Waist-to-Height Ratio as an Index of Central Obesity: its association with Life-Style Characteristics

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Abstract

Background: In addition to all health complications of obesity, screening for central obesity is more important for diagnosing metabolic syndrome than body mass index, as there are increasingly “metabolically healthy obese” patients who have no central obesity; on the other hand, a subset of “metabolically obese normal weight" patients have central obesity.

Objective: To evaluate the prevalence of central (abdominal) obesity amongst Iraqi university students , by applying a novel index of central obesity (ICO) , using the proportion of waist circumference divided by height (WHtR) with a cutoff of 0.5; so that to obviate various gender-characteristic cutoffs for waist circumference, and to assess its association with life style.

Patients and Methods: In our cross-sectional analysis, 175 students randomly chosen from three different colleges in university of Baghdad at April 2014. Dietary, exercise, and sleep habits; history of cigarette smoking, and family history of diabetes mellitus evaluated by self-appraised survey. Physical measurements involved weight, height, and waist circumference.

Results: Among our sample of students, 14.9 % were overweight, and 5.1% had general obesity. When using ICO, The prevalence of central obesity is 30.3%, which is higher than that when using waist circumference (23.3%). There is significant percentages of male and female students with normal BMI have a central obesity 15.8%, and 17.1% respectively ($p<0.0001$).There is a strong association between skipping breakfast ,and sleeping less than 7 hours with the risk of having central obesity, ($P < 0.001$).

Conclusion: Central obesity is a common problem among Iraqi university students. When using waist-to-height ratio, central obesity can be manifested in normal BMI and waist circumference (WC). Central obesity is strongly associated with skipping breakfast, and sleeping less than 7 hours.

Key words: Central obesity, ICO, WHtR, Breakfast Skipper, Metabolic syndrome.

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Introduction

Obesity is considered the most prevalent metabolic disease and considerable hazard to the health for increasing the likelihood of many complications and elevated risk like diabetes mellitus, ischemic heart disease, and malignancy [1].

The National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) appended central obesity as one of

the five criteria for diagnosing the metabolic syndrome.

In relation to general obesity indices, waist circumference is regarded a preferable measurement of visceral fattiness, which is a risk factor for insulin resistance and metabolic syndrome [2].

Miscellaneous techniques such as dual energy X-ray absorptiometry, magnetic resonance imaging , and computerized tomography, have been applied for evaluating obesity, but are not suitable for detection of visceral adiposity in the population level because of their high cost, and risk [3].On the other hand, anthropometric measures, such as body mass index (BMI), waist circumference (WC), and waist-to-height ratio (WHtR), [4] are easier to perform and can be used as principal indices of central obesity [5].

Researchers are not in an agreement with which obesity index is the best predictor for metabolic syndrome [6]. In spite of the fact that WHtR is not a criterion for metabolic syndrome, recent researches propose that a waist-to-height ratio (WHtR), could be the best indicator of abdominal adiposity [7].

Many studies indicate that indices of regional distribution of fattiness may better predict cardiovascular risk than BMI, and those persons with above normal waist circumferences have increased prevalence of cardiovascular disease in comparison to these with normal waist circumferences and have the same BMI grades [8][11].

Ashwell exactly measured persons' abdominal fattiness via DEXA and noticed that WHtR was the strongly associated with visceral adiposity than WC, BMI, and WHR [9].

Parikh suggested ICO as a measurement and assumed that ICO associated strongly with abdominal obesity than WC [10].

Waist-to-height ratio may have special clinical relevance in obesity of young people, as the inclusion of height in the denominator may cancel the demand for sex - and ethnic- particular reference data. An estimation of 0.5 for WHtR has been proposed as a clinical threshold meaning an increased obesity-related health risk in kids and adults [12].

To my information, no studies have been organized using waist to height proportion as an index of central obesity (ICO) in Iraq. This cross sectional study aims to evaluate and apply WHtR (ICO) as a novel parameter of diagnosing abdominal obesity and metabolic syndrome, and to establish its association to life style parameters like sleep duration, exercise, and dietary habits

Patients and Methods

Participants

A cross sectional study carried out at April 2014 among students from three different colleges in university of Baghdad. A random sample of 175 students aged 19 to 22 years old stratified by gender (97 females and 78 males). Written permission was obtained from the officials of the university to conduct this study on their students.

