

EPIDEMIOLOGICAL STUDY ON PATTERN OF DYSLIPIDAEMIA AMONG TYPE II DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL IN CHENNAI - A CROSS-SECTIONAL STUDY

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Abstract

Background: Diabetes mellitus is a significant risk factor for cardiovascular disease and atherosclerosis as it is a common secondary cause of hyperlipidaemia when glycaemic control is poor. The prevalence of dyslipidaemia in type 2 diabetes is double concerning the general population. Therefore, early detection and treatment of dyslipidaemia can avoid the risk of cardiovascular disorder in diabetic patients. The present study aimed to find out the pattern of dyslipidaemia in type 2 diabetic patients in tertiary care hospitals in Chennai. **Materials and Methods:** This cross-sectional study was conducted in a tertiary care hospital in Chennai; among 130 patients with Type 2 Diabetes Mellitus, patients who met the inclusion criteria were enrolled based on simple random sampling. All known cases of type II diabetes mellitus were evaluated for their lipid profile. Descriptive statistics were used to analyze qualitative and discrete variables. The Chi-square test was used to assess a statistically significant association between the variables. **Result:** According to NCEP-ATP III guidelines, dyslipidaemia was observed in 105 (81%) study participants. Hypercholesterolemia was seen in 52(40%) study Participants. Increased LDL and triglycerides were observed in 60 (46.15%) 46(35.38%) study subjects. Lower HDL cholesterol values were observed in 30 (23.10%) study subjects. **Conclusion:** The majority of the study participants were dyslipidaemia. The most prevalent pattern among both males and females was high LDL and low HDL. The prevalence of dyslipidaemia is significantly high, which indicates immediate lifestyle intervention strategies to prevent and manage this important health problem and risk factor.

INTRODUCTION

India has the largest number of diabetic patients. It is often referred to as the diabetes capital of the world, which could be due to rapid urbanization that brought along with it a sedentary lifestyle, an essential factor inducing diabetes mellitus. Diabetes mellitus is an endocrine disorder characterized by metabolic abnormalities with micro and macrovascular complications which cause significant morbidity and mortality.^[1,2] Diabetes mellitus is associated with a considerably increased risk of premature atherosclerosis, particularly coronary heart disease (CHD) and peripheral arterial disease.^[3] The international diabetic federation

estimated that the prevalence of diabetes in India is 8.3%. According to a study in 2011, the estimated number of patients with diabetes in India was 62.4 million, projected to rise to a staggering 101.2 million by 2030.^[4,5] Diabetic dyslipidaemia in India is one of the leading causes of Coronary Artery Disease (CAD) mortality. Diabetes mellitus is a significant risk factor for cardiovascular disease and atherosclerosis as it is a common secondary cause of hyperlipidaemia when glycaemic control is poor. The prevalence of dyslipidaemia in type 2 diabetes is double concerning the general population.^[6,7] “Dyslipidemia” is the term used widely to describe the abnormal lipid profile. Dyslipidemia contributes to increased atherosclerosis risk and consequent

mortality in diabetic patients. It often precedes the onset of diabetes, particularly type 2 DM and may persist despite adequate blood sugar control.^[2,8,9] The typical diabetic dyslipidemia is characterized by elevations of triglycerides (TG), low-density lipoproteins (LDL) and decreased high-density lipoproteins values. The enzyme lipoprotein lipase, located on the vascular endothelium, determines the rate of removal of triglycerides from circulation. In contrast to intracellular hormone-sensitive lipase, this lipoprotein lipase may be down-regulated in states of insulin resistance or deficiency, which contributes to postprandial lipemia. Dyslipidaemia in diabetes mellitus refers to raised low-density lipoprotein cholesterol (LDL- C), decreased high-density lipoprotein cholesterol (HDL-C) levels, or elevated triglyceride (TG) levels.¹⁰ Early detection and treatment of dyslipidaemia can avoid risk for the cardiovascular disorder in diabetic patients. The present study aimed to find the pattern of dyslipidaemia in type 2 diabetic patients in tertiary care hospitals in Chennai.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at a tertiary health centre in Chennai from September 2022 to October 2022. A total of 130 patients with Type 2 Diabetes Mellitus who attended the medicine Out Patient Department were enrolled based on a simple random sampling technique. Written consent was taken from all type 2 diabetic patients willing to be enrolled in the study. Patients presenting with diabetic ketoacidosis, hyperglycemic hyperosmolar state and denied to give written consent were excluded from the study. The sample size was calculated based on the single proportion formula $n = (z_{1-\alpha/2})^2 \times pq/d^2$ at 95% of confidence $\alpha = 0.05$, prevalence (p) is 86%, $q = 100 - p$ ($100 - 86 = 14$), relative precision = 6%, a sample size of 128 was obtained which was rounded off to 130. All patients who met inclusion criteria were sent for lipid profile assay in the department of biochemistry. The sample was collected in an overnight fasting state. All participants were asked relevant questions to note demographic information and risk factors based on prestructured questionnaires. Data were collected throughout the study period to meet the sample size for the study. For serum lipids. National Cholesterol Education Programme Adult Treatment Panel III (NCEP-ATP III) guideline was referred.¹¹ According to NCEP-

