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Original Research Article

Lipid profile in Bangladeshi patients with type-2 diabetes: a series of 101 cases

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is a major public health concern in Bangladesh, affecting over 13 million people, with prevalence rising due to urbanization, sedentary lifestyles, and demographic changes. Abnormal fasting lipid profiles, substantially increases cardiovascular disease (CVD) risk in T2DM patients. This study aimed to assess the fasting lipid profile among Bangladeshi type 2 medicated diabetic patients.
Methods: This cross-sectional descriptive study was conducted at the Department of Laboratory Medicine, Epic Health Care Limited, Chattogram, Bangladesh, from December 2023 to May 2024. A total of 101 medicated T2DM patients were enrolled. Data were analyzed using SPSS Version 23.0.
Results: The most frequent age group was 45–54 years (30.7%), with a mean age of 50.11±11.87 years. Females constituted 60.6% of participants. Desirable total cholesterol (<200 mg/dl) was observed in 59.4% of patients, while 20.8% had borderline and 19.8% high levels (mean: 193.00±51.07 mg/dl). Low high-density lipoprotein (HDL) (<40 mg/dl) was highly prevalent (73.3%), with a mean of 37.21±8.64 mg/dl. Optimal low-density lipoprotein (LDL) (<99 mg/dl) was noted in 45.5% (mean: 108.18±30.53 mg/dl). Triglycerides were normal in 33.7%, borderline in 24.8%, high in 35.5%, and very high in 5.9%, with a mean of 221.67±154.80 mg/dl.
Conclusions: Despite mostly desirable cholesterol levels, the high prevalence of low HDL and elevated triglycerides indicates a considerable dyslipidemia burden, necessitating targeted lipid management to reduce CVD risk among Bangladeshi T2DM patients.

Keywords: Lipid profile, Type 2 diabetes, Dyslipidemia, Cardiovascular risk, Bangladesh

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a significant and growing public health issue in Bangladesh, with over 13 million individuals affected, and the number continues to rise due to lifestyle changes, urbanization, and demographic transitions.[1,2] This metabolic disorder is often associated with dyslipidemia, characterized by abnormal fasting lipid profiles that significantly increase the risk of cardiovascular diseases (CVD). CVD remains the leading cause of morbidity and mortality among diabetic patients globally, including in Bangladesh.[3,4] Dyslipidemia in T2DM is typified by elevated triglycerides (TG), increased low-density lipoprotein cholesterol (LDL-C), and reduced high-density lipoprotein cholesterol (HDL-C), collectively contributing to atherogenic dyslipidemia.[5,6] In Bangladesh, dysfasting lipidemia is prevalent among T2DM patients. A study conducted in Kushtia reported that a substantial proportion of newly diagnosed T2DM patients presented with abnormal fasting lipid profiles.[7] Additionally, a study conducted in Dhaka reported significantly elevated

TC, TG and LDL-C, along with significantly reduced HDL-C among T2DM patients — indicating widespread dyslipidemia in this cohort.[8] These abnormalities are strongly linked to poor cardiovascular outcomes, emphasizing the need for early diagnosis and targeted interventions to improve fasting lipid profiles and reduce CVD risk.[9] However, achieving optimal fasting lipid control among T2DM patients in Bangladesh is a considerable challenge. In a recent multicenter study of Bangladeshi T2DM patients on lipid-lowering therapy, only 81% achieved the LDL-C target, while target attainment was much lower for other lipids (40.8% for TC, 21.6% for TG, 66.3% for HDL-C), and only 8.8% had all lipid parameters within target simultaneously — highlighting major gaps in overall lipid control despite therapy.[10] Suboptimal glycemic control, older age, and longer duration of diabetes have been identified as key factors affecting clinical outcomes among T2DM patients in Bangladesh, potentially contributing to inadequate lipid management.[11,12] Furthermore, evidence suggests that glycemic control, measured by glycated hemoglobin (HbA1c), signifies a crucial role in fasting lipid metabolism. Elevated HbA1c levels are associated with worsened fasting lipid profiles, highlighting the interplay between glucose and fasting lipid dysregulation.[13] Comorbid conditions such as hypertension and smoking further exacerbate abnormal fasting lipid profiles and complicate management.[14] This study aimed to evaluate the fasting lipid profiles of Bangladeshi T2DM patients to find out the burden of fasting dyslipidemia and its clinical implications.

