

Study of Dyslipidemia in Type-2 Diabetes Mellitus Patients

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Conflict of interest: Nil

Abstract:

Background: Type 2 diabetes is recognized as a major public health concern with a considerable impact on human life and health expenditures. Rapid economic development and urbanization have led to a rising burden of diabetes. Chronic hyperglycemia with metabolic derangements in patients with diabetes mellitus can cause complications of which are microvascular and macrovascular complications. Dyslipidemia is one of the risk factors for ASCVD (Atherosclerotic cardiovascular disease) major cause of death worldwide. Early detection of dyslipidemia is necessary to prevent the mishap.

Methods: Type 2 diabetes mellitus patients who came to OPD or got admitted in KR Hospital, Mysore Medical College and Research Institute, Mysore. All patients fulfilling the inclusion criteria was interviewed as per proforma and a detailed clinical examination was done. The wanted blood tests, urine examination and imaging were done. The values are correlated with duration of type 2 diabetes mellitus.

Results: In our study of 100 patients, the minimum age taken was 26 years and the maximum age taken was 85 years with a mean value of 57. Majority of patients were above 60 years of age. Our study had female predominance with 52% and male: female ratio of 12:13, 74% patients have HbA1c level >7, Hypertriglyceridemia is more as duration of diabetes increases levels are higher in patients with higher duration of diabetes which is statistically significant ($p < 0.05$). HDL levels are lower in patients with higher duration of diabetes which is statistically significant ($p < 0.05$).

Conclusion: Results suggest high prevalence of dyslipidemia among type 2 diabetes mellitus study subjects, Most common pattern observed was single parameter dyslipidemia. Dyslipidemia is more as duration of diabetes mellitus. These lipid abnormalities might be the important in view of development of cardiovascular or cerebrovascular diseases. Hence type 2 diabetic patient should undergo the routine monitoring of blood sugar and lipid profile.

Keywords: Type 2 diabetes mellitus, Dyslipidemia, HbA1c.

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Introduction

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose.[1] Type 2 diabetes is mainly due to insulin resistance. Factors that likely to developing type 2 diabetes include being overweight, not getting enough exercise, and genetics.[2] Over time, type 2 diabetes can cause serious damage to the body.

Type 2 diabetes susceptibility varies largely around the globe, with Pacific Islanders, Asian Indians, and Native Americans having a significantly higher risk of developing the disorder.[3] Current global statistics shows that 463 million and 374 million individuals have diabetes and impaired glucose tolerance (IGT), a prediabetic condition. These numbers are estimated to increase to 700 million

people with diabetes and 548 million people with IGT by 2045, which represents a 51% increase compared to 2019. The estimates in 2019 showed that 77 million individuals had diabetes in India, which is expected to rise to over 134 million by 2045. Approximately 57% of these individuals remain undiagnosed.[4] The population growth and ageing in the world's largest countries, such as China and India, are driving the absolute increase in the number of people with diabetes.[5] The elevated blood insulin in insulin resistance drives dyslipidemia, high blood pressure, and glucose metabolism alteration.[6]

Dyslipidemia is considered as one of the most important cardiovascular risk factors among type 2 diabetic population. The lipid abnormalities observed in diabetes mellitus are due to increased

free fatty acid flux secondary to insulin resistance aggravated by increased inflammatory adipokines.[7]

It is estimated that 30-60% of patients with T2DM have dyslipidemia. It should be recognized that the lipid changes in patients with T2D are characteristic of the alterations in lipid profile seen in obesity and the metabolic syndrome (insulin resistance syndrome). Since a high percentage of patients with T2DM are obese, insulin resistant, and have the metabolic syndrome, it is not surprising that the prevalence of increased TG and small dense LDL and decreased HDL-C is common in patients with T2DM even when these patients are in good glycemic control. Obesity is also accompanied by increased systemic inflammation which increases the prevalence of dyslipidemia.[8]

Identifying the prevalence of dyslipidemia and establishing its relationship with glycemic control may help us in making necessary implementations to reduce the complications associated with diabetic dyslipidemia. So, this study is conducted to evaluate the dyslipidemia in type 2 diabetes mellitus.

Aims and Objectives

1. Study of lipid profile in type 2 diabetes mellitus.
2. Correlating dyslipidemia with duration of disease in type 2 diabetes mellitus.

Materials and Method

The current Hospital based Cross Sectional-Observational study was conducted for a period of one and a half year between January 2021 and July 2022 on 100 patients.

Source of Data

Primary Source: The study group includes type 2 diabetes mellitus who came to OPD or got admitted in the department of General medicine, KR Hospital, Mysore Medical College, Mysore, Karnataka.

