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Analysis of Risk Factors for Haemorrhagic Stroke Patients in a Tertiary Care Hospital of Bangladesh

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Abstract **Original Research Article**

Background: Cardiovascular diseases are the leading cause of death worldwide, with stroke coming in second. Controlling risk factors is the best strategy to avoid a stroke. Disability is also a cause of death. For treating and preventing hemorrhagic stroke, understanding the risk factors is critical. The aim of the study: The current study's objective was to determine the risk factors for hemorrhagic stroke. ***Materials and Methods:*** This study was a case-control study carried out at Sher-E-Bangla Medical College Hospital, Barishal, 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:*** The risk factors between the groups were evaluated, it was found that the study group had 22 smokers and the control group had 18 smokers. The study group had 11 nonsmokers and the control group had 15. There were 29 non-diabetic patients in the study group and 28 in the control group, according to the findings. The study group had 4 diabetes while the control group had 5. In the smoker vs. non-smoker and diabetics vs. non-diabetics population, there was no statistically significant difference between study and control groups. There were also 8 non-hypertensive patients in the study group and 29 non-hypertensive patients in the control group. The study group consisted of 25 hypertension patients, while the control group consisted of four. Between the study and control groups, there was a statistically significant difference. In terms of hypertension and total serum cholesterol, there were statistically significant differences between the study and control groups. ***Conclusion:*** We can conclude from the results of this study that hypertension and low total serum cholesterol are potential risk factors for hemorrhagic stroke.

Keywords: Hemorrhagic Stroke, Risk Factors, DM, HTN, Serum Cholesterol.

INTRODUCTION

Stroke is a disease that is characterized by an acute loss of focal brain function with symptoms lasting more than 24 hours or leading to (earlier) death, and it is caused by insufficient 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 brain's surface (subarachnoid hemorrhage) [1]. The bleeding of a blood vessel supplying the brain causes haemorrhagic stroke (HS). Stroke can result from a subarachnoid hemorrhage, which is usually caused by an aneurysm rupturing. It is more severe and is associated to a higher rate of early mortality [2]. HS is most frequently associated with hypertension. A number of factors have been linked to an increased risk of stroke [3]. Patients with acute stroke have a hospital mortality and morbidity rate ranging from 7.6% to 30%. Neurological fatalities account for roughly 80% of them, while non-neurological deaths represent for about 17% [4].

During the first four days of admission, neurological fatalities such as progressive increasing intracranial pressure and subsequent herniation were the most common causes of death in both groups5. Medical problems following a stroke are prevalent, can obstruct optimal recovery or lead to poor outcomes, and can be

prevented or treated [6]. Complications are estimated to occur in 40% to 96% of patients, with the severity of the stroke being the most relevant risk factor [7]. In other cases, the consequences were deadly, contributing to hospital mortality [8]. The goal of this study was to evaluate and assess the risk factors for hemorrhagic stroke in a healthy population versus a hemorrhagic stroke in a healthy population.

MATERIAL AND METHODS

This study was a case-control study carried out at the Department of Medicine of Sher-E-Bangla Medical College Hospital, Barishal, Bangladesh from January 2021 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 SBMCH 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, SBMCH. 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

A number of 33 hemorrhagic stroke patients from SBMCH were enrolled in this study. A control group of 33 age and sex-matched healthy people, on the other hand, was enlisted. Patients' attendance was used to create the control groups. In the study and control groups, 31.7 percent of the respondents were female and 68.3 percent were male, for a male to female ratio of 2.14:1. The study group ranged in age from 20 to 70 years old, with a p-value of 0.00043. When the risk factors between the groups were compared, it was discovered that the study group had 22 smokers and the control group had 18 smokers. The study group had 11 nonsmokers and the control group had 15. There were 29 non-diabetic patients in the study group and 29 in the control group, according to the findings. The study group had four diabetes while the control group had five. In the smoker vs. non-smoker and diabetes vs. non-diabetics population, there was no statistically significant difference between study and control groups. There were also 8 non-hypertensive patients in the study group and 28 non-hypertensive patients in the control group. The study group consisted of 25 hypertension patients, while the control group consisted of four. Between the study and control groups, there was a statistically significant difference. This study focused on the mean value of serum total cholesterol. Total cholesterol levels in the study group were 174.53 26.64 mg/dl, while in the control group they were 195.15 26.05 mg/dl, which was statistically significant (p0.001). There was also a statistically significant difference in LDL parameters between the study and control groups, with the study group receiving 113.93 9.2 mg/dl and the control group having 127.15 20.10 mg/dl. HDL was 37.01 4.87 mg/dl versus 37.95 3.53 mg/dl, while TG was 169.73 42.12 mg/dl versus 158.60 26.99 mg/dl. There was no statistically significant difference in HDL and TG serum values between the two groups. Being a smoker (unadj OR. 2.59, 95 percent CI (1.24–5.41), having diabetes (unadj OR. 3.24, 95 percent CI (1.24–4.49), having high blood pressure (unadj OR. 4.38, 95 percent CI (1.88–10.21), having a low level of serum TC (unadj OR. 4.28, 95 percent CI (1.91–9.61), having TG (unadj OR.

