.944	1.1
Primary (1-4)	14 (26.4)	29 (27.9)		
High school (5-10) or more	9 (17.6)	19 (18.2)		
Type of family				
Nuclear	27 (50.9)	42 (39.6)	0.349	1.5
3 generation	17 (32.1)	38 (35.8)		
Joint family	9 (17.0)	26 (24.5)		
Per capita income (in Rs.)				
<500	5 (9.4)	9 (8.5)	0.943	1.2
500-1499	28 (52.8)	52 (49.1)		
1500-2999	15 (28.3)	35 (33)		
3000 and above	5 (9.4)	10 (9.4)		

Table 2: Distribution of cases and controls according to water usage.

	Cases (%)	Controls (%)	P value
Source of drinking water			
Well	34 (64.2)	81 (76.4)	0.247
Well with pump	18 (34.0)	23 (21.7)	
Others	1 (1.9)	2 (1.9)	
Purification of drinking water			
Yes	27 (50.9)	58 (54.7)	0.653
No	26 (49.1)	48 (45.3)	
Method of purification of water			
Boiling	26 (96.3)	57 (96.6)	1.00
Others	1 (3.7)	1 (3.4)	

Table 3: Frequency of palm oil consumption among cases and controls.

Palm oil consumption	Cases (%)	Controls (%)	P value	OR
Present	34 (64.15)	74 (69.8)	0.398	0.7
Absent	19 (35.8)	32 (30.2)		
Total	53 (100)	106 (100)		

Fishing was the main occupation among the cases (45.3%) while almost half of the controls were housewives (40.6%) followed by those involved in fishing 36 (34.0%).

There was an equal representation of cases and controls from all the four villages namely Mavinkurve, Belne, Talgod and Karikal. Half of the cases (50.9%) and two thirds of the controls (39.6%) belonged to nuclear families. It was also seen that 9 (17.0%) of the cases and

26 (24.5%) of the controls belonged to joint families. The monthly family income ranged from Rs. 500 – Rs.1499 in 28 (52.8%) of the cases and 52 (49.1%) of the controls.

A large proportion of the cases (64.2%) and controls (76.4%) used well water for drinking purposes. Half of

the cases and 54.7% of the controls purified the water before drinking ($p=0.653$) and the most common method used for purification was boiling.

The proportion of people consuming palm oil was similar among both cases and controls (Table 3).

Table 4: Frequency of milk powder consumption among cases and controls.

Milk powder consumption	Cases (%)	Controls (%)	P value	OR
Present	24 (45.3)	49 (46.2)	0.910	0.9
Absent	29 (54.7)	57 (53.8)		
Total	53 (100)	106 (100)		

Table 5: Frequency of cases and controls consuming milk.

Milk Consumption	Cases (%)	Controls (%)	P value	OR
Present	29 (54.7)	64 (60.3)	0.495	0.79
Absent	24 (45.3)	42 (39.7)		
Total	53 (100)	106 (100)		

Table 6: Distribution of cases and controls according to smoking status.

Smoking	Cases (%)	Controls (%)	P value	OR
Present	9 (17.0)	17 (16.0)	0.879	1.07
Absent	44 (83.0)	89 (84.0)		
Total	53 (100)	106 (100)		

Table 7: Tobacco chewing status among cases and controls.

Tobacco Chewing	Cases (%)	Controls (%)	P value	OR
Present	20 (37.7)	31 (29.2)	0.280	1.46
Absent	33 (62.3)	75 (70.8)		
Total	53 (100)	106 (100)		

Table 8: Local liquor consumption status among cases and controls.

Local liquor consumption	Cases (%)	Controls (%)	P value	OR
Present	9 (17.0)	11 (10.4)	0.237	1.7
Absent	44 (83.0)	95 (89.6)		
Total	53 (100)	106 (100)		

Table 9: Stress score status among cases and controls.

Stress score	Cases (%)	Controls (%)	P Value
(0-7) low stress	7 (13.2)	38 (35.8)	0.001
(8-14) moderate stress	38 (71.7)	65 (61.3)	
(15-20) high stress	8 (15.1)	3 (2.8)	
Total	53 (100)	106 (100)	

Table 10: Hypertension status among cases and controls.

Status	Cases (%)	Controls (%)	P Value
Normal	7 (13.2)	29 (27.4)	0.044
Hypertension	46 (86.8)	77 (72.6)	
Total	53 (100)	106 (100)	

Table 11: Frequency of cases and controls with respect to waist-hip ratio status.

