Risk Factors of Stroke in Adult Population

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Abstract:

   Background: *Stroke is the second leading cause of death worldwide and the leading cause of long-term disability. A worldwide study based on vital record and data imputation shows that per year 15 million people faces the event 'stroke' which causes in 5 million deaths and a further 5 million patients living with permanent cognitive and physical disability.* **Objective:** *The aim of this study was to assess risk factors of stroke among adult population in Bangladesh.* **Methods:** *This was a cross sectional descriptive study with a sample size of 350. The samples were selected purposively on the basis of inclusion and exclusion criteria. A pretested semi structured questionnaire was used to collect data and consent was taken prior interview. SPSS version 11.5 was used to analyze data.* **Result**: *Most*

of the male respondents (43.5%) were in 55-64 age groups and female participants (39.2%) constitute 45-54 age groups. About 58.9% study subjects had the habit of using extra table salt during their major meal. Nearly half of the respondents were overweight (46.9%) followed by normal (32%) and obese (21.1%). About 76.3% respondents were hypertensive (SBP ≥140, DBP≥ 90) and remaining was normal. Result shows that previous smoking habit have found significantly higher among the respondents with ischemic stroke (76%) compared to hemorrhagic stroke (24%), p<0.05. Chewing tobacco habit have found significantly higher in ischemic stroke (75.6%) compared to hemorrhagic stroke (24.4%), p<0.05. The intake of extra table salt have found significantly higher among the respondents with ischemic stroke (70%) compared to hemorrhagic stroke (30%), p<0.05. History of HTN have found significantly higher among the respondents with ischemic stroke (65.9%) compared to hemorrhagic stroke (34.1%), p<0.05. TIA have found significantly higher among the respondents with ischemic stroke (78.2%) compared to hemorrhagic stroke (21.8%), p<0.05. Conclusion: High prevalence of HTN, DM, IHD and Dislipidemia among the stroke patients was found.

Key words: Risk factors**,** Stroke, Adult

Introduction

The global epidemic of stroke is not only the public health concern in high income countries. Nearly 85% of all stroke deaths are recorded in low- and middle-income countries, which results in 87% of total losses caused by stroke in terms of DALYs, measured, globally, in 72 millions per year[1]. Bangladesh is currently undergoing both epidemiologic and demographic transitions, where the decline in both fertility and mortality rates in early life have resulted in increased life expectancy. According to the estimation of the United Nations, life expectancy at birth is expected to increase to 74 years in

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2025 in Bangladesh[2]. Bangladeshi men tend, however, to have a high prevalence of diabetes, smoking, physical inactivity, and high serum triglyceride concentrations, and low serum high density lipoprotein cholesterol concentrations[3-6]. For women, the burden from these risk factors is also high, except for smoking, which is uncommon[5]. A population-based case-control study of 1250 stroke deaths in rural Bangladesh present that Risk of stroke death have significantly increased with hypertension, diabetes mellitus betel consumption when adjusted for age and sex[7]. Bhopal et al[8] propose that the explanation for high rates of stroke in Bangladeshis lies in their heavier burden of some established risk factors, their socioeconomic deprivation, and some novel risk factors that are yet to be characterized. Pending deeper understanding of the causes, doctors should be aware of the high risk of stroke and stroke fatality in Bangladeshis even in the absence of raised blood pressure. There is a high modifiable burden of risk factors for adult stroke deaths in rural Bangladesh, most notably including hypertension. Betel consumption may be an under-recognized risk factor for stroke death35. Prevalence of stroke were 2.0, 3.0, 2.0, 10.0, and 10.0 per 1000 within age groups of 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80 years and above age group respectively with an overall prevalence of 3 per 1000(95% CI 0.95 to 2.45)[9]. In Bangladesh Stroke constitute 8.9% of the hospital admissions among those aged 30 or above[10]. The public health burden of young age stroke is high in these populations because of a relatively greater loss of productivity and wage-earning years[11]. To lessen the financial burden of stroke in a low income country like Bangladesh prevention could be the best way and the recognition of amendable risk factors is vital[12]. The current study search for recognize the risk factors of stroke in adult population of Bangladesh based on the attended stroke patient in some tertiary level hospital in Dhaka city.

Methodology

Study design: The study was a descriptive type of cross sectional.

Place of study: The study was conducted in the indoor and outdoor of Department of Neurology (Neuro medicine and surgery) in Dhaka Medical College and Hospitals (DMCH), Bangobondhu Sheikh Mujib Medical University (BSMMU), Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), National Institute of Neuroscience and Hospital (NINH), Centre for the Rehabilitation of the Paralysed (CRP) (Savar & Mirpur) in where strokes patient attended.

