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COMPARITIVE STUDY OF HDL-C LEVEL IN DIABETIC AND NON-DIABETIC STROKE SUBJECTS

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ABSTRACT

BACKGROUND: Diabetes mellitus is a well recognized risk factor for acute stroke, resulting in a greater ischemic to hemorrhagic stroke ratio in the people with diabetes compared with the general population. Diabetes also doubles the risk of stroke recurrence and has a poor outcome (or having poor prognosis for survival) as compared to non-diabetic patients, warranting strong and comprehensive preventive efforts, The aim of this study was to evaluate the High Density Lipoprotein-Cholesterol (HDL-C) level in the adult diabetic and non-diabetic stroke patients coming to Medical Unit of Saidu Teaching Hospital, Swat.

MATERIAL AND METHODOLOGY: This was a cross-sectional study, comprised of 100 subjects, 50 were diabetic and 50 were non -diabetic stroke patients of ages between 40 to 90 years. The study subjects underwent a detailed history and examination. Individuals with a history of medications known to affects body composition, patients on anti-coagulants and having a history of blood dyscrasias like leukemia's, thalasemia, polycythemia, endocrinopathies and patients having clotting disorders, extradural and intradural hemorrhage as a cause of stroke were excluded from the study. Fasting as well as random blood sample were drawn from the participants for biochemical assays. The serum HDL-C level, blood sugar (random and fasting), blood pressure (systolic and diastolic) of Diabetic stroke subjects were compared with Non-diabetic stroke subjects.

RESULTS: The HDL-C level was significantly low in our study in diabetic as compared to non-diabetic stroke subjects.

CONCLUSION: The low HDL-C level along with poor metabolic control is an important risk factor for chronic complications of diabetes mellitus like microvascular and macrovascular disease like unstable angina, myocardial infarction and stroke. Therefore there is intense need of early screening and interventions, to prevent macrovascular complications especially stroke in high risk diabetic patients.

KEY WORDS: Diabetes mellitus, High-density Lipoprotein-Cholesterol (HDL-C), Blood pressure, Stroke.

INTRODUCTION

The relation between High Density Lipoprotein Cholesterol [HDL-C] and the risk of ischemic stroke was inconsistent previously, but in the current opinions, more studies supported an inverse association between HDL-C and the risk of ischemic stroke.[1] The level of HDL-C was decreased obviously in the diabetic group compared to non-diabetic group and also low level of HDL-C was present in the acute ischemic stroke patients with diabetes.[2] HDL-C or good cholesterol, is primarily involved in returning lipid, largely cholesterol[3] from the blood and arteries walls to the liver where it is converted to bile to be used for digestion or disposed up by the body. This is called "reverse cholesterol transport" and is believed to be useful in preventing or reversing cardiovascular diseases.[4] The risk of CVD (angina, infarction, and stroke) increases by 2 to 3% for every 1mg/dl decrease in HDL-C[5]. Wood P.D (1983) suggested that a threshold of running approximately 8 miles/week over a 1-year period is necessary to increase in HDL-C levels[6]. HDL-C has numerous positive effects on the endothelium and arterial vessel wall,

which decreases non-diabetic atherosclerosis and the accelerated atherosclerosis, i.e. atherosclerosis associated with metabolic syndrome and overt type-2 DM. Finally one can conclude that low HDL-C and isolated Low HDL-C constitutes an important risk factor for atherosclerosis. Therapies that lead to a return to normal physiologic range of HDL-C may result in the delay of atherosclerosis progression[7]. Normal HDL-C levels for diabetic patients are greater than 45 mg/dl in males and 55 mg/dl in females[8]. High-density lipoprotein cholesterol is beneficial for a number of reasons. The most important is its ability to drive a process called "reverse cholesterol transport". In general, the higher the HDL -C, the greater the capacity to remove cholesterol and prevent dangerous blockages from developing in the vessel walls. HDL-C helps to keep the blood vessels widened (dilated), thereby promoting better blood flow. HDL-C also reduces blood vessel injury through its anti-oxidant and anti-inflammatory functions, among other effects[9]. The reduction of HDL-C levels was associated with beta-cell dysfunction in subjects with impaired glucose tolerance[10]. Many diabetics do not even know that they have the condition until their blood glucose starts to cause serious problems and if untreated diabetes can lead to serious problems like microvascular and macrovascular complications[11]. The macrovascular complications are unstable angina, myocardial infarction, and stroke[12] Diabetes mellitus is a well recognized risk factor for acute stroke, resulting in a greater ischemic to hemorrhagic stroke ratio in the people with diabetes compared with the general population. Diabetes also doubles the risk of stroke recurrence[13] and has a poor outcome (or having poor prognosis for survival) as compared to non-diabetic patients[14]. Diabetes mellitus (DM) is considered as one of the important risk factors of acute ischemic stroke (AIS), which has been proved in a series of studies[15]. The important pathogenicity behind it is atherosclerosis (AS)[16], which perhaps has more direct correlation with the blood lipid especially HDL-C[17] and HDL-C has inverse correlation to the occurrence of ischemic stroke with diabetes[2]. Asian Indians, without diabetes had the lowest serum HDL-C, followed by Malays and Chinese. The ethnic differences persisted even in those with diabetes mellitus. This study showed that Asian Indians with diabetes had lower HDL-C than Chinese and Malays with diabetes mellitus[18]. Different studies indicate that lipid profile especially HDL-C plus stroke occurrence varies among population of different ethnic origin. So the present study was designed to evaluate the levels of HDL-C in Diabetic and Non-diabetic Stroke patients in Pakistani population.

