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ANTHROPOMETRY AND DIABETES

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ABSTRACT

A study on Type 2 diabetic subjects seeking treatment in the various hospitals, private clinics and health care centers running in different location of Patna (Bihar) was undertaken. A total of 200 subjects visiting the centers regularly were selected. Half of the number of diabetic subjects, age and sex matched normal healthy subjects were also selected for comparative study. General information and other details of the subjects were obtained through a questionnaire cum interview schedule method. To know the nutritional status of the subject's anthropometric indices like weight, height, Body Mass Index (BMI) and Waist Hip Ratio (WHR) were recorded and compared with standard to establish the extent of obesity. Dietary pattern and dietary intake of the subjects were assessed by 24 hour-recall-cum-weighment method. The average daily intake of different nutrients by the subjects was calculated from the actual amount of each food consumed daily by using the value given by Raghuram, ICMR and Swaminathan. The data collected were tabulated and analyzed by using appropriate statistical tools like percentage, mean, standard deviation, test of significance (paired t-test) and correlation between variables. In the present study with respect to anthropometric indices, most of the diabetics were fell under overweight and obese category. Regarding central obesity 40 percent of male diabetics and 30 percent of female diabetics were seen in severe category i.e. $WHR > 1$. There were significant differences in the gender-adjusted BMI and WHR between diabetic subjects and controls was observed. Regarding food intake it was found that intake of cereals, root and tubers, fats and oils, sugar and jaggery and salt was higher than RDA in both vegetarian and non-vegetarian male and female subjects. However percent inadequacy in the consumption of pulses, green leafy vegetables, fruits and milk was observed in both male and female subjects. Correlation coefficient between nutrient intake and blood sugar levels revealed that intake of energy, fat, carbohydrate and cholesterol was positively and significantly correlated with both fasting and postprandial blood sugar levels while it was negatively correlated with the intake of protein, fibre, calcium and vitamin C. From the study it might be concluded that elevated anthropometric indices (body weight, BMI and WHR) and faulty diet are strongly associated with an increased risk of developing diabetes.

INTRODUCTION

The metabolic disease we know today as diabetes mellitus is ever growing and the prevalence is increasing day by day affecting 150 million people across the world. Out of which 33 million are Indian and India has been declared as the Diabetic Capital of the World (Bezbaruah, 2003). It is a chronic metabolic disorders characterized by high blood glucose levels resulting from defects in insulin secretion, insulin action or both, which prevents the body to utilize glucose completely or partially (Zimmet, 1983).

It is a general observation that diabetes particularly of the NIDDM type is genetically transferred among family

members however the hereditary pre-disposition alone is not the only factors but several factors such as diet, obesity, ethnic background, ageing and stress have all been shown to influence the development of diabetes. People who eat too much food and lead a sedentary life become overweight and obese. Obesity reduces the sensitivity of tissues to the action of insulin in the utilization of glucose. Lack of physical activity and obesity increases the risk for development of diabetes in the later stage of a person's life (Raghuram et al, 1998). Anthropometry (particularly, BMI and WHR) is known to be one of the best techniques to measure obesity

which uses simple measuring devices to quantify differences in human form. So the present investigation was designed to study the relationship of anthropometric indices with diabetes.

METHODOLOGY

For the study 200 Non-Insulin Dependent Diabetes Mellitus (NIDDM) subjects were selected. Half of the number of diabetic subjects, age and sex matched normal healthy subjects were also selected for comparative study. Details of anthropometric indices were recorded and compared to standard methods of Jelliffe (1966).

Under the anthropometric measurement, body weight, height, waist and hip circumferences were measured with the participant in the standing position wearing light clothing and no shoes. Body weight was determined using a digital scale to the nearest 0.1 kg. Height was measured with a portable Seca Stadiometer 2080 to the nearest 0.1 cm. Body Mass Index (BMI) was computed as the ratio of weight (kg) per height squared (m^2). Waist circumference was measured at the minimum circumference between the umbilicus and iliac crest; hip circumference was measured at the widest circumference around the buttocks; waist-to-hip ratio was calculated from these circumferences.

