

## Original Article

# Comparison of Serum Lipid Profile among Different Groups of Diabetic Patients

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Razwana Parvin<sup>1\*</sup>, Mizanur Rahman<sup>2</sup>, Roksana Parvin<sup>3</sup>

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Sheikh Sayera Khatun Medical College (SSKMC), Gopalganj, Bangladesh

\*Corresponding Author

This article is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).**ABSTRACT**

**Introduction:** Diabetes mellitus is a common endocrine and metabolic problem all over the world. Type 2 diabetic patients have an increased prevalence of dyslipidemia which commonly manifests as raised low-density lipoprotein (LDL), decreased high density lipoprotein (HDL) or elevated triglycerides (TG) levels and causes public health problem worldwide as well as in our country. **Methods & Materials:** This cross sectional study was conducted in the Out Patient Department of Shaheed Ziaur Rahman Medical College Hospital from July 2018 to June 2019. A total number of 90 subjects (34 males and 56 females) were selected with the age above 18 year on the basis of exclusion and inclusion criteria. Data were collected in a pre-designed structured questionnaire form by us. **Results:** In our study, 57.9% male diabetic patients on therapy and 46.7% male newly diagnosed diabetic patients had dyslipidemia.

There were no significant difference observed between lipid profile of diabetic patients on therapy and newly diagnosed diabetic patients. In our study, 15.8% male diabetic patients on therapy and 100% male newly diagnosed diabetic patients had  $HbA_{1C} \geq 6.5\%$ . Positive correlation was found between  $HbA_{1C}$  levels and TG, TC, LDL but HDL level showed negative correlation with  $HbA_{1C}$ . **Conclusion:** There were no significant difference between lipid profile of diabetic patients on therapy and newly diagnosed diabetic patients but statistically significant difference was found between  $HbA_{1C}$  levels of diabetic patients on therapy and newly diagnosed diabetic patients. The pattern of diabetic dyslipidemia was high triglycerides and low high density lipoprotein.

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1. Assistant Professor, Department of Physiology, Naogaon Medical College, Naogaon, Bangladesh
2. Senior Consultant, Department of Medicine, Shahid Syed Nazrul Islam Medical College, Kishoreganj, Bangladesh
3. Lecturer, Department of Pharmacology, Shahid Syed Nazrul Islam Medical College, Kishoreganj, Bangladesh

**Keywords:** Type 2 diabetes mellitus, lipid profile, HbA<sub>1C</sub>, diabetic dyslipidemia.

## INTRODUCTION

Diabetes mellitus is a world- wide health problem in general population. Diabetes mellitus is a syndrome of impaired carbohydrate, fat and protein metabolism caused by either deficiency of insulin secretion or decreased sensitivity of tissues to insulin<sup>[1]</sup>. According to the American Diabetes Association 2019, diabetes can be classified into general categories such as Type-1, Type-2 Diabetes, Gestational Diabetes Mellitus (GDM), Specific types of diabetes due to other causes eg. monogenic diabetes syndromes, diseases of the exocrine pancreas, and drug- or chemical- induced diabetes. The global figure of people suffering from diabetes is estimated to rise 415 million to 642 million by 2040<sup>[2]</sup>. Bangladesh was said as the 8<sup>th</sup> highest diabetic populous country and about 1.29 lac deaths were attributed to diabetes in 2015 which was reported by leading research organization ICDDR,B<sup>[3]</sup>. But from recent scoping review the prevalence of type 2 diabetes in Bangladesh varied from 4.5% to 35% and according to the international diabetic federation 7.1 million Bangladeshi people had diabetes and almost equal number had undetected diabetes which will be doubled by 2025. *Das et al.* conducted a cross sectional study among the diabetic patients in Southern Bangladesh and found that 73% male and 71% female study subjects had diabetic dyslipidemia<sup>[4]</sup>. Patient with type 2 diabetes have increased risk of cardiovascular disease which is associated with atherogenic dyslipidemia. The prevalence of dyslipidemia in type 2 diabetes is almost twice than the general population<sup>[5]</sup>. Dyslipidemia is a major risk factor for macrovascular complications in type 2 diabetes mellitus. Dyslipidemia