METHODS

This cross-sectional descriptive type of study was carried out at the Department of Laboratory Medicine, Epic Health Care Limited, in Chattrogram, Bangladesh, from December 2023 to May 2024. The risks and benefits of the study were explained to participants in their local language, and informed consent was obtained. A consecutive sampling method was used, and a series of 101 type 2 diabetic cases of varying ages and sex, taking different modes of medication and referred to Epic Health Care Limited for testing fasting lipid profile were recruited in this study. Fasting and postprandial blood samples were collected to assess glycemic control and lipid profile status of the study patients. Fasting plasma glucose level was assessed by Glucose Oxidase-Pre-oxidase Methods and postprandial serum glucose level was assessed by Venus Blood Sampling (Laboratory Methods). Fasting lipid profile parameters, with total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C), were analyzed using enzymatic colorimetric methods. The demographic data including duration of diabetic were collected through face-to-face interview using a pre-structured questionnaire. The data of fasting lipid profile parameters, fasting and postprandial serum plasma glucose levels were collected from the test reports of medical records using a case record form. The collected data were processed and analyzed using Statistical Package for Social Sciences (SPSS), version-23.0. Chi-square tests were performed to identified the association of age and sex with fasting lipid profile of the type2 diabetic cases, where $p<0.05$ considered as the level of significance.

RESULTS

A series of 101 type 2 diabetic cases were recruited in this investigation. The most frequent age group was 45-54 years which includes 31 (30.7%) patients. The mean age of the patients was 50.11±11.87 years. The majority of the cases were females, 61 (60.6%) (Table 1).

Table 1: Age and sex category of the study cases (n=101).

Variables	Frequency	
	N	%
Age groups (years)		
25-34	8	7.9
35-44	25	24.8
45-54	31	30.7
55-64	19	18.8
65-74	16	15.8
≥ 75	2	2.0
Total	101	100
Mean age(years)	50.11±11.87	
Median	50	
Mode	45	
Range	25-77	
Sex		
Male	40	39.6
Female	61	60.6
Total	101	100

Age group was determined with an interval of 1 decade (10 years).

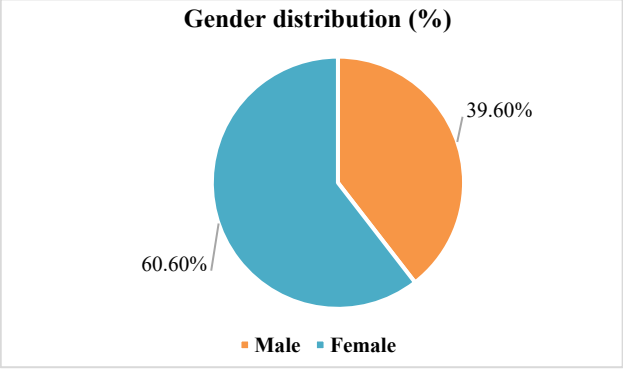

Figure 1: Proportion of sex category of the study cases (n=101).

The most frequent, 46 (45.5%) patients were on diabetic tablets, followed 32 (31.7%) used insulin, 13 (12.9%), used a combination of insulin and tablets. Additionally,

10 (9.9%), patients managed their condition through physical exercise alone (Table 2).

Table 2: Mode of medication of the study cases (n=101).

Mode of medication	Frequency	
	N	%
Diabetic tablet	46	45.5
Diabetic insulin	32	31.7
Diabetic insulin and tablet	13	12.9
Physical exercise (alone)	10	9.9
Total	101	100

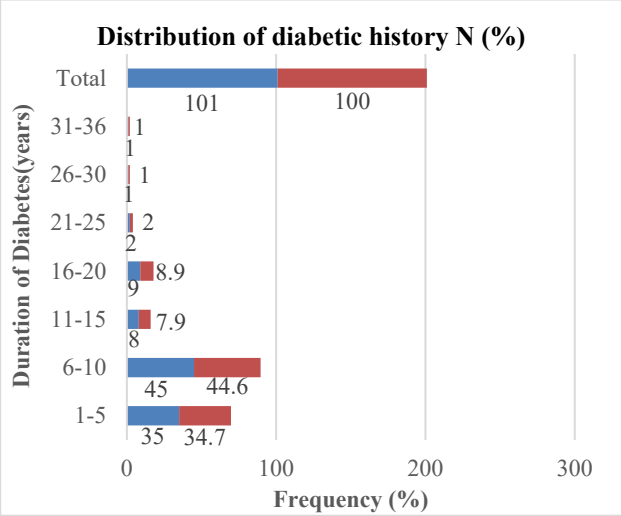

Figure 2: The duration of diabetic history of the study cases (n=101).

