http://www.banglajol.info/index.php/JNINB

Original Article

Journal of National Institute of Neurosciences Bangladesh, July 2016, Vol. 2, No. 2

oISSN 2518-6612
pISSN 2410-8030

Comorbid Risk Factors for Acute Stroke: A Case-Control Study in Tertiary Care Hospital of Bangladesh

Salahuddin Feroz[1], Shahjada Selim[2], Afsar Ahammed[3], Rahat Afza Chowdhury[4], Shahabul Huda Chowdhury[5], Md. Nazmul Karim[6], Md. Ridwanur Rahman[7]

[1]Officer on Special Duty (OSD), Director General of Health Services, Ministry of Health & Family Welfare, Dhaka, Bangladesh; [2]Assistant Professor, Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh; [3]Officer on Special Duty (OSD), Director General of Health Services, Ministry of Health & Family Welfare, Dhaka, Bangladesh; [4]Consultant (Gynae & Obstetrics), BRB Hospital, Dhaka, Bangladesh; [5]Senior Consultant, Department of Medicine, Sarkari Korma Chari Hospital, Dhaka, Bangladesh; [6]PhD Research Scholar, Monash University, Melbourne, Australia; [7]Professor, Department of Medicine, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh

[**Received:** 20 February 2016; **Revised:** 5 March 2016; **Accepted:** 11 May 2016; **Published:** 1 July 2016]

Abstract

Background: There is a high prevalence of coexisting medical conditions in patients with acute stroke; therefore, clinical investigators often need to adjust for comorbidities when assessing the effect of those risk factors on patient outcome. **Objective:** This study aimed to determines comorbid risk factors in patients with acute stroke. **Methodology:** A hospital-based case control study was conducted in Shaheed Suhrawardy Medical College Hospital (ShSMCH) and Dhaka Medical College Hospital between January-June 2011. The cases and controls studied consisted of 175 hospitalized patients with stroke (confirmed by computed tomography scan) and 171 matched-age and sex controls that were hospitalized at the study hospital for condition other than stroke. After obtaining written informed consent from the patient or the closest attendant, all the information included to record were age, sex, monthly family income, family size, family history of CVD death, history of hypertension and diabetes mellitus, ECG change, aspirin intake, blood pressure and heart rate, waist and hip circumference and psychosocial factors. The edited data then analyzed by SPSS V. 16. **Result:** The most predictive independent variables were history of hypertension (OR 4.056), psychosocial stress (OR 4.90) and increased WHR (OR 3.806) were found significant risk factor for developing stroke. **Conclusion:** Therefore, to recognize comorbid risk factors and to treat them appropriately is the key to establish primary preventive strategies in non-stroke patients or secondary preventive measures to avoid recurrence in stroke victims. [Journal of National Institute of Neurosciences Bangladesh, 2016;2(2): 84-88]

Keywords: Comorbidity; risk Factor; case control study

Correspondence: Dr. Salahuddin Feroz, Officer on Special Duty (OSD), Director General of Health Services, Ministry of Health & Family Welfare, Dhaka, Bangladesh; Email: ferozk52@yahoo.co.uk ; Cell no.: +8801819273706

Conflict of interest: There is no conflict of interest to any of the authors of this article.

Funding agency: The study was not funded by any authority.

Contribution to authors: Feroz S, Selim S, Chowdhury SH, Afza R and Rahman MR were involved in protocol preparation, data collection and literature search up to report writing. Ahammed A and Karim MN was involved in manuscript preparation as well as involved in literature search up and manuscript revision and also in statistical analysis.

