



## A study of anthropometric measurements and different vascular complications in obese type 2 diabetes mellitus patients from central India

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### Abstract

**Introduction:** India is experiencing an epidemic of Type-2 Diabetes mellitus and related disorders. With an estimated 50.8 million diabetic people, India has the world's largest diabetes population. Individual with Type 2 DM are at particular risk of the adverse consequences of obesity. The interaction of both disorders with other components of the metabolic syndrome culminates in an increase in macro-vascular and micro-vascular complications and associated reduction in quality of life.

**Materials and Methods:** Present work was conducted in department of medicine, MGM Medical College, Indore, from October 2012 to September 2013. 100 cases with type 2 diabetes mellitus having associated obesity were taken for present work.

**Results:** Out of 70 female cases, 61% female cases had BMI between 25-29.9%. Only 5% female cases had BMI  $\geq 40$ . Out of 30 male cases, 70% of male cases had BMI Between 25-29.9. In our study none of male case had BMI  $\geq 40$ . In female patients, 11%, 22%, and 67% patients had Waist Hip Ratio (WHR)  $< 0.81$ ,  $0.81-0.85$ , and  $> 0.85$  respectively. 46% of male cases had  $\leq 0.95$  WHR. 30% male cases had  $> 1.0$  WHR.

**Conclusions:** Basic anthropometrics measurements (BMI+WHR) are simple clinical parameters to evaluate obese DM type 2 cases for CVS complications. Obese DM type 2 cases with abnormal WHR and BMI may have abnormalities in ECG & 2D ECHO DOPPLER. Hence ECG & 2D ECHO DOPPLER study may help for proper evaluation of obese DM type 2 cases.

**Keywords:** BMI, Diabetes Mellitus, Obesity, Waist hip ratio.

### Introduction

India is experiencing an epidemic of Type-2 Diabetes mellitus and related disorders. With an estimated 50.8 million diabetic people, India has

the world's largest diabetes population. Individual with Type 2 DM are at particular risk of the adverse consequences of obesity. The interaction of both disorders with other components of the

metabolic syndrome culminates in an increase in macro-vascular and micro-vascular complications and associated reduction in quality of life.

The American heart association has designed DM as CAD risk equivalent. Type 2 diabetes mellitus patients without a prior MI have a similar risk for coronary artery related events as non-diabetic individuals who had a prior MI.

Obesity is increasing health problem worldwide including the developing countries. In India, obesity is emerging as an important health problem particularly in urban area. Almost 30-65% of adults urban Indians are either overweight or obese or have abdominal obesity. The rising prevalence overweight and obesity in India has a direct correlation with the increasing prevalence of obesity related co-morbidities; systemic hypertension, metabolic syndrome, dyslipidaemia, type2 diabetes mellitus and cardio vascular disease (CVD).

In our study, we studied various anthropometric parameters in diabetic patients and correlated with clinical outcome of those studied patients.

### Materials and Methods

Present work was conducted in department of medicine Indore from October 2012 to September 2013. 100 cases with type 2 diabetes mellitus having associated obesity were taken for present work. Patients were taken randomly from various medical wards and OPDs.

### Inclusion Criteria

1. Age 25 years to 60 years
2. Both male and female cases.
3. Cases who met the criteria for Diabetes mellitus type 2.
4. Cases with BMI >25.
5. Old as well as newly detected diabetic cases with various risk factors.

### Exclusion Criteria

1. Age <25 year and case with age>60 years not included because cases with <25 year of age may have often diabetes mellitus type 1 and severe other age related diseases may see in senior citizens.

2. Cases with the normal and subnormal BMI.
3. Seriously ill cases with multisystem disease.
4. Cases were excluded who had clinical hypo or hyperthyroidism.
5. COPD cases.
6. Cases with deranged renal function.

The anthropometric measurements of cases were recorded by observer and his colleagues, using standard protocol. Cases were instructed to empty their bladder prior to anthropomorphic measurements.

**Height** was measured to the nearest 0.1 cm using by inches centimeter tape pasted to wall. Cases were asked to stand erect while their occiput shoulder hips and heel touched the wall. A firm cardboard was put over the vertex to get the height in centimeter.

**Weight** was measured by using conventional weight machine.

**Body mass index (BMI)** was calculated from weight (kg) divided by square of height in meter square. A plastic coated inch/ centimeter tape was used for the waist circumference and hip circumference measures.

**Waist circumference** was measured at the smallest circumference between the costal margin and the iliac crest to the nearest 0.1 cm while the case was standing with the abdomen relaxed, at the end of normal expiration. Where there was no natural waistline, the measurement was taken at the level of umbilicus.

**Hip circumference** was measured at the maximum circumference between the iliac crest and the crotch while the participant in standing and recorded to the nearest 0.1 cm.

### Results

In this study total 100 obese diabetes mellitus type 2 patients were included out of which 30 were males and 70 were females.

As shown in table 1, out of 100 cases 38(38%) were in age group >55 years, 24(24%) in age group 50-55 years, 15(15%) in age group 40-45 years.

