

**Original Article**

**Serum Lipid Profile status of Type 2 Diabetic Patients in the cross section population in Dhaka City of Bangladesh**

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**Abstract**

**Objectives:** Serum lipid profile viz the level of total cholesterol (TC), Triglyceride (TG), HDL-cholesterol and LDL-cholesterol of type2 diabetic patients have been studied and compares them with levels of control subjects. **Results:** The mean value of the TG level for male diabetics was higher than that for the female diabetics and the mean values of TC, HDL-C and LDL-C were not found significantly different between male and female diabetics. Hyperlipidemia has a documented causative relation with CAD, but the major risk associated with diabetes may be due to the associated hyperlipidemia. The study revealed that dyslipidemia is very common in type2 diabetics and the most common abnormality observed was increased serum triglyceride levels (58%). The next common abnormality was decreased serum high-density lipoprotein cholesterol (HDL-C) levels and increased serum low-density lipoprotein cholesterol (LDL-C) levels. A high total serum cholesterol levels was found in 41% patients. 39% of the patients examined were overweight, and 7% were overtly obese. **Conclusion:** Thus, the study clearly shows the relationship between type2 diabetes and hyperlipidemia, which may influence the mechanism by which type2 diabetes is associated with increased CAD risk.

**Key words:** Diabetes, Lipid profile, Dyslipidemia, Coronary artery disease.

**Introduction:**

Diabetes is one of our greatest public health problems, primarily because of the dramatic increase in type2 diabetes, also known as age-related diabetes, which now represents a global threat to human health. Worldwide there are in excess of 100 million people with type2 diabetes and in most developing countries at least one in ten deaths in adults aged 35 to 64 is attributable to diabetes.

Lipid abnormalities and diabetes have been recognized as independent risk factors for coronary artery disease (CAD) events and atherosclerosis. Type2 diabetes has been frequently observed to be associated with dyslipidemia whereas type1 diabetes has serum lipid levels similar to those of non-diabetic population. The presence of dyslipidemia in association with type2 diabetes puts the patient at higher risk of CAD.

The link between elevated low-density lipoprotein cholesterol (LDL-C) and coronary artery disease (CAD) is now firmly established<sup>1</sup>. Evidence also supports an independent link between low levels of high-density lipoprotein cholesterol (HDL-C)<sup>2</sup> and high levels of triglycerides (TG)<sup>3,4</sup> and atherosclerosis and CAD. CAD and type2 diabetes may be significantly linked by the presence of dyslipidemia which is characterized by low HDL-C with high LDL-C and TG. Such a pattern of dyslipidemia has been frequently observed in patients with type2 diabetes. A study has shown that the prevalence of hyperlipidemia in type2 diabetes can be as high as 70%<sup>5</sup> whereas an Indian study has shown dyslipidemia in 25 – 60% of diabetic hypertensive population<sup>6</sup>. Such Asian patients are shown to have lower

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levels of HDL-C<sup>7,8</sup>. The aim and objects of the present study were to find out the relationship between type2 diabetes and serum lipid profile.

**Materials And Methods**

All reagent kits for this study were purchased from Human Laboratories Ltd., Wiesbaden, Germany, Biotec Laboratories Ltd., Suffolk, U.K. and Randox Laboratories Ltd., Antrim, U.K. This prospective study was carried out from July 2007 to June 2008 in the Department of Biochemistry and Molecular Biology, University of Rajshahi, Bangladesh. A total of 175 human subjects ranging in age from 30 – 80 years were included in this study. Out of the 175 subjects, 60 (35 males and 25 females) were selected as healthy controls (group 1). The remaining 115 subjects (60 males and 55 females) were grouped as type-2 diabetic patients (group 2). Blood samples were randomly collected from 115 hospitalized patients from BIRDEM hospital and five Dhaka city diagnostic centers. This study design was approved by 'Research and Ethics Committee' of Department of Biochemistry and Molecular Biology, Rajshahi University.

Serum lipid profile was measured after an overnight fasting of at least 10 hours. Serum total cholesterol levels was determined by enzymatic (CHOD-PAP) calorimetric method<sup>9</sup> and triglyceride by enzymatic (GPO-PAP) method of Jacobs and Van demark<sup>10</sup>. HDL-C and LDL-C were estimated using precipitant<sup>11</sup> and Friedewald formula<sup>12</sup>. All the above parameters under investigation were determined in the serum of patients and controls. All values were expressed as mean ± S.E. Statistical significance of differences between control and study groups were evaluated by student's "t" test.