ATP III guideline hypercholesterolemia-serum total cholesterol level ≥ 200 mg/dl; hypertriglyceridemia-serum TG level ≥ 150 mg/dl; low HDL-C level ≤ 40 mg/ dl for men and ≤ 50 mg/dl for women; high LDL-C level ≥ 100 mg/dl. Dyslipidemia is defined by the presence of one or more than one abnormal serum lipid concentrations. Mixed dyslipidemia is defined by two or more abnormal values of the lipid mentioned above parameters. T2DM was designated to patients with a physician already diagnosed and under treatment and who had plasma glucose levels above the cut-off values recommended by American Diabetes Association (ADA) criteria.^[4]

RESULTS

The data collected among the study participants were entered into Microsoft Excel and analyzed using SPSS 25.0 software version. The descriptive tables were expressed as frequency and percentages. The Chi-square test was used to identify the association between selected variables, and a p-value < 0.05 was considered statistically significant. The results obtained were presented in the form of tables and graphs.

[Table 1] explains the variables related to the characteristics of the study participants. The present study was conducted among 130 subjects to determine the prevalence and pattern of dyslipidemia in type 2 diabetes mellitus patients. Among the respondents, the majority (86, 66.15%) were aged 45 and > 45 years of age. Male predominance (74, 56.92%) was observed among the participants. Almost equal distribution of the patients with and without a history of smoking. It was observed that 46.15% were smokers, and 51.85% of the participants were non-smokers. Only one-third (44, 33.85%) of the study group were alcoholic, and about two-thirds (86, 66.15%) were non-alcoholic. The majority (96, 73.85%) of the patients were within the range of normal BMI ($18.5 \text{ kg/m}^2 - 25.0 \text{ kg/m}^2$). About were overweight or obese with BMI value $> 25.0 \text{ kg/m}^2$.

[Table 2] shows the pattern of lipid profile values among the study participants who were known case of diabetics. The most common type of dyslipidaemia among type 2 diabetics was high LDL which was observed among 46.15% (60), followed by high total cholesterol 52 (40%). High Triglycerides were noted in 35.38% (46), and only 23.10% (30) participants showed low HDL level

Table 1: Characteristics of the study participants

| S.No | Variable | Frequency | Percentage (%) |
|------|-----------------|-----------|----------------|
| 1. | Age | | |
| | < 45 years | 44 | 33.85 |
| | ≥ 45 years | 86 | 66.15 |
| 2. | Gender | | |
| | Male | 74 | 56.92 |
| | Female | 56 | 43.08 |
| 3. | Smoking | | |
| | Yes | 60 | 46.15 |

| | | | |
|----|-----------------------|----|-------|
| | No | 70 | 53.85 |
| 4. | Alcoholism | | |
| | Yes | 44 | 33.85 |
| | No | 86 | 66.15 |
| 5. | Body Mass Index (BMI) | | |
| | Overweight/obese | 96 | 73.85 |
| | normal | 34 | 26.15 |

Table 2: Pattern of Dyslipidaemia among the participants

| S.No | Variable | Frequency | Percentage (%) |
|------|--------------------------|-----------|----------------|
| 1. | Total Cholesterol | | |
| | ≥ 200 mg/dl; | 52 | 40.0 |
| | < 200 mg/dl; | 78 | 60.0 |
| 2. | High-Density Lipoprotein | | |
| | ≤ 40 mg/ dl | 30 | 23.10 |
| | > 40 mg/ dl | 100 | 76.90 |
| 3. | Low-Density Lipoprotein | | |
| | ≥ 100 mg/dl | 60 | 46.15 |
| | < 100 mg/dl | 70 | 53.85 |
| 4. | Triglycerides | | |
| | ≥ 150 mg/dl; | 46 | 35.38 |
| | < 150 mg/dl; | 84 | 64.62 |

Table 3: Association between dyslipidemia and its risk factors

| S.no | Variable | Dyslipidemia | | Chi-square | P value |
|------|-----------------------|--------------|--------|------------|---------|
| | | High | Normal | | |
| 1. | Age | | | 0.047 | 0.828 |
| | < 45 years | 36 | 8 | | |
| | ≥ 45 years | 69 | 17 | | |
| 2. | Gender | | | 4.593 | 0.032* |
| | Male | 55 | 19 | | |
| | Female | 50 | 6 | | |
| 3. | Smoking | | | 0.042 | 0.836 |
| | Yes | 48 | 12 | | |
| | No | 57 | 13 | | |
| 4. | Alcoholism | | | 4.555 | 0.037* |
| | Yes | 31 | 13 | | |
| | No | 74 | 12 | | |
| 5. | Body Mass Index (BMI) | | | 5.104 | 0.023* |
| | Overweight/obese | 23 | 11 | | |
| | normal | 82 | 14 | | |

