

# Anthropometric Indices: Good Predictor of Diabetes Mellitus Type-2

Sanjeev Dhakal<sup>1</sup>, Uday N Singh<sup>2</sup>, Subodh Kumar<sup>3</sup>

<sup>1</sup>Associate Professor, Department of Biochemistry, Sikkim Manipal Institute Of Medical Sciences, Gangtok, Sikkim(India)

<sup>2</sup> Professor, Department of Biochemistry, Major S.D. Singh Medical college & Hospital, Farrukhabad, U.P.(India)

<sup>3</sup>Assistant Professor, Department of Biochemistry, Haryana Institute Of Medical Sciences, Karnal, Haryana(India)

**Abstract:** Anthropometric indices especially, body mass index (BMI) and waist-hip ratio(WHR) are important in the development of Diabetes Mellitus(DM) type-2. BMI is the marker of overweight and obesity whereas WHR is the marker of fat content in upper and lower part of human body. Increased BMI and WHR leads to insulin insensitivity also known as insulin resistance which results into diabetes mellitus type-2 due to hyperglycemia. Most of the diabetics have impaired BMI and WHR which have been found closely correlated with blood sugar levels in DM type-2 patients. They can predict the onset of DM type-2 in future in persons having abnormally increased BMI and WHR.

**Keywords:** BMI, WHR, Diabetes Mellitus, type-2

## 1. Introduction

Diabetes mellitus is the commonest global metabolic disease at present and its prevalence is gradually increasing day by day all over the world, especially in developing nations. According to World Health Organisation report 2005, the no. of diabetic people was around 171 million and would increase to 366 million by year 2030.<sup>[1]</sup>

The maximum burden of diabetic society is particularly contributed by diabetes mellitus type-2. It accounts for about 90% cases of diabetes.<sup>[2]</sup> and it is assumed that diabetes type -2 will alone affect 250 million people by year 2010 and 300 million people by year 2025.<sup>[3,4]</sup>

India has been declared as the Diabetic Capital of the world.<sup>5</sup> In India alone, 31.7 million people were affected in year 2000 and is expected to reach 79 million by the year 2030.<sup>[1]</sup> Diabetes is a chronic metabolic disease characterized by high blood sugar levels resulting from defects in insulin secretion, insulin action, or both which prevent the body to utilize glucose completely or partially.<sup>[6]</sup>

Diabetes was previously considered an elderly disease but now-a-days, its prevalence is gradually increasing in youth and middle aged people.<sup>[2]</sup> it is perhaps due to change in life style and food style of human beings. Obesity, particularly visceral or central as evidenced by the waist –hip ratio is very common in diabetes mellitus type-2.<sup>[7]</sup> The waist –hip ratio is used as an indirect measure of upper and lower body fat content..

It is a multifactorial disease in which hereditary predisposition alone is not only responsible but several factors such as ethnic background, diet, physical work, obesity, ageing and stress have been shown to affect the development of diabetes. People having little physical activity and energy rich foods are most likely to develop overweight and obesity. Excess deposition of fat in body as seen in obesity leads to the reduced sensitivity of body tissues to the action of insulin

also known as “INSULIN RESISTANCE “ in the utilization of glucose.<sup>[8,9]</sup> lack of physical activity and obesity predisposes to the development of diabetes in the later stage of a person’s life.<sup>[10]</sup>

Anthropometry indices, particularly body mass index(BMI) and waist hip ratio( WHR) are mainly used to measure obesity in persons. WHR is closely linked with BMI and is appropriate index of intra abdominal fat mass and total body mass. Obesity ,particularly visceral or central as evidenced by the waist hip ratio(WHR) is very common in Diabetes type-2.<sup>[7]</sup> There is an increased risk of metabolic complications for men with WHR.≥102 cm and women with WHR≥88 cm. A higher WHR reflects a greater proportion of abdominal fat with greater risk for hyperinsulinemia, insulin resistance, diabetes type 2, endometrial cancer, hypercholesterolemia, hypertension and atherosclerosis. <sup>[11]</sup> So the present study is aimed to evaluate BMI and WHR as predictor of diabetes type -2.