causes more complex abnormalities when interrelated with obesity, insulin resistance and hyperinsulinism<sup>[6]</sup>. According to the *Freedman et al.*, when the overweight subject were compared with their respective thinner counterparts, they presented 2.4 to 7.1times higher probability to have elevated total cholesterol, LDL, TG, blood pressure as well as 12.6 times higher probability to have hyperinsulinemia<sup>[7]</sup>. The most pattern of diabetic dyslipidemia consists of low HDL and high triglycerides<sup>[8]</sup>. Type 2 diabetes is also equivalent to coronary heart disease especially myocardial infarction, it is the major cause of morbidity and mortality in diabetic patients<sup>[9]</sup>. Therefore, most of the type 2 diabetic patients have elevated TG and reduced HDL level<sup>[10]</sup>. The protocol for screening, diagnosis and identification of individuals at risk of diabetes are changing. The most pattern of diabetic dyslipidemia consists of low HDL and high triglycerides<sup>[8]</sup>. On the other hand, hyperlipidemia in females may be attributed to the effects of sex hormones on body fat distribution, which may cause differences in altered lipoproteins<sup>[11]</sup>. Higher level of LDL is found in males than in females as because androgen increases LDL cholesterol and estrogen stimulates the uptake of VLDL by the liver and increases catabolism of LDL in the liver<sup>[12,13]</sup>. It is also identified that menopause causes decrease of HDL levels and also changes the structure of HDL as well<sup>[14]</sup>. All of these inspired us to conduct this study and the aim of the study was to find out the serum lipid profile status in different group of diabetic patients and to create awareness among the clinicians, general populations and diabetic patients

about diabetic dyslipidemia and glycemic control of the patients.

## METHODS & MATERIALS

This cross sectional study was conducted in the Out Patient Department of Shaheed Ziaur Rahman Medical College Hospital from July 2018 to June 2019. A total number of 90 subjects of both sexes (34 males and 56 females) were selected with the age above 18 years and BMI was 18.5 to  $\leq 30$  Kg/m<sup>2</sup> and study patients' must have newly diagnosed Type 2 diabetes mellitus or on therapy and their ethnicity had to be

Bengali. Among exclusion criteria renal failure, cardiac disease, liver disease, mal-absorption syndrome, malignancy was present. Protocol was strictly followed; data were collected in a predesigned structured questionnaire form. SPSS windows was used, version 22.0. ( $P$  value  $<0.05$ ) In this study, A<sub>1</sub> = Male diabetic patients on therapy (n=19), A<sub>2</sub> = Female diabetic patients on therapy (n=26), B<sub>1</sub> = Male newly diagnosed diabetic patients (n=15), B<sub>2</sub> = Female newly diagnosed diabetic patients (n=30)

## RESULTS

**Table I: Age and BMI in different groups of the study subjects (n=90)**

Groups	n	Age (years)	BMI (kg/m <sup>2</sup> )
A <sub>1</sub>	19	52.68±12.78	23.91±2.09
		(32.0 – 75)	(20.10 – 29.0)
A <sub>2</sub>	26	49.19±9.45	24.90±2.68
		(32.0 – 70.0)	(21.0 – 29.40)
B <sub>1</sub>	15	52.20±10.27	23.91±2.06
		(30.0 – 65.0)	(19.0 – 26.10)
B <sub>2</sub>	30	46.23±8.11	25.66±3.20
		(27.0 – 60.0)	(21.0 – 30.0)
<b>p-value</b>		<b>0.107<sup>ns</sup></b>	<b>0.083<sup>ns</sup></b>

Data were expressed as mean  $\pm$ SD and range; One way ANOVA test was performed to compare among four groups; Figure in parenthesis indicate ranges; ns = not significant; A<sub>1</sub> = Male diabetic patients on therapy (n=19); A<sub>2</sub> = Female diabetic patients on therapy (n=26); B<sub>1</sub> = Male newly diagnosed diabetic patients (n=15); B<sub>2</sub> = Female newly diagnosed diabetic patients (n=30); n = Number of the subjects in each group; N= Total number of the subjects.