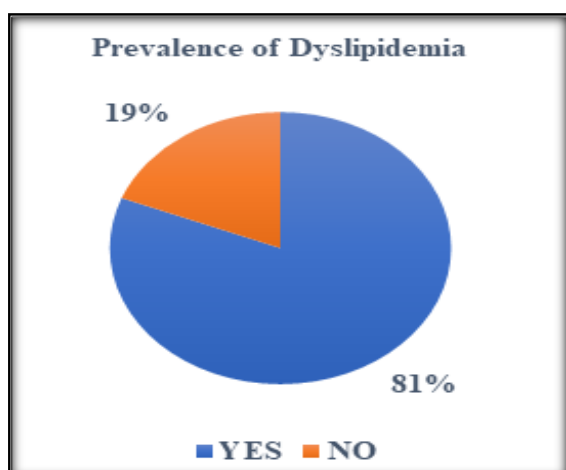


Figure 1: Prevalence of Dyslipidaemia among Type 2 Diabetes patients

[Figure 1] illustrates the prevalence of dyslipidemia among type 2 diabetes patients. In the present study, out of 130 study participants, 105 respondents had dyslipidemia as one or two parameters of the lipid profile were outside the target recommended by the guidelines of the national cholesterol education

program. Hence the prevalence of dyslipidemia was found to be 81%

[Table 3] describes the association between dyslipidemia and its associated risk factors among the study participants. It was observed that variables such as male gender, history of alcohol consumption and patients who were overweight or obese with increased BMI had abnormal lipid profiles, and this finding was found to be statistically significant with $p < 0.05$.

DISCUSSION

Type 2 diabetes mellitus accounts for more than 90% of diabetes mellitus, leading to a significant public health burden in the community. Dyslipidaemia is one of the essential metabolic abnormalities related to diabetes mellitus. Therefore, the present study was conducted to assess the prevalence and pattern of dyslipidemia in type 2 diabetes mellitus patients. In the present study, it was observed that type 2 diabetic patients had poor glycemic control, which was reflected by higher fasting and post prandial blood sugar values.

In the present study, 46% of study participants had increased LDL, 40% showed hypercholesterolemia, and 35% had increased triglycerides. Low HDL was observed among 23% of study respondents. The most common pattern of dyslipidaemia was improved. LDL, followed by total cholesterol and triglycerides. In a study of Dayakar E et al. in Haryana, the incidence of hypercholesterolemia and lower HDL were similar to the present study results. Still, the incidence of increased LDL was too high compared to the present study.^[10,11,12] In another study by Bali K et al., the incidence of dyslipidemia in type 2 diabetic patients of the Punjab population was reported as 81.8% and hypercholesterolemia at 36.5%, hypertriglyceridemia at 57.2%, high LDL levels at 59.3% and low HDL as 34.4% patients where the hyper triglyceride incidence was high and reduced HDL incidence was similar compared to the present study.^[13] In a study by Singh G et al. found the incidence of dyslipidemia as 59% of people with type 2 diabetes had hypercholesterolemia, 53% had hypertriglyceridemia, 98% had abnormal LDL levels, and 89% had the HDL less than 40 mg/dl.^[14] The difference in dyslipidemia among the study participants may be attributed to many reasons. Consumption of a diet rich in carbohydrates, high fat and calorie intake and lack of physical activity would be the significant reasons for dyslipidemia. In the present study, the prevalence of dyslipidemia was 81%, similar to that of Agarwal Y et al., Pandya H et al., Jayrama N et al. and Dixit et al. The observed prevalence was higher as compared to that observed by Rajput et al. and Kondveeti et al. This increased prevalence might be due to variation in the study area chosen and the selection of the study population with different dietary habits and characteristics.^[15,16,17,18]

In this study, males show slightly higher levels of lipid profile parameters than females, and this difference was statistically insignificant. These findings were similar to those observed by Kondveeti et al. in Tamilnadu, Rajput et al. in Bhopal and Agarwal Y et al. in a study carried out in Haryana. It was observed that patients with diabetes who were overweight or obese were at increased risk of developing dyslipidemia which was found to be statistically significant.^[18,19,20] Similar finding was observed in a study conducted by Sheth J et al. in Western India in which there was a significant linear association observed in T2DM subjects with central- and peripheral obesity along with dyslipidemia.^[21] Study participants with a history of alcohol consumption had a statistically significant association with dyslipidemia. This finding was similar to the results in a study by Liang Z et al. in which alcoholics with diabetes had the highest risk of dyslipidemia in the study population.^[22]

CONCLUSION

From this study, we can conclude that dyslipidemia, especially hypercholesterolemia, hypertriglyceridemia and elevated Low Density Lipoprotein cholesterol, has become a widespread and threatening phenomenon in our country. This study has a high prevalence of dyslipidaemia, and it might play a significant role in the development of cardiovascular diseases among diabetic patients here. These results show an extensive need for routine screening programs for blood lipid levels and appropriate intervention programs targeting risk factor reduction. Frequent blood sugar and serum lipid profile monitoring should be included in treating diabetic patients for optimum care.

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