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Association of Lipids with Hemorrhagic Stroke: A study in a Tertiary Care Hospital

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Abstract

Introduction: Hemorrhagic stroke is rupture of blood vessel in focal region of the brain and spills of blood in surrounding area of brain parenchyma. The low- and middle-income countries experience 80% mortality rate among all hemorrhagic stroke. Although the association of Hemorrhagic Stroke with Hypertension, Smoking and Alcohol consumption are well establish, the association between lipids and hemorrhagic stroke has not been well investigated so far. ***Aim of the study:*** The aim of the study was to investigate the association of Serum lipids levels with hemorrhagic stroke in a tertiary care hospital of Bangladesh. ***Materials & Methodology:*** This cross-sectional study was conducted in the department of neurology in Enam medical college hospital, Dhaka, Bangladesh. Data was collected between April 2019 and May 2020. Seventy two cases with hemorrhagic stroke were randomly included. Appropriate statistical methods were used to analyze the results. Data were analyzed using SPSS 20.0 version (Chicago, Inc., USA) software and MsExcel-2016 version. ***Result:*** From 72 study people we found highest 22(30.6%) in the range of 60-69 years. There were 46(63.9%) males and 26(36.1%) females were enrolled in this study. Hypertension was found in 80.6% study people. The univariate analysis was done to see the association of lipids with Hemorrhagic Stroke. It has been obsereved that, the Total cholesterol and Serum Triglyceride level were low among the cases of hemorrhagic stroke. We found strong association in hemorrhagic stroke with Total cholesterol and Serum Triglyceride of serum lipids. ***Conclusion:*** 60-69 age ranges people had faced this stroke the most and males are predominant. The low level of serum total cholesterol and triglycerides may intensify the of risk hemorrhagic stroke.

Keywords: Stroke; Hemorrhagic Stroke; Total cholesterol (TC); Low-density lipoprotein cholesterol (LDL-C); High-density lipoprotein cholesterol (HDL-C); Triglyceride; Bangladesh.

INTRODUCTION

Stroke or cerebro-vascular accident is defined by the abrupt onset of a neurological deficit that is attributable to a focal vascular cause [1].The global prevalence of stroke increased by 21% from 2005 to 2015, affecting 42.4 million people in 2015 [2]. In China, stroke was the top leading cause of death and disability-adjusted life-years in 2017 estimated with data from Global Burden of Diseases 2017 [3]. Hemorrhagic stroke is rupture of blood vessel in focal region of the brain and spills of blood in surrounding area of brain parenchyma [4]. Collected hematoma increases intracranial pressure then cause neuronal injury [5]. It is second most common subtype of stroke, it accounts approximately 10-20 % of all stroke events. However, compared to ischemic stroke, it causes more severe disability with higher mortality. Stroke is second leading cause of death and disability worldwide. 15.2 million People have to face stroke throughout the world till 2015, in which 5 million die and left over are disabled. . The low- and middle-income countries experience 80% mortality rate among all hemorrhagic stroke [6, 7]. In middle- and lower-income country the disability adjusted life years rate of hemorrhagic stroke 137/100000 per year till 2013 [8]. The incidence of hemorrhagic stroke differs from country to country. Low- and middle-income countries like Bangladesh having double incidence rate of hemorrhagic stroke as compare to high income countries [9]. Most studies

have found a positive association between Total cholesterol (TC) and ischemic stroke [10, 11], whereas an inverse relationship between Total cholesterol (TC) and hemorrhagic stroke was found in others [10-13]. In some other studies, TC was not identified to be associated or showed only weak relationships with hemorrhagic stroke [14, 15]. For other lipids components including low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglyceride, their associations with stroke especially type-specific stroke were also discrepant [16-18]. Although the burden of hemorrhagic stroke was high in Bangladesh, the association between lipids and hemorrhagic stroke has not been well investigated in any studies. To better understand the etiology and prevent stroke, more evidence on the association between lipids and stroke is needed. The aim of the study was to investigate the association of lipids with hemorrhagic stroke in a tertiary care hospital of Bangladesh.

OBJECTIVES

The objective of the study was to investigate the baseline characteristics of hemorrhagic stroke and to investigate the association of lipids with hemorrhagic stroke in a tertiary care hospital of Bangladesh.