Secondary Source of information from published articles, journals, books, case sheets, discharge summary, related websites.

Inclusion Criteria

- Age group of more than 18 years.
- All patients with type 2 Diabetes mellitus

Exclusion Criteria

- All those who had prior thyroid disorder and on treatment.
- Prior dyslipidemia on treatment
- Cardiac disease
- Liver disorder
- Renal diseases

Sample Size Estimation: In the present study, sample size was calculated using the formula

$$n = 4pq/d^2$$

Where

$$p = \text{Prevalence} = 20$$

$$q = 100 - p = 100 - 20 = 80$$

$$d = \text{Allowable error} = 8$$

Therefore,

$$n = 4 \times 80 \times 20 / 8 \times 8$$

$$= 6400 / 64$$

$$= 100$$

$$\text{Sample size } n = 100$$

Methods

Institutional ethical committee approval has been taken after presenting the study to IEC. As per the inclusion and exclusion criteria subjects are enrolled in the study. All subjects included in the study has been explained the procedure and valid informed written consent was taken.

Data was collected from type 2 diabetes mellitus patients who came to OPD or got admitted in KR Hospital, Mysore Medical College and Research Institute, Mysore. All patients fulfilling the inclusion criteria was interviewed as per proforma and a detailed clinical examination was done. The wanted blood tests, urine examination and imaging were done. The values are correlated with duration of type 2 diabetes mellitus.

Statistical Analysis: Data obtained from the study has been entered in excel sheets and analyzed using SPSS (Statistical Package for Social Sciences) software version 20 and has been presented as descriptive statistics in the form of frequency, tables, figures and graphs. Descriptive statistics of the explanatory and outcome variables were calculated by mean, Standard deviation for quantitative variables, frequency and proportions for qualitative variables.

- Inferential statistics like
- Chi-square test was applied for qualitative variables.
- Independent sample t test will be applied to compare the quantitative variables between the groups.
- The level of significance is set at 5%.

A 'p' value of <0.05 is considered statistically significant.

Results

In the present study TFT, Lipid profile, FBS, PPBS and HbA1C are studied among Type 2 Diabetes mellitus patients and their correlation and results observed has been tabulated as follows.

Mean age group and distribution of the subjects based on age group

Table 1: Gender and mean age group distribution

Gender	N	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Male	48	54.750	9.95842	1.43737	40.00	80.00
Female	52	59.0769	11.73038	1.62671	26.00	85.00
Total	100	57.000	11.07641	1.10764	26.00	85.00

In our study of 100 patients, the minimum age taken was 26 years and the maximum age taken was 85

years with a mean value of 57.0000 and standard deviation of 11.07.

Table 2: Distribution of patients according to HbA1c levels

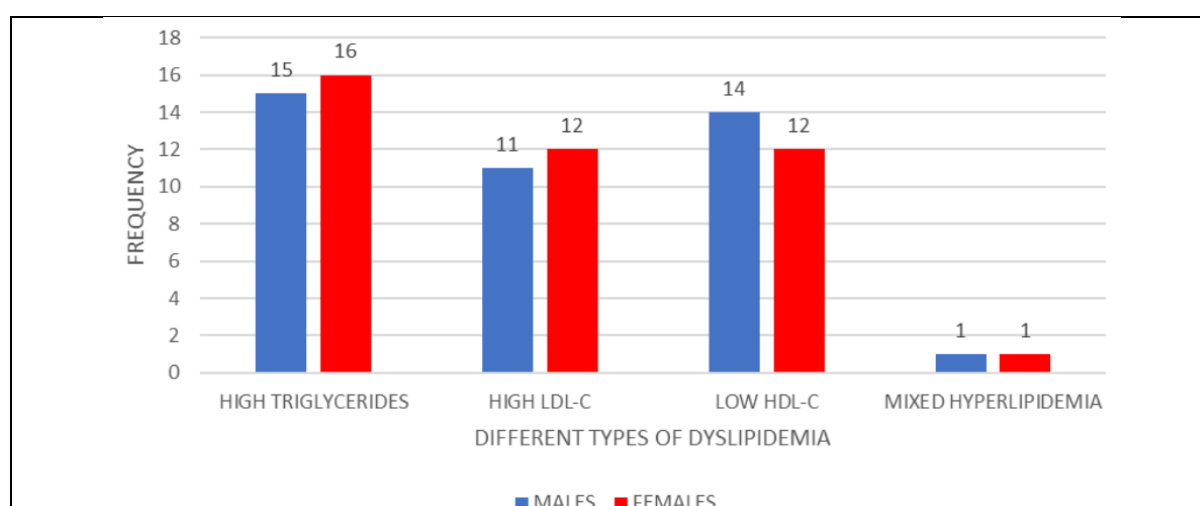
Age group (years)	Number	Percentage
18 to 40	2	2
41 to 50	32	32
51 to 60	28	28
>60	38	38
Total	100	100.0
Age distribution		
Gender	Number	Percentage
Female	52	52
Male	48	48
Total	100	100
Distribution of the subjects based on gender		
HbA1c	Number of patients	Percentage
<7	26	26
>7	74	74
Total	100	100

