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Original Research Paper

Physiology

ASSOCIATION OF ANTHROPOMETRIC PARAMETERS WITH NATURE OF EXERCISE AND OCCUPATION OF PATIENTS ATTENDING DIABETIC CLINIC AT A TERTIARY CARE HOSPITAL IN NORTH-EAST INDIA.

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ABSTRACT

Introduction- Diabetes mellitus is not a single disease entity but rather a group of metabolic disorders sharing the common underlying feature of hyperglycemia. Obesity and particularly abdominal obesity are strongly associated with insulin resistance. Clinical evidence indicates a stronger association of diabetes with central obesity than general obesity. Long work hours may be contributing to the rising obesity problem by reducing time for physical activity, particularly for individuals working in sedentary occupations. **Material And Methods:** A Cross-sectional, observational study conducted at the diabetic clinic of AGMC and GBP hospital. Diagnosed Type 2 diabetes mellitus cases attending the clinic were recruited after simple random sampling. Data was collected by a predesigned questionnaire. Height, Weight, waist circumference and hip circumference were measured. The data was subjected for statistical analysis using SPSS-26 software for windows. P-value <0.05 was considered to be significant. Results: 270 patients with type 2 diabetes mellitus (age>20 years) were studied out of which 138(51.1%) were male and 132(48.9%) were female. The overall prevalence of obesity according to BMI, WC, WHR, WSR was 41.90%, 57%, 87.80% and 58.90% respectively. In male, the prevalence of BMI, WC, WHR and WSR obesity was 26.80%, 35.50%, 83.30% and 44.20% respectively. However, in females the prevalence of BMI, WC, WHR and WSR obesity was 57.60%, 79.50% ,92.4% and 74.20% respectively. Obesity was not significantly associated with nature of occupation but was significantly associated with WC obesity with p-value of 0.040. **Conclusions:** This study concluded that obesity is a highly prevalent co-morbidity in diabetic patients. The change in waist hip ratio was a better predictor of the disease.First line intervention for weight loss should be stressed for the effective management of T2DM.

KEYWORDS : Type 2 Diabetes mellitus, Obesity, Waist circumference, Waist hip ratio, BMI.

INTRODUCTION:

Diabetes mellitus is not a single disease entity but rather a group of metabolic disorders sharing the common underlying feature of hyperglycemia. Hyperglycemia in diabetes results from defect in insulin secretion, insulin action, or most commonly, both. The chronic hyperglycemia and attendant metabolic dysregulation may be associated with secondary damage in multiple organ systems, especially the kidneys, eyes, nerves, and blood vessels. The prevalence of diabetes is increasing sharply in the developing world as people adopt more sedentary lifestyles, with India and China being the largest contributors to the world's diabetic load.[1]

Tripura, a small state in north eastern part of India, according to a report published by ICMR-INDIAB in 2017, has the highest prevalence of diabetes (9.4%) among all the north eastern states followed by Mizoram (5.8%). The prevalence was more in urban Tripura (15.5%) then rural (7.2%). The prevalence of pre-diabetes was also high in Tripura (14.7%).[2]

Clinical evidence indicates a stronger association of diabetes with central obesity than general obesity. In spite of a relatively lower rate of obesity as defined by the Body Mass Index (BMI) cut points, South Asians tend to have larger waist measurements and waist-to-hip ratios (WHR), indicating a greater degree of central body obesity. This is associated with a characteristic metabolic profile with higher insulin levels, a greater degree of insulin resistance, a higher prevalence of diabetes.[3]

Simple anthropometric measurements have been used as surrogate measurements of obesity and have more practical value in both clinical practice and for large-scale epidemiological studies. BMI is a simple method which is used to calculate the prevalence of overweight and obesity in the population. Waist circumference (WC) is the best measure of both intra-abdominal fat mass and total fat. But BMI can be misleading, such as in individuals with a high proportion of lean muscle mass. WC, a more accurate measure of the distribution of body fat, has been shown to be more strongly associated with morbidity and mortality. Recently, the waist-to-stature ratio (WSR) has been proposed as a better screening tool than WC and BMI for adult metabolic risk factors. [3]

Long work hours may be contributing to the rising obesity problem by reducing time for physical activity, particularly for individuals working in sedentary occupations.Now a days there is a trend of consumption of fast food and fatty food which lead to increase in prevalance of obesity.[4]

The anthropometric parameters have ethnic susceptibility, so the objective of this study is to determine the prevalence of obesity using the anthropometric parameters of WC, WSR, WHR, and BMI among type 2 diabetes mellitus (T2DM) patients and the associated risk factors of obesity.