How to cite this article: Feroz S, Selim S, Ahammed A, Chowdhury RA, Chowdhury SH, Karim MN, Rahman MR. Comorbid Risk Factors for Acute Stroke: A Case-Control Study in Tertiary Care Hospital of Bangladesh. J Natl Inst Neurosci Bangladesh 2016;2(2): 84-88

Introduction

Stroke is an illness of escalating socioeconomic importance. World Health Organization's definition of stroke is rapidly developed clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or until death, with no apparent non-vascular cause[1]. Stroke is the main reason of functional disability. Neurological sequelae are present

in 90% of stroke patients, one third of which will not be able to resume daily life activities at the same level than before stroke[2-3]. Approximately 20 million people each year will suffer from stroke, and 5 million of these will not survive[4]. In 2005, stroke accounted for 5.7 million deaths worldwide, with 87% of the deaths occurring in developing countries[5]. In Asia, the problem of stroke has a particularly strong impact, not only because more than half of the world's population lives in Asia, but stroke is the predominant vascular disease in many parts of Asia[6]. The prevention, identification and control of the cardiovascular risk factors at individual and population level is poor in Asia because of ignorance and high cost of the interventions. The burden of stroke is likely to increase substantially in the near future because of the aging population. Moreover, the financial burden of stroke on society is high, including both direct and indirect costs for stroke care[7]. It is crystal clear that, this devastating condition not only affects the patient but also their family.

Stroke is a multifactorial condition. A number of risk factors have been shown to be associated with stroke, including age, sex, heredity, hypertension, diabetes, hypercholesterolemia, dietary factors, obesity, smoking, alcohol intake, and physical inactivity[8-9]. However, the contribution of each risk factor to the outcome of stroke varies from one study to another. Several risk factors for stroke are established and should be placed in identifying modifiable risk factor in achieving effective prevention strategies[10]. But prevention is possible by early detection and reducing the modifiable risk factors for stroke. Comorbidities are a major determinant in the treatment of acute stroke. The relationship between comorbidity risk factor has been less well studied. This study, aimed to find out the common comorbidity conditions in acute stroke patients in a tertiary care hospital of Bangladesh. Therefore, to recognize risk factors and to treat them appropriately is the key to establish primary preventive strategies in non-stroke patients or secondary preventive measures to avoid recurrence in stroke victims.

Methodology

A tertiary level hospital based case control study recruited admitted cases of acute stroke patients confirmed by CT-scan or MRI of brain from the Shaheed Suhrawardy Medical College Hospital (ShSMCH) and Dhaka Medical College Hospital, Dhaka between January to June 2011 for a period of six (6) months. The patients for control group were recruited from the same hospital who was admitted for other reasons. Controls were based in hospital and had no history of stroke. Subjects with acute stroke and focal neurological deficit lasting <24 hours, death within 24 hours of admission, past history of stroke, primary sub-arachnoid hemorrhage, co-existing acute coronary syndrome and unwilling to participate were excluded from the study. The primary distinction between stroke subtypes ischemic, intra-cerebral hemorrhagic, and subarachnoid hemorrhagic was based on neuro-imaging (CT or MRI). After obtaining written informed consent, a semi-structured questionnaire was administered, which included information on all the stroke risk factors. The variables included to record were age, sex, monthly family income, family size, family history of CVD death, history of hypertension and diabetes mellitus, ECG change, aspirin intake, blood pressure and heart rate, and anthropometrical measurements waist and hip circumference, height, and weight and psychosocial factors. It had been defined diabetes as having a fasting plasma glucose level of >7 mmol/L (126 mg/dL), a random glucose level of >11.1 mmol/L (200 mg/dL), or the requirement of regular hypoglycemic drugs. The same definitions were used for the controls, who were recruited from the hospitalized patients admitted to units other than medicine and never had a stroke in the past. Age and sex for the controls were matched. Collected data was sorted and screened for any discrepancy. The edited data were then analyzed by SPSS V. 16. For background variables and socio-demographic data descriptive statistics and relative frequency (percentage) was generated. Individual risk factors were identified through Multivariate analysis and the possible confounders were adjusted. Odds Ratio with 95% CI was generated through binary logistic regression to assess individual refractors adjusting for all possible confounders. Approval from Institutional ethical review board was taken prior to commencement of the study. Informed written consent was taken from the participant after explaining all the facts to the patient or the closest attendant in case of data collection. Sample size was determined by STATAR, for comparison proportion of hypertension one of the most striking risk factors in stroke was considered. To detect odds ratio >3, with the proportion exposed among controls of 0.15 and the proportion exposed among cases of 0.340, at 80% power and with number of control three fold of case a total of 70 cases of hemorrhagic stroke and 105 ischemic stroke is required.