MATERIALS & METHODOLOGY

This cross-sectional study was conducted in the department of neurology in Enam medical college hospital, Dhaka, Bangladesh. Data were collected between April 2019 and May 2020. Seventy two randomly selected cases with hemorrhage were enrolled in the study. To avoid the biasness, patients who had used lipid-lowering drugs in the past six months were excluded from the study. A checklist was provided for each stroke patient, and the required information was collected. Diagnosis of the type of stroke was confirmed by CT scan of brain in the emergency department within 24 hours after the presentation of clinical signs. Patients taken of age more than 30 years to less than 90 years were included in this study. Patients with the serum lipids, including TG, TC, low-density lipoprotein-cholesterol (LDL-C), and high-density lipoprotein-cholesterol (HDL-C), were measured in the fasting state. Our laboratory method for measurement of these lipids was enzymatic photometric method using commercial kits. Appropriate statistical methods were used to analyze the results. Data were analyzed using SPSS 20.0 version (Chicago, Inc., USA) software and MsExcel-2016 version. Data were expressed as percentage. Unpaired z- test was used as a test of significance; with p value < 0.05 was taken to be significant. Univariate analysis was used to see the association of 5 level lipids with hemorrhagic stroke.

RESULTS

In this present study, most of the study people (30.6%) were in the age group of 60-69 with mean age of 59.5 years (SD± 13 years) ranged between 34-84 years (Table-1). Figure 1 shows that majority of the study people were male (63.9%).Figure 2 shows that most of the study people (81.9%) were from rural area. Most of the study people (38.9%) were primary pass (Figure 3).Table 2 shows the distribution of the study people according to presenting complaints and symptoms. Most of the study people (47.2%) had weakness in the left side, 34.7% had weakness in the right side and 5.6% had weakness in both side. Most of the study people (29.2%) had Hemi sensory Loss in the left side, 27.8% had Hemi-sensory Loss in the right side and 2.8 had Hemi sensory Loss in both side. Table-3 shows the distribution of the study people according to past history. In the clinical history, hypertension was seen in 80.6% study people which is the most common. Almost half (54.2%) study people had family history of HTN. Forty eight (66.7%) study people had history of taking anti hypertensive drug, 34 (47.2%) study people missed anti hypertensive before attack, 16 (22.2%) study people had history of taking NSAID drug, 8 (11.1%) study people had history of taking anti diabetic drug, 3 (4.2%) study people had history of taking OCP drug and 2 (2.8%) study people had history of taking steroid. Table-4 shows the distribution of the study people according to results of physical examination. Most of the study people (61.1%) had normal BMI, 30.6% had overweight, 4.2% had underweight and 4.2% had obese. The most common site of hemorrhagic stroke was basal ganglia which was seen in 55.6% study people, thalamus was seen in 20.8% study people, lobar was seen in 16.7% study people and cerebellar was seen in 6.9 % study people. Most of the study people (52.8%) had mild GCS score followed by 29.2% had moderate score and 18.0% had severe score. Table-5: Distribution of the study people according to serum lipid profile (Fasting). In this study mean serum total cholesterol was found 113.4 mg/dL which is 56.9% of the study population and this is below desired level of total cholesterol (<200mg/dl), followed by 23.6% had Borderline high level (200-239mg/dl) and 19.4% had high level (>240mg/dl) of total cholesterol level. P value is <0.0001 which statistically significant. Mean HDL-C was found 46.9 mg/dl, mean LDL-C was found 127.4mg/dl which is 36%and 43% respectively. P value is >0.0001 which is statistically insignificant. Serum Triglyceride was found 48.2 mg/dl which is 98.6% of the study population and p value <0.0001 which is significant. Serum total cholesterol and serum Triglyceride shows strong significant association with hemorrhagic stroke but HDL-C and LDL-C shows no association. Low level of serum Cholesterol and serum Triglycerides increase risk of hemorrhagic stroke.

Table-1: Demographic characteristics of the study people. (n=72)

Age (years)	n	%
30-39	2	2.8
40-49	12	16.7
50-59	14	19.4
60-69	22	30.6
70-79	20	27.8
80-89	2	2.8
Mean± SD	59.5± 13	
Range	34-84	

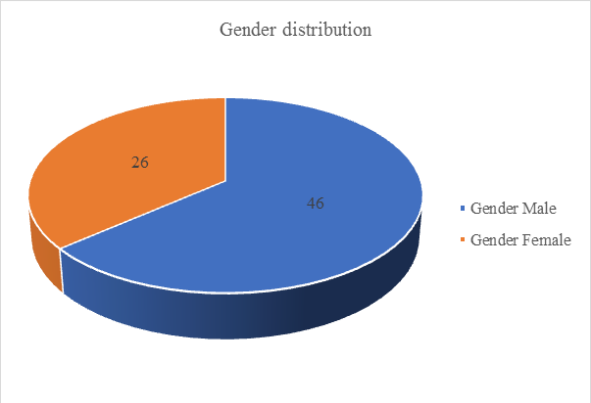

Fig-1: Gender distribution of the study people. (n=72)

