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THE STUDY OF BODY MASS INDEX, BODY FAT PERCENTAGE AND WAIST TO HIP RATIO AND ITS ASSOCIATION AS PREDICTORS OF CARDIO-VASCULAR DISEASE IN 1ST PROFESSIONAL MBBS STUDENTS.

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ABSTRACT

Background: Excess adiposity is associated with cardiovascular disease (CVD) risk factors such as hypertension, diabetes mellitus and dyslipidemia. Amongst the various measures of adiposity, the best one to help predict these risks factors. **Aims & Objective:** The purpose of this study is to compare the relationship between Body Mass Index (BMI), Body fat Percentage, Waist-to-Hip Ratio (WHR) and CVD risk factors in the 1st Professional MBBS Students. **Methods And Materials:** The present cross sectional study was carried out in the Department of Physiology, Madhubani Medical College, Madhubani, Bihar during August 2022 to July 2023 and it was approved by the Institutional Ethical and Research Committee. **Result:** The results of the present study demonstrated that the overall prevalence of overweight and obesity were 21.5% and 6.3%, respectively, while 22.3% were underweight. In addition, according to the present results, 12.59% of the participants had waist-to-hip circumference ratio >0.93. Waist - hip ratio in this study is in significant correlation with body. **Conclusion:** We found that greater WC and WHR were associated with an increased risk for CVD and all-cause mortality, with WHR showing the highest magnitude of association. No clinically relevant difference in discrimination capabilities was observed between these three adiposity variables.

KEYWORDS : Body fat percentage, body mass index (BMI) and waist-hip ratio (WHR).

INTRODUCTION:

The prevalence of obesity in the world has risen to epidemic proportions [1]. This is of major concern as excess adiposity is strongly associated with cardiovascular disease (CVD) risk factors such as hypertension, diabetes mellitus and dyslipidemia [2, 3]. Hence, a simple and effective measure of adiposity is needed for risk assessment in order to guide appropriate management and develop preventive strategies. However, this 'best' measure of adiposity to help and predict these CVD risk factors remains contentious despite years of research. Body Mass Index (BMI) is the widely used measure of obesity. However, the BMI is unable to differentiate between lean mass and fat mass, and hence, it is limited by differences in body adiposity for a given BMI across age, gender and ethnicity [4]. For example, the current definition of obesity based on BMI (BMI 30 kg/m2) may actually underestimate obesity among non-Caucasian populations, especially Asians [5]. In addition, the BMI does not consider body fat distribution, which is an important limitation since there are suggestions that the metabolic complications of obesity are more closely related to visceral adiposity than overall adiposity [2]. Hence, other measures of adiposity, which consider body fat distribution, like waist circumference (WC), waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR) have been developed and studied. WC has been proposed to be the best amongst these measures, with excellent correlation with abdominal imaging and high association with CVD risk factors, especially diabetes [2,6,7]. However, waist circumference does not account for differences in height, therefore, potentially over- and under-evaluating risk for tall and short individuals respectively [8]. Consequently, several researchers independently proposed the WHtR as an alternative to WC. This ratio has been shown to be a good indicator of abdominal adiposity, similar to WC [9] and recent systematic reviews and meta-analyses have supported the use of WHtR as a better predictor of CVD risk factors [10–12].

Definition of CVD Risk Factors

Hypertension was defined as having one or more of the following: (1) a systolic BP -140 mmHg, (2) a diastolic BP 90 mmHg, (3) physician-diagnosed hypertension and (4) use of antihypertensive medication. Diabetes mellitus was defined as having one or more of the following: (1) FBG 126 mg/dl, (2) physician-diagnosed diabetes mellitus and (3) use of oral hypoglycemic agents. The cut-off points for dyslipidemia were plasma TC 240 mg/dl and/or use of medications to lower blood cholesterol for high TC, TG 200 mg/dl for high TG, HDL-C <40 mg/dl for low HDL-C, and LDL-C 160 mg/dl and/or use of medications to lower blood cholesterol for high LDL-C [13].Overweight and obesity are major, and increasing, public health concerns in all parts of the globe. Obesity increases the risk of chronic health consequences including hypertension, hypercholesterolemia, hyperglycemia, type II diabetes and cardiovascular diseases. In Australia, 19% of adult males and 22% of adult females are considered obese and the direct health care costs of obesity are estimated at approximately 830 million annually. To relate obesity directly to health risks, assessment of both total body fat deposition and distribution as subcutaneous or visceral fat are important. Methods frequently used to determine overall body fatness include Body Mass Index (BMI; body mass (kg)/stature m^2) and percentage body fat (%BF). However, a number of studies have shown that it is not appropriate to use a single BMI cut-off point to detect obesity as different BMI-%BF relationships have been observed in different ethnic groups. Using anthropometry, it was found that the BMI value of 23kg/m2 for young Japanese adults equates with a BMI value of 25kg/m2 for Australian Caucasians . In India the BMI values of 18.5 to 24.9 as normal, less than 18.5 underweight, 25 to 29 overweight and above 29 as obese apply equally to men as well as women. A woman have a BMI of 35 is exposed to the same health risks as a man having a similar BMI. The use of BMI in this way has a number of limitations, including its inability to distinguish between fat mass and non-fat mass.