Questionnaire

A pre-tested questionnaire was self-administered to the students after taking their consent and included: family history of diabetes, smoking, exercise, dietary and sleep habits. Daily exercise (<0.5 hour/week, >2 hour/week), Soft drinks intake (< 3 drinks weekly,> 3 drinks weekly) and Intake of breakfast was classified as skippers (eating breakfast less than 4 days weekly), and non-skippers (eating breakfast more than 4 days weekly). Night sleep duration classified into <7 hours, and >7 hours.

Anthropometric measurements

Body weight is measured to the closest ±0.1 kg utilizing a high-quality mechanical scale. Stature is measured to the closest ±1 cm using a wall-mounted stadiometer. Body mass index (BMI) calculated by the accompanying formula: BMI = weight (kg)/height (m2).BMI then sorted by

suggested orders received by The National Institute of Health (NIH) and World Health Organization (WHO) into: Underweight - BMI <18.5 kg/m2 ,Normal weight - BMI ≥18.5 to 24.9 kg/m2, Overweight - BMI ≥25.0 to 29.9 kg/m2, and Obesity - BMI ≥30 kg/m2. Waist perimeter (WC) measured with an adaptable tape placed on a horizontal plane at a level halfway between the lower rib boundary and iliac crest. Central obesity then surveyed according to The National Cholesterol Education Program's Adult Treatment Panel III report (NCEP ATP III) and stratified by gender:

Table (1): Distribution of abdominal obesity according to gender.

Abdominal obesity, given as waist circumference	
Men	>102 cm (>40 inch)
Women	>88 cm (>35 inch)

Prevalence of overweight and obesity was evaluated utilizing age-and sexual orientation particular BMI cutoff reference gauges of the International Obesity Task Force (IOTF).Waist-to-height ratio (WHtR) was determined, dividing WC (in cm) by height (in cm). A WHtR cutoff point of 0.50 was utilized in determining abdominal stoutness in males and females .Index of central obesity (ICO) is the term used to define WHtR , suggested by International Diabetes Federation (IDF) assent meaning of metabolic syndrome (MS) into: Central obesity- ICO>0.5,and No central obesity- ICO<0.5 .

Statistical Analysis

After the collection of data was completed, the data was entered and examined entirely utilizing PC software of the Statistical Package for the Social Science (SPSS) version 17.0. Standard approaches were used including frequencies, descriptive summaries, Chi-square test (X 2) with 95% confidence. A P- value of < 0.05 was been considered to indicate the level of significance throughout the study. A logistic regression was performed to examine the relationship of demographic, lifestyle components with the odds of central obesity.

Results

The prevalence of underweight, normal weight, overweight, and obesity was 4%, 76%, 14.9%, and 5.1% respectively (figure 1).

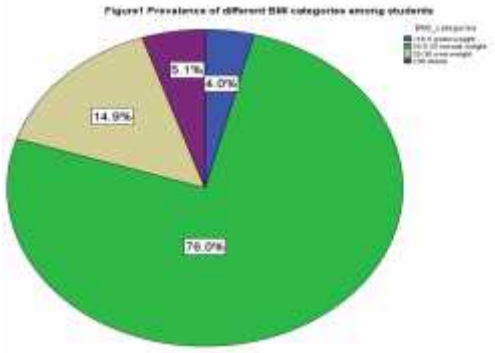

Figure (1): Prevalence of different BMI categories among students.

There is no significant difference in the distribution of Students' BMI regarding to gender, x^2(3) = 0.916, P = 0.822.

The prevalence of high waist circumference (central obesity) was 22.3%; 72.0 % of them were females, and 28.0% were males." There is a significant difference in the distribution of student s waist circumference regarding to gender, x^2 (1) = 4.456, P = 0.035)".

The mean ICO for the population was 0.50 ± 0.06.When utilizing cutoffs based on WHtR (ICO) of 0.5, the prevalence of central obesity was 30.3%; 57.0% of them were females, and 43.0% were males .

