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Study Of Correlation Of Waist-To-Hip Ratio And Lipid Profile In Type-II Diabetics Mellitus Subjects.

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ABSTRACT

Type-II Diabetes Mellitus (T2DM) is often associated with dyslipidemia, contributing to increased cardiovascular risk. Waist-to-Hip Ratio (WHR) is a reliable measure of central obesity, which is strongly linked to insulin resistance and lipid abnormalities. Our study aims to assess the correlation between WHR and lipid profiles in T2DM patients. A cross-sectional study was conducted over one year involving 100 T2DM patients. Anthropometric measurements, including waist and hip circumference, were recorded to calculate WHR. Fasting blood samples were collected to analyze lipid parameters: total cholesterol, triglycerides, low-density lipoprotein (LDL), and high-density lipoprotein (HDL). Pearson's correlation coefficient was used to assess the relationship between WHR and lipid parameters, with statistical significance set at $p < 0.05$. WHR showed a significant positive correlation with total cholesterol ($r = 0.45$, $p < 0.05$), triglycerides ($r = 0.60$, $p < 0.01$), and LDL ($r = 0.52$, $p < 0.05$), and a negative correlation with HDL ($r = -0.35$, $p < 0.05$). Participants with higher WHR were more likely to have abnormal lipid profiles. Higher WHR is associated with dyslipidemia in T2DM patients, emphasizing the importance of WHR as a predictor of cardiovascular risk.

Keywords: Waist-to-Hip Ratio, Lipid Profile, Type-II Diabetes Mellitus.

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INTRODUCTION

Type-II Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance, impaired insulin secretion, and hyperglycemia. It is associated with several comorbidities, including cardiovascular disease (CVD), which remains the leading cause of mortality among diabetic patients. Abnormal lipid profiles, such as elevated total cholesterol, triglycerides, low-density lipoprotein (LDL), and reduced high-density lipoprotein (HDL), are common in T2DM and significantly contribute to the increased cardiovascular risk [1, 2].

Waist-to-Hip Ratio (WHR) is a simple and reliable anthropometric measure of fat distribution, representing the proportion of fat stored around the abdomen relative to the hips. Abdominal obesity, often indicated by a higher WHR, is associated with insulin resistance and dyslipidemia, both of which are prevalent in T2DM. Several studies have demonstrated a strong correlation between WHR and adverse lipid profiles, which in turn heighten the risk of cardiovascular complications [3-5].

METHODOLOGY

Our study aims to explore the correlation between WHR and lipid profiles in patients with T2DM, assessing whether WHR could serve as a predictive marker for dyslipidemia in this population. By understanding this relationship, clinicians may be able to identify at-risk individuals earlier and implement timely interventions to mitigate the associated risks.

The study was conducted as a cross-sectional observational study in a tertiary care hospital over a period of one year. A total of 100 patients diagnosed with Type-II Diabetes Mellitus were included. These patients were selected based on specific inclusion and exclusion criteria, with informed consent obtained from each participant. The inclusion criteria consisted of individuals aged 30 to 70 years with a confirmed diagnosis of T2DM for at least one year. Patients with other significant metabolic disorders, on lipid-lowering drugs, or with a history of major cardiovascular events were excluded.

Anthropometric measurements were taken, including waist circumference, hip circumference, and body weight. Waist-to-Hip Ratio (WHR) was calculated by dividing the waist circumference by the hip circumference. Fasting blood samples were collected from all participants to assess their lipid profiles. The lipid parameters measured included total cholesterol, triglycerides, low-density lipoprotein (LDL), and high-density lipoprotein (HDL). Standardized laboratory methods were used for the biochemical analyses, ensuring accuracy and consistency of the results.

The data were compiled and analyzed using statistical software. Descriptive statistics were employed to summarize the demographic and clinical characteristics of the study participants. Pearson's correlation coefficient was used to assess the relationship between WHR and lipid profile parameters. The strength and direction of the association between WHR and each lipid parameter were analyzed, with statistical significance set at a p-value of less than 0.05.