Study population: Adult stroke (age≥25) patients attended in indoor and outdoor of neurology (Neuro-medicine and surgery) department of DMCH, BSMMU, BIRDEM, NINH and CRP (Savar & Mirpur) were study population.

Sample size: In this study 383 participants were interviewed but due to some incomplete data 8.61% participants were excluded in data cleaning process. For that reason, information of 350 participants was finally selected for data analysis.

Sampling technique: The samples were selected purposively. The respondents who fulfilled the inclusion criteria and admitted in indoor and presented in outdoors of Neuro-medicine and surgery departments of DMCH, BSMMU, BIRDEM, NINH and CRP (savar, mirpur)

Data collection instrument: Data were collected through face to face interviews by the semi - structured questionnaire and checklist which was pretested before finalization.

Data collection techniques: The interview was done in the outdoor and indoor department from stroke patient who attended in DMCH, BSMMU, BIRDEM, NINH and CRP (Savar & Mirpur) hospital in a suitable time for the respondent. Face to face interview was taken by using questionnaire and filling up checklists on observation in a comfortable environment in which the respondent could free to disclose their information. Before interviewing the patients, inform consent was taken. Relevant information was collected from medical record.

Results

Among the 350 respondents, the majority of the participants were male 230(65.7%) and rests of them were female 120(34.3%). Age group distribution of the participants shows that 141 (40.3%) number of participants were in 55-64 age group which was followed by 115(32.9%), 45(12.9%), 36(10.3%), 13(3.7%) of 45-54 age group, 35-44 age group , ≥65 age group and 25-34 age group respectively. Most of the male respondents (43.5%) were in 55-64 age groups which were followed by 45-54 age groups (29.6%). On the other hand, most the female participants (39.2%) constitute 45-54 age groups and it was followed by 55-64 age groups (34.2%). About 5.7% male participants were in 25-34 age groups whereas there were no female participants in this young age group. Among the male participants 13% was in ≥65 year's age group whereas only 5% female participants were in this age group. Education levels of the respondents were classified in five groups. Among the groups 139(39.7%) participants complete HSC education that was followed by 110(31.4%) participant's complete graduation and post graduation level education. Remaining 40(11.4%) participants were illiterate, 36(10.3%) participants complete SSC education and only 25(7.1%) participants complete Primary education. Occupational distribution of the participants shows that majority (31.7%) of the respondents

were service holder which followed by 27.7% housewives, 24.0% business, 9.4% retired person, 4.6% day labor, 2.3% farmers and 0.3% others occupation . Among the female participants 80.8% were housewives. Monthly income of the participants family were categories in three group, namely low income group (≤5000 TK), middle income group (5000-15000 TK.) and upper middle income group (≥15000 TK.). Most of the participants (72.9%) comprises upper income group followed by middle income group (25.4%) and low income group (1.7%) (Table1). Within the study subjects 67.4% participants never smoke directly, on the other hand 18.3% were current smoker and 14.3% participants were previous smoker. Among the male participants 27.8% was current smoker and 21.7% was previous smoker. All female participants of this study were no smoking habit. Within smoker respondents, 58.8% were moderate (5-10 sticks/day) smoker, 27.2% light smoker (1-5 sticks/day) and 14% was heavy smoker (≥10 sticks/day). About 78.1% smoker smoked for more than 10 years while 21.9% smoker smoke for less than 10 years. Most of the subjects (59.1%) of this study had never used chewing tobacco, 25.7% subjects was previous user of chewing tobacco and 15.1% subjects were current chewing tobacco users. Among the chewing tobacco user, 71.3% participants consume Betel Nut with tobacco, 14.7% subjects consume only sadapata and 14% consume only zarda as a chewing tobacco format. Data related to alcohol consumption shows that, most of the respondent (86.6%) never consumed alcohol, 12.6% respondents previously consumed alcohol and 0.9% consumer currently consumed alcohol. About 58.9% study subjects had the habit of using extra table salt during their major meal and 41.1% subjects don't use extra table salt during their major meal. Among the study subjects physical activity data shows that 59.4% subjects was moderate worker, 33.1% was light worker, 5.7% sedentary worker, 1.7% hard worker (Table 2). Body mass index of the respondents were categories in normal (18.5-23 kg/m2), overweight (23-27.5 kg/m2) and