These limitations may become an important issue when comparing ethnic groups with distinctively different body proportions or physiques. Several studies have suggested that the relationship between BMI and %BF (i.e. the BMI–%BF relationship) varies with age, gender and ethnicity. In this study, we investigated BMI, percent body fat, and waist - hip ratio in male students.

AIMS AND OBJECTIVE:

The purpose of this study is to compare the relationship between Body Mass Index (BMI), Body fat Percentage, Waist-to-Hip Ratio (WHR) and CVD risk factors in the 1st Professional MBBS Students.

MATERIAL AND METHODS:

Subjects

One hundred students of Madhubani Medical College, Madhubani belonging to MBBS classes aged, 18 to 26 years were recruited to participate in the present study. In order to recruit the subjects, students from all classes were randomly selected. Written informed consent was obtained from all subjects prior to their participation.

Methodology

In this study, we measured body mass index (BMI), percent body fat (%BF), and waist to hip ratio (WHR) by using Bioelectrical Impedance apparatus.

Anthropometrical Measurements:

Anthropometrical measurements were taken using standard apparatus. A digital scale was used to measure body weight (BW) with an accuracy of +100g. Subjects were weighed without shoes, in light clothing. Standing body height (BH) was measured without shoes to the nearest 0.5cm with the use of a commercial stadiometer with the shoulders in relaxed position and arms hanging freely. Body mass index (BMI) was then calculated as BW in kilograms (kg) divided by square of the BH in meter (m2). Waist was measured horizontally at the level just above the uppermost border of the iliac crest. The measurement was made at a normal minimal respiration. Hip was measured as the maximum circumference over the buttocks. Central obesity was also calculated and defined on the basis of WHR. The cut-off value of central obesity was considered >0.95 in males while normal value for females was >0.80.4. Test performed at 8 AM and subjects were fasting and they had not done any body activity before test. Test had been done through using Bioelectrical Impedance apparatus produced by GWON Corporation Korea, model Olympia.

Inclusion criteria

1. Age – 18yrs to 26 yrs.
2. All male subject having weight between 68-88.

Exclusion criteria

1. Age – 18yrs to 26 yrs.
2. Female subjects
3. Subject having underlying cardiovascular, pulmonary and renal failure diseases.

Statistical Analysis:

All statistical analyses were performed using SPSS version 21. Continuous variables were tested for normality using the Kolmogorov- Smirnov test.

RESULTS:

The results of the present study demonstrated that the overall prevalence of overweight and obesity were 21.5% and 6.3%, respectively, while 22.3% were underweight. In addition, according to the present results, 12.59% of the participants had waist-to-hip circumference ratio >0.93. Waist - hip ratio in this study is in significant correlation with body mass index (r= 0.709, P=0.001).

Table -1

variable	Mean and standard deviation	Minimum	Maximum
Age	23.22 ± 2.77	18	26
Height	175 ± 2.77	166	194
Weight	68.07 ± 9.42	53.10	87.7

Table2. Means and standard deviations of study variables (BMI, %BF, and WHR)

variable	Mean and standard deviation	Minimum	Maximum
%BF	19.37 ± 2.78	11.80	32.90
BMI	23.18 ± 5.71	18.30	33.90
WHR	0.80± 9.43	0.70	0.94

Table3. Percentage of BMI, BF, and WHR according to Iran national standard

variable	Very low		Low		Moderate low		Moderate		Moderate to high		High		Very high	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
%BF	0	0	0	0	2	3	10	13	18	24	32	43	13	17
BMI	1	1	10	13	6	8	15	20	16	22	15	20	12	16
WHR	14	18	16	21	16	21	22	28	5	7	2	5	1	1

According to table 3, body fat percentage of most subjects in three age classifications assigned to in moderate to high and high classifications, body mass index of most subjects in three age groups assigned to in moderate, moderate to high and high classifications and waist-hip ratio of most subjects in three age classifications assigned to in moderate classification.

DISCUSSION:

The purpose of this study was to provide data on the prevalence of overweight and obesity and their associations with hypertension among young adult medical college students. BMI and WHR were used in the present study for two reasons. First, due to simplicity and reproducibility of height, weight, hip and waist circumference measurements, second because both have been recognized as important indicators for estimating cardiovascular disease risk factors, in particular their association with hypertension [14-17].

CONCLUSION:

We found that greater WC and WHR were associated with an increased risk for CVD and all-cause mortality, with WHR showing the highest magnitude of association. No clinically relevant difference in discrimination capabilities was observed between the variables.

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