A detailed clinical workup including height, weight and body mass index (BMI) was taken. BMI was calculated as weight (kg)/height (m)<sup>2</sup>. BMI of 18 to 25 was considered normal, 26 to 29 as overweight and 30 and above as obese. Classification of different components of serum lipid was followed according to the recommendation of NCEP ATP III<sup>13</sup>.

**Ethical & legal Procodure:** The Studey was approved by 'ethics committee' of depart of Biochemistry & Molecular Biology, University of Rajshahi.

**Results And Discussion**

Most of the patients with type2 diabetes were in the age group 30 – 40 years (35.6%). The next largest group was 41 – 50 years (34.7%). Most of the type2 diabetic males were of the age group 41 – 50 years

while most of the females were of the age 30 – 40 years (TABLE I).

**Table I. Age Distribution Of Type2 Diabetic Patients (N – 115)**

Age (yrs)	Male	Female	Total	Percentage (%)
30 – 40	15	26	41	35.6
41 – 50	26	14	40	34.7
51 – 60	12	4	16	13.9
61 –70	4	9	13	11.3
> 70	3	2	5	4.3

In TABLE II, most of the subjects of group 1, had normal BMI whereas in group 2, 54 % of type2 diabetic patients had normal BMI, and 39 % were overweight. A small proportion (7%) of patients in group

**Table II. Body Mass Index of group 1 (healthy controls) and group 2 (type2 diabetic patients)**

Group	BMI	No. of patients	Percentage (%)
Group 1 (n=60)	18 - 25	44	73.3
	25 – 26	14	23.3
	> 30	2	3.3
Group 2 (n=115)	18 - 25	62	53.9
	25 – 26	45	39.1
	> 30	8	6.9

2 was found to be obese.

Most of the patients of group 1 and group 2 had desirable levels of serum total cholesterol, i.e., 66% and 59% respectively. 25% of group 1 and 20% of group 2 had borderline levels whereas only 20% of the type2 diabetic patients had high serum cholesterol levels (TABLE III).

**Table III. Total Cholesterol Levels Of Type2 Diabetic Patients**

Group	Total Cholesterol (mg/dl)	No. of patients	Percentage (%)
Group 1 (n = 60)	< 200	40	66.6
	200-239	15	25.0
	≥240	5	8.3
Group 2 (n =115)	< 200	68	59.1
	200-239	24	20.8
	≥240	23	20.0

In Table IV, 30% of group 1 and 29% of group 2 had desirable LDL-C levels respectively. 35% of type 2 diabetic patients were found to have above optimal levels of LDL-C whereas 15% had borderline levels and 19% had high LDL-C levels.

**Table IV. Low-density lipoprotein cholesterol levels of type2 diabetic patients**

Group	LDL-C (mg/dl)	No. of patients	Percentage (%)
Group 1 (n = 60)	<100	18	30.0
	100-129	25	41.6
	130-159	12	20.0
	≥160	5	8.3
Group 2 (n = 115)	<100	34	29.5
	100-129	41	35.6
	130-159	18	15.6
	≥160	22	19.1

Majority of group 1 (45%) and group 2 (41%) had desirable TG levels. 16% of type 2 diabetics were found to have a borderline high serum TG levels while 37% had a high serum TG levels and only 4% had higher TG levels (Table V).

**Table V. Triglyceride Levels Of Type2 Diabetic Patients**

Group	TG (mg/dl)	No. of patients	Percentage (%)
Group 1 (n =60)	<150	27	45.0
	150-199	16	26.6
	200-499	15	25.0
	≥500	2	3.3
Group 2 (n =115)	<150	48	41.7
	150-199	19	16.5
	200-499	43	37.4
	≥500	5	4.3

Most of the healthy controls and type2 diabetic patients had less than desirable HDL-C levels (71% and 69% respectively) whereas 23% (group 1) and 27% (group 2) had desirable serum HDL-C levels (Table VI).

Among the type2 diabetic patients the serum TG levels of male were found to be higher than that of female whereas serum total cholesterol, HDL-C and LDL-C levels of male were less than that of female (Table VII).

