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Original Research Article

"Risk Factors Analysis for Patients with Hemorrhagic Stroke: A Single Centre Study of Bangladesh"

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Abstract: *Introduction:* Cardiovascular diseases are the leading cause of death globally and stroke is the second cause of death. To prevent the stroke, controlling risk factors is the best way. Disability is a death cause also. So, knowledge regarding the risk factors is very important for treating and preventing hemorrhagic stroke. *Aim of the study:* The aim of this current study was to evaluate the risk factors for hemorrhagic stroke. *Materials and Methods:* This study was a case-control study carried out at Dept. of Medicine, Sheikh Hasina Medical College Hospital, Tangail, Bangladesh from January to June 2021. A total number of 66 subjects of more than 18 years were considered for the study as the study subjects. Among them, 33 were in the study (Case) group and 33 were in the control group. The study population had been selected according to the pre-defined exclusion and inclusion criteria. *Results:* In analyzing the risk factors between the groups, it was found that there were 22 smokers in the study group and 18 in the control group. There were 11 non-smokers in the study group and 15 in the control group. The study shows that there were 29 non-diabetic patients in the study group and 28 in the control group. There were 4 diabetics in the study group and 5 in the control group. There was statistically no significant difference between study and control groups in smoker vs non-smoker and diabetics vs non-diabetics population. It was also found that there were 8 non-hypertensive patients in the study group and 29 in the control group. There were 25 hypertensive patients in the study group and 4 in the control group. There was a statistically significant difference between the study and control groups. There were statistically significant differences between the study and control groups regarding hypertension and total serum cholesterol. *Conclusion:* According to the findings of this study we can conclude that hypertension, as well as low total serum cholesterol, are potential risk factors of hemorrhagic stroke.
Keywords: Hemorrhagic Stroke, Risk Factors, DM, HTN, Serum Cholesterol.

INTRODUCTION

Stroke is traditionally defined as a clinical syndrome characterized by an acute loss of focal brain function with symptoms lasting more than 24 h or leading to (earlier) death, and it is due to inadequate blood supply to a part of the brain (ischemic stroke) or spontaneous hemorrhage into a part of the brain (primary intracerebral hemorrhage) or over the surface of the brain (subarachnoid hemorrhage) [1]. Haemorrhagic stroke (HS) is caused by bleeding of a blood vessel supplying the brain. Subarachnoid hemorrhage, which usually occurs due to rupturing of an aneurysm, may also lead to stroke. It tends to more severe and associated with higher early mortality [2]. HS most commonly occur in association with hypertension. Several factors identified as associated with an increased risk of stroke [3]. The hospital mortality and morbidity rate of patients with acute stroke ranges from 7.6% to 30%. From these, neurological deaths constitute about 80% and non-neurological deaths constitute about 17% [4].

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Neurological deaths such as progressive increased intracranial pressure and subsequent herniation were the most common causes of death in both groups within the first 4 days of admission[5].Medical complications after stroke are common, present barriers to optimal recovery or related to poor outcomes and are potentially preventable or treatable [6]. Estimates of frequency of complications range from 40% to 96% of patients, with severity of stroke as the most important risk factor [7]. The complications have been fatal in some cases, contributing to the hospital mortality [8]. The objective of this study was to asses and compare the risk factors between hemorrhagic stroke and healthy population.

MATERIAL AND METHODS

This study was a case-control study carried out at Dept. of Medicine, Sheikh Hasina Medical College Hospital, Tangail, Bangladesh from January to June 2021. A total number of 66 subjects of more than 18 years were considered for the study as the study subjects. Among them, 33 were in the study (Case) group and 33 were in the control group. The study population had been selected according to the pre-defined exclusion and inclusion criteria. Study or case group was formed by 33 hemorrhagic stroke patients admitted in the Medicine wards of SHMCH On the other hand, the control group was formed 33 age and sex matched apparently healthy people and patient attendants' having no history of hemorrhagic stroke. Purposive sampling technique was done for selecting both study and control group, who fulfilled the inclusion criteria were included in the study until target sample size was achieved.