Table 3: Fasting and postprandial serum plasma glucose levels of the study cases (n=101).

Variables	Frequency	
	N	%
Fasting plasma glucose level (mmol/l)		
3.9-5.5	44	43.6
5.6-6.9	12	11.9
7.0-10	27	26.7
10.1-15	14	13.9
≥15.1	4	3.9
Total	101	100.0
Mean fasting plasma glucose level (mmol/l)	10.53±4.59	
Postprandial plasma glucose levels after 2-hours (mmol/l)		
<7.8	13	12.9
7.8-11.0	26	26.7
11.1-15.0	25	24.8
15.1-20	22	21.8
≥20.1	15	14.85
Total	101	100

The mean duration of diabetic history of the study cases was 8.46±6.12 years (Figure 2). The mean fasting plasma glucose level was counted 10.53±4.59 mmol/l and the mean postprandial plasma glucose levels after 2-hours was counted 13.51±5.21 mmol/l (Table 3).

Table 4: Distribution of observed lipid profile among the study patients (n=101).

Variables	Frequency	
	N	%
Cholesterol level (mg/dl)		
<200	60	59.4
200-239	21	20.8
≥240	20	19.8
Total	101	100
Mean cholesterol level (mg/dl)	193.00±51.07	
HDL level (mg/dl)		
<40	74	73.3
40-59	24	23.8
≥60	3	3.0
Mean HDL level(mg/dl)	37.21±8.64	
LDL level (mg/dl)		
<99	46	45.5
100-129	24	23.8
130-159	24	23.8
≥160	7	6.9
Mean LDL level (mg/dl)	108.18±30.53	
Triglycerides level (mg/dl)		
<150	34	33.7
150-199	25	24.8
200-499	36	35.5
≥500	6	5.9

The most frequent 60 (59.4%) patients, had desirable cholesterol level (below 200 mg/dl), followed 21 (20.8%) borderlines (200–239 mg/dl), and 20 (19.8%) patients had high level of cholesterol (≥240 mg/dl). The mean cholesterol level was counted 193.00±51.07 mg/dl. In terms of HDL levels, most patients, 74 (73.3%) had low level of HDL (below 40 mg/dl), followed 24 (23.8%) acceptable level (40–49 mg/dl) and 3 (3.0%) high level (≥ 60 mg/dl). The mean HDL level was counted 37.21±8.64 mg/dl. Regarding LDL levels, the most frequent 46 (45.5%) patients had optimal level of LDL (below 99 mg/dl), followed 24 (23.8%), near optimal level (100–29 mg/dl) and 24(23.85), borderline level (130–159 mg/dl) and 7 (6.9%) high level (≥160 mg/dl). The mean LDL level was counted 108.18±30.53 mg/dl. For triglycerides, most frequent, 34 (33.7%) had normal level of triglicerides (150 mg/dl), followed 25 (24.8%) borderline level (150–199 mg/dl), 36 (35.5%) high level (200–499 mg/dl) and 6 (5.9%) had very high level of triglicerides (≥500 mg/dl). The mean triglyceride level was 221.67±154.80 mg/dl, indicating a notable prevalence of elevated triglyceride levels in the recruited cases (Table 4).

Table 5: Association of fasting lipid profile with different age groups of the study cases (n=101).