RESULTS AND DISCUSSION

Anthropometric indices of male and female subjects have been shown in table '1' and '2' respectively. It shows that the height of diabetics was lower than normal subjects but at the same time weight of diabetics was higher than normals. With respect to anthropometric indices most of the diabetics (60% of female and 40% of male) were fell under overweight category and 30 percent of male and female both were in obese category. Jimaima *et.al* (2001) also reported that 63 percent of the respondents had BMI ≥ 30 kg/m².

Table: 1. Anthropometric indices of male subjects

Variables	Diabetic(N=120)	Normal(N=60)
Height (Mean±SD)	169.2±5.2	171.3±4.3
Weight (Mean±SD)	89.3±21.2	70±13.2
BMI(kg/m²)	-	8(13.3)
≤18.5	36(30)	40(66.7)
18.5-25	48(40)	10(16.7)
25-30	36(30)	2(3.3)
≥30	30.4±11.2	24.9±6.2
Mean±SD		
WHR	12(10)	30(50)
≤0.9	60(50)	15(25)
0.91-1	48(40)	15(25)
≥1	0.99±0.35	0.91±0.31
Mean±SD		

Regarding central obesity 40 percent of male diabetics and 30 percent of female diabetics were seen in severe category i.e. WHR>1. There were significant differences in the gender-adjusted BMI and WHR between

diabetic subjects and controls was observed. Similar result was found by Despress (1993) who revealed that in particular abdominal obesity has been identified as a significant risk factor for the development of type-2 diabetes.

Table '3' presents correlation coefficient between anthropometric indices and blood sugar levels of the subjects. From the table it is clear that fasting blood sugar levels was positively and significantly correlated with total body weight, BMI and WHR. Postprandial blood sugar level was positively and significantly correlated with total body weight and BMI.. Need et al (2005) and Nabi et al (2002) also observed in their study that fasting serum glucose was positively and significantly correlated with BMI. The findings support the evidence that BMI as well as central obesity (WHR ratio of > 0.8 for women and > 0.9 for men) pose a higher risk towards diabetes

Table: 2. Anthropometric indices of female subjects

Variables	Diabetic (N=80)	Normal (N=40)
Height (Mean±SD)	158.3±6.9	161±5.3
Weight (Mean±SD)	72.6±11.5	66.7±9.3
BMI(kg/m²)	-	2(5)
≤18.5	8(10)	27(67.5)
18.5-25	48(60)	6(15)
25-30	24(30)	5(12.5)
≥30	32.5±6.9	26.1±3.9
Mean±SD		
WHR	20(25)	24(60)
≤0.8	36(45)	12(30)
0.81-1	24(30)	4(10)
≥1	0.96±0.3	0.83±0.3
Mean±SD		

Table: 3. Correlation coefficient between anthropometric indices and diabetes

Particulars	Blood sugar levels(mg/dl)	
	Fasting**	Postprandial*
Total body weight	0.459**	0.319*
BMI	0.567**	0.313*
WHR	0.649**	0.129 ^{NS}

**- Significant at one percent level, *- Significant at five percent level, NS- Not Significant

SUMMARY AND CONCLUSIONS

It is a general observation that diabetes particularly of the NIDDM type is genetically transferred among family members however the hereditary predisposition alone is not the only factors but several factors such as diet, obesity, ethnic background, ageing and stress have all been shown to influence the development of diabetes. Obesity reduces the sensitivity of tissues to the action of insulin in the utilization of glucose. Lack of physical activity and obesity increases the risk for development of diabetes in the later stage of a person's life.

In the present study with respect to anthropometric indices, most of the diabetics were fell under overweight and

obese category. Regarding central obesity 40 percent of male diabetics and 30 percent of female diabetics were seen in severe category i.e. WHR>1. There were significant differences in the gender-adjusted BMI and WHR between diabetic subjects and controls was observed. From the study it might be concluded that elevated anthropometric indices (body weight, BMI and WHR) are strongly associated with an increased risk of developing diabetes.

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