MATERIALS AND METHODS

Study design: Cross-sectional study.

Type of study: Observational study.

Study setting: Diabetic clinic at AGMC and GBP hospital

Study duration: One and half years

Study population:
Diagnosed Type 2 diabetes mellitus cases attending diabetic clinic in AGMC & GBP Hospital.

Inclusion criteria:
i) Age ≥20 years of both gender
ii) Diagnosed with T2DM willing to participate.
iii) Patients attending the Diabetic clinic of AGMC and GBP hospital.

Cases were interviewed in the hospital and additional details about investigations, complications etc. were obtained from OPD patient records.

Exclusion criteria :
i) Patients with type 1 diabetes mellitus.
ii) Patients of type 2 diabetes mellitus having severe co-morbidities like stroke, chronic renal diseases and chronic lung diseases at the time of recruitment into the study.
iii) Pregnant females.

Sample size calculation: Sample size was calculated using the Cochran's formula:

$$N = \frac{(Z\alpha)^2 pq}{d^2}$$

Where **N** = sample size
(Zα) = 1.96 = constant
p = prevalence
q = 100-p
d = allowable error 6%
Confidence interval = 95%
Here, **p** = 53.42. [5]
Sample size: 265.52 rounded to 270.

Sampling technique: 1st sample I will be taking randomly, after that every 3rd patient I will take according to my inclusion criteria.

Study tools:
(1) A pre-designed and pre-tested questionnaire set.
(2) Digital weighing scale.
(3) Non stretchable measuring tape
(4) Stadiometer

Data collection:
All the cases were selected consecutively during the study period following the inclusion and exclusion criteria. The data was collected from diabetes mellitus patients attending diabetes clinic of AGMC and GBP hospital, Agartala.

All the patients were personally subjected to detailed history regarding name, age, sex, occupation, socioeconomic status, educational status, family history of diabetes mellitus, anthropometric measurements, dietary habits etc. These findings were recorded in a predesigned and pretested proforma.

Consent:
Written informed consent was obtained from all the study subjects.

Operational definitions:
(1) Diabetes: Any subject with FBS value of ≥7mmol (≥126 mg/dl) or two-hour plasma glucose ≥11mmol (≥200mg/dl) or HbA1C ≥6.5 %(48mmol/mol) will be considered as having diabetes (as per WHO criteria for diagnosis of diabetes).[6]

(2) Waist circumference:
It is measured at the midpoint between the tip of the iliac crest and the lower margin of last palpable rib, using a non stretchable tape, at the end of normal expiration, with the subject standing erect and arms relaxed in sides. Abdominal/central obesity was considered to be present when the waist circumference was ≥80 cm in women and ≥90 cm in men.[7]

(3) Hip circumference:
It is measured by a measuring tape and recorded in centimeters, to the nearest 0.1 cm, at the level of maximum circumference of the ischial tuberosity of the participant.

(4) Height:
Height is measured by a measuring tape against a flat vertical surface and recorded in centimeters to the nearest 0.1cm.

(5) WHR (Waist-hip ratio):
It is calculated as waist circumference divided by hip circumference.

(6)WSR(Waist-stature ratio):
It is calculated as waist circumference(cm) divided by height (cm).

(7)Body Mass Index (BMI):
Defined as weight in kilograms divided by the square of the height in meters. Individuals are classified as underweight (BMI <18.5), normal (BMI 18.5 – 24.99) and overweight (BMI ≥25) in WHO criteria. [8]

In Asians, the cut-offs for overweight (≥23.0 kg/m^2) and obesity (≥25.0 kg/m^2) are lower than WHO criteria due to risk factors and morbidities.

Criteria for defining obesity:
- BMI ≥ 23.0 kg/m^2 - overweight and BMI ≥25.0 kg/m^2 – obese. [9]
- WSR > 0.5. [3]
- WC ≥ 90 cm in males and ≥ 80 cm in females (central/abdominal obesity).[3]
- WHR ≥ 0.95 for men and ≥ 0.85 for women. [10]

Plan for statistical analysis:
A P value of ≤0.05 has been considered statistically significant. P value <0.001 has been considered strongly statistically significant.

Statistical Package for Social Sciences (SPSS) Software has been used for the analysis of the data and Microsoft Word and Excel have been used to generate tables, figures etc.