obese (≥27.5kg/m2). Nearly half of the respondents were overweight (46.9%) followed by Normal (32%) and obese (21.1%). Females are comparatively higher in obese (25%) among the female respondents than the male (19.1%) among the male respondents. About 76.3% respondents were hypertensive (SBP ≥140, DBP≥ 90) and remaining was normal. Among the respondents, 58.9% were high total cholesterol (≥200 mg/dl) and 41.1% were normal (<200 mg/dl) total cholesterol. In case of HDL, 64.3% respondents were low HDL and 35.7% respondents were desirable HDL. Most of the female respondents (92.5%) were low HDL (≤50 mg/dl). Among the respondents 76.6% were high LDL (>100 mg/dl), 23.4% were normal LDL. Data of triglyceride shows that 75.1% subjects had normal (≤150 mg/dl) triglycerides level, 24.9% subjects had higher (>150 mg/dl) triglyceride levels. Data of Blood sugar level of the respondent's shows that 74.6% subjects was high blood sugar level (diabetic) and 25.4% subjects were normal (non- diabetic) (Table 3). Data shows that previous smoking habit have found significantly higher among the respondents with ischemic stroke (76%) compared to hemorrhagic stroke (24%), p<0.05.   Duration of smoking habit have found significantly higher among the ischemic stroke (88%) compared to hemorrhagic stroke (12%), p<0.05. Chewing tobacco habit have found significantly higher in ischemic stroke (75.6%) compared to hemorrhagic stroke (24.4%), p<0.05. Sadapata consumer have found significantly higher among the ischemic stroke (71.4%) compared to hemorrhagic stroke (28.6%), p<0.05. Alcohol consumption habit have found significantly higher among the respondents with ischemic stroke (88.6%) compared to hemorrhagic stroke (11.4%), p<0.05. The intake of extra table salt have found significantly higher among the respondents with ischemic stroke (70%) compared to hemorrhagic stroke (30%), p<0.05. The moderate level of physical activity level have found significantly higher among the respondents with ischemic stroke (64.9%) compared to hemorrhagic stroke (35.1%), p<0.05.

History of HTN have found significantly higher among the respondents with ischemic stroke (65.9%) compared to hemorrhagic stroke (34.1%), $p<0.05$. History of IHD have found significantly higher among the respondents with ischemic stroke (57.6%) compared to hemorrhagic stroke (42.4%), $p<0.05$. TIA have found significantly higher among the respondents with ischemic stroke (78.2%) compared to hemorrhagic stroke (21.8%), $p<0.05$. Blood glucose level have found significantly higher among the respondents with ischemic stroke (64.4%) compared to hemorrhagic stroke (35.6%), $p<0.05$ (Table 4).

Table -1: Socio demographic characteristics of the respondents

Variables	Male n (%)	Female n (%)
Gender	230(65.7)	120(34.3)
Age group		
25-34 years	13(5.7)	0(0)
35-44 years	16(8.3)	26(21.7)
45-54 years	68(29.6)	47(39.2)
55-64 years	100(43.5)	41(34.2)
≥65 years	30(13)	6(5)
Education level		
Illiterate	21(9.1)	19(15.8)
Primary level	14(6.1)	11(9.2)
SSC	16(7)	20(16.7)
HSC	95(41.3)	44(36.7)
Graduation and above	84(36.5)	26(21.7)
Occupation		
Housewife	0(0)	97(80.8)
Retired	31(13.5)	2(1.7)
Service Holder	93(40.4)	18(15)
Business	81(35.2)	3(2.5)
Day labor	16(7.0)	0(0)
Farmer	8(3.5)	0(0)
Others	1(0.4)	0(0)
Monthly income		
≤5000 TK.	2(0.9)	4(3.3)
5000-15000 TK	62(27.8)	27(22.5)
≥15000 TK	166(72.2)	89(74.2)

Table -2: Behavioral risk factors of the respondents

Variables	Male n (%)	Female n (%)
Smoking habit		
Current smoker	64(27.8)	0(0)
Previous smoker	50(21.7)	0(0)
Never smoked	116(50.4)	120(100)
Smoking rate		
1-5 sticks	31(27.2)	0(0)
5-10 sticks	67(58.8)	0(0)
≥10 sticks	16(14)	0(0)
Year of smoking		
≤10 years	25(21.9)	0(0)
> 10 years	89(78.1)	0(0)
Chewing tobacco		
Current user	35(15.2)	18(15)
Previous user	59(25.7)	31(25.8)
Never user	136(59.1)	71(59.2)
Type of chewing tobacco		
Zarda	13(13.7)	7(14.6)
Sadapata	13(13.7)	8(16.7)
Betel nut	69(72.6)	33(68.8)
Alcohol intake		
Current consumer	2(0.9)	1(0.8)
Previous consumer	32(14.8)	12(10)
Never consumed	196(85.2)	107(89.2)
Use of extra table salt		
User	137(59.6)	61(57.5)
Not user	93(40.4)	51(42.5)
Physical activity		
Sedentary	11(4.8)	9(7.5)
Light work	74(32.2)	42(35)
Moderate work	143(62.2)	65(54.2)
Hard work	2(0.9)	4(3.3)