Results

The demographic characteristics of the 175 cases and 171 controls are shown in table 1. Due to missing data in 4 of the controls, the results of 171 controls are described. Majority of the case and controls (111 and 113 respectively) were 60 or more years of age. At the same time male respondents were more among both cases and controls. There is no significant difference between cases and controls in demographic characteristics. Monthly family income and family size of the respondents showed no significant difference among cases and controls. Family history of premature cardiovascular death (<55 years in male and <65 years in female) were more among the cases than controls, but it is not statistically significant.

Table 1: Socio-demographic Characteristics

Variables	Case (n=175)	Control (n=171)	Test statistics
Age(years)			
• <60	64(36.6%)	58(33.9%)	χ2 0.267; p 0.61
• ≥60	111(63.4%)	113(66.1%)	
Sex			
• Male	125(71.4%)	125(73.1%)	χ2 0.12; p 0.73
• Female	50(28.6%)	46(26.9%)	
Religion			
• Muslim	157(89.7%)	162(94.7%)	χ2 3.03; p 0.08
• Other	18(10.3%)	9(5.3%)	
Monthly family income			
• <30000 BDT	89 (50.9%)	70(40.9%)	χ2 3.4; p 0.064
• ≥30000 BDT	86(49.1%)	101(59.1%)	
Family Size			
• <5	121(69.1%)	124(72.5%)	χ2 0.48; p 0.49
• ≥5	54(30.1%)	47(27.5%)	
Family history of pre-mature CVD death			
• Yes	9(5.1%)	02(1.2%)	χ2 4.4; p 0.035
• No	164(93.9%)	169(98.8%)	

Among the co-morbid diseases, hypertension (self-reported or mean of 3 measurements>160/90 mm Hg) was present among significantly (p<.001) higher number of cases than the controls. At the same time psycho-social stress (reported by the patient or attendant) was more common among the cases (79, 45.1%) than controls (30, 17.5%). Waist-to-hip ratio (for male >0.9 and for female>0.6) was associated with increased risk of stroke as there is significant differences in waist hip ratio among cases than control (p<0.000). Other important co-morbid conditions like Diabetes mellitus (self-reported) and arrhythmia (as evidenced by on admission ECG) showed no significant difference among case and controls of this study. Dyslipidemia, an established risk factor of stroke, is found not to be significant, as very small number of cases and controls gave self-reported history of dyslipidemia in this study. History of regular intake of aspirin (for other disease) was found to be more among cases than controls but it was not statistically significant.

Table 2: Co-morbid Risk Factors

Variables	Case (n=175)	Control (n=171)	Test statistics
Hypertension (self-reported or mean of 3 measurements)			
Yes	93(53.1%)	35(20.5%)	χ2 39.62; p 0.000
No	82(46.9%)	136(79.5%)	
Diabetes Mellitus (self-reported)			
Yes	33(18.9%)	35(20.5%)	χ2 0.14; p 0.706
No	142(81.1%)	136(79.5%)	
Dyslipidemia (self-reported)			
Yes	12(6.9%)	15(8.8%)	χ2 2.17; p 0.141
No	163(93.1%)	156(91.2%)	
Abnormalities in ECG on admission			
Yes	44(25.1%)	22(12.9%)	χ2 8.44: p 0.004
No	131(74.9%)	149(87.1%)	
Waist hip ratio			
Normal	23(13.1%)	70(40.9%)	χ2 33.9: p 0.000
Increased (M>.9;F>.6)	152(86.9%)	101(59.1%)	
Psychosocial stress(self-reported)			
Yes	79(45.1%)	30(17.5%)	χ2 30.5; p 0.000
No	96(54.9%)	141(82.5%)	
History of aspirin intake			
Yes	29(16.6%)	10(5.8%)	χ2 9.94;p 0.002
No	146(83.4%)	161(94.2%)	

Stepwise logistic regression analysis was carried out for continuous variables (WHR) and for categorical variables (history of dyslipidemia and hypertension).

