

## LIPID PROFILE OF ADULT TYPE-2 DIABETES PATIENTS- A HOSPITAL BASED STUDY FROM SOUTH ODISHA

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### Abstract

**Background:** Diabetic patients face an elevated risk of dyslipidemia, hypertension, and obesity, with a tendency for underdiagnosis and undertreatment, particularly in high-risk populations such as those with type-2 diabetes. This study aims to explore the association between serum lipid profiles in individuals diagnosed with type-2 diabetes. **Materials and Methods:** A cross-sectional study involving 200 participants diagnosed with type-2 diabetes was conducted at MKCG Medical College, Berhampur. The subjects were already undergoing treatment. Following the NCEP-ATPIII guideline, hypercholesterolemia was considered when TC > 5.2 mmol/l, high LDL-C when the value exceeded 2.6 mmol/l, hypertriglyceridemia with TG > 3.8 mmol/l, and low HDL-C when the value was <1.0 mmol/l. Dyslipidemia was determined by the presence of one or more abnormal serum lipid concentrations. Diabetes was defined based on the American Diabetes Association (ADA) criteria. **Result:** The mean age of males (58.5 ± 2.1) did not exhibit statistically significant differences (p=0.7123) when compared to females (56.8 ± 1.5). Contrary to expectations, the mean waist circumference (WC), hip circumference (HC), Body Adiposity Index (BAI), and Body Mass Index (BMI) did not show statistically significant differences between genders (p=0.0943, 0.3121, 0.1767, and 0.2398, respectively). Among diabetic individuals, 112 (56.0%) displayed only one abnormal lipid profile parameter, 78 (39.0%) had two abnormal lipid parameters, and 55 (27.5%) exhibited more than two abnormal lipid profile parameters. **Conclusion:** This study emphasizes that early diagnosis, facilitated by cost-effective blood testing, can play a pivotal role in screening high-risk diabetic patients for timely intervention using lipid-lowering drugs.

## INTRODUCTION

Type-2 diabetes mellitus (T2DM) has emerged as a global health challenge with profound implications for morbidity and mortality.<sup>[1]</sup> Beyond the immediate implications of glycemic control, the coexistence of dyslipidemia, hypertension, and obesity in diabetic individuals has garnered increasing attention.<sup>[2]</sup> Dyslipidemia, characterized by abnormal lipid profiles, is particularly prevalent in this population, contributing to an elevated risk of cardiovascular diseases (CVD) and other complications.<sup>[3]</sup> The association between diabetes and dyslipidemia is well-established.<sup>[4]</sup> Diabetic dyslipidemia is characterized by elevated triglyceride (TG) levels, reduced high-density lipoprotein cholesterol (HDL-

C), and often, increased low-density lipoprotein cholesterol (LDL-C) levels.<sup>[5]</sup> These lipid abnormalities play a crucial role in the accelerated atherosclerosis observed in diabetes, leading to increased cardiovascular events and mortality.<sup>[6]</sup> The prevalence of dyslipidemia in T2DM varies across populations and is influenced by genetic, environmental, and lifestyle factors.<sup>[7]</sup> While some studies suggest that up to 70% of individuals with T2DM may have dyslipidemia, the burden of this condition and its impact on cardiovascular risk factors require further exploration, especially in specific geographic regions such as South Odisha. Despite its significant impact, dyslipidemia in T2DM often goes undiagnosed or is diagnosed late.<sup>[8]</sup> This delay in recognition can be attributed to the

asymptomatic nature of dyslipidemia and the focus on glycemic control in routine diabetes management. The underestimation of the cardiovascular risk associated with dyslipidemia in T2DM underscores the need for targeted screening and intervention.<sup>[9]</sup> The burden of diabetes-related complications, including dyslipidemia, exhibits geographic variability.<sup>[10]</sup> South Odisha, characterized by its unique sociodemographic and cultural attributes, may present distinct patterns of diabetes-related complications. The geographic variability in lifestyle, dietary habits, and genetic predispositions could contribute to variations in the prevalence and characteristics of dyslipidemia among individuals with T2DM in this region.

The need for region-specific studies on the lipid profiles of individuals with T2DM is underscored by the potential regional differences in lifestyle, genetics, and healthcare access. Understanding the prevalence, patterns, and factors influencing dyslipidemia in T2DM within the context of South Odisha is critical for tailoring effective preventive and therapeutic strategies. Moreover, the MKCG Medical College in Berhampur serves as a vital hub for healthcare delivery in South Odisha. Investigating the lipid profiles of individuals with T2DM within this healthcare setting can provide insights into the real-world challenges faced by healthcare professionals and guide the development of context-specific interventions.

## MATERIALS AND METHODS

**Study Design:** This research employed a cross-sectional study design to investigate the lipid profiles of adult patients diagnosed with type-2 diabetes mellitus (T2DM) at MKCG Medical College in Berhampur, South Odisha.