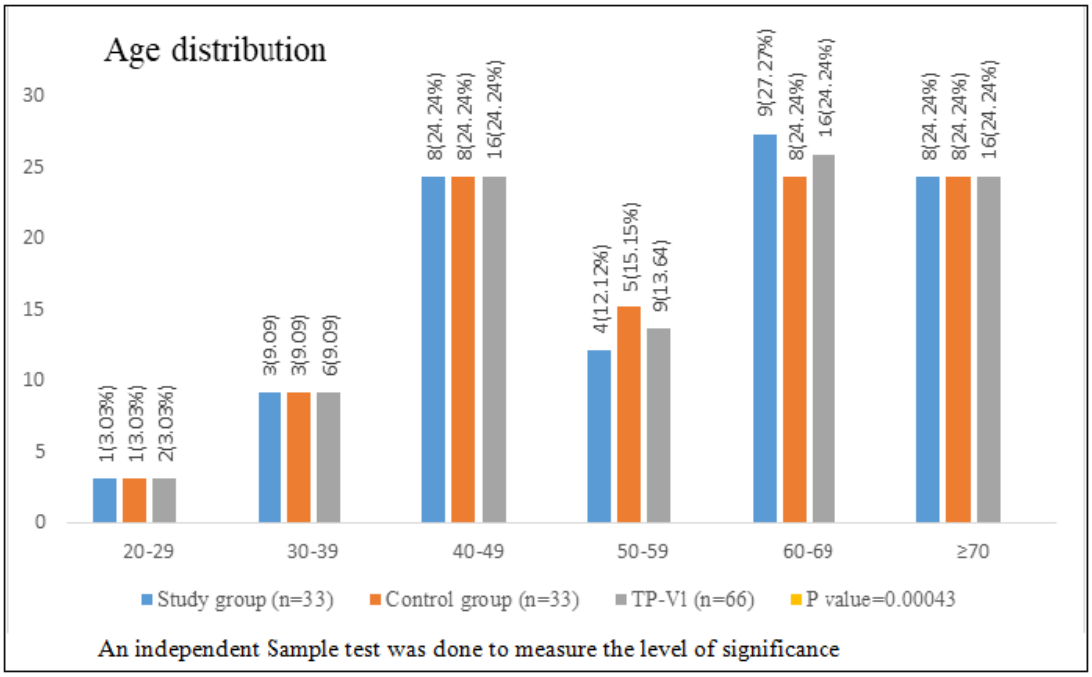

Figure-1: Age distribution of both group participants (N=66)

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

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

Table-II: 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	0.234 NS
	Non-smoker	11	33.33	15	45.45	
	Total	33	100.00	33	100.00	
DM	Absent	29	87.88	28	84.85	0.0258 NS
	Present	4	12.12	5	15.15	
	Total	33	100.00	33	100.00	
HTN	Absent	8	24.24	29	87.88	0.950 Sig
	Present	25	75.76	4	12.12	
	Total	33	100.00	33	100.00	

Table-III: 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(0.57-2.8
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