The most predictive independent variables were history of hypertension (p<0.001), Psychosocial stress (p<0.001) and increased WHR (p<0.001). Variables revealed to be significantly associated with acute stroke by bivariate analyses were all entered into the model directly. Among the variables, known hypertension, increased waist hip ratio and psycho social stress were found to be the independent predictors of acute stroke (Table-3).

Table 3: Multiple variable logistic regression analysis

Variables	Odds ratio	95%Confidence Interval	p value
Psycho social stress	4.90	2.752-9.334	0.0001
Hypertension(self-reported)	4.056	2.218-7.416	0.0001
ECG pathology(on admission)	1.924	0.922-4.012	0.81
History of aspirin intake	2.521	0.957-6.642	0.061
Dyslipidemia(self-reported)	1.079	0.462-2.521	0.860
Increased WHR	3.806	1.954-7.415	0.0001

Discussion

Based on this study majority of the cases and controls were above the age of 60 (63.4%) and most of the respondents among cases and controls were male (71.4%). Although there were no significant association risk factors with age but most stroke in this hospital study occurs in male. Male incidence is 30% higher than female which coincide with international study[11]. The respondents were categorized with monthly family income of less than 30000 BDT or more than that at the same time number of family members were also taken into account but it didn't show any significant difference among the cases and controls. Family history of pre mature cardio vascular death was present in only a very few cases. It was not described as an important risk factor in any major studies regarding risk factors of acute stroke[12-13].

Among the co-morbid diseases, hypertension (self-reported or mean of 3 measurements) was found in significantly higher number of cases of this study.)Several other studies also showed hypertension as an important risk factor[14-15]. Diabetes is the main risk factor following hypertension of cerebral small vessel disease and has been identified as a significant independent variable of symptomatic recurrence in patients with first ever cerebral infarction of the lacunar type[16-17]. A study among Bangladeshi patients also found hypertension and diabetes mellitus were significant risk factors for stroke[18-19]. However, in this study any significant relation of Diabetes Mellitus is not found as a risk factor. Dyslipidemia is another recognized risk factor of stroke. Data from prospective studies in male patients have shown that in the presence of total serum cholesterol values > 240 to 270 mg/dL, there is an increase in the rates of ischemic stroke[20]. But it was not found to be a significant risk factor in this study .May be this is due to lack of testing serum lipid profile as a routine test among the people of Bangladesh as self-reported history of Dyslipidemia was used in this study. Arrhythmia (especially atrial fibrillation) is an important risk factor for developing stroke. ECG findings including myocardial ischemic change, LVH and AF were risk factors for stroke as shown in other studies. The most common arrhythmia detected in the setting of stroke is A[21-22]. In this study we used ECG done on admission to diagnose any baseline arrhythmia present or not. This study didn't show arrhythmia as an important risk factor which is in contrast to other study finding.