Waist- hip ratio	Cases (%)	Controls (%)	P value	OR
Normal	33 (62.3)	55 (51.9)	0.215	1.53
Abnormal	20 (37.7)	51 (48.1)		
Total	53 (100)	106 (100)		

The proportion of people consuming milk powder was similar among both cases and controls (Table 4).

While only 29 (54.7%) cases consumed milk, 64 (60.3%) controls were consuming milk ($p=0.495$) (Table 5).

Smoking was seen among 17.0% of cases and 16.0% of the controls and the difference was not found to be significant ($p=0.879$) (Table 6).

Although the percentage of tobacco chewers was more among cases (37.7%) compared to the controls (29.2%) the difference was not statistically significant ($p=0.280$) (Table 7).

Local liquor consumption was seen to be more among the cases (17.0%) as compared to controls but the difference was not significant. ($p=0.237$) (Table 8).

15% of the cases had a high stress when evaluated with the “perceived stress scale” whereas only 2.8% of the controls had a high stress score. Most of the cases (71%) and controls (61.3%) had a moderate stress ($p=0.001$). Thereby statistically significant association was found between high stress and stroke among the study subjects. However temporality is not established with this study, the cases might be stressed due to stroke rather than stress leading to stroke (Table 9).

Blood pressure $<140/90$ mm Hg was considered as normal. Subjects with a blood pressure $\geq 140/90$ mm Hg, a known history of hypertension or on medications for hypertension were considered as hypertensives (Table 10).

Based on the above criteria, it was found that 46 (86.8%) of cases and 77 (72.6%) of controls were hypertensive with a p value of 0.04 (Table 10).

Waist-Hip ratio of >1 is considered as abnormal for men and >0.85 for women. Waist-Hip ratio was abnormal in 20(37.7%) cases and 51(48.1%) controls with a p value of 0.215 (Table 11).

DISCUSSION

Studies conducted in various parts of the country in rural and urban populations have reported prevalence rate of stroke varying from 1.27 to 2.20 per 1,000 individuals.⁵

A community based study conducted in Kolkata during 2003-2004 reported the crude prevalence rate to be 4.72

per 1,000 (men, 4.96 per 1,000; women, 4.44 per 1000; 95% CI, 4.15-5.34). With age standardization, to the World Standard Population, a prevalence rate of 5.45 per 1,000 was obtained. (95% CI, 4.80-6.17).⁵

However, a survey among Parsis in Mumbai, India, reported a higher prevalence rate (842.3 cases/100,000 population).⁶

The variation in prevalence rates could be due to the widely different age compositions of the populations studied. A low prevalence rate in some of the community based studies might be due to low survival after an acute event, many cases of transient ischemic attacks and complete recovery from strokes, which may be missed on inquiry thus underestimating the prevalence.

Because of cultural and economic diversity, the risk factors for stroke may differ from region to region within the country. A carbohydrate-rich, predominantly vegetarian diet and a sedentary lifestyle, especially in urban population may be important reasons for atherosclerotic diseases. Indians as a race are susceptible to stroke at a younger age.

The pattern of risk factors for stroke among those belonging to the higher socio-economic class in India, is similar to risk profile in Western population. Established risk factors such as diabetes mellitus, hypertension, and tobacco smoking and/or chewing are the most important factors. Anaemia was found to be another important contributor to ischaemic stroke among Indians.⁷

It has been reported that in some stroke patients, inflammation and immune reaction secondary to acute infection with *C. pneumonia* may trigger an acute stroke.⁸

Alcohol abuse, clinical infection/inflammation, recreational drug abuse, psychological distress, stressful life events, birthday, negative or positive emotions, anger, heavy physical exertion, heavy eating, sudden posture change in response to a startling event have been isolated as potential triggering factors for stroke.⁹

In a study conducted in Kerala state of Southern India, key components of the metabolic syndrome and smoking are associated with ischaemic stroke in young adults. These results were similar to that observed in the current study in which High BP was found to be a risk factor for stroke. This necessitates, screening of young adults to reduce the burden of ischaemic stroke.¹⁰ A similar study done among 100 cases and controls in Northern Karnataka reported that uncontrolled risk factors like

hypertension, hypercholesterolaemia and diabetes were significantly associated with stroke.¹¹