The mean ( $\pm$ SD) ages of the study subjects were 52.68±12.78, 49.19±9.45, 52.20±10.27; 46.23±8.11 years in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively. All the values were almost similar and no statistically significant differences of the ages were observed among the groups; The mean

( $\pm$ SD) BMI of the subjects were 23.91±2.09, 24.90±2.68, 23.91±2.06 and 25.66±3.20 kg/m<sup>2</sup> in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively. In this study, all the values were almost similar and showed no statistically significant differences of BMI among the groups.

**Table-II: Serum total cholesterol (TC), triglycerides (TG), high density lipoprotein (HDL) and low-density lipoprotein (LDL) in different groups of study subjects (n=90)**

Groups	n	TC (mg/dl)	TG (mg/dl)	LDL(mg/dl)	HDL(mg/dl)
A <sub>1</sub>	19	166.93±60.58	172.35±106.29	96.01±51.29	43.74±5.51
		(90.0-271.6)	(64.9-395.0)	(33.2-193.0)	(34.8-52.5)
A <sub>2</sub>	26	161.15±41.89	157.05±77.19	88.69±35.99	43.23±8.63
		(90.0-244.0)	(51.6-349.3)	(36.0-155.0)	(33.0-76.1)
B <sub>1</sub>	15	166.35±44.82	167.35±94.71	105.84±34.00	43.97±5.49
		(111.0-244.0)	(74.7-433.0)	(48.0-160.0)	(34.0-59.0)
B <sub>2</sub>	30	185.37±62.74	193.08±100.99	106.73±50.73	42.43±10.41
		(87.0-321.0)	(68.0-523.0)	(32.2-208.3)	(32.0-75.8)
<b>Statistical analysis</b>					
<b>p value</b>					
A <sub>1</sub> vs A <sub>2</sub>		0.707 <sup>ns</sup>	0.579 <sup>ns</sup>	0.576 <sup>ns</sup>	0.825 <sup>ns</sup>
B <sub>1</sub> vs B <sub>2</sub>		0.302 <sup>ns</sup>	0.416 <sup>ns</sup>	0.952 <sup>ns</sup>	0.595 <sup>ns</sup>
A <sub>1</sub> vs B <sub>1</sub>		0.976 <sup>ns</sup>	0.887 <sup>ns</sup>	0.527 <sup>ns</sup>	0.902 <sup>ns</sup>
A <sub>2</sub> vs B <sub>2</sub>		0.101 <sup>ns</sup>	0.144 <sup>ns</sup>	0.136 <sup>ns</sup>	0.756 <sup>ns</sup>

The mean ( $\pm$ SD) of TC levels of the subjects were 166.93±60.58, 161.15±41.85, 166.35±44.82 and 185.37±62.74 gm/dl in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively; TG were 172.35±106.29, 157.05±77.19, 167.35±94.71 and 193.08±100.99 gm/dl in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively; LDL were 96.01±51.29, 88.69±35.99, 105.84±34.00 and 106.73±50.73 gm/dl in

group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively; HDL were 43.74±5.51, 43.23±8.63, 43.97±5.47 and 42.43±10.41 gm/dl in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively.

The mean TC, TG, LDL and HDL levels were almost similar and no statistically significant differences were observed between A<sub>1</sub> vs A<sub>2</sub>, B<sub>1</sub> vs B<sub>2</sub>, A<sub>1</sub> vs B<sub>1</sub> and A<sub>2</sub> vs B<sub>2</sub>.

