European Journal of Academic Essays 2(11): 75-79, 2015
ISSN (online): 2183-1904
ISSN (print): 2183-3818
www.euroessays.org

The relationship between Body Mass Index and Waist Circumference in Patients with Metabolic Syndrome

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Abstract: The aim of this study was to find the relationship between Body Mass Index and Waist Circumference in Patients with Metabolic syndrome as defined by the National Cholesterol Education Program-Third Adult Treatment Panel (NCEP: ATPIII) in the diagnosis of the metabolic syndrome criteria to consider any criteria of metabolic syndrome is one of the risk of heart disease. This study was conducted on patients with diabetes during their review in the laboratory of Murjan Hospital Educational Specialist of Babylon city for the period from April / john 2015. In the present study, six biomarkers were selected from routine health check-up data, including body mass index (BMI), systolic blood pressure (SBP), diastolic blood pressure (DBP), fasting blood-glucose (FBG), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein LDL-c, This study included 51 sample for metabolic syndrome for the average age (54.68±0.976), were male 24 (47.1%), and females 27 (52.9%) (Mean 57.0 ± standard error 1.34 years), (Mean 52.62 ± standard error 1.30 years) for the average age male and female Consecutive for age groups ranging from 35-65 years. The results showed significant correlation $P<0.01$ between the average levels of the body mass index and Waist circumference at the patients with metabolic syndrome. While there is no significant correlation $p > 0.01$ between waist circumference and body mass index in male Metabolic Syndrome whiles showed significant correlation $p < 0.01$ between waist circumference and body mass index in female Metabolic Syndrome .

Keywords: Body Mass Index**,** Metabolic Syndrome, waist circumference.

1. Introduction

Metabolic syndrome (MetS) is a disorder with co-occurrence of several known cardiovascular risk factors, including insulin resistance, obesity, atherogenic dyslipidemia and hypertension [1]]. The the National Cholesterol Education Program-Third Adult Treatment Panel (NCEP:ATPIII required for diagnosis metabolic syndrome criteria at least three of the following criteria: Systolic BP equal and over 140 mmHg or diastolic BP equal and over 90 mmHg on two different occasions or taking antihypertensive medication. Hyperlipidemia was defined as: A history of taking anti-hyperlipidemia drugs or lipoprotein disorders according to NCEP ATPIII (TC>5.17 mmol/l or TG>1.7 mmol/l or HDL-c< 1.03 mmol/l in men, and HDL-c<1.29 mmol/l in women or LDL-c>4.1 mmol/l).Diabetes: A history of using hypoglycemic agents or a fasting blood sugar (FBS) of at least 7 mmol/l that was confirmed by a blood sugar of at least 11.1 mmol/l after taking 75 g of oral glucose (glucose tolerance test, GTT). The glucose tolerance test was not performed for known diabetic patients. Obesity: A body mass index (BMI) of ≥30 is defined as obesity and 25<BMI<30 is considered as overweight. Abdominal obesity was defined as: Waist >90 cm in men and >80 cm in women. Waist circumference measured at 2 – 3 cm over the umbilicus (or waist circumference at the middle of nipple and top of thigh) and hip circumference defined as the greatest diameter between waist and knee. [2]. The WHO and ATP III definitions of metabolic syndrome both include abdominal obesity, but it is a necessary requirement in the IDF definition [3]. That reflects the IDF position -though the pathogenesis of the metabolic syndrome and its components is complex, abdominal obesity is a key causative factor. Despite the importance of obesity in the model, we should remember that patients of normal weight can also be insulin resistant. Those are called metabolically obese, normal-weight individuals, typically having increased amount of visceral adipose tissue. According to some theories, with increases in visceral adipose tissue, a higher rate of flux of adipose tissue-derived free fatty acids to the liver through the splanchnic circulation would be expected, while increases in abdominal subcutaneous fat

could release lipolysis products into the systemic circulation and avoid more direct effects on hepatic metabolism.[4]