Psychosocial stress was associated with an increased risk of all stroke. A Study demonstrated that the accumulation of life events is associated with an increased risk of stroke event[23]. Socioeconomic status may affect incidence and mortality of stroke as a stressor[24]. Medication history (aspirin, NSAID, OCP for females) was recorded from the cases and controls but very small of respondents gave history of regular intake of NSAID or oral contraceptive pill. History of aspirin ingestion (for other diseases) was found among cases and controls but it was not statistically significant. In the Swedish Aspirin Low-Dose Trial (SALT), in which CT or necropsy was carried out in 98% of the patients with stroke, there was an excess of hemorrhagic strokes and a significant increase in the risk of fatal hemorrhagic strokes among the aspirin (75 mg/d) users[25]. However, Thrift et al.[26] found no increase in risk among those who took low doses of aspirin (<1225 mg/wk). Our results showed that increased WHR appeared to have a statistically greater risk for ischemic stroke .In other studies, the risk of stroke was 2.3 times greater in the highest quintile of WHR (0.98) for men[27] and 1.6 times greater in the highest tertile of WHR (0.87) for women[28]. Stepwise multiple logistic regression analysis showed known hypertension, increased waist hip ratio and psycho-social stress to be the independent predictors of acute stroke and risk management should be considered in population at risk. This study aimed at identifying the comorbid conditions as a risk factors of stroke in Bangladeshi Population. The study was conducted in a tertiary care hospital serving an urban and suburban population in Dhaka, the capital city of Bangladesh. Since the cases are confirmed cases of stroke with or without having previous heart disease, the study avoids the problem of misdiagnosis associated with sole use of neuro-imaging as diagnostic criteria. The problems associated with

migration and acculturation also avoided because the study included Bangladeshi residents only; it unveiled the risk factors among individuals within a relatively homogeneous ethnic origin and geographic region, rather than between populations.

The controls were taken carefully from admitted patient to avoid putative risk factor. Although controls from the community would have been ideal, hospital based controls were easier to recruit and generally belonged to the same population as hospital-based cases. Without a prospective cohort study, it is difficult to assess the potential impact on risk factors, if any, of pre-existing silent IHD, changing risk factors among cases, and any treatment for diabetes mellitus and hypertension that patients may have received. However, such factors generally tend to reduce differences between cases and controls. Finally, the patients in this study are predominantly male and any extrapolation to women should be done cautiously.

Conclusion

Stroke is an important health problem among the elderly. Many attempts had conducted but the incidence of stroke is still high. The efforts to reduce the incidence of stroke should be based on risk factors that may influence, in particular, risk factors related to comorbid condition. Therefore, identifying and understanding these risk factors may contribute to the reduction in stroke morbidity and mortality. Therefore, a study to identify the comorbid risk factors in acute stroke patients were treated at tertiary level hospital was undertaken to help health organization to enhance intervention to public in reducing stroke morbidity and mortality, specifically in Bangladesh.

