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ANTHROPOMETRIC INDICES – ARE THEY RISK FACTORS IN YOUNG MALE SUBJECTS WITH FAMILY HISTORY OF TYPE II DIABETES?

Physiology

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ABSTRACT

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. The main objective of the study is to observe the correlation of anthropometric indices in young individuals with family history of diabetes. Anthropometric measurements of weight, height, body mass index (BMI) with waist circumference, waist to hip ratio (WHR), waist-height ratio (WHtR) were measured and their correlation with family history of type2 Diabetes (mother/father/both) was recorded. Waist hip ratio can be used as a predictor of type 2 diabetes in individuals with a family history of diabetes and it can be used for early detection of diabetes.

KEYWORDS

Anthropometric indices, Type2 Diabetes, Family history

INTRODUCTION:

India is undergoing a rapid epidemiological transition with increased urbanization and socioeconomic development leading to a dramatic change in lifestyle, consisting of physical inactivity, diet rich in fat, sugar and salt coupled with a high level of mental stress. This has led to increased incidence of lifestyle diseases like hypertension, type II Diabetes Mellitus, dyslipidemia, obesity and ischemic heart diseases [1]. The risk of becoming diabetic for an individual with a positive family history of diabetes varies with the age of the proband when the diagnosis was made and the type of diabetes. Family history represents the integration of shared genomic and environmental risk factors. First degree relatives share half their genomic information and also behaviour, life styles, beliefs, culture and physical environment, so their disease experience may offer a clue to shared susceptibilities [2]. The risk of becoming a diabetic for an individual with a positive family history of diabetes increases by two- to fourfold an offspring's chance and individuals with a positive family history of diabetes have higher body mass index (BMI) than controls [3] .Type 2 Diabetes Mellitus in the presence of a low BMI is more strongly familial than that at a higher BMI [4]. Thus family history could be used as a tool for genomic studies in order to understand the underlying shared gene-environment interrelation associated with complex traits in managing various diseases. Parental history of type 2 diabetes mellitus increases risk of not only glucose intolerance but also other cardio metabolic risk factors like overweight, low high-density lipoprotein cholesterol, and high blood pressure. [5] A positive family history was associated with increased risk of Impaired Fasting Glucose /Impaired Glucose Tolerance (IFG/IGT) and type2 DM as well as higher levels of obesity, fasting triglyceride (TG), and lower levels of high density lipoprotein (HDL) cholesterol [6].

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. [7] Body Mass Index (BMI), which relates weight to height, is a simple measure of body size. Waist circumference (WC) and waist-hip ratio (WHR) are alternatives to BMI. Waist circumference is the best simple measure of both intra-abdominal fat mass and total fat. [8, 9] A larger hip circumference is associated with a lower prevalence of self-reported type-2 diabetes and lower fasting glucose concentrations, independent of BMI and waist circumference. [10, 11] Individuals with a family history of diabetes have higher waist hip Ratio. [12] It is a well-known fact that physical activities are less in obese individuals and obesity is one of the most important risk factor of type 2 diabetes mellitus.

Basic anthropometric measurements (weight, height, waist circumference and hip circumference) and their derived indices (body mass index, waist-hip ratio and waist-height ratio) may be used as indicators for the presence of diseases and their assessment in clinical practice. [13]

AIMS AND OBJECTIVES: The main objective of the study is to observe the correlation of anthropometric indices in young individuals with family history of diabetes.

MATERIAL AND METHODS:

The present study was conducted in 50 male subjects (healthy young adults aged 18-25 years with a family history of type 2 DM). Anthropometric measurements of weight, height, body mass index (BMI) with waist circumference, waist to hip ratio (WHR), waist-height ratio (WHtR) were measured and their correlation with family history of type2 Diabetes (mother/father/both) was recorded. Control subjects were selected from the same age group with no family history of type2 diabetes mellitus. Informed consent was obtained from all the participants and ethical approval for the study was obtained from the Institutional Ethical Committee. Complete general physical examination was performed and various anthropometric measurements were recorded.

Anthropometric measurements: The following basic and derived anthropometric measurements (indices) were recorded in each subject, using standard methodology. Screening for normal fasting glucose levels (70 - 100mg/dl) was done using glucometer.

1. **Height:** Height in centimetres was measured (to the nearest 0.1centimeter) with steel, anthropometric rod, with the subject, standing bare footed in erect position.
2. **Weight:** in kilograms (to the nearest 0.5kg) was recorded with the subject standing on the weighing scale, bare footed wearing minimum clothes.
3. **Circumferences: -** The waist and hip circumferences in centimetres was measured with a non stretchable measuring tape.
4. **Waist circumference (WC) –** was measured midway between iliac crest and lowermost margin of ribs. According to the standard guidelines, cut-offs for waist circumference will be 90 cm for Indian men (as opposed to 102 cm globally) and 80 cm for Indian women (as opposed to 88 cm at the international level).
5. **Hip circumference (HC) –** was measured at the level of the greater trochanters in centimetres.
6. **Body Mass Index (BMI):-** BMI was calculated as weight in kilograms divided by squared height in meters (weight in kg/height in m^2) [3].Normal weight (BMI > 18.5 – <23.0 Kg/m^2); Over weight (BMI ≥ 23.0 Kg/m^2).
7. **Waist-Hip Ratio (WHR):-** It was calculated using following formula: WHR = WC (cm) /HC (cm). Elevated WHR = 0.95 for males and 0.88 for females [3].
8. Waist-Height Ratio (WHtR) or Waist-Stature Ratio (WSR):- calculated using following formula: WHtR = WC (cm)/Height (cm). The cut-off value will be 0.5 for both sexes (men & women) [3]

RESULTS & ANALYSIS:

Statistical Analysis was done using SPSS software. Unpaired t test was used to compare the mean and SD for each parameter in between the two groups. A p value less than 0.05 was considered to be significant.