According to the inclusion criteria of this study, 18 years and above aged patients with WHO defined stroke confirmed by CT scan that the stroke was hemorrhagic were included as the case group participants. On the other hand, according to the exclusion criteria of this study, ischemic stroke patients, patients receiving drugs that effect on cholesterol levels, patients with, malabsorption syndrome and patients with known hypo or hyperthyroid patient were excluded. In control group, apparently healthy adults of similar ages of both genders having no history of hemorrhagic stroke were included. Hemorrhagic stroke patient diagnosed both clinically as well as by CT scan of head was taken as study group and control group were age, sex, matched apparently healthy people and patient attendants having no hemorrhagic stroke. Study and control group were selected 1:1 ratio and compared accordingly. After obtaining the informed consent of the cases and controls, fasting blood was drawn under all aseptic precautions. Measures were taken to prevent hemolysis. Samples were sent to the Lab, SHMCH. Samples were sent to the Lab the statistical analysis was done by using computer with SPSS version 20 to estimate the association of hemorrhagic stroke with serum cholesterol level. All data were processed, analyzed and disseminated by MS Office and SPSS program as per need.

RESULTS

In this study 33 hemorrhagic stroke patients were enrolled as a study group taken from SHMC. On the other hand, 33 age and sex-matched healthy adults were enrolled as a control group. Those control groups were taken from the attendance of patients. Out of 66 respondents in the study group and control group, 31.7% were female, 68.3% were male and the male & female ratio was 2.14:1. The age range was found 20-≥70 years in the study group and the p-value was 0.00043. In analyzing the risk factors between the groups, it was found that there were 22 smokers in the study group and 18 in the control group. There were 11 non-smokers in the study group and 15 in the control group. The study shows that there were 29 non-diabetic patients in the study group and 29 in the control group. There were 4 diabetics in the study group and 5 in the control group. There was statistically no significant difference between study and control groups in smoker vs non-smoker and diabetic's vs non-diabetics population. It was also found that there were 8 non-hypertensive patients in the study group and 28 in the control group. There were 25 hypertensive patients in the study group and 4 in the control group. There was a statistically significant difference between the study and control groups. The mean value of serum total cholesterol was the focus of this study. Total cholesterol was found 174.53 ± 26.64 mg/dl in the study group and 195.15 ± 26.05 mg/dl in the control group which was statistically significant (p<0.001). There was also a statistically significant difference in LDL parameters in the study group 113.93 ± 9.2 mg/dl and in the control group it was 127.15 ± 20.10 mg/dl. The other parameters were HDL 37.01 ± 4.87 VS 37.95 ± 3.53 mg/dl and TG was 169.73 ± 42.12 VS 158.60 ± 26.99 mg/dl. No statistically significant difference was observed in serum levels of HDL and TG between the two groups. In unadjusted odds, being a smoker (unadj OR. 2.59, 95% CI (1.24–5.41); DM (unadj OR. 3.24, 95% CI (1.24–4.49); HTN (unadj OR. 4.38, 95% CI (1.88–10.21); Low level of serum TC [unadj OR. 4.28, 95% CI (1.91–9.61); TG [unadj OR. 0.67, 95% CI (2.10 – 4.46); LDL (unadj OR. 1.63, 95% CI (1.08–6.42); and decreased level of HDL (unadj OR. 3.00, 95% CI (2.23–6.13); were found, significant predictors.