2. Materials and method:

The materials that were used in this research is the Kit to measure the lipid profile of the company BIOLABO and the company Rondo and , (Kit) to measure a patient's blood sugar level is equipped with a Company Audit. Was conducted practical part of the research in the laboratory of Murjan Hospital Educational Specialist, as samples were collected (blood) for people with diabetes type II during fasting and before breakfast (8- 12 hours) and randomly, Where the level of glucose were measured in fasting serum after 12 hours of fasting according to the principle of enzymatic oxidation presence of an enzyme Glucose _Oxidase (GOD) [5]. Measuring the level of triglycerides TG in fasting serum after 12 hours of fasting according to the principle of enzymatic hydrolysis [6, 7]. Measuring the level of high-density lipoprotein HDL in the blood serum of human according to the principle that the low-density lipoprotein LDL and chylomicrons resides within the blood serum were separated and deposited mediated Add solution phosphotungstic acid-containing ions of magnesium and Concentration was measured after a process of centrifugation The wavelength of 500 Nanometer in Temperature (21) ° C. [8].. Calculate body mass index (BMI) by measuring the weight (kg) and height (m) for each person was measured body mass index according to the following equation: $BMI=Wt/(Ht)^2$ Where: weight = weight (kg), $(Ht)^2$= box height $(m)^2$, Calculate Waist circumference at 2– 3 cm over the umbilicus [9].