Ethical clearance was obtained from the institutional ethics committee before the commencement of the study. Throughout the research process, confidentiality of the participants' data was maintained, and the study adhered to the ethical principles outlined in the Declaration of Helsinki. The findings were recorded and compiled for further analysis and publication.

RESULTS

Table 1: Demographic and Clinical Characteristics of the Study Population (n = 100).

Characteristic	Mean ± SD (Range)	Frequency (%)
Age (years)	55.6 ± 8.7 (30-70)	-
Gender (Male/Female)	-	54 (54%) / 46 (46%)
Duration of Diabetes (years)	7.5 ± 3.2 (1-20)	-
Body Mass Index (BMI) (kg/m^2)	29.3 ± 4.2 (21.1-35.4)	-
Waist-to-Hip Ratio (WHR)	0.92 ± 0.07 (0.82-1.2)	-

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Table 2: Lipid Profile of Study Participants (n = 100).

Lipid Parameter	Mean ± SD	Range
Total Cholesterol (mg/dL)	198.7 ± 37.5	120-250
Triglycerides (mg/dL)	160.5 ± 45.3	100-280
Low-Density Lipoprotein (LDL) (mg/dL)	121.4 ± 28.7	80-180
High-Density Lipoprotein (HDL) (mg/dL)	42.8 ± 8.1	30-60

Table 3: Correlation between Waist-to-Hip Ratio (WHR) and Lipid Profile.

Lipid Parameter	Pearson's Correlation Coefficient (r)	p-value
Total Cholesterol (mg/dL)	0.45	< 0.05
Triglycerides (mg/dL)	0.60	< 0.01
Low-Density Lipoprotein (LDL) (mg/dL)	0.52	< 0.05
High-Density Lipoprotein (HDL) (mg/dL)	-0.35	< 0.05

Table 4: Distribution of Waist-to-Hip Ratio and Abnormal Lipid Profiles.

WHR Category	n (%)	Abnormal Total Cholesterol (%)	Abnormal Triglycerides (%)	Abnormal LDL (%)	Low HDL (%)
WHR < 0.90 (Normal)	30 (30%)	8 (26.7%)	9 (30%)	6 (20%)	5 (16.7%)
WHR ≥ 0.90 (High)	70 (70%)	45 (64.3%)	48 (68.6%)	42 (60%)	30 (42.9%)

DISCUSSION

The present study aimed to investigate the correlation between waist-to-hip ratio (WHR) and lipid profiles in Type-II diabetic subjects. The findings from this study offer significant insights into the relationship between central obesity, as measured by WHR, and dyslipidemia in patients with Type-II Diabetes Mellitus (T2DM). Our study adds to the growing body of evidence that demonstrates the importance of anthropometric measures in assessing cardiovascular risk factors in diabetic populations [6].

Demographic and Clinical Characteristics

In this study, the average age of participants was 55.6 years, with a balanced gender distribution (54% male and 46% female). The mean duration of diabetes was 7.5 years, indicating that the participants were well-established diabetics, which is relevant for understanding the long-term impact of diabetes on lipid metabolism and fat distribution. The average body mass index (BMI) of 29.3 kg/m^2 indicates that most of the participants were overweight, which is typical in T2DM patients and consistent with findings from previous studies. The mean WHR of 0.92 shows that central obesity was prevalent in the study population. This is consistent with the known relationship between abdominal fat accumulation and insulin resistance, both of which are common in T2DM patients [7, 8].

