

Correlation of Body Mass Index, Waist Hip Ratio and Lipid Profile in Patients with Type II Diabetes Mellitus in Tertiary Care Hospital

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Abstract: Diabetes Mellitus is one chronic and potentially disabling disease that represents an important public health concern because of the economic burden it imposes on the person, family and society. The transition from a traditional to modern lifestyle, consumption of fat and calories rich diets combined with a high level of mental stress has compounded the problem further. Present study was undertaken to correlate body mass index (BMI), waist hip ratio (WHR) and lipid profile in type 2 diabetes mellitus patients. In our study, 100 patients with type 2 diabetes mellitus were recruited and subjected to detailed anthropometric measurements for BMI and WHR along with laboratory investigations. Study revealed Increased BMI in total 29 patients out of which 37.5% (17) were females and 37.5% (12) were males. Increased waist hip ratio was present in total 53 patients, more in females 81.2% (26) than in males 39.7% (27). The most common lipid abnormality in type 2 diabetic patients was hypertriglyceridemia followed by elevated LDL with the least common parameter being low HDL.

Keywords: Correlation, Diabetes Mellitus, Body Mass Index, Waist Hip Ratio, Lipid Profile.

INTRODUCTION

Diabetes mellitus is a group of metabolic disorders of carbohydrate metabolism in which glucose is underutilized and/or overproduced, ultimately leading to hyperglycaemia. The current worldwide prevalence is estimated to be approximately 250 million and is expected to reach 592 million by 2035[1].

Several pathogenic processes are involved in the development of diabetes mellitus. These range from autoimmune destruction of the cells of the pancreas with resultant deficiency of insulin to abnormalities that result in resistance to insulin action. It is one of the major risk factors resulting in premature mortality and morbidity due to its complications. Type 2 Diabetes Mellitus is the most prevalent form of Diabetes seen in India and constitutes for more than 95% of the diabetic population. Type 2 Diabetes Mellitus is characterised by impaired insulin secretion, insulin resistance, excessive hepatic glucose production and abnormal fat metabolism. Insulin resistance, decreased ability of insulin to act effectively on target tissues is a prominent feature of Type 2 Diabetes Mellitus and results from a combination of genetic susceptibility and obesity.

MATERIALS AND METHODS

Selection of patients

The present study was conducted on 100 consecutive subjects of type 2 Diabetes Mellitus

attending the outpatient department of Medicine, DVVPF'S Medical and Hospital, Ahmednagar

METHOD OF STUDY

Anthropometric measurements were done to calculate BMI and WHR. Waist was measured at the midpoint between lower costal margin and superior iliac crest in the mid axillary line. Hip circumference was measured at the level of greater trochanter of femur. Fasting blood sugar and post prandial blood sugar levels were determined by using glucose oxidase-peroxidase test. Lipid profile was done by using enzymatic methods.

BMI>25 for males and females was taken as an indicator of Generalised obesity. WHR >0.90 for males and >0.80 for females was taken as an indicator of increased WHR.

Exclusion criteria

Smokers, Chronic Renal Failure patients, Chronic alcoholics, Patients using lipid lowering drugs, Hypothyroidism, Familial dyslipidaemias.

RESULTS

In this present study 100 patients with TYPE 2 DIABETES MELLITUS who met the inclusion and exclusion criteria were randomly selected and the results of this study are as follows.

Table-1: Gender distribution among the study population

Gender	Frequency	Percentage
Male	68	68%
Female	32	32%
Total	100	100%

In our study 68% patients were male and 32% patients were female

Table-2: Bmi distribution in patients with type 2 diabetes mellitus

BMI	Males	Cumulative Total	Females	Cumulative Total
19.5-20.9	12(17.65%)	53(77.94%)	4(12.50%)	20(62.5%)
21-23.5	18(26.47%)		7(21.88%)	
23.6-24.9	23(33.82%)	15(17.64%)	9(28.13%)	12(37.5%)
25 – 27.9	3(4.41%)		2(6.25%)	
28.0 – 29.9	5(7.35%)		3(9.38%)	
>30	7(10.29%)		7(21.88%)	
Total	68(100.0%)		32(100.0%)	

As BMI increases, occurrence of type 2 diabetes mellitus increases in males and females

Table-3: Sex distribution of increased bmi in patients with type 2 diabetes mellitus

SEX	N0.
MALES	15(58.34%)
FEMALES	12(41.66%)

Table 4: Waist hip ratio distribution in male patients with type 2 diabetes mellitus

WHR CATEGORIES	MALES	CUMULATIVE TOTAL
<0.80	10(14.70%)	41(60.3%)
0.81-0.84	14(20.59%)	
0.85-0.89	17(25.00%)	
0.90-0.94	06(8.80%)	27(39.7%)
0.95-0.99	10(14.70%)	
>1	11(16.17%)	
	68(100%)	

Increased WHR was present in 39.7% of total males and normal WHR was present in 60.3% of total males.

Table 5: Waist hip ratio distribution in females with type 2 diabetes mellitus

WHR CATEGORIES	FEMALE (n%)	CUMULATIVE TOTAL (%)
<=0.75	1(3.12%)	34.4%
0.76-0.79	1(3.12%)	
0.80-0.84	9(28.66%)	
0.85-0.89	8(25.0%)	65.6%
>=0.90	13(40.6%)	
TOTAL	32	

Increased WHR was present in 65.6% of total females and normal WHR was present in 34.4% of total females.

Table 6: Distribution of high waist hip ratio in patients with type 2 diabetes mellitus

SEX	NUMBER (%)
MALE	27(50.9%)
FEMALE	26(49.1%)
TOTAL	53(100.0%)

Occurrence of high waist hip ratio was more common in males than females.