Variables	Age category of the study cases						Total N (%)	P value
	25-34 N (%)	35-44 N (%)	45-54 N (%)	55-64 N (%)	65-74 N (%)	≥ 75 N (%)		
Cholesterol level (mg/dl)								
<200	3 (2.9)	10 (9,9)	16 (15.8)	14 (13.8)	16 (15.8)	1 (0.9)	60 (59.4)	0.008[S]
200-239	1 (0.9)	7 (6.9)	9 (8.9)	3 (2.9)	0 (0.0)	1 (1.9)	21 (20.8)	
≥240	4 (3.9)	8 (7.9)	6 (5.9)	2 (1.9)	0 (0.0)	0 (0.0)	20 (19.8)	
Total	8 (7.9)	25 (24.7)	31 (30.7)	19 (18.8)	16 (15.8)	2 (1.9)	101 (100)	
HDL level(mg/dl)								
<40	8 (7.9)	18 (17.8)	23 (22.7)	13 (12.8)	11 (10.8)	1 (0.9)	74 (73.3)	0.344
40-59	0 (0.0)	7 (6.9)	8 (7.9)	5 (4.9)	3 (2.9)	1 (0.9)	24 (23.7)	
≥ 60	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.9)	2 (1.9)	0 (0.0)	3 (2.9)	
Total	8 (7.9)	25 (24.7)	31 (30.6)	19 (18.8)	16 (15.8)	2 (1.9)	101 (100)	
LDL level (mg/dl)								
<99	1 (0.9)	10 (9.9)	13 (12.8)	9 (8.9)	12 (11.8)	1 (0.9)	46 (45.5)	0.059
100-129	3 (2.9)	3 (2.9)	11 (10.8)	6 (5.9)	1 (0.9)	0 (0.0)	24 (23.7)	
130-159	2 (1.9)	9 (8.9)	7 (6.9)	2 (1.9)	3 (2.9)	1 (0.9)	24 (23.7)	
≥160	2 (1.9)	3 (2.9)	0 (0.0)	2 (1.9)	0 (0.0)	0 (0.0)	7 (6.9)	
Total	8 (7.9)	25 (24.7)	31 (30.6)	19 (18.8)	16 (15.8)	2 (1.9)	101 (100)	
Triglycerides level (mg/dl)								
<150	1 (0.9)	4 (3.9)	10 (9.9)	8 (7.9)	9 (8.9)	2 (1.9)	34 (33.6)	0.015[S]
150-199	4 (3.9)	2 (1.9)	9 (8.9)	7 (6.9)	3 (2.9)	0 (0.0)	25 (24.7)	
200-499	3 (2.9)	16 (15.84)	9 (8.9)	4 (3.9)	4 (3.9)	0 (0.0)	36 (35.6)	
≥ 500	0 (0.0)	3 (2.9)	3 (2.9)	0 (0.0)	0 (0.0)	0 (0.0)	6 (5.9)	
Total	8 (7.9)	25 (24.7)	31 (30.6)	19 (18.8)	16 (15.8)	2 (1.9)	101 (100)	

Chi-square tests were performed to identify the association between fasting lipid profile and different age category of the study patients, where P<0.05 considered as the level of significance with 98% CI. S= significant.

Table 6: Association of fasting lipid profile with the sex of the study cases (n=101).

Variables	Sex		Total N (%)	P value
	Male N (%)	Female N (%)		
Cholesterol level (mg/dl)				
>200	26 (25.7)	34 (33.6)	60 (59.4)	0.565
200-239	8 (7.9)	13 (12.8)	21 (20.7)	
≥240	6 (5.9)	14 (13.8)	20 (19.8)	
Total	40 (39.6)	61 (60.4)	101 (100)	
HDL Level (mg/dl)				
<40	32 (31.6)	42 (41.5)	74 (73.3)	0.014[S]
40-59	5 (4.9)	19 (18.8)	24 (23.7)	
≥60	3 (2.9)	0 (0.0))	3 (2.9)	
Total	40 (39.6)	61 (60.4)	101 (100)	
LDL level (mg/dl)				
<99	27 (26.7)	19 (18.8)	46 (45.5)	0.004[S]
100-129	7 (6.9)	17 (18.8)	24 (23.7)	
130-159	5 (5.9)	19 (18.8)	24 (23.7)	
≥160	1 (0.9)	6 (5.9)	7 (6.9)	
Total	40 (39.6)	61 (60.4)	101 (100)	
Triglycerides level (mg/dl)				
<150	16 (15.9)	18 (17.8)	34 (33.6)	0.192
150-199	10 (9.9)	15 (14.8)	25 (24.7)	
200-499	10 (9.9)	26 (25.7)	36 (35.6)	
≥500	4 (3.9)	2 (1.9)	6 (5.9)	
Total	40 (39.6)	61 (60.4)	101 (100)	

Chi-square tests were performed to determine the association between fasting lipid profile and sex of the study patients, where P<0.05 considered as the level of significance with 98% CI. S=significant.