Table 1. Classification of the subjects according to the family history

No. of subjects (18-25 years)	Criteria
25	With family history of Diabetes
25	With no family history of Diabetes

Table no.2 Anthropometric parameters

Anthropometric and Physiological variables	Control group(25)	Study group(25)	P value
Weight(kg)	68.44 ± 16.42	75.88 ± 13.58	0.09
Height(cm)	171.60 ± 5.38	174.14 ± 6.26	0.13
Hip Circumference (cm)	98.94 ± 12.44	101.76 ± 7.25	0.33
Waist Circumference (cm)	82.50 ± 12.98	88.20 ±10.31	0.09
BodyMass Index (Kg/m^2)	23.11± 4.87	25.03 ±3.77	0.12
Waist Hip Ratio	0.83± 0.04	0.86 ± 0.06	0.02
Waist Height Ratio	0.48 ± 0.07	0.51 ± 0.06	0.16

The results were expressed as mean ± standard deviation. The classification of the subjects according to the family history of type 2 diabetes was given in Table - 1. The mean and standard deviations of various anthropometric indices among study subjects and controls were given in Table -2.

The mean weight of control group was non-significantly less (68.44 ± 16.42 kg) when compared to the mean weight of study group (75.88 ± 13.58 kg, p< 0.09) (Table - 2). The mean height of control group was non-significantly less (171.60 ± 5.38 cm) when compared to the height of the study group (174.14 ± 6.26 cm, p<0.13) (Table – 2).

The mean hip circumference of control group was non-significantly less (98.94 ± 12.44 cm) when compared to the mean hip circumference of study group (101.76 ± 7.25cm, p<0.33) (Table - 2).The mean waist circumference of control group was non-significantly less (82.50 ± 12.98cm) when compared to the mean waist circumference of study group (88.20 ± 10.31cm, p<0.09) (Table - 2). The mean body mass index of control group was non-significantly less (23.11± 4.87 Kg/m2) when compared to the mean body mass index of study group (25.03 ± 3.77 Kg/m2, p<0.12) (Table - 2).

The mean waist hip ratio of control group was significantly less (0.83 ± 0.04) when compared to the mean hip circumference of study group (0.86 ± 0.06, p<0.02) (Table - 2).The mean waist height ratio of control group was non-significantly less (0.48 ± 0.07) when compared to the mean waist height ratio of study group (0.51 ± 0.06, p<0.16) (Table - 2).

DISCUSSION:

Various anthropometric indices which assess the degree of obesity and its associated diseases are in practice currently. However, the accuracy among these indices is still controversial. The present study was conducted on 50 male subjects (25 subjects with a family history of type2 diabetes and 25 normal subjects) and their anthropometric indices like BMI, WC, HC, WHR and Waist Height Ratio were recorded.

From the results of our study we observed a statistically significant increase in waist hip ratio (p value = 0.02) among all the anthropometric indices and random blood sugar in subjects (p value =0.01) with a family history of type 2 diabetes when compared with normal subjects. Other anthropometric indices like body mass index, waist circumference, hip circumference and waist height ratio increased (non significant) when compared between subjects with family history of diabetes and normal subjects.

High Waist Circumference (WC), Waist-Hip Ratio (WHR), Body Mass Index (BMI) and age are risk factors as well as predictors of type 2 Diabetes. The higher risk of type 2 Diabetes in people with a high WHR and WC may be due to increase in visceral fat accumulation. Among various anthropometric measurements used to measure the obesity, WC and WHR have been used as measures of visceral obesity whereas BMI as general obesity. 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. [14]

Statistically significant increase in waist hip ratio observed in our study partly correlates with the study of Khanna Neenu et al [15] who observed a significant increase in WHR and also other anthropometric indices like BMI, WHtR .Increase in WHR observed in our study corroborate with the findings of another similar study done by Sanjeev Dhakal [16] . We observed an increase in the BMI in subjects with family history of diabetes with a mean difference of 1.92 which is not statistically significant (p = 0.12).

LIMITATIONS:

This Study is a cross-sectional study and cannot determine any cause effect relation between the anthropometric indices and development of type2 diabetes. Sample size is small as the study was a pilot study. We did not consider both maternal and paternal history of type 2 diabetes in particular. Prospective studies with a large sample size may be beneficial in identifying the role of different anthropometric indices and development of diabetes.

IMPLICATIONS:

Although family history is a predictor of increased susceptibility to disease because of an interaction between genetic traits, environmental factors and behaviour, which are shared to a larger extent than among the general population, these factors are difficult to disentangle. An implication of our study results might be that general practitioners should be encouraged to pay attention to the distribution of body fat of their patients when assessing the risk for diabetes, since visceral fat is more hazardous than evenly distributed body fat.

CONCLUSION:

The measurement of anthropometric indices is non invasive, simple and the indices are good predictors of medical complications of obesity. Waist hip ratio can be used as a predictor of type 2 diabetes in individuals with a family history of diabetes and it can be used for early detection of diabetes.

SUMMARY:

Basic and derived anthropometric indices may aid in predicting the onset of obesity related diseases like type 2 diabetes.

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Conflicts of interest: Nil

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