**Table-III: Distribution of the study subjects of both sexes by the presence of high total cholesterol (TC), high triglycerides (TG), high low-density lipoprotein (LDL) and low high-density lipoprotein (HDL) (n=90)**

Groups	n	High TC	High TG	High LDL	Low HDL
A <sub>1</sub>	19	6(31.6%)	7(36.8%)	6(31.6%)	6(31.6%)
A <sub>2</sub>	26	5(19.2%)	10(38.5%)	3(11.5%)	10(38.5%)
B <sub>1</sub>	15	4(26.7%)	6(40.0%)	4(26.7%)	1(6.7%)
B <sub>2</sub>	30	9(30.0%)	20(66.7%)	8(26.7%)	18(60.0%)

In this study, 31.6%, 19.2%, 26.7% and 30% of the study subjects had high serum TC in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively whereas 36.8%, 38.5%, 40% and 66.7%

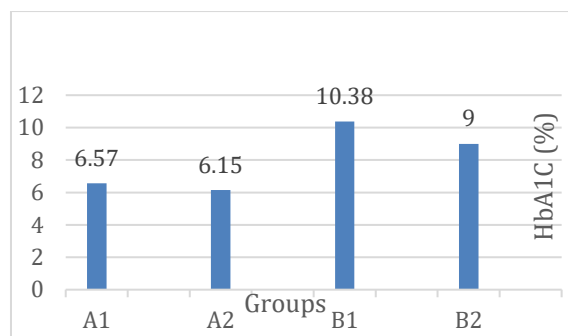
had high serum TG in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively. Again, in this study, 31.6%, 11.5%, 26.7% and 26.7% of the study subjects had high serum LDL in

group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively where as 31.6%, 38.5%, 6.7% and 60% of the study subjects had low HDL in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively.

**Table-IV: Distribution of the study subjects of both sexes by the presence of dyslipidemia (n=90)**

Groups	n	Dyslipidemia	Desirable lipid profile
A <sub>1</sub>	19	11(57.9%)	8(42.1%)
A <sub>2</sub>	26	14(53.8%)	12(46.2%)
B <sub>1</sub>	15	7(46.7%)	8(53.3%)
B <sub>2</sub>	30	23(76.7%)	7(23.3%)

In this study, in group A<sub>1</sub> 57.9% of the study subjects had dyslipidemia and 42.1% had desirable lipid profile whereas in group A<sub>2</sub> 53.8% of the study subjects had dyslipidemia and 46.2% had desirable lipid profile. Again, in this study, in group B<sub>1</sub> 46.7% of the study subjects had dyslipidemia and 53.3% had desirable lipid profile whereas in group B<sub>2</sub> 76.7% of the study subjects had dyslipidemia and 23.3% had desirable lipid profile. Again, in this study, in male study subjects 52.9% had dyslipidemia and 47.1% had desirable lipid profile whereas in female study subjects 66.1% had dyslipidemia and 33.9% had desirable lipid profile.



**Figure-1: Glycated haemoglobin (HbA1C) in different groups of study subjects (n=90)**

The mean ( $\pm$ SD) HbA<sub>1C</sub> of the study subjects were 6.57 $\pm$ 1.72, 6.15 $\pm$ 0.81, 10.38 $\pm$ 3.08, 9.00 $\pm$ 1.61 in group A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> and B<sub>2</sub> respectively. The mean ( $\pm$ SD) HbA<sub>1C</sub> of the subjects were significantly higher ( $P < 0.001$ ) in group B<sub>1</sub> than those of the group A<sub>1</sub> but not significantly higher in group A<sub>1</sub> than those of group A<sub>2</sub>. Again, the mean ( $\pm$ SD) HbA<sub>1C</sub> of the study subjects were significantly higher ( $P < 0.001$ ) in group B<sub>2</sub> than those of group A<sub>2</sub> but not significantly higher in group B<sub>2</sub> in comparison to that of group B<sub>1</sub>.

**DISCUSSION**

In this study, serum TC, TG, LDL and HDL values were almost similar and showed no significant differences between male diabetic patients on therapy and male newly diagnosed diabetic patients and female diabetic patients on therapy & female newly diagnosed diabetic patients. No data were available for comparison. In our study, while assessing diabetic patients on therapy, 31.6% male and 19.2% female showed raised serum cholesterol (>200 mg/dl), 36.8% male and 38.5% female showed raised serum TG level (>150 mg/dl) which is in consistent with that of the Das et al. [4]. On the other hand, considering the newly diagnosed diabetic pa-