Table -3: Physical and Biochemical findings

Variables	Male n (%)	Female n (%)
BMI category		
Normal(18.5-23 kg/m ^{2})	78(33.9)	34(28.3)
Overweight(23-27.5 kg/m ^{2})	108(47)	56(46.7)
Obesity (≥ 27.5 kg/m ^{2})	44(19.1)	30(25)
Blood pressure		
Normal	56 (24.3)	27(22.5)
Hypertensive	174(75.7)	93(77.5)

Cholesterol category		
<200 mg/dl (normal)	91(39.6)	53(44.2)
≥200 mg/dl (high)	139(60.4)	67(55.8)
HDL category		
>40(m), >50mg/dl (desirable)	116(50.4)	9(7.5)
≤40(m),≤50 mg/dl (low)	114(49.6)	111(92.5)
LDL category		
≤100 mg/dl (normal)	49(21.3)	33(27.5)
> 100 mg/dl(high)	181(78.7)	87(72.5)
Triglyceride category		
≤150 mg/dl (normal)	169(73.5)	94(78.3)
>150 mg/dl (high)	61(26.5)	26(21.7)
Blood glucose level		
Normal(>6.1mmol/L)	60(26.1)	29(24.2)
High (≥6.1mmol/L)	170(73.9)	91(75.8)

Table -4: Association between type of strokes and variables of interest

Variables	Type of stroke		Chi-square value	p value
	Ischemic	Hemorrhagic		
Smoking habit				
Current smoker	42(35.6%)	22(34.4%)		
Previous smoker	38(76%)	12(24%)		
Never smoked	135(57.2%)	101(42.8%)	6.734	0.034
5-10 sticks	44(65.7%)	23(34.3%)		
> 10 sticks	14(87.5%)	2(12.5%)		
Year of smoking				
≤ 10 years	22(88%)	3(12%)	.028	0.021
>10 years	58(65.2%)	31(34.8%)		
Chewing tobacco				
Current consumer	27(50.9%)	26(49.1%)		
Previous consumer	68(75.6%)	22(24.4%)	11.084	0.004
Never consumed	120(58%)	87(42%)		
Type of chewing tobacco				
Zarda	7(35%)	13(65%)		
Sadapata	15(71.4%)	6(28.6%)	9.250	0.010
Betelnut	71(69.6%)	31(30.4%)		
Alcohol consumption				
Current consumer	2(66.7%)	1(33.3%)		
Previous consumer	39(88.6%)	5(11.4%)	15.831	0.001
Never consumed	174(57.4%)	129(42.6%)		
Intake of table salt				

Yes	144 (70%)	62 (30%)	15,176	0.001
No	71 (49.3%)	73 (50.7%)		
Physical activity level				
Sedentary	16(80%)	4(20%)	8.130	0.043
Light work	61(52.6%)	55(47.4%)		
Moderate work	135(64.9%)	73(35.1%)		
Hard work	3(50%)	2(50%)		
History of hypertension				
Yes	174(65.9%)	90(34.1%)	34.425	0.001
No	21(32.8%)	43(67.2%)		
Don't know	20(90.9%)	2(9.1%)		
History of ischemic heart disease				
Yes	106(57.6%)	78(42.4%)	6.566	0.038
No	88(62.4%)	53(37.6%)		
Don't know	21(84%)	4(16.9%)		
History of transient ischemic attack				
Yes	79(78.2%)	22(21.8%)	17.310	0.001
No	133(55%)	109(45%)		
Don't know	3(42.9%)	4(57.1%)		
Blood glucose level				
Normal	47(52.8%)	42(47.2%)	3.742	0.036
High	168(64.4%)	93(35.6%)		