Table 7: Bmi and whr distribution

CATEGORY	HIGH WHR (%)	Normal WHR (%)	Total (%)
Normal BMI	51(96.2%)	21(44.7%)	72(72%)
High BMI	2(3.8%)	26(55.3%)	28(28%)
Total	53(100.0%)	47(100.0%)	100

P<0.001**

Normal BMI was observed in 72% of total type 2 diabetic patients with High BMI in 28%. Normal WHR was observed in 47% of total type 2 diabetic patients with High WHR observed in

53%.96.2%of patients had normal BMI with high WHR,3.8% had high BMI and high WHR.44.7% of patients had normal BMI with normal WHR,55.3% had high BMI with normal WHR.

Table-8: Triglyceride level distribution in patients with type 2 diabetes mellitus

TGL (mg%)	High BMI	Normal BMI	Total n(%)	High WHR	Normal WHR	Total
<200	7(25.9%)	53(72.6%)	60(60%)	23(43.4%)	37(78.7%)	60(60%)
200-250	7(25.9%)	18(24.7%)	25(25%)	17(30.2%)	9(19.9%)	25(25%)
251-300	8(29.6%)	2(2.7%)	10(10%)	9(17%)	1(2.1%)	10(10%)
>300	5(18.6%)	0(0%)	5(5%)	5(9.7%)	0(0%)	5(5%)
Total	27(100%)	73(100%)	100(100%)	53(100%)	47(100%)	100(100%)
P value	<0.001**			<0.001**		

High TGL significantly correlated with higher BMI and also correlated with WHR

Table-9: Total cholesterol level distribution in patients with type 2 diabetes mellitus

Total High Cholesterol	High BMI	Normal BMI	Total n(%)	High WHR	Normal WHR	Total
<150	5(18.5%)	51(69.9%)	56(56%)	19(35.8%)	37(78.7%)	60(60%)
151-200	14(51.9%)	18(24.7%)	32(32%)	23(43.4%)	9(19.9%)	25(25%)
201-250	6(22.2%)	2(2.7%)	8(8%)	7(13.2%)	1(2.1%)	10(10%)
>250	2(7.4%)	2(2.7%)	4(4%)	4(7.6%)	0(0%)	5(5%)
Total	27(100%)	73(100%)	100(100%)	53(100%)	47(100%)	100(100%)
P value	<0.001**			<0.001**		

High cholesterol significantly correlated with higher BMI and correlated with higher WHR

Table-10: Ldl level distribution in patients with type 2 diabetes mellitus

LDL	High BMI	Normal BMI	Total n(%)	High WHR	Normal WHR	Total
<100	9(33.3%)	57(78.1%)	66(56%)	29(54.6%)	37(78.7%)	66(66%)
101-150	14(51.9%)	14(19.2%)	28(28%)	18(34%)	9(19.9%)	27(27%)
151-200	2(7.4%)	2(2.7%)	4(4%)	3(5.7%)	1(2.1%)	4(4%)
>200	2(7.4%)	0(0%)	2(2%)	3(5.7%)	0(0%)	3(3%)
Total	27(100%)	73(100%)	100(100%)	53(100%)	47(100%)	100(100%)
P value	<0.001**			<0.001**		

Higher LDL Levels significantly correlated with higher BMI. Similarly, higher LDL significantly correlated with high WHR

Table-11: Lipid abnormalities in patients with type 2 diabetes mellitus

GROUPS(N)	High TGL (30-150 mg %)	High cholesterol (upto 200mg% n (%))	Low HDL (40-60 mg %)	HIGH LDL 50-150mg%
Generalised obese (27)(BMI>=25)	24(24.0%)	25(25%)	22(22%)	24(24%)
Central obese(53) Whr>=0.9male, >=0.8female	39(39.0%)	38(38%)	42(42%)	39(39%)
Non obese(20) Normal BMI and normal whr	37(37.0%)	37(37%)	36(36%)	37(37%)

Hypertriglycemia was observed more in all groups followed by hypercholesterolemia, high LDL and low HDL

DISCUSSION

From the clinical perspective, visceral adipose tissue is known to generate diabetogenic substances[2] and may be more informative than total fat for diagnostic evaluation. Waist circumference and waist/hip ratio have been used as measures of central obesity and body mass index (kg/m²) has been used as a measure of general obesity[3]. Clinical evidence suggests that the association of diabetes with central obesity is stronger than the association with general fat. Studies using computed tomography and magnetic resonance imaging have provided further evidence to support that central obesity, visceral adipose tissue, and upper-body non-visceral fat are the major contributors to the metabolic complication[4-7]. Both lipid profile and body fat have been shown to be the important predictors for metabolic disturbances including dyslipidaemia, hypertension, diabetes mellitus, cardiovascular diseases etc.

Among the 100 consecutive patients with type 2 diabetes mellitus (68 males and 32 females) increased BMI was observed in total 29 patients including 37.5% of females and 37.5% of males. Increased waist hip ratio was present in total 53 patients, more in females 81.2% than males 39.7%. The most common lipid abnormality in patients with type 2 diabetes mellitus was hypertriglyceridemia.

Hypertriglyceridemia was observed in both groups 72%in generalized obese and 75% in central obese (high WHR).Most common lipid abnormality after Hypertriglyceridemia was elevated LDL in 70%of generalized obese and 67.7% of central obese patients.

Least common lipid abnormality was low HDL which was observed in 44.8% of generalized obese and 65.5% of centrally obese patients. Hypercholesterolemia was observed in 50% of generalize obese and 68.3%of centrally obese subjects.

CONCLUSION

This study showed significant positive correlation between high BMI and high WHR with lipid abnormalities in patients with type 2 diabetes mellitus. So, measurement of BMI and WHR in patients with type 2 diabetes mellitus can help to prevent complications.

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