**Table VII. Sex Difference Of Serum Lipid Profile Of Type2 Diabetic Patients (Group 2)**

Sex	Total Cholesterol (mg/dl)	Triglyceride (mg/dl)	HDL-cholesterol (mg/dl)	LDL-cholesterol (mg/dl)
Male (n = 60)	186.10 ± 2.25	249.11 ± 4.55	35.45 ± 4.36	114.55 ± 5.24
Female (n = 55)	204.24 ± 3.55	206.45 ± 2.58	38.95 ± 2.45	128.56 ± 4.65

**Table VIII. Sex Difference Of Serum Lipid Profile Of Healthy Controls (Group 1)**

Sex	Total Cholesterol (mg/dl)	Triglyceride (mg/dl)	HDL-cholesterol (mg/dl)	LDL-cholesterol (mg/dl)
Male (n = 35)	184.26 ± 2.54	205.20 ± 3.12	36.63 ± 4.65	113.23 ± 5.48
Female (n = 25)	183.24 ± 3.45	160.48 ± 2.85	38.24 ± 3.74	115.48 ± 3.25

**Table VI. High-Density Lipoprotein Cholesterol Levels Of Type2 Diabetic Patients**

Group	HDL-C (mg/dl)	No. of patients	Percentage (%)
Group 1 (n = 60)	<40	43	71.6
	40-59	14	23.3
	≥60	3	5.0
Group 2 (n = 115)	<40	80	69.5
	40-59	32	27.8
	≥60	3	2.6

The mean serum TG levels of males were found to be higher than that of females while Total Cholesterol, HDL-C and LDL-C levels of males were very close to that of females (Table VIII).

The association of dyslipidemia in type2 diabetics is evident in this study. The most common lipid abnormality trend detected in type2 diabetics was an increased serum triglyceride (58%) with a concomitant decreased serum HDL-C and increased serum LDL-C. A slight majority of patients had desirable serum total cholesterol levels.

Elevated serum cholesterol levels increase the cardiovascular morbidity associated with type2 diabetes and can be an important causative link in majority of cases. Epidemiological studies provide a large body of evidence for the relationship between serum cholesterol level and the risk of CAD. In the multiple risk factor intervention trial, CAD risk declined with progressively lower cholesterol levels<sup>14</sup>. Further support for the relationship between CAD risk and high lipid levels comes from various recent primary and secondary prevention trials with lipid lowering therapy. The heart protection study has shown that cholesterol lowering with statin therapy

is efficacious in patients with diabetes to reduce the CAD risk<sup>15</sup>. Similarly, the Pravastatin or Atorvastatin Evaluation and Infection-Thrombolysis in Myocardial Infarction trial has demonstrated that intensive LDL-C lowering will reduce the major coronary events<sup>16</sup>.

Various epidemiological data have shown a log-linear relationship between LDL-C and CAD risk<sup>17</sup>. The NCEP ATP III guidelines recommend a LDL-C goal of < 100mg/dl in those with type-2 diabetics<sup>13</sup>. However, on the basis of recent landmark studies, the recommendation for the optimal goal of <70mg/dl, whereas <100mg/dl is considered as minimal goal for therapy<sup>18</sup>. Recent other studies indicate that for every 1% reduction in LDL-C levels, the relative risk for major CAD events is reduced by approximately 1%<sup>19</sup>.

Framingham study<sup>20</sup> has demonstrated the correlation between low HDL-C and CAD as an independent risk factor. Also the elevated triglyceride level

has recently become an independent predictor of CAD risk<sup>21</sup>.

In conclusion, the present observation supports the association between dyslipidemia and type2 diabetes that may influence the mechanism by which type2 diabetes is associated with increased CAD risk. The presence of type2 diabetes alone is taken as an indication for lipid lowering therapy as a primary CAD prophylaxis which includes therapeutic lifestyle changes (TLC) as well as drug therapy<sup>18</sup>. The presence of both dyslipidemia and type2 diabetes warrants a more intensive drug therapy in addition to TLC to successfully achieve the NCEP ATP III recommendations<sup>13</sup>.

#### **Acknowledgement**

The authors gratefully acknowledge the research facilities provided by the staffs of the Department of Clinical Biochemistry Laboratory of BIRDEM and five other Diagnostic Centers of Dhaka, Bangladesh.

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