## 2. Methodology

For the present study, 100 diabetic type -2 males and 100 normal males were randomly selected between age group 35 to 45 years of life in medicine O.P.D. OF Major S D Singh Medical College and Hospital, Farrukhabad. The purpose of the study was explained and they gave their consent for the work. BMI and WHR value were calculated by measuring height, weight ,waist and hip circumference of all study subjects(both diabetic and normal) in standing position wearing light clothing and no shoes .Body weight was measured by digital weighing machine. Height was measured with a portable sicca stadiometer. .Body mass index (BMI) was calculated as the ratio of body weight (kg) per height square (m<sup>2</sup>). Waist circumference was measured at the level of umbilicus and hip circumference was measured at the widest circumference around the buttocks, waist hip ratio(WHR) was calculated from these circumferences. In addition to ,their fasting and post- prandial blood sugar values were also collected from clinical Biochemistry lab.

### 3. Result and Discussion

The different parameters of anthropometry in the study group had been shown in table no. 1. In addition ,their correlation were also studied with fasting and post prandial blood sugars levels of the study groups as shown in table no .2. All anthropometric indices except height shows significant difference between diabetic and control groups. Diabetic person's body weights were quite higher than control subjects.

**Table 1:** Distribution of anthropometric indices among male diabetic type-2 and male controls

Variables	Diabetic subjects(n=100)	Control subjects(n=100)
Height (Mean±SD) in meter	1.625±0.04	1.627±0.035
Weight (Mean±SD) in kg	89.2±20.9	70.1±12.92
BMI (kg/m <sup>2</sup> )		
≤18.5	-	13
18.2-25	30	67
25-30	40	17
>30	30	3
(Mean±SD)	30.0±11.1	24.8±6.0
WHR		
≤0.9	10	50
0.91-1	50	25
≥1	40	25
(Mean±SD)	0.99±0.35	0.91±0.31

Most of the diabetic persons (about 70%) fell under pre-obese or obese category as compared to controls having 20% pre-obese or obese category. Jimaima et al(2001) also reported that 63% of the diabetics had BMI ≥30 kg/m<sup>2</sup>.<sup>[2,12]</sup> This observation was in consistent with previous findings.<sup>[13,14]</sup> Regarding waist hip ratio in the study groups,50 % of the diabetics fell under moderately impaired WHR and 40% of the diabetics had severely impaired WHR as compared to the control groups(table no.1 ) i.e. 90% of the diabetics had impaired WHR and 10% of the diabetics had normal WHR as compared to control groups having 50% normal WHR showing that gradual increase in WHR threatens the onset of diabetes type -2. Diabetes people were most likely to had impaired WHR. Similar result was also found by Despress(1993) who found that ,in particular ,abdominal obesity has been shown as a significant risk factor for the development of diabetes type -2.<sup>[15]</sup>

WHR (waist hip ratio) is the important anthropometric indice to indicate central obesity and distribution of fat in the body. Increased WHR leads to the insensitivity of insulin receptors also known as insulin resistance which results into the development of diabetes.<sup>[8,9]</sup> In the study, diabetics type -2 had significantly higher WHR ratio than controls which were in consistent with previous findings.<sup>[16,17,18]</sup>

**Table 2:** Correlation of coefficient between anthropometric indices and diabetes type-2

NS=Non-Significant \*- significant at 5%, \*\*- significant at 10%

Anthropometric indices	Blood sugar level (mg/dl)	
	Fasting	Post-prandial
Total body weight	0.458	0.319*
BMI	0.567**	0.313*
WHR	0.647**	0.129(NS)

Anthropometric indices ,especially BMI and WHR are positively and significantly correlated with blood sugar levels of the diabetics (Table no.2). Need et.al. (2005) and Nabi et al (2002) also observed in their study that fasting sugar levels were positively and significantly correlated with BMI.<sup>[19,20]</sup> These findings supported the evidence that BMI and WHR posed a higher risk for the diabetes type -2.

In the study, most of the diabetes were fallen under overweight(40%) or obese category (30%).whereas 90% of diabetics were seen in moderately or severely impaired WHR i.e. WHR>1.Thus the study showed that BMI AND WHR were strongly associated with an increased risk of developing diabetes type -2. and could warn against impending diabetes in future.

### 4. Conclusion

The study showed that anthropometric indices i.e. BMI and WHR could predict the onset of diabetes type -2 or the susceptibility of persons to diabetes type-2 in near future.

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