Discussion

The greater prevalence of stroke in men is well known[13]. In this study 65.7% subjects were male and 34.3% were female and ratio was M: F=1.91:1, which coincide with previous study of Hossain AM et al[14] and chowdhury et al[15]. These findings also coincide with the study of Dey SK[16] in which M: F in ischemic group was 1.73:1 and in hemorrhagic group was 1.42:1. The present study defers with a previous study of Alamgir et al[17] which showed male: female ratio was 4:1. Age is the single most important risk factor for stroke[18]. Frequency of stroke rises exponentially with increasing age[19]. The risk of stroke doubles for each successive decade after age 55 years[20-21.] In this study shows that pick stroke incidence (40.3%) occurs at the 55-64 year age group and it is followed by 45-54 year age group (32.9%). It estimates that almost 73% stroke occurs in age 45-64 age group in Bangladesh which affect the golden years of

active population. This study is slightly differ from the Mollah AS et al[22] study, in which mean age of the stroke patients was 60.0 ±13.7 years and the highest occurrence of stroke was found in the age group of 61-70 years and this findings is coincide with the study of Bashar et al[23], Chowdhury21 and Arif et al[24]. In other hand, findings of this study differ from the data of demographically developed countries, where stroke occurs is around 73 years reflecting the older age structure of these countries[25]. In this study almost half of the respondents live in urban area which is followed by semi urban and rural areas. This study is coincide with the study of Bashar et al[23] which showed higher urban preponderance among the respondents and this study is contraindicate with the study of Hossain AM et al[13] which shows stroke is common both in urban and rural population. This study also contradinct with the study of Mollah AS et al[21] in where proportions of rural, semi urban and urban patients were 46.2%, 27.4% and 26.4% respectively. According to Ferri CP et al[26] Stroke Prevalence is inversely proportional to the education levels of stroke survivors. But this study shows that majority (39.7%) of the respondent's complete HSC education and it was followed by graduate and postgraduate completed respondents (31.4%). The study represents only 11.4% respondents were illiterate which coincide the study of Hossain AM et al[13] and contradict with the findings of Mollah AS et al (47.2%).[21] Occupational category of this study shows that majority (31.7%) of the population were service holders in which male subjects (40.4%) were preponderance. The second highest occupation category comprises housewives (27.7%) in which 80.8% were only female subjects. Third highest categories of occupation comprise business (24%) which also shows male preponderance (35.2%). Finding of this study was coinciding with Hossain et al[13], which also shows service holder preponderance (28%). This study showed that among the affect persons 89% were working force of our society, which indicates a serious impact on the families

of the sufferers. Our study shows that most of the subjects (72.9%) comprises upper middle income group (≥15000 TK/month) and the mean income was 26311.4±28551.6. This study coincides with the study of Chapman et al[27] which showed the incidence of stroke was high among the high-income group. But this study differ from the findings of Hossain et al which shows the low-income group (monthly income TK <5000) comprised the majority (47%). This results also differ with the study by Hart-CL et al[28] which concluded that poor socio-economic circumstances was associated with greater risk of stroke, which was also found in other studies[29]. Findings of this study may reflect the recent trend of socioeconomic status of Bangladesh. Data of this study presents that, 67.4% participants never smoked directly, on the other hand 18.3% were current smoker and 14.3% participants were previous smoker. These findings contradict with the previous study of Haque MM et al[30] (60% smoker) and Hossain AM et al[31] (53.53% smoker). Among the participants, 58.9% subjects have the habit of using extra table salt during their major meal and these data support some ecological[32] and prospective study[33, 34], a higher level of sodium intake is associated with an increased risk of stroke. Our data also support the findings of National Heart Foundation Hospital and Research Institute[35]. Extra table salt consumer have found significantly higher in ischemic stroke (70%) compared to hemorrhagic stroke. From the hospital records of the subjects it shows that most respondents were hypertensive (76.3%). It is generally accepted, that hypertension is the most important modifiable risk factor for stroke and has the highest population-attributable risk for stroke[36]. Findings of this study shows that, 58.9% respondents were suffered from dislipidemia (TC≥200 mg/dl) with mean TC was 204.16±30.07 and this study coincide with two South Asian stroke studies, where >50% of the patients with stroke had elevated cholesterol levels[37].

Conclusion:

There are many risk factors for stroke, some are modifiable and some are non modifiable. This study also focus on some major modifiable lifestyle and behavioral pattern of Bangladeshi population such as smoking habit of male, chewing tobacco practice of both male and female, unhealthy diet practice, low level of physical activity and use of oral contraceptives. This study also focuses on some co-morbid condition of stroke such as Diabetes, Hypertension, Ischemic Heart Disease, Transient Ischemic Attack, Obesity and Dislipidemia. Study found that there is a high prevalence of HTN, DM, IHD and Dislipidemia among the stroke patients. Implementation of screening program in the community to identify risk factors and educate people about primary prevention should be initiated in this regard. This way, we can reduce morbidity and mortality among stroke patients and alleviate the burden of stroke.

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