MATERIAL AND METHODS

This was a cross-sectional study carried out by the Department of Physiology, Saidu Medical College, swat, in collaboration with the Department of Medicine, Saidu Teaching Hospital, Swat. The study comprised of 100 subjects between 40-90 years of age. They were divided into two groups, 50 subjects with diabetic stroke and 50 with Non-diabetic stroke patients. Subjects taking medications known to affect lipid profile, on anti-coagulants, and having a history with endocrinopathies (e.g. down syndrome, Cushing syndrome, acromegally, thyro- toxicosis, etc) or any other major illness were excluded from the study. Patients having intra-cerebral tumors, CSF obstruction, Extradural and Intradural haemorrhage as cause of stroke were also excluded from the study.

After obtaining informed consent, a detailed history, general physical and systemic examination was performed. Blood pressure was measured in the right arm in sitting position. Blood was drawn to estimate fasting HDL-C, random and fasting blood sugar. CT scan was done in each and every stroke patient to differentiate between Ischemic and Hemorrhagic stroke.

Statistical analysis was done using SPSS version 16. Mean and standard deviation (SD) were determined for quantitative data. Comparative analysis between the two groups was done using two tailed student's t-test. P value <0.05 was considered statistically significant, while p<0.001 was taken as highly significant.

RESULTS

There were a total of 100 subjects, 45% were males and 55% were females. Out of these 23 males and 27 females were diabetic. In diabetic group 96% patients had Ischemic stroke while 4% had hemorrhagic stroke. On the other hand in non-diabetic group 76% patients had Ischemic while 24% had hemorrhagic stroke, showing significantly high ischemic to hemorrhagic ratio in diabetic stroke as compared to non diabetic stroke patients. The HDL-C level in diabetic stroke patients was significantly low as compared to the non-diabetic stroke patients group.

Table 1 Shows blood sugar (fasting & random) level both in diabetic stroke and Non-diabetic stroke group. Fasting blood sugar level of diabetic stroke was 219.12± 75.31 and that of Non -diabetic stroke group was 96.22 ± 13.15. Similarly random blood sugar level of diabetic stroke was 301.70 ± 80.09 and that of control was 140.04 ± 19.45. Blood sugar, both fasting & random was statistically highly significant in diabetic stroke as compared to control group. The values were given as mean ± SD (standard deviation)

Table-1: Blood sugar in diabetic and non-diabetic stroke patients

	Diabetic (n = 50)		Non-diabetic (n = 50)		
	Mean S.D	Range	Mean ± S.D	Range	p -value
Fasting blood sugar(mg/dl)	219.12± 75.31	120-583	96.22± 13.15	75-139	<0.001**
Random blood sugar (mg/dl)	301.70± 80.09	192-590	140.04± 19.45	109-200	<0.001**

Variables expressed as mean± S.D, ** Highly Significant

Table-2, Shows HDL-C levels both in diabetic and non-diabetic stroke group. High-density Lipoprotein -Cholesterol (HDL-C) level of diabetic stroke was 28.48 ± 8.04 and that of non-diabetic stroke subjects group was 36.84 ± 12.22, showing that the HDL-C level of Diabetic group is statistically highly significantly low than the Non-diabetic group. *Significan

Table-2: HDL-C level in Diabetic and Non-diabetic Stroke subjects

	Diabetic (n = 50)		Non-diabetic (n = 50)		
	Mean ± S.D	Range	Mean ± S.D	Range	p-value
HDL-C (mg/dl)	28.48±8.04	13-54	36.84± 12.22	14-74	< 0.001**

The values are expressed as Mean± S.D (standard deviation) *Significant, ** Highly Significant

Table-3 Shows that in diabetic subjects, the ischemic and hemorrhagic stroke patients were 48 (96%) and 2 (4%) out of 50 cases respectively and in non-diabetic subjects the ischemic and hemorrhagic stroke patients were 38 (76%) and 12 (24%) out of 50 cases respectively. The p-value is 0.004 and the Chi-square value is 8.306, showing that the ratio of ischemic to hemorrhagic stroke is significantly high in diabetic as compared to non-diabetic stroke subjects.