"There is no significant difference in the distribution of WHtR regarding to gender, x^2 (1) =.043, p = 0.837"(Figure 2).

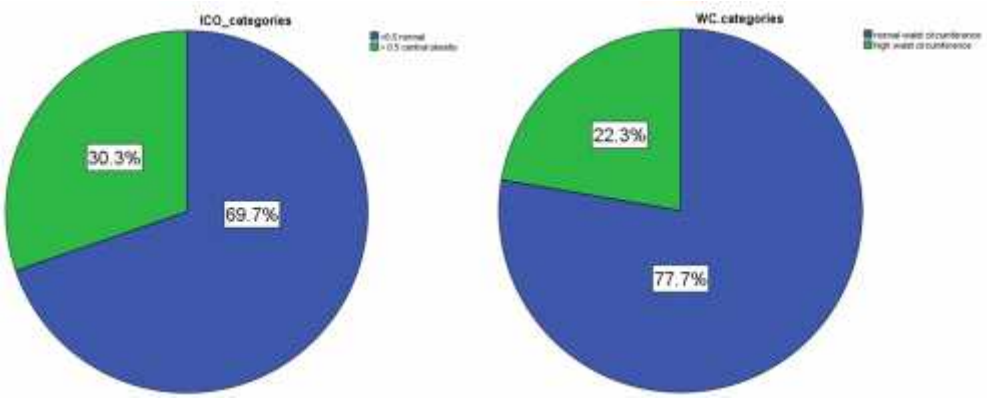

Figure (2): Prevalence of central obesity using WC vs. ICO among students.

Regarding students with High ICO, 41.5% are categorized as a normal BMI and 17% are categorized as obese (BMI>30), and 26.4% are categorized as normal WC.P <0.001.The characteristics of study participants according to ICO are presented in table 1.

Table (1): Characteristics of study participants according to ICO.

Characteristics	ICO -Categories		P value for difference
	<0.5 normal	>0.5 central obesity	
Gender Male % Female %	 45.1% 54.9%	 43.4% 56.6%	0.837
BMI-Categories <18.5 underweight % 18.5-25 normal weight % 25-30 overweight >30 obese	 5.7% 91.0% 3.3% 0.0%	 0.0% 41.5% 41.5% 17%	<0.001*
WC-Categories Normal % High %	 100% 0.0%	 26.4% 73.6%	<0.001*
Smoking Non-smokers % Smokers %	 71.3% 28.7%	 71.7% 28.3%	0.959
Soft drinks intake <3 drinks weekly >3 drinks weekly	 55.7% 44.3%	 49.1% 50.9%	0.415
Breakfast Skippers Non-skippers	 28.7% 71.3%	 54.7% 45.3%	0.001*
Sleep duration <7 hours >7hours	 30.3% 69.7%	 84.9% 15.1%	<0.001*
Exercise <0.5 hour weekly >2 hours weekly	 68.0% 32.0%	 73.6% 26.4%	0.463
Family History of Obesity Negative history Positive history	80.3% 19.7%	34.0% 66.0%	<0.001*

*significant difference

In the multivariable Risk Assessment, breakfast skipping, night sleeping less than 7 hours, and positive family history of DM were all significantly associated with central obesity. (Table 2).

Table (2): Multivariable-Adjusted Odds Ratio for ICO.

Variable	ICO -Categories	
	Odds Ratio (95% CI)	P Value
Gender	1.85 (0.65-5.30)	0.249
Smoking	0.60 (0.21-1.74)	0.355
Soft drinks	1.98 (0.76-5.11)	0.160
Breakfast	0.17 (0.06-0.45)	<0.001*
Sleep duration	0.06 (0.02-0.17)	<0.001*
Exercise	1.41 (0.51-3.89)	0.506
Family history of Obesity	10.15 (3.77-27.30)	<0.001*

*Significant association

Discussion

The results of present study indicate that general obesity is a common medical condition in Iraqi university students. The prevalence of overweight and general obesity is 14.9% and 5.1% respectively, In comparison to Iraqi studies, the prevalence of general obesity is similar to a study done by Saad Al-Ghabban, who studies the prevalence of obesity among college students of University of Karbala, where it was 5.6% [16].