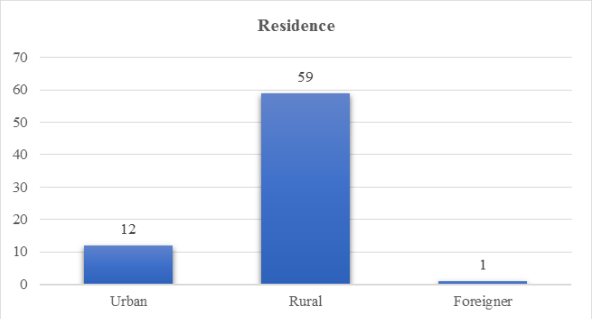

Fig-2: Distribution of the study people according to residence. (n=72)

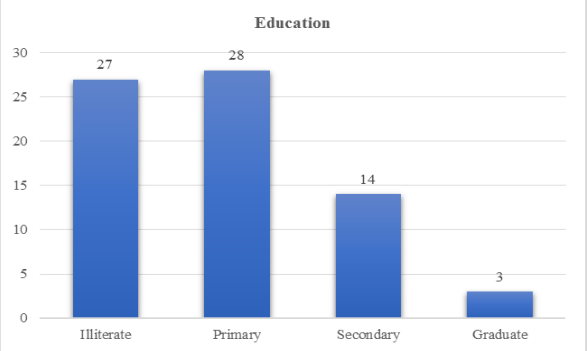

Fig-3: Distribution of the study people according to education level. (n=72)

Table-2: Distribution of the study people according to presenting complaints and symptoms. (n=72)

Presenting Complaints		n	%
Weakness	Right	25	34.7
	Left	34	47.2
	Both	4	5.6
	None	9	12.5
Hemi sensory Loss	Right	20	27.8
	Left	21	29.2
	Both	2	2.8
	None	29	40.3

Table-3A: Distribution of the study people according to past history. (n=72)

Past history		n	%
Clinical history	Migraine	5	6.9
	Stroke	2	27.8
	Hypertension	58	80.6
	DM	14	22.2
	IHD	3	9.7

Table-3B: Distribution of the study people according to family and Drug history. (n=72)

Family History	DM	25	34.7
	HTN	39	54.2
	IHD	16	22.2
Drug History	NSAID	16	22.2
	Anti Hypertensive	48	66.7
	Anti Diabetic	8	11.1
	OCP	3	4.2
	Steroid	2	2.8
	Missed anti Hypertensive before Attack	34	47.2

Table-4: Distribution of the study people according to results of physical examination. (n=72)

Characteristics		n	%
BMI (kg/m^2)	Underweight (<18.5)	3	4.2
	Normal (18.5-24.9)	44	61.1
	Overweight (25.0-29.9)	22	30.6
	Obese (30)	3	4.2
Site of hemorrhagic stroke	Basal ganglia	40	55.6
	Thalamus	15	20.8
	Lobar	12	16.7
	Cerebellam	5	6.9
GCS score	Mild (13-15)	38	52.8
	Moderate (9-12)	21	29.2
	Severe (≤8)	13	18.0

Table-5: Distribution of the study people according to serum lipid profile (Fasting). (n=72)

Parameter		n	%	p-value
S. Total Cholesterol (mg/dL)	Desirable level: <200	41	56.9	<0.0001
	Borderline high: 200-239	17	23.6	0.567
	High: ≥ 240	14	19.4	0.499
	Mean±SD	113.4±49.2		
HDL-Cholesterol (mg/dL)	Desirable: >60	44	19.4	0.5068
	Risk level: <40	28	36.1	0.1270
	Mean±SD	46.9±14.9		
LDL-Cholesterol (mg/dL)	Desirable level: <100	20	27.8	0.6800
	Borderline high: 130-159	31	43.1	0.7889
	High: 160-189	17	23.6	0.789
	Very high: >190	4	5.6	0.5567
	Mean±SD	127.4±35.1		
S. Triglycerides (mg/dL)	Desirable level: <150	71	98.6	<0.0001
	Borderline high: 150-199	1	1.4	0.733
	High: 200-499	0	0	0.3938
	Very high: >500	0	0	0.3938
	Mean±SD	48.2±27.7		