Table-3: Distribution of ischemic and hemorrhagic stroke in diabetic and non-diabetic subjects

Variables expressed as numbers and percentages

		Groups		Total
		Diabetic	Non-diabetic	
	Ischemic	48	38	86
		96.0%	76.0%	86.0%
Stroke	Hemorrhagic	2	12	14
		4.0%	24.0%	14.0%
Total		50	50	100
		100.0%	100.0%	100.0%
Chi-square = 8.306			p-value = 0.004	

DISCUSSION

Stroke remains a major healthcare problem. Its human and economic toll is staggering. It is estimated that there are >795,000 incident strokes in the United States each year, resulting in >130,000 deaths annually[19], with 4.8 million stroke survivors alive today. No large scale epidemiological studies are available to determine the true incidence of stroke in Pakistan. Estimated annual incidence is 250/100,000, translating to 350,000 new cases every year[25]. Stroke is also a leading cause of functional impairments, with 20% of survivors requiring institutional care after 3 months and 15% to 30% being permanently disabled. Stroke is a life-changing event that affects not only the person who may be disabled, but the entire family and other caregivers as well[20]. Stroke is the leading cause of serious long term disability and the fifth common cause of death in the Unted States[21]. Stroke is also the second most common cause of death in the world and the most common cause of disability in developed and developing countries[22]. Koroshetz and Gonzalez reported that Ischemic stroke occurs due to a multitude of underlying pathologic processes and about 85% of all strokes are due to ischemia[23]. Our study is also consistent with this report because of the 86% ischemic stroke and 14% hemorrhagic stroke in our study.

Our study is also partially in accordance with the study of Lehto S et al which showed elevated total cholesterol, reduced high-density lipoprotein cholesterol (HDL-C), and elevated triglycerides to be important predictor of stroke[24]. Our study has significantly low level of high-density lipoprotein, in diabetic as compared to non-diabetic stroke patients.

The present study is also in accordance with the study of Yeo et al who reported that Asian Indian, without diabetes had the lowest serum HDL-C, followed by Malays and Chinese. The ethnic differences persisted even in those with diabetes mellitus. This study showed that Asian Indians with diabetes had lower HDL-C than Chinese and Malays with diabetes mellitus[18]. In our study although HDL-C level has not been compared with Chinese and Malays but the HDL-C level of diabetic is compared with that of non-diabetic stroke patients and in diabetic stroke subjects the HDL-C is significantly low as compared to non-diabetic stroke subjects. The HDL-C level of diabetic and non-diabetic stroke subjects in our study is (Mean ± SD) 28.48 ± 8.04 and 36.84 ± 12.22 respectively) with p-value < 0.001, showing that HDL-C level in DM group is significantly low as compared to non-diabetic group. As the normal HDL-C level is that, HDL-C greater than 45 mg/dl in males and 55 mg/dl in females[8], so we can say that in our population the mean HDL-C is low both for diabetic and non-diabetic as shown in the study of Yeo et al, for Asian Indians. Our study (Ischemic to Hemorrhagic stroke in diabetic vs. non -diabetic group is 48:2 and 38:12 respectively) is also consistent with the study report that diabetes mellitus is a well recognized risk factor for acute ischemic stroke, resulting in a greater ischemic to hemorrhagic stroke ratio in the people with diabetes compared with the general population[13]. Since the incidence of ischemic stroke is higher and the clinical outcome poorer in patients with diabetes and the general public is more concerned with having a major stroke than with having a myocardial infarction, prevention of this problem is therefore important.

CONCLUSION

The low HDL-C level along with poor metabolic control is an important risk factor for chronic complications of diabetes mellitus i.e microvascular and macrovascular disease like unstable angina, myocardial infarction and stroke. Therefore there is intense need of early screening and interventions, to prevent macrovascular complications especially stroke in high risk diabetic patients because the general public is more concerned with having a major stroke than with having a myocardial infarction.

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