Table-1: Age distribution of both group participants (N=66)

Age (Year)	Study group (n=33)		Control group (n=33)		TP-Vl (n=66)		P value
	n	%	n	%	n	%	
20-29	1	3.03	1	3.03	2	3.03	
30-39	3	9.09	3	9.09	6	9.09	
40-49	8	24.24	8	24.24	16	24.24	
50-59	4	12.12	5	15.15	9	13.64	0.00043
60-69	9	27.27	8	24.24	17	25.76	
≥70	8	24.24	8	24.24	16	24.24	
Total	33	100.00	33	100.00	66	100.00	

An independent Sample test was done to measure the level of significance

Table-2: Serum lipid profile (mg/dl) in case and control groups (N=66)

Serum lipid	Study group Mean ± SD	Control Group Mean ± SD	P value
S. Chol. (mg/dl)	174.53±26.64	195.15±26.04	0.001[Sig]
HDL (mg/dl)	37.01±4.87	37.95±3.53	0.122[NS]
LDL (mg/dl)	113.93±9.2	127.15±20.1	0. 001[Sig]
TG (mg/dl)	169.73±42.12	158.6±26.99	0. 880[NS]

Table-3: Chi-square test results of the factors between the groups (N=66)

Risk factors		Study group	%	Control group	%	P-value
Smoking	Smoker	22	66.67	18	54.55	
	Non-smoker	11	33.33	15	45.45	0.234 [NS]
	Total	33	100.00	33	100.00	
DM	Absent	29	87.88	28	84.85	
	Present	4	12.12	5	15.15	0.0258 [NS]
	Total	33	100.00	33	100.00	
HTN	Absent	8	24.24	29	87.88	
	Present	25	75.76	4	12.12	0.950 [Sig]
	Total	33	100.00	33	100.00	

Table-4: Logistic regression between risk factors for hemorrhagic stroke.

Risk factors	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Smoking Status		
Non-smoker (Ref).	1	1
Smoker	2.59 (1.24-5.41)	0.85(0.57-2.82)
DM		
Absent (Ref).	1	1
Present	3.24(1.24-8.49)	.88(0.36-3.06)
HTN		
Absent (Ref).	1	1
Present	4.37(1.87-10.21)	3.66(1.11-12.12)
TC		
Up to 189 mg/dl (Ref).	1	1
less than 189 mg/dl	4.27(1.9-9.61)	6.24(2.07-22.83)
TG		
Up to 150 mg/dl (Ref).	1	1
less than 150 mg/dl	0.66(2.1-4.46)	0.90 (1.17-5.86)
HDL		
30 and above (Ref).	1	1
less than 30mg/dl	3.00 (2.23-6.13)	0.67 (0.33-2.25)
LDL		
Up to 130(Ref).	1	1
less than 115	1.63(1.07-6.41)	4.45(0.10-8.05)