In a study conducted in Spain, a total of 300 acute ischemic stroke patients and 300 controls with evaluation of dietary habits were analysed. Stroke patients reported a higher caloric intake: 2444.8 (1736.8–3244.5) vs. 2208.7 (1753.1–2860.7) Kcal, $p=50.001$. After adjusting for energy intake, patients had higher intake of proteins ($p, 0.001$; OR 1.02), total cholesterol ($p=50.001$; OR=1.04), and breaded foods ($p=50.001$; OR=1.94) and lower consumption of probiotic yogurt ($p=50.002$; OR=0.88). However in the present study, there was no association of stroke with palm oil, milk or milk powder consumption and could be due to smaller sample size in the present study.¹²

CONCLUSION

The prevalence of stroke in this coastal area is higher than the state and the national average. The study reveals High Blood pressure and Stress as the important risk factors for stroke among the subjects residing in the Mavinkurve Gram Panchayath area. Although other factors like Tobacco chewing and liquor consumption was more among the stroke patients, it was not statistically significant.

Recommendations

Though the risk factors of hypertension and stroke are known to a great extent among the educated, the common man needs to be educated regarding the risk factors for stroke. They need to understand the necessity for lifestyle modification for prevention of Hypertension and its sequelae. Periodic screening for high blood pressure is to be undertaken. Those who are identified need to undergo prompt treatment & regular follow-up.

ACKNOWLEDGEMENTS

The authors are thankful to the Government of Karnataka for permitting to conduct the study. We also express our gratitude to Dr. Veena Kamath, HOD, Community Medicine for the support and guidance rendered and Dr. Asha Kamath for the statistical advice.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Suwanwela NC, Pongvarin N. The Asian Stroke Advisory Panel. Stroke burden and stroke care system in Asia. Neurol India. 2016;64 (Suppl S1):46-51.
2. World Health Organization. The Atlas of Heart Disease and Stroke. Global burden of stroke, 2004. Available at: http://www.who.int/cardiovascular_diseases/en/cvd_atlas_15_burden_stroke.pdf?ua=1. Accessed on 22 February 2017.
3. World Health Organization. The Atlas of Heart Disease and Stroke. Global burden of stroke, 2004. Available at: http://www.who.int/cardiovascular_diseases/en/cvd_atlas_16_death_from_stroke.pdf?ua=1. Accessed on 22 February 2017.
4. Pandian JD, Sudhan P. Stroke Epidemiology and Stroke Care Services in India. J Stroke. 2013;15(3):128-34.
5. Banerjee TK, Das SK. Fifty years of stroke researches in India. Annals Indian Acad Neurol. 2016;19(1):1-8.
6. Bharucha NE, Bharucha EP, Bharucha AE, Bhise AV, Schoenberg BS. Prevalence of stroke in the Parsi community of Bombay. Stroke. 1988;19:60–2.
7. Singla S, Singla R. Stroke in India: Bio-socioeconomic determinants. J Soc Health Diabetes. 2016;4:71-6.
8. Rai NK, Choudhary R, Bhatia R, Singh MB, Tripathi M, Prasad K, et al. Chlamydia pneumoniae seropositivity in adults with acute ischemic stroke: A case-control study. Ann Indian Acad Neurol 2011;14:93-7.
9. Guiraud V, Amor MB, Mas JL, Touzé E. Triggers of ischemic stroke: A systematic review. Stroke. 2010;41:2669-77.
10. Lipska K, Sylaja PN, Sarma PS, Thankappan KR, Kutty VR, Vasani RS, et al. Risk factors for acute ischaemic stroke in young adults in South India. J Neurol Neurosurg Psychiatry 2007;78(9):959-63.
11. Sorganvi V, Kulkarni MS, Kadeli D, Atharga S, Risk factors of stroke: A case control study. Int J Cur Res Rev 2014;6(3):46-52.
12. Rodríguez CA, Jiménez CJ, Ois Á, Cuadrado GE, Giralte SE, Schroeder H, et al. Dietary Habits in Patients with Ischemic Stroke: A Case-Control Study. PLoS ONE. 2014;9(12): e114716.

Cite this article as: Jacob GP, Kulkarni MM. Risk factors of stroke in coastal villages of Uttara Kannada district, Karnataka, India: a case control study. Int J Community Med Public Health 2017;4:3145-9.