DISCUSSION

In the present study, the association of the serum lipid with hemorrhagic stroke was investigated. A total of 72 patients with hemorrhagic stroke, who did not receive treatment with anti-lipid drugs, were enrolled in this study after examination by a neurologist, based on the results of CT scan of brain. As far our study, we found that most of the study people (30.6%) were in the age group of 60-69 with mean age of 59.5 years (SD± 13 years) and majority of the study people were male (63.9%). This proportion is similar to a study of an Indian Journal conducted by Shrivastav D et al [19]. The most common site of hemorrhagic stroke was Basal ganglia which was seen in 55.6% study people, thalamus was seen in 20.8% study people, lobar was seen in 16.7% study people and cerebellar was seen in 6.9 % study people.A study of Vakilian A. et al. [20] showed in his study that lobar stroke was the most common site of ischemic stroke (48.3%), followed by basal ganglia and internal capsule (20.9%), which were mostly reported in hemorrhagic cases. The least common involvement was detected in the lobar region, along with thalamus involvement [20]. Hemorrhagic stroke is also linking to brain tumors, amyloid angiopathy and various malformation and the location of hemorrhagic stroke is also important. In this study, maximum patients 58 (80.6%) were hypertensive. Hypertension, and diabetes are common risk factor for hemorrhagic stroke. Major cause of hemorrhagic stroke is hypertension it covers up to two third of hemorrhagic stroke. The hypertension causes small vessel damage by microaneurysms at bifurcation of arterials and chronic elevation of intraluminal arterial pressure [5].Cholesterol is a major component of plasma membrane in all mammalian cells where phospholipid and cholesterol ratio are 1:1 [21]. Changes in membrane cholesterol level cause major effect on physical properties of plasma membrane like membrane fluidity, phospholipids arrangement and it also cause membrane deformability [22-23]. The brain contains 20%of body cholesterol and use for formation synapse and dendrites [24-25].The univariate analysis was done to see the association of lipids with Hemorrhagic Stroke. In this study mean serum total cholesterol was found 113.4 mg/dL which is 56.9% of the study population and this is below desirable level of total cholesterol (<200mg/dl), followed by 23.6% had Borderline high level (200-239mg/dl) and 19.4%had high level (>240mg/dl) of total cholesterol level. P value is <0.0001 which statistically significant. Mean HDL -C was found 46.9 mg/dl, mean LDL-C was found 127.4mg/dl which is 36%and 43% respectively. P value

is >0.0001 which is statistically insignificant. Serum Triglyceride was found 48.2 mg/dl which is 98.6% of the study population and p value <0.0001 which is significant. Serum total cholesterol and serum Triglyceride shows strong significant association with hemorrhagic stroke but HDL-C and LDL-C shows no association. Low level of Serum Cholesterol and Serum Triglycerides causes increase risk of hemorrhagic stroke. There are so many previous studies which show similar results. An observational study of Japan elucidates that serum cholesterol [<160mg/dl] has a strongest risk factor for hemorrhagic stroke [26]. In a study of multi risk factor intervention Trail, people which have total cholesterol <4.13 mmol/L the risk of hemorrhagic stroke is three times higher than that of normal [27]. A prospective study of Finland was observed the total cholesterol associated with hemorrhagic stroke [28]. A study showed risk of death from subarachnoid hemorrhage among men was significantly associated with serum cholesterol level and this association was U shaped [29]. A Meta-analysis observed that 15% hemorrhagic stroke risk was decrease with increment of 1mmol/L of total cholesterol concentration. LDL-C concentration was significantly associated with increased risk of hemorrhagic stroke [30]. An observational study reveals that the association between hemorrhagic stroke and LDL-C are independently associated [31]. In our study we found that the triglyceride and LDL-C is low. Wang et al. [32] also found that hemorrhagic stroke is associated with plasma serum high density lipoprotein cholesterol (HDL-C). Astudy of Zeng et al. [33] observed that serum HDLand ratio of LDLand HDLwas not associated with hemorrhagic stroke.

Limitations of the study

Our study was a single centered study with small sized samples. So, the findings of this study may not reflect the exact scenario of the whole country. Further study is required to have better understanding.

CONCLUSION & RECOMMENDATIONS

This study concluded that lipid profile levels play a strong significant role in hemorrhagic stroke patients. The lower concentration of total cholesterol triglycerides may predispose individual towards the higher risk hemorrhagic stroke. We found that most of the suffered patients were male. However, there was a significant relationship between gender and serum lipid profile. In order to validate our findings, a larger number of samples and long-term assessments are necessary.

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