RESULTS:

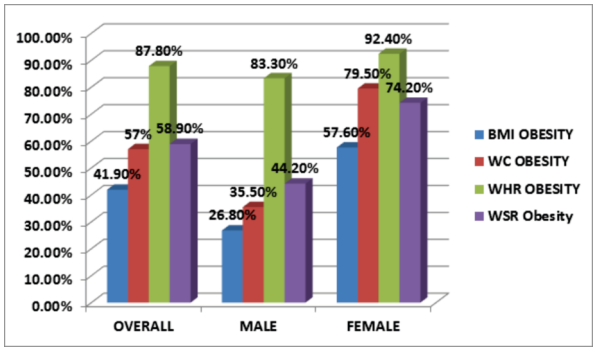

Figure 1: Proportion of different types of obesity among Type 2 Diabetes patients

Table 1: Distribution of the study participants according to the types of obesity.

Types of obesity	n (%)
BMI	
Underweight (<18.5)	10 (3.7)
Normal (18.5-22.9)	78 (28.9)
Overweight (23.0 – 24.9)	69 (25.6)
Obese (≥25)	113 (41.9)
WC Obesity	
Obese	154 (57.0)
Non Obese	116 (43.0)
WHR Obesity	
Obese	237 (87.8)
Non Obese	33 (12.2)
WSR Obesity	
Obese	159 (58.9)
Non-obese	111 (41.1)

Table 2: Association of types of obesity with physical activity factors (Nature of work done in occupation, type of exercise done by people who exercise regularly) in the study population (Pearson Chi Square Test).

Risk factors	n	BMI Obesity	WC Obesity	WHR Obesity	WSR Obesity
Nature of work done in occupation					
Sedantary	181	80(44.2)	108 (59.7)	162 (89.5)	112(61.9)

Active	89	33(37.1)	46(51.7)	75(84.3)	47 (52.8)
P-value		0.485	0.213	0.217	0.155
Nature of exercise in people who exercise regularly	197				
Aerobic	155	72 (46.5)	90 (58.1)	135 (87.1)	90 (58.1)
Strength	22	7 (31.8)	9 (40.9)	18 (81.8)	9 (40.9)
Yoga	13	4 (30.8)	6 (46.2)	11 (84.6)	7 (53.8)
Stretching	7	3 (42.9)	7 (100.0)	7 (100.0)	5 (71.4)
p-value		0.054	0.040	0.658	0.392

The overall proportion of BMI obesity, Waist circumference obesity, Waist to hip ratio obesity and waist to stature ratio obesity were 41.90%, 57%, 87.80% and 58.90% respectively.

The male proportion of BMI obesity, WC obesity, WHR obesity, WSR obesity were 26.80%, 35.50%, 83.30%, 44.20% respectively.

The female proportion of BMI obesity, WC obesity, WHR obesity, WSR obesity were 57.60%, 79.50%, 92.40%, 74.20% respectively.

Pearson's Chi-square test was used to find the association between types of obesity and various factors of the study population. P value <0.05 was found to be statistically significant at 95% confidence interval.

Nature of exercise among people who exercised regularly was significantly associated with WC obesity with p-value of 0.040. Nature of activity level in occupation was not significantly associated with any type of obesity.

DISCUSSION:

This cross sectional study was conducted in a Tertiary care centre of North-Eastern region of India to assess the proportion of obesity among the patients attending the diabetic clinic of the centre and to determine the factors associated with various types of obesity. 270 of such diabetic patients were taken as samples for this study.

The distribution of the study participants was such that most of them were between the age group of 41 and 60 years which shows that T2DM (type 2 diabetes mellitus) was more prevalent among the age group of 41-60 years. This observation was similar to the WHO report which predicts that in India and other developing countries, the highest increase would occur in the age group of 41-60 years.[11]

The overall proportion of obesity based on BMI was 41.9% and proportion of overweight patients in our study was 25.6%. Study conducted in Warangal reported 59.2% of overweight and obese subjects.[11] Another study conducted in Bangalore reported 73% obesity with the mean BMI 26 kg/m^2 which is in par with our study. [12]

The proportion of central obesity assessed by WC, WHR and WSR was 57%, 87.80% and 58.90% respectively in our study. "Asian Indian phenotype" is characterized by less of general obesity(measured by BMI) and more of central obesity. Our study supports this hypothesis. In a study done in a rural area of Mangalore district of Karnataka showed higher central obesity prevalence (90.63%) when compared to BMI. [13]

In our study, activity level in an occupation was not significantly associated with any type of obesity which is in agreement with a study conducted by Cook et al.[4] Increasing energy expenditure can help reduce excess adipose tissue and obesity.[14] In our study nature of exercise was significantly associated with WC obesity with p-value of 0.040.

CONCLUSION:

This study concluded that obesity is a highly prevalent co-morbidity in diabetic patients. The change in waist hip ratio was a better predictor of the disease.First line intervention for weight loss should be stressed for the effective management of T2DM.

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