In comparison to other studies we found that prevalence of overweight and general obesity is much less than that of some Arabic countries university students such as in Kuwait (32% and 8.9%) [13]. And Jordan (28.5 and 10.2%) [14]. But the prevalence of obesity is similar to other countries like Singapore (6.4%) and Thailand (4.3%) [15].

In spite of the fact that BMI is a valuable indicator of obesity prevalence, this obesity index has some disadvantages when assessing risk of cardiovascular and metabolic disorders [17].

Numerous studies have evidenced that BMI does not evaluate abdominal obesity and metabolic related disease as WC, and WHtR [18-20].

This study is the first report on the trends in WHtR among Iraqi university students, and there are very limited studies on central obesity and use of ICO in Iraq.

When using WC, we found that the prevalence of central obesity is more common in females than in males by nearly three times; but when using ICO, we found that there is no significant gender difference. That is to say WC underestimates Central Obesity in 15% of males, and overestimates Central Obesity in 16% of females. The limitation of WC is that it does not take height into consideration. There is some evidence that the cardiometabolic risk may differ between people who have the same WC in spite of their difference in height. It was reported that taller people have lower cardio metabolic risk than short people with the identical WC [21].

Scientists recommended that WHtR (ICO) might be a superior indicator of risk for Cardiovascular disease than BMI or WC for the accompanying reasons. WHtR is highly associated with visceral fat mass and cardiovascular risk factors; WHtR may be a more precise pursuit index of fat distribution and accumulation by age, the value of WHtR is in a close consent between genders at each age group; Making WHtR (ICO) a useful surrogate measure for central obesity across different age, sex, or cultural subpopulations. By using ICO, Prevalence of Central Obesity increases by 8% when compared to WC.

We found that Central obesity is very common in Iraq. The prevalence of central obesity is 30.3%, which is similar to that in Saudi Arabia (32%)[22]. And Iran (32.1%) [23]. But is less to that in Croatia (42%)[24]. And Oman (64.4%)[25].

In the current study, we detected that there were higher prevalence of isolated central obesity (abdominal obesity among normal BMI) with rate of 41.5% which is higher than that found by a study in Japan [26]. And India [27]. We detected also an entity of normal waist circumference central obesity (High ICO with normal WC) with prevalence of 26.4% .which means that normal WC does not exclude central obesity, making ICO more sensitive than WC in detecting central obesity in medical practice.

There are limited studies especially in Iraq to evaluate the relationship between abdominal obesity and various life styles. Most studies evaluate the relationship between general obesity and life styles.

Most studies show a strong association between general obesity and soft drinks intake. In our study, we found a weak association between central obesity and soft

drinks intake (P=0.160), like the study of Lin BH [28]. No significant association was observed between sufficient exercise and protection from central obesity, like the study of Mohammed [29].

Skipping breakfast is strongly associated with central obesity (p<0.001), like the study of Lehto [30]. Researchers postulate persons who omit morning meal ingest further for lunch eating more fatty and sugary foods, imposing them at risk of attaining obesity. Night sleeping duration less than 7 hours is strongly associated with central obesity (p<0.001), like the study of Jiang YR [31]. There is a no significant association between smoking and central obesity (p=0.355), like the study of Xu F [32].This can be explained partly by the increased metabolism induced by nicotine [33], suppresses appetite and those who smokes are more likely to have diseases that may cause weight loss.

There were some limitations in this research in which nature of the cross sectional survey and usage of self-reported survey such as information on night sleep duration, breakfast ,soft drinks, exercise and smoking habit that may have been resulting in under reporting or over reporting of the lifestyle factors by the respondents.

In conclusion, according to the results of this survey, we conclude that diagnosis of central obesity is better measured using WtHR (ICO); Central obesity is a common hidden medical problem in Iraqi university students, with prevalence (30.3%) more than general obesity (5.1%); Nearly half of students with normal BMI have central obesity, and Nearly quarter of students with normal WC have central obesity; breakfast skipping, night sleeping less than 7 hours, and definite family history of DM were significantly associated with central obesity; smoking, exercise, soft drinks, and gender were not significantly associated with central obesity.

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