Risk factors	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)
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 recent study's objective was to identify the risk factors for hemorrhagic stroke. A total of 66 patients with hemorrhagic stroke were enrolled in this study. A control group of 66 age and sex matched healthy adults was also used for better precision. There were 45 men and 21 women among them. According to age distribution analysis, there was no significant difference between the two groups. An analysis of the age distribution revealed that more patients in the study group were in the older age categories of 60 to 69 years. It was 26.4 percent in the study group and 25% in the control group. The study and control groups were 56.41 15.06 and 56.2014.79 years old, respectively. In this study, 33.33% of hemorrhagic stroke patients were government and non-government employees. The majority of the people were retirees. Farmers made up 21.66 percent of the population, while businesspeople made up 23.66 percent. Housewives made up 68% of the female population. Hemorrhagic stroke was shown to be more common in peri-urban dwellers than in urban and rural areas in this study. It was 43.30 % in periurban, 26.70 % in urban, and 30 percent in rural. The link between having a history of smoking and hemorrhagic stroke was re-evaluated in this study. It was significant with an unadjusted odd ratio of 2.59 and a 95 % confidence interval of 1.248 to 5.41, and it is significant in an adjusted odd ratio model with an adjusted odd ratio of 85 and a 95 percent confidence interval of (0.57 to 2.82) (p=0.521). It's of no consequence. Cigarette smoking was also determined to be a risk factor for stroke by Tan *et al*., (2008), with an OR of 2.3 and a 95 percent confidence interval of 1.10 to 4.96 [9]. In a multivariate analysis, Jafre *et al*., (2014) found that smoking is a risk factor for stroke [10]. This study focused more on ischemic stroke than hemorrhagic stroke. All of these research contradict the findings of the current study. To establish this factor, more research with a large sample size was required. It could possibly be because the majority of the case and control females in this study were nonsmokers in terms of sociocultural and religious background. In referral studies, however, female smokers were more prevalent. People with associated risk factors such as diabetes and hypertension were more likely to get a stroke. The logistic regression model proved it. In the unadjusted model, DM (OR. 3.24, 95 percent CI) was a significant risk factor for hemorrhagic stroke (OR. 88), while in the adjusted model, only HTN adj OR. 3.66, 95 percent CI was a significant risk factor for hemorrhagic stroke (OR. 3.66, 95 percent CI). In a study by Uddin *et al*., [11], hypertension and diabetes mellitus (DM) were revealed to be significant risk factors for ischemic stroke (P0.01 and P0.05, respectively). Tan *et al*., [9] found that the odd ratio of hypertension was 2.7, with a 95 % confidence interval of 1.53 to 4.80, which is consistent with this study. In this study, serum total cholesterol was 173.53 (39.57) mg/dl in the case group and 195.15 (22.08) mg/dl in the control group; [p value 0.001]. There was a statistically significant difference between the study and control groups. 55.7 % (33/60) of the study group and 20.0 % (12/60) of the control group had low total cholesterol levels. In a study of people with low cholesterol levels, there was a 6.2-fold increased risk of hemorrhagic stroke, with a 95 percent confidence interval of (2.07-22.83). Serum cholesterol and hemorrhagic stroke were evaluated in the Honolulu Heart Program, and there was a significant (p=0.001) inverse relationship between serum cholesterol and hemorrhagic stroke. The inverse relationship was nonlinear, with a higher incidence rate only for serum cholesterol in the lowest quintile of 189mg/dl, with a risk ratio of 2.55 (95% confidence interval 1.58-4.12) [12]. According to a study published in 2012 by the Malaber Institute in Kerala, India, the proportion of ICH patients with low cholesterol was substantially higher than the control group (68 percent VS 43%). The present investigation found that mean total cholesterol in ICH patients was considerably lower than in controls (177mg/dl vs 200mg/dl; p value 0.0006). Mercola.com discovered in 2008 that as cholesterol levels decline, the risk of hemorrhagic stroke rises dramatically. Compared to someone with a cholesterol level of 230mg/dl, those with a cholesterol level below 180mg/dl had twice the risk of hemorrhagic stroke. According to Larry B. Goldstein, ICH was 3 times more common (p=0.04) in males with serum cholesterol 160mg/dl compared to those with higher levels, which were linked to an elevated risk of ischemic stroke (p=.007) [13]. In January 2001, Green Med Info released an article Stroke. In a multivariate proportional hazards life table regression analysis of 386 events, Carlos Iribarren, David R. Jackob, and Stephen Sidney

found that serum cholesterol levels below the 10th percentile (178mg/dl) were associated with a significantly increased risk of ICH in men aged 65 years or older (RR, 2.7; 95 percent CI, 1.4 to 5.0) [14]. All of these results are consistent with the findings of this investigation. In this study, it was also discovered that the level of LDL in the study and control groups was 113.93(9.2) mg/dl vs 127.15(20.10) mg/dl; P=0.001 was statistically significant, and the adjusted odds were 4.45 in the logistic regression test (0.10-8.05). According to a study conducted by the Malaber Institute in Kerala, India in 2012, a significant majority of ICH patients have low levels of serum LDL-c, which is consistent with the findings of this study. HDL was 37.014.87 vs 37.95 3.53, and TG was 169.73 42.12 mg/dl vs 158.60 26.99 mg/dl, all of which were statistically non-significant. In that study, the proportion of ICH patients with low serum TG was found to be low, which contradicts the findings of the current study. However, there was no significant difference in the levels of high-density lipoprotein in both groups, which is in line with the findings of this study.

CONCLUSION

We can conclude from the findings of this study that hypertension and low total serum cholesterol are both possible risk factors for hemorrhagic stroke.

RECOMMENDATION

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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