Majority of patients were above 60 years of age. Our study had female predominance with 52% and male:

female ratio of 12:13. 74% patients have HbA1c level >7.

Table 3: Patterns of dyslipidemia in type 2 diabetes mellitus patients

Dyslipidemia	Male	Female	Total
High Triglycerides	15	16	31
High LDL-C	11	12	23
Low HDL-C	14	12	26
Mixed Hyperlipidemia	1	1	2

**Figure 1: Gender differentiation among dyslipidemia****Mixed Hyperlipidemia**

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	.003	1	.954	
Fisher's Exact Test				1.000

Table 4: Triglycerides versus duration of diabetes

Diabetes Mellitus Duration	Triglycerides<150	Triglycerides>150	Total
Diabetes mellitus <5 years	22	12	34
Diabetes mellitus 5-10 years	36	12	48
Diabetes mellitus >10 years	11	7	18
Total	69	31	100

In our study, Hypertriglyceridemia is more as duration of diabetes increases.

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.189	2	.552

Table 5: LDL versus duration of diabetes

Diabetes Mellitus Duration	LDL<130	LDL>150	Total
Diabetes mellitus <5 years	31	4	35
Diabetes mellitus 5-10 years	35	7	42
Diabetes mellitus >10 years	11	12	23
Total	77	23	100

Chi-Square Tests	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.397	2	.000

In our study, LDL levels are higher in patients with higher duration of diabetes which is statistically significant ($p<0.05$).

Table 6: HDL Versus duration of diabetes

Diabetes Mellitus Duration	HDL>40/50	HDL<40/50	Total
Diabetes mellitus <5 years	28	5	33
Diabetes mellitus 5-10 years	32	9	41
Diabetes mellitus >10 years	14	12	26
Total	74	26	100

In our study, HDL levels are lower in patients with higher duration of diabetes which is statistically significant ($p<0.05$).

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.453	2	.001

Discussion

The various studies which have been done in our country and abroad have been reviewed in our

study. Statistical data of age, gender, HbA1c, lipid profile were studied and compared with those published in literature.

Study	Number of Patients	Mean Age	Sex Ratio
Present Study	100	>60 years	12:13
Ram Kumar Mehta et al Morang ^[9]	355	50-60 years	1.4:1
Shrestha HK et al Dhulikhel Nepal ^[10]	150	50-60 years	1:1
Comparison of age and sex ratio between different studies in dyslipidemia in type 2 diabetes mellitus			

In our study majority of patients were in the age group of >60 years and sex ratio of 12:13. As compared to study done by Ram Kumar Mehta and

Shrestha H K et al, majority of patients were in age group of 51-60 years and with sex ratio of 3:2 and 1:1 respectively

Study	Number of patients	Single parameter dyslipidemia	Two parameter dyslipidemia	Mixed dyslipidemia
Present study	100	55%	13%	2%
Ram Kumar Mehta et al Morang	355	94%	86%	91%
Shrestha H K et al, Dhulikhel Nepal	150	72%	69%	37%
Comparison of dyslipidemia in type 2 diabetes mellitus between different studies				

In our study majority of patients (55%) have single parameter dyslipidemia followed by two parameter dyslipidemia and mixed dyslipidemia. As compared to studies done by Ram Kumar Mehta et al and Shrestha H K et al, majority of patients had single parameter dyslipidemia just like our study.

Conclusion

Results suggest high prevalence of dyslipidemia among type 2 diabetes mellitus study subjects. Most common pattern observed was single parameter dyslipidemia.

Dyslipidemia is more as duration of diabetes mellitus. Hence, regularly diabetic patients should be screened for dyslipidemia especially of patients with longer duration of diabetes. These lipid abnormalities might be the important in view of development of cardiovascular or cerebrovascular diseases. Hence type 2 diabetic patient should undergo the routine monitoring of blood sugar and lipid profile so that any abnormalities can be identified and preventive measures along with interventions can be initiated at the earliest.

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