**Study Setting:** The study was conducted at MKCG Medical College, a prominent healthcare institution serving the population of South Odisha. The choice of this setting ensured access to a diverse patient population and comprehensive medical records.

**Sample Size and Selection:** A sample size of 200 adult patients diagnosed with type-2 diabetes was determined based on the prevalence of T2DM and dyslipidemia in the region. Participants were selected using a systematic random sampling approach from the outpatient department of the endocrinology unit at MKCG Medical College.

### Inclusion Criteria

1. Adult individuals aged 18 years and above.
2. Confirmed diagnosis of type-2 diabetes according to the American Diabetes Association (ADA) criteria.
3. Undergoing active treatment for type-2 diabetes.

### Exclusion Criteria

1. Patients with a history of secondary causes of dyslipidemia, such as hypothyroidism or renal dysfunction.

2. Individuals with a history of liver disease or on medications known to significantly affect lipid metabolism.

### Data Collection

1. **Clinical Assessment:** Detailed clinical assessments, including medical history, medication records, and anthropometric measurements (e.g., waist circumference, hip circumference, Body Mass Index [BMI], and Body Adiposity Index [BAI]), were conducted for each participant.
2. **Biochemical Analysis:** Fasting venous blood samples were collected from each participant for lipid profile analysis. The lipid profile included total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TG). The measurements were performed using standardized protocols and equipment.
3. **Diagnostic Criteria:** Dyslipidemia was defined based on the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) guidelines. Hypercholesterolemia was defined as TC > 5.2 mmol/l, high LDL-C when the value was > 2.6 mmol/l, hypertriglyceridemia as TG > 3.8 mmol/l, and low HDL-C when the value was < 1.0 mmol/l.
4. **Data Management and Statistical Analysis:** Data were entered into a secure database and analyzed using statistical software (e.g., SPSS). Descriptive statistics such as mean, standard deviation, and percentages were used to summarize demographic and clinical characteristics. The relationship between lipid profile parameters and clinical variables was assessed using appropriate statistical tests, including t-tests and chi-square tests. A p-value < 0.05 was considered statistically significant.

### Ethical Considerations

**Informed Consent:** Informed consent was obtained from each participant before inclusion in the study, ensuring voluntary participation and the right to withdraw at any point.

**Ethical Approval:** The study received ethical approval from the Institutional Review Board (IRB) of MKCG Medical College, ensuring compliance with ethical guidelines and principles.

**Confidentiality:** Patient confidentiality was strictly maintained throughout the study. Personal identifiers were removed or anonymized during data analysis and reporting.

This methodology provides a robust framework for investigating the lipid profiles of adult patients with type-2 diabetes at MKCG Medical College, Berhampur. The systematic sampling, standardized measurements, and ethical considerations enhance the reliability and validity of the study findings, contributing valuable insights to the understanding of dyslipidemia in the context of T2DM in South Odisha.

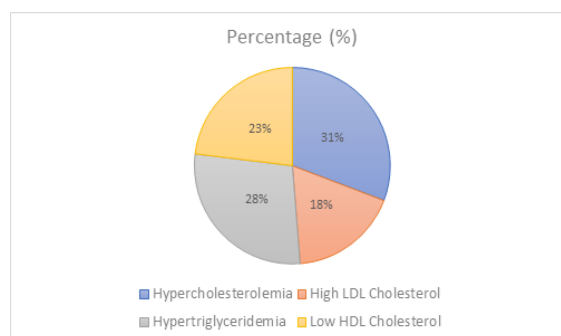
## RESULTS

**Demographic and Clinical Characteristics:** A total of 200 adult patients with type-2 diabetes participated in the study. The mean age of males was 58.1±2.3 years, and females had a comparable mean age of 57.1±1 year. Analysis indicated no statistically significant difference in mean age between males and females (p=0.6402). However, gender differences were observed in anthropometric measurements, with females exhibiting significantly higher mean waist circumference (p=0.0008), hip circumference (p=0.0002), Body Adiposity Index (BAI) (p=0.000), and Body Mass Index (BMI) (p=0.0002) compared to males. [Table 1]

**Lipid Profile Parameters:** [Table 2] presents the lipid profile parameters of the study population. Among the diabetic individuals, 120 (60%) had hypercholesterolemia, 70 (35%) had high LDL cholesterol, 110 (55%) had hypertriglyceridemia, and 90 (45%) had low HDL cholesterol. Notably, 119 (59.5%) had only one abnormal lipid profile parameter, 68 (34.0%) had two abnormal lipid parameters, and 54 (27%) had more than two abnormal lipid profile parameters.