The association of various age groups with fasting lipid profile of the patients, cholesterol level and triglycerides level were observed statistically significant ($p<0.05$) but the association of different age groups with HDL and LDL level was not found statistically significant ($p>0.05$) (Table 5).

The association of sex with fasting lipid profile was found statistically significant in HDL and LDL levels of the study cases ($p<0.05$) (Table 6).

DISCUSSION

This research gave important insights into the fasting lipid profiles of T2DM patients in Bangladesh, revealing a notable burden of dyslipidemia characterized by low HDL levels and elevated triglycerides. These results are matched with the global evidence on the fasting lipid abnormalities frequently observed in diabetic population and have significant implications for CVD risk management in Bangladesh.[15,16] In our study, the mean total cholesterol level was 193.00 ± 51.07 mg/dL, with 59.4% of patients having cholesterol below 200 mg/dL. This finding is similar to results reported by Ozder (2014) in Turkey, where a comparable proportion of T2DM patients had desirable total cholesterol levels, highlighting a consistent pattern of moderate cholesterol control among diabetic populations across different settings.[17] However, a higher prevalence of borderline and elevated total cholesterol was observed in a Pakistani cohort of T2DM patients, suggesting regional variations in fasting lipid profiles within the South Asian population.[18] Low HDL-C was the most striking lipid abnormality in our study, with a mean of 37.21±8.64 mg/dl. This finding aligns with previous reports from South Asia, where low HDL-C is a common feature of dyslipidemia among T2DM patients.[19,20] This underscores the shared genetic predispositions and lifestyle factors across the region, such as diets rich in carbohydrates and low physical exercise, which may contribute to low HDL levels. Elevated triglyceride levels (≥200 mg/dl) were observed in 41.4% of patients in our study, with a mean triglyceride level of 221.67±154.80 mg/dl. In contrast, a study from Southern Sri Lanka reported that raised triglycerides were less common, affecting less than 20% of newly diagnosed T2DM patients, while elevated LDL-C was the most frequent lipid abnormality.[21] The high carbohydrate diets common in Bangladesh and neighboring countries likely exacerbate triglyceride elevations, necessitating dietary interventions as part of fasting lipid management. The significant association of cholesterol and triglyceride levels with age and ethnicity observed in our study is consistent with findings from Dabbous et al, who reported differential lipid changes among T2DM patients of different ethnicities during Ramadan.[22] Similarly, the sex-specific differences in HDL and LDL levels measured in this investigation reflect findings from previous research, suggesting that postmenopausal hormonal shifts and differences in fat distribution patterns may account for the lower HDL and higher LDL levels in female diabetic patients.[23] In Bangladesh context, where healthcare access and awareness remain limited, the high prevalence of fasting dyslipidemia among T2DM patients poses a substantial public health challenge. These results call for urgent implementation of community-based fasting lipid screening programs, particularly targeting middle-aged and elderly populations, alongside educational initiatives to promote healthy lifestyle practices.

Limitations

This investigation is limited by its cross-sectional design, which prevents establishing causality between variables. Additionally, the sample size was relatively small and drawn from a single healthcare facility, which partially recruited the broader population of type 2 diabetic patients in Bangladesh.

CONCLUSION

This study prevailed that the majority of type 2 diabetic patients had desirable cholesterol levels but exhibited low HDL levels and a notable prevalence of elevated triglycerides. The fasting lipid profile performed significant relationship with age groups and sex, particularly with HDL and LDL levels, emphasizing the significance of tailored fasting lipid profile management strategies in type2 diabetic patients.

Recommendations

Healthcare providers should prioritize regular monitoring of fasting lipid profiles in type 2 diabetic patients to identify and manage abnormal fasting lipid profiles early. Tailored interventions, including lifestyle modifications such as diet and exercise, along with appropriate pharmacological treatments, are essential to address low HDL and elevated triglyceride levels. Public health initiatives should focus on raising awareness about the importance of fasting lipid management and cardiovascular risk deduction among diabetic cases in Bangladesh.

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