DISCUSSION

The aim of this current study was to evaluate the risk factors for hemorrhagic stroke. In this study, 66 patients of hemorrhagic stroke were enrolled as study group. For better precision, 66 age and sex matched healthy adults were also taken as control group. Among them 45 were male and 21 were female. According to analysis of age distribution, there was no significant difference among both groups. Analysis of age distribution showed that out of all patients, more respondents of study group were in elder age groups which were of 60 to 69 years. In the study group it was 26.4% and in control 25%. The mean age of study and control groups was 56.41± 15.06 and 56.20±14.79 respectively. In this study, 33.33% hemorrhagic stroke patient were service holder both govt. and non-government. Majority ware retired persons. Farmers were 21.66% and businessmen were 23.66%. Among the female 68% were house wives. In this study, among the peri urban dweller hemorrhagic stroke was more than the urban and rural area. In peri urban it was 43.30% and urban 26.70% and rural 30%. This study re-evaluated that the association between having a history of smoking and hemorrhagic stroke. It was significant with unadjusted odd ratio 2.59 and 95% confidence interval ranging from 1.248 to 5.41 and in adjusted odd ratio model, it is. 85 with 95% confidence interval ranging from (0.57 to 2.82) (p=0.521). It is non-significant. Tan *et al*. (2008) also found cigarette smoking as risk factor of stroke with an OR 2.3 and 95% CI=1.10 to 4.96 [9]. Jafre *et al*. (2014) showed that smoking as a risk factor of stroke in a multivariate analysis, this study had given more emphasis in ischemic stroke than hemorrhagic stroke [10]. All these studies are not consistent with the present study result. So, it needed further studies with large sample size to establish this factor. It may also a cause that in this study both the case and control females, maximum was nonsmoker as for socio cultural and religious background. But in case of referral studies the female smoker were more. The person having associated risk factor like diabetes mellitus and hypertension, were more vulnerable to develop stroke. It was proved by logistic regression model. In unadjusted DM (OR. 3.24, 95% CI but adjusted OR. 88 but in adjusted model only HTN adj OR. 3.66, 95% CI was significant risk factor for hemorrhagic stroke. Hypertension and diabetes mellitus (DM) were found to be significant risk factor for ischemic stroke (P<0.01 and P<0.05 respectively) in a study by Uddin *et al*. [11]. The odd ratio of hypertension in a study by Tan *et al*. [9] was 2.7 with 95% confidence interval ranging from 1.53 to 4.80, which is consistent with this study. In this study, Serum total cholesterol between case and control groups was 173.53 (39.57) mg/dl Vs 195.15. (22.08) mg/dl; [p value <0.001]. The difference between study and control group was statistically significant. Low total cholesterol levels were found in 55.7% (33/60) of the study group and 20.0% (12/60) of the control group. There was 6.2 times risk of development hemorrhagic stroke in study of having low cholesterol level and with the range of (2.07-22.83); 95% CI. In Honolulo Heart Program they studied serum cholesterol and hemorrhagic stroke, there was a significant (p=0.001) inverse association between serum cholesterol and hemorrhagic stroke. This inverse association was nonlinear, with a higher incidence rate only for serum cholesterol in lowest quintile was <189mg/dl, The RR was 2.55 (95% CI 1.58-4.12) [12]. In study of Malaber Institute kerala, India, 2012, showed that the proportion of ICH patient with low cholesterol was significantly higher than the control group (68% VS 43%). Mean total cholesterol was significantly low in ICH patient compared with controls (177mg/dl vs 200mg/dl; p value 0.0006), which is consistent with the present study. Mercola.com 2008 found that as cholesterol dropped, the risk of hemorrhagic stroke increases significantly. A person with a cholesterol level below 180mg/dl had twice the risk of hemorrhagic stroke compared with someone at 230mg/dl. Larry B. Goldstein showed that ICH was 3 times more common (p=0.04) in men with serum cholesterol <160mg/dl compared with those with higher levels, where higher levels were associated with increased risk of ischemic stroke (p=.007) [13]. The Green Med Info published an article on January 2001. Stroke. Carlos Iribarren, David R. Jackob, Stephen Sidney 1996 showed among 386 events by multivariate proportional hazards life table regression analysis, serum cholesterol level bellow 10th percentile (178mg/dl) compared with higher cholesterol level, was associated with a significantly increased risk of ICH in men aged 65years or older (RR, 2.7; 95% CI, 1.4 to 5.0) [14]. All these study results are in accordance with this study findings. In this study, it was also found that level of LDL between study and control was 113.93(9.2) mg/dl vs 127.15(20.10) mg/dl; P=0.001 which was statistically significant and in logistic regression test adjustable odds 4.45 (0.10-8.05). In the study of Malaber Institute kerala, India, 2012 showed that the proportion of ICH patient have low level serum LDL-c which is consistent with this study. The other parameters were HDL 37.01±4.87 vs 37.95 ± 3.53 and TG was 169.73 ± 42.12 mg/dl vs 158.60 ± 26.99 mg/dl statistically non-significant. In that study Indian study 2012 showed that the proportion of ICH patient has low level serum TG, which is not consistent with the present study. But there was no significant difference in high-density lipoprotein level in both groups which is consistent with this study.

CONCLUSION & RECOMMENDATION

According to the findings of this study, we can conclude that hypertension, as well as low total serum cholesterol, are potential risk factors of hemorrhagic stroke. Basically, this was a single-centered study with a small-sized sample. So, the findings of this study may not reflect the exact scenario of the whole country. For getting more specific results, we would like to recommend conducting similar studies in several places with larger size samples.

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