tients in this study for both sexes, 26.7% male and 30% female showed raised serum cholesterol, 40% male and 66.7% female showed raised serum TG level. No data were available for comparison. Regarding serum TG level and serum TC an observation was found in our study, where serum TG level were found higher in diabetic females compared to diabetic males whereas serum TC were higher among diabetic males than that of the diabetic females. This finding is in consistent with that of Parikh et al. and Uttara et al. Again, Uttara et al. and Firdous et al. showed similar findings as our study<sup>[15-17]</sup>. We observed that, 31.6% male and 11.5% female diabetic patients on therapy had high serum LDL level (> 100mg/dl) and 26.7% male and 26.7% female newly diagnosed diabetic patients had higher serum LDL level (>100 mg/dl). No data were available for comparison. While examining the level of LDL, we got that diabetic males showed higher level of LDL than those of the diabetic females. This finding was consistent with that of the Parikh et al. and Uttara et al. While searching the HDL level in our study we found that, 31.6% male and 38.5% female diabetic patients on therapy had low HDL level in their serum (< 40mg/dl). This echoed with the findings of Oyelade et al., Parikh et al. and Khan et al<sup>[15-19]</sup>. Again in this study, 6.7% male and 60% female newly diagnosed diabetic patients had low serum HDL levels. No comparable data were available. In our study, we found that diabetic females showed low level of serum HDL than that of diabetic males which is close to the result of Parikh et al. and Uttara et al.<sup>[15-16]</sup>. In present study 52.9% male and 66.1% female diabetic patients had dyslipidemia. This result shows resemblance to Parikh et al., where he found

that, 85.5% male and 97.8% female diabetic patients had dyslipidemia<sup>[15]</sup>. That clearly reveals that female diabetic patients are much prone to have dyslipidemia. In current study, significant differences between lipid profile of diabetic patients on therapy and newly diagnosed diabetic patients were not found. The probable reasons behind this are dietary habit of the both diabetic patients on therapy and newly diagnosed diabetic patients were almost similar and most of the study subjects were sedentary workers. Another reason behind this is none of the study subjects were taking any kind of lipid lowering drugs. Improving glycemic control by sulphonylurea, thiazolidinediones and insulin generally has a beneficial effect on lipoprotein i.e lower TG, cholesterol & raise HDL but may stimulate weight gain and thus increase insulin resistance, again nullifying or even reversing any beneficial effect<sup>[20]</sup>. It is strongly proved that, cholesterol lowering therapy significantly reduces dyslipidemia of both with or without diabetes<sup>[21-23]</sup>. In the present study HbA<sub>1C</sub> levels were significantly higher in newly diagnosed diabetic patients than diabetic patients on therapy. Proper taking of oral hypoglycemic drugs or insulin or both and increasing consumption of whole-wheat flour in place of rice had contributed to the change in HbA<sub>1C</sub> level. Increasing literacy rate and life style modification of most of the people can be another factor. This study reveals high prevalence of hypercholesterolemia, hypertriglyceridemia, high LDL and low HDL level among the subjects with high HbA<sub>1C</sub> level. Insulin affects liver apolipoprotein production. It regulates the enzymatic activity of lipoprotein lipase and cholesterol ester transport protein and peripheral actions on adipose tissue and muscle.

**Limitations of the Study:**

Data were only collected from Bogura city and the sample size was so small. Besides, laboratory investigations were not carried out as per include and exclude subjects in the study due to time and financial constraints. For this, actual scenario might not reveal. Further study in larger scale is required for better view.

**Conclusion:**

After analyzing the results of the study, it can be concluded that, there were no significant difference between lipid profile of diabetic patients on therapy and newly diagnosed diabetic patients but statistically significant difference was found between HbA<sub>1C</sub> levels of diabetic patients on therapy and newly diagnosed diabetic patients. The pattern of diabetic dyslipidemia was high triglycerides and low high density lipoprotein. Positive correlation was found between HbA<sub>1C</sub> levels and TG, TC, LDL but HDL level showed negative correlation with HbA<sub>1C</sub> levels.

**Recommendation:**

The study can be carried out nationwide and it can be done with large sample size. Along with that, an interventional study can be done to observe the effect of hypoglycemic therapy on serum lipid profile

**Ethical approval:** The study was approved by the Institutional Ethics Committee

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