Lipid Profile and Dyslipidemia in T2DM

The lipid profile of the study participants revealed that dyslipidemia was common. The mean total cholesterol level was 198.7 mg/dL, with a significant number of participants showing cholesterol levels above the recommended threshold. The mean triglyceride level was 160.5 mg/dL, which is notably higher than the recommended upper limit of 150 mg/dL, indicating a higher prevalence of hypertriglyceridemia in the study population. The LDL levels averaged 121.4 mg/dL, which is higher than the ideal target of less than 100 mg/dL for diabetic patients, thus suggesting an increased cardiovascular risk. Meanwhile, the HDL level was relatively low, averaging 42.8 mg/dL, with several participants showing levels below the desired threshold of 40 mg/dL in men and 50 mg/dL in women [9].

These findings are consistent with the well-established dyslipidemic pattern seen in patients with T2DM, which is characterized by elevated triglycerides, increased LDL, and reduced HDL. This

dyslipidemic profile is a significant contributor to the increased risk of cardiovascular disease in diabetic patients. The abnormal lipid profiles observed in this study highlight the importance of regular lipid monitoring and management in diabetic patients to reduce the risk of cardiovascular complications.

Correlation Between WHR and Lipid Profile

The results show a significant positive correlation between WHR and several lipid parameters. WHR was positively correlated with total cholesterol ($r = 0.45$, $p < 0.05$), triglycerides ($r = 0.60$, $p < 0.01$), and LDL ($r = 0.52$, $p < 0.05$). These findings suggest that higher central obesity, as indicated by a higher WHR, is associated with worsening lipid profiles. Specifically, participants with higher WHR had elevated levels of total cholesterol, triglycerides, and LDL, all of which are risk factors for cardiovascular disease.

The strongest correlation was observed between WHR and triglyceride levels ($r = 0.60$), indicating that abdominal obesity may play a significant role in the elevation of triglycerides in T2DM patients. Hypertriglyceridemia is a well-known consequence of insulin resistance, and central obesity is closely linked to insulin resistance. This finding is supported by previous studies, which have shown that visceral fat accumulation leads to increased free fatty acid release, hepatic triglyceride production, and reduced clearance of triglyceride-rich lipoproteins, all of which contribute to hypertriglyceridemia [10].

In contrast, a significant negative correlation was observed between WHR and HDL levels ($r = -0.35$, $p < 0.05$), indicating that higher WHR was associated with lower HDL levels. Low HDL is a hallmark of diabetic dyslipidemia and is associated with an increased risk of atherosclerosis and cardiovascular events. The inverse relationship between WHR and HDL is consistent with previous research, which has shown that central obesity is linked to reduced HDL levels, likely due to altered lipid metabolism in individuals with increased abdominal fat.

Distribution of WHR and Abnormal Lipid Profiles

The distribution of WHR among participants further highlights the impact of central obesity on lipid metabolism. In this study, 70% of participants had a WHR above 0.90, which is indicative of central obesity. Among these individuals, a significant proportion exhibited abnormal lipid profiles. For example, 64.3% of participants with a high WHR had elevated total cholesterol levels, 68.6% had elevated triglyceride levels, and 60% had elevated LDL levels. Furthermore, 42.9% of participants with high WHR had low HDL levels.

These findings emphasize that central obesity, as measured by WHR, is strongly associated with an unfavorable lipid profile. The participants with a higher WHR were more likely to exhibit dyslipidemia, which places them at a greater risk for developing cardiovascular complications. This supports the hypothesis that WHR is a useful predictor of cardiovascular risk in T2DM patients, as it reflects the degree of visceral fat accumulation, which is closely linked to insulin resistance and dyslipidemia.

CONCLUSION

In conclusion, our study demonstrates a significant correlation between WHR and lipid profiles in Type-II diabetic patients. Central obesity, as reflected by a higher WHR, is associated with dyslipidemia, particularly elevated triglycerides, total cholesterol, and LDL, as well as reduced HDL levels. Given the association between these lipid abnormalities and cardiovascular risk, WHR should be routinely assessed in diabetic patients as part of a comprehensive cardiovascular risk assessment. Early identification and management of dyslipidemia in patients with high WHR may help reduce the burden of cardiovascular disease in the diabetic population.

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