**Table 1:** Age wise distribution of cases (n=100)

Age (years)	No. of patients	%
25-30	05	05
30-35	02	02
35-40	06	06
40-45	15	15
45-50	10	10
50-55	24	24
>55	38	38

As shown in table 2, out of 70 cases, 61% female cases had BMI between 25-29.9% and only 5% female cases had BMI  $\geq$ 40. 70% of male cases had BMI Between 25-29.9. In our study none of male case had BMI  $\geq$ 40

**Table 2:** Distribution of Obese DM type 2 female cases according to BMI (n=70)

BMI(kg/m <sup>2</sup> )	No. of female patients	%	No. of male patients	%
25-29.9	43	61	21	70
30-34.9	16	22	8	27
35-39.9	7	10	1	3
$\geq$ 40	4	5	0	0

As shown in table 3 and 4, (8)11%, (16)22%, and (46)67% female patients had WHR  $<$ 0.81, 0.81-0.85, and  $>$ 0.85 respectively. Among male patients, 7(23%), 7(23%), 7(23%) and 9(31%) patients had  $<$ 0.9, 0.91-0.95, 0.95-1 and  $>$ 1.0 WHR respectively. In female patients macrovascular complications was found in 2.8%, 5.7%

and 25.7% respectively while in male patients 3.3%, 10%, 10% and 13.3% respectively. In female patients, micro-vascular complications was found in 1.4%, 7.1%, and 31.4% respectively while in male micro-vascular complications was found in 3.3%, 6.6% , 13.3%, and 13.3% patients respectively.

**Table 3:** Distribution of obese DM type 2 female cases according to WHR (n=70)

WHR	No. of female patients	%	Macrovascular Complications(%)	Microvascular complications(%)
$<$ 0.81	8	11	2(2.8%)	1(1.4%)
0.81-0.85	16	22	4(5.7%)	5(7.1%)
$>$ 0.85	46	67	18(25.7%)	22(31.4%)

**Table 4:** Distribution of obese DM type 2 male cases according to WHR (n=30)

WHR	No. of male patients	%	Macrovascular Complications(%)	Macrovascular Complications(%)
$<$ 0.90	7	23	1(3.3%)	1(3.3%)
0.91-0.95	7	23	3(10%)	2(6.6%)
0.95-1.0	7	23	3(10%)	4(13.3%)
$>$ 1.0	9	31	4(13.3%)	4(13.3%)

## Discussion

In this study we studied 100 obese patients of diabetes mellitus type 2, in which 70 were female patients and 30 were male patients. This study was conducted at department of medicine in MGM Medical College and MY Hospital Indore, MP. This study was aimed with anthropometric measurements and vascular complications in obese patients suffering from type 2 diabetes mellitus in Central India.

In our study, out of 70 cases, 61% female cases had BMI between 25-29.9% and only 5% female cases had BMI  $\geq$ 40. 70% of male cases had BMI Between 25-29.9. In our study none of male case had BMI  $\geq$ 40. Vijay Achari et al<sup>1</sup> observed in their study that out of 936 cases subjected to study, 596(64.2 %) were positive for the metabolic syndrome, while 516(55.6 %) tested positive for coronary artery disease, There was a strong correlations between these entities(p value  $<$ 0.001). When the individual components were

tested for their relationship with coronary artery disease, it was found that obesity had the strongest association with the presence of ischemic heart disease.

Our study showed, (8)11%, (16)22%, and (46)67% female patients had WHR <0.81, 0.81-0.85, and >0.85 respectively. Among male patients, 7(23%), 7(23%), 7(23%) and 9(31%) patients had <0.9, 0.91-0.95, 0.95-1 and >1.0 WHR respectively. In female patients macro-vascular complications was found in 2.8%, 5.7% and 25.7% respectively while in male patients 3.3%, 10%, 10% and 13.3% respectively. In female patients, micro-vascular complications was found in 1.4%, 7.1%, and 31.4% respectively while in male micro-vascular complications was found in 3.3%, 6.6% , 13.3%, and 13.3% patients respectively. A study conducted by M Pascual et al<sup>2</sup>, in which they concluded that subclinical left ventricular diastolic dysfunction is present in all grades of isolated obesity, correlated with BMI, and was associated with increased systolic function in the early stages of obesity. One Indian study, R. Gupta et al 2002<sup>3</sup>, on risk factors for coronary heart disease observed that percentage of subjects who have abdominal obesity(as defined by WHR >0.9, and >0.8 in woman) as being 57.4% and 68.4% respectively. In another study (2001) it was noted that WHR was significantly higher in cases with acute myocardial infarction than controls(0.93 v.0.89).

In a study Bannerji et al<sup>4</sup> working on cases with visceral obesity reported a men BMI of 24.5, WHR of 0.88 and waist circumference of 86.2 in Asian Indian men.

It is clear that as obesity increases in diabetes mellitus type 2 patients, it also increases the possibilities of several macro-vascular and micro-vascular complications. So early management of obesity in diabetes mellitus type 2 patients by regular exercise, change in dietary pattern, and somehow by medical management can help more before development of deadly vascular complications.

## Conclusions

Basic anthropometrics measurements (BMI+WHR) are simple clinical parameters to evaluate obese DM type 2 cases for CVS complications. Obese DM type 2 cases with abnormal WHR and BMI may have abnormalities in ECG & 2D ECHO DOPPLER. Hence ECG & 2D ECHO DOPPLER study may help for proper evaluation of obese DM type 2 cases.

## Disclosures

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Ethical Approval: Study was approved by institutional ethical board.

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