**Distribution of Abnormal Lipid Profiles:** Figure 1 illustrates the distribution of abnormal lipid profiles

in type-2 diabetic patients based on NCEP-ATP III guidelines. The most prevalent abnormality was hypertriglyceridemia, observed in 110 (55%) of the participants, followed by low HDL-C in 90 (45%), hypercholesterolemia in 120 (60%), and high LDL-C in 70 (35%).



**Figure 1: Distribution of Abnormal Lipid Profiles in Type-2 Diabetic Patients**

The findings reveal a high prevalence of abnormal lipid profiles among type-2 diabetic patients, with variations in the distribution of specific abnormalities. Hypertriglyceridemia emerged as the most common abnormality, emphasizing the need for targeted interventions in this population.

**Table 1: Demographics and Anthropometric Variables of the Study Population Stratified by Gender**

Parameters	Cases (N=200)	Male Cases (N=53)	Female Cases (N=147)	P-Value
AGE (Years)	57.4±1	58.1±2.3	57.1±1	0.6402
Anthropometry				
WT (Kg)	70.2±1.5	71.0±1.8	69.8±1.7	0.8048
HT (cm)	162.1±1.0	168.5±1.2	159.7±1.0	0.0012
WTCIR (cm)	97.2±1.3	91.8±2.0	99.0±1.5	0.0008
HIPCIR (cm)	101.0±1.2	95.6±2.0	103.2±1.2	0.0002
WAIST/HIP RATIO	0.98±0.02	0.99±0.02	0.98±0.02	0.6311
BAI	32.0±0.6	26.2±0.9	34.1±0.6	0.0008
BMI (kg/m <sup>2</sup> )	28.2±0.5	26.0±0.5	28.8±0.6	0.0002

**Table 2: Lipid Profile Parameters of Type-2 Diabetic Patients**

Lipid Parameters	Mean ± SD	Abnormal (n, %)
Total Cholesterol (TC)	235.2 ± 11.0	120 (60%)
LDL Cholesterol (LDL-C)	162.8 ± 10.6	70 (35%)
HDL Cholesterol (HDL-C)	31.0 ± 8.2	90 (45%)
Triglycerides (TG)	163.9 ± 14.2	110 (55%)

## DISCUSSION

The present study investigated the lipid profiles of adult patients with type-2 diabetes, aiming to elucidate the prevalence of dyslipidemia in this high-risk population. Consistent with previous research (Dekker et al., 2018),<sup>[11]</sup> our findings revealed a significant prevalence of dyslipidemia, with variations in the distribution of abnormal lipid parameters. Notably, dyslipidemia is a well-established risk factor for cardiovascular disease, which is a major cause of morbidity and mortality in individuals with type-2 diabetes (Mooradian et al., 2019).<sup>[12]</sup>

Our results indicated that hypertriglyceridemia was the most prevalent abnormality, affecting 55% of the

studied population. This aligns with the understanding that hypertriglyceridemia is a common lipid abnormality in individuals with type-2 diabetes and contributes to the increased risk of atherosclerosis (Sarwar et al., 2007).<sup>[13]</sup> Notably, the mean triglyceride levels in our study fell within the normal range, emphasizing the need for a nuanced interpretation of lipid profiles in diabetic patients. The study also revealed significant gender differences in anthropometric measurements, with females exhibiting higher mean waist circumference, hip circumference, Body Adiposity Index (BAI), and Body Mass Index (BMI) compared to males. These findings are consistent with the broader literature indicating that gender may influence the metabolic parameters and cardiovascular risk factors in

individuals with diabetes (Regitz-Zagrosek, 2018).<sup>[14]</sup> Further investigations are warranted to explore the underlying mechanisms contributing to these gender disparities.

Early diagnosis of dyslipidemia in type-2 diabetes is crucial for timely intervention and risk reduction. Our study supports the notion that routine lipid profile monitoring is essential for identifying individuals at high risk, allowing for the implementation of preventive measures (Stone et al., 2014).<sup>[15]</sup> Early identification of abnormal lipid profiles provides an opportunity for targeted interventions, including lifestyle modifications and lipid-lowering medications, to mitigate cardiovascular risk.

While our study contributes valuable insights, it is essential to acknowledge its limitations. The cross-sectional design limits our ability to establish causality, and findings may not be generalizable to broader populations. Additionally, the single-site nature of the study may introduce selection bias. Future research should employ longitudinal designs and involve diverse populations to enhance the generalizability of findings.

## CONCLUSION

Our study highlights the high prevalence of dyslipidemia among adult patients with type-2 diabetes in the South Odisha region. The observed gender differences in anthropometric measurements underscore the need for personalized approaches in managing cardiovascular risk in diabetic individuals. Early detection through routine lipid profiling offers a valuable opportunity for preventive interventions. Healthcare practitioners should remain vigilant in monitoring lipid profiles in diabetic patients to optimize risk management strategies.

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