References

1. World Health Organization. Stepwise approach to stroke surveillance. 2010; http://www.who.int/ncd_surveillance/en/steps_stroke_manual_v1.2.pdf
2. Catalan Society of Neurology. Official Guidelines for diagnosis and treatment. In: Cerebrovascular Diseases. 2nd ed. Barcelona: Societat Catalana de Neurologia 2011:159-240
3. Kalaria RN. Cerebrovascular disease and mechanisms of cognitive impairment: evidence from clinic-pathological studies in humans. Stroke 2012; 43: 2526-2534
4. Dalal P, Bhattacharjee M, Vairale J, Bhat P. UN millennium development goals: can we halt the stroke epidemic in India? Annals of Indian Academy of Neurology 2007;10 (3):130-136
5. Strong K, Mathers C, Bonita R. Preventing stroke: saving lives around the world. Lancet Neurology 2007;6:182-187
6. Shi F, Hart RG, Sherman DG, Tegeler CH. Stroke in the People's Republic of China. Stroke 1989; 20:1581–85
7. Rahman KM. Risk factors & clinical presentations--a study of eighty-five hospital admitted stroke cases. Mymensingh Med J 2002;11(2):113-15
8. Sacco, R.L and B. Albala. Stroke Risk Factors: Identification and Modification. In: Stroke Therapy, Fischer, M(Ed). 2nd Edn. Butterworth-Heinemann, Boston, USA. 2001;pp 1-24
9. Caplan, L.R, 2000. Stroke Prevention and Risk Factor. In: Caplan Stroke: A Clinical Approach 3rd Edn. Butterworth Heinemann, Boston, USA. pp 491-501
10. Goldstein LB, Bushnell CD, Adam RJ, Appel LJ, Braun LT, Chaturvedi S, et al. Guidelines for the primary prevention of stroke. A Guideline for health care professionals from the American Heart Association. Stroke 2011;42:517-584
11. Naseem, A., Mahmood, Hussain, T., Khan, I.A. Clinical spectrum of stroke in our adult population. Pak Armed Forces Med J 2003; 53: 59–67
12. O'Donnell MJ, Xavier D, et al on behalf of the INTERSTROKE investigators; Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study. Lancet 2010: 376; 112–23
13. Yusuf S, Hawken S, Ôunpuu S, et al, on behalf of the INTERHEART Study Investigators. Obesity and the risk of myocardial infarction in 27 000 participants from 52 countries: a case-control study. Lancet 2005; 366: 1640–49
14. Martin J O'Donnell, Denis Xavier et al on behalf of the INTERSTROKE investigators; Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study, Lancet 2010: 376; 112–23
15. Banerjee TK, Mukherjee CS, Sarkhel A. Stroke in the urban population of Calcutta: an epidemiological study. Neuroepidemiology 2001;20:201–207
16. Megherbi SE, Milan C, Minier D, Couvreur G, Osseby GV, Tilling K, Di Carlo A, Inzitari D, Wolfe CD, Moreau T, Giroud M. Association between diabetes and stroke subtype on survival and functional outcome 3 months after stroke: data from the European BIOMED Stroke Project. Stroke 2003; 34: 688-694
17. Arboix A, Font A, Garro C, García-Eroles L, Comes E, Massons J. Recurrent lacunar infarction following a previous lacunar stroke: a clinical study of 122 patients. J Neurol Neurosurg Psychiatry 2007; 78: 1392-1394
18. Uddin MJ, Alam B, et al Association of lipid profile with ischemic stroke. Mymensingh Med Journal 2009; 18(2):131-5
19. Haque MM, Nasreen SA; Epidemiological study of risk factors of stroke and its immediate consequence., Mymensingh Med J 2008;17(2):124-8
20. Hankey GJ. Potential new risk factors for ischemic stroke: what is their potential? Stroke 2006; 37: 2181-2188
21. Oppenheimer SM, Hachinski VC. The cardiac consequences of stroke. Neurol Clin 1992; 10:167-76
22. Britton M, de Faire U, Helmers C, et al. Arrhythmias in patients with acute cerebrovascular disease. Acta Med Scand 1979; 205:425-8
23. Kornerup H, Osler M, Boysen G, Barefoot J, Schnohr P, et al. Major life events increase the risk of stroke but not of myocardial infarction: results from the Copenhagen City Heart Study. Eur J Cardiovasc Prev Rehabil 2010;17: 113-118
24. Cox AM, McKevitt C, Rudd AG, Wolfe CD. Socioeconomic status and stroke. Lancet Neurol 2006;5: 181-188
25. The Swedish Aspirin Low-dose Trial Collaborative Group. Swedish aspirin low-dose trial (SALT) of 75 mg aspirin as secondary prophylaxis after cerebrovascular ischaemic events. Lancet 1991; 338:1345–1349
26. Thrift AG, McNeil JJ, Forbes A, Donnan GA. Risk of primary intracerebral haemorrhage associated with aspirin and non-steroidal anti-inflammatory drugs: case-control study. BMJ 1999; 318:759–764
27. Walker SP, Rimm EB, Ascherio A, Kawachi I, Stampfer MJ, Willett WC. Body size and fat distribution as predictors of stroke among US men. Am J Epidemiol 1996; 144:1143–1150
28. Folsom AR, Prineas RJ, Kaye SA, Munger RG. Incidence of hypertension and stroke in relation to body fat distribution and other risk factors in older women. Stroke 1990; 21:701–706