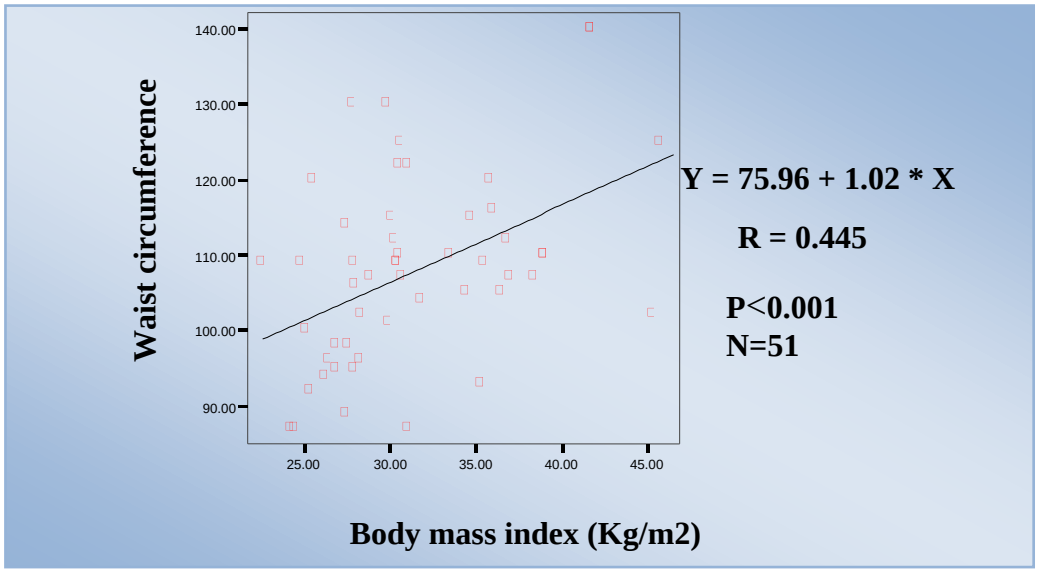
3. Results and Discussions

The results showed The average metabolic syndrome criteria (as defined by the National Cholesterol Education Program-Third Adult Treatment Panel (NCEP:ATPIII)) were as follows in male : Average high level of Fasting blood glucose (mmol/l.) has reached 6.62(mmol/l.), Average high level of Systolic B. P. 15.15 (mmHg), : Average high level of Diastolic B. P. 8.83 (mmHg), Average high body mass index 29.76 (Kg/m2), Average high level Triglycrides 2.11 (mmol/l), Average high level of Cholesterol 4.75 (mmol/l), Average high level HDL1.05 (mmol/L) , Average high level LDL 2.87 (mmol/L) , and Average high level Waist circumference 107.83 while Femle Average high level of Fasting blood glucose (mmol/l.) has reached 9.38 (mmol/l.), Average level of Systolic B. P. 15.72 (mmHg), : Average high level of Diastolic B. P. 8.88 (mmHg), Average high body mass index 33.19 (Kg/m2), Average high level Triglycrides 1.92 (mmol/l), Average high level of Cholesterol 4.92 (mmol/l), Average high level HDL1.04 (mmol/L), Average high level LDL 3.03 (mmol/L) , and. Average high level Waist circumference 108.29 . Results showed no linear relationship significant ($p> 0.05$) between the bady mass index and Waist circumference Male metabolic syndrome $Y = 100.38 + 0.25 * X$ and correlation coefficient (r) is equal to (0.1131). See Figure (1) :C, If the linear equation $Y = 75.96 + 1.02 * X$ and correlation coefficient (r) is equal to(0.455) See Figure (1): a, and linear relationship significant ($p> 0.05$) between the Body Mass index and Waist circumference of patients with metabolic syndrome, If the linear equation $Y = 75.96 + 1.02 * X$ and correlation coefficient (r) is equal to(0.644) See Figure (1): b, and linear relationship significant ($p> 0.05$) between the Body Mass index and Waist circumference of female with metabolic syndrome.

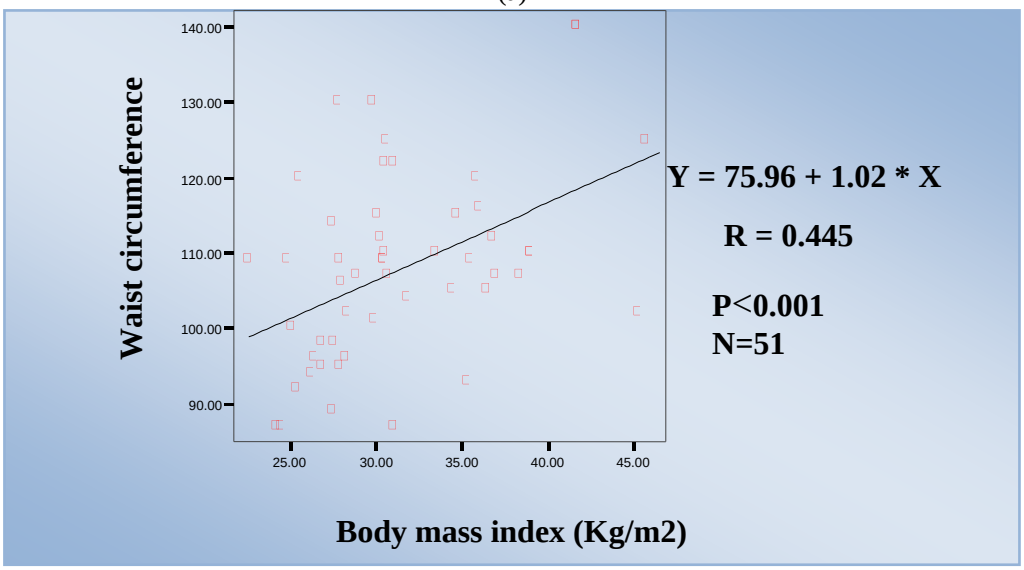
Metabolic syndrome (MetS) is a serious public health problem worldwide and its occurrence is increasing [11, 12, 13] . Clinical diagnosis is made on the basis of the presence of 3 of 5 conditions: 1) high triglyceride level, 2) low high-density lipoprotein (HDL) cholesterol level, 3) high fasting blood glucose level, 4) presence of central obesity (ie, high waist circumference), and 5) high blood pressure (1). The metabolic syndrome classification is of interest in epidemiologic studies because of its ability to predict the development of cardiovascular disease (CVD) and type 2 diabetes in adults [14] .

The results showed that the average body mass index and Waist circumference levels were within abnormal levels in samples of patients with metabolic syndrome. Results also showed significant relationship between the average levels of the body mass index and Waist circumference metabolic syndrome and female metabolic syndrome See Figure 1 a,b. This corresponds with the study of its predecessor [15] Specifically, waist circumference (WC)1 provides a simple and practical anthropometric measure for assessing central adiposity [16–17], and Recently, it has been reported that WC is a better predictor of metabolic abnormalities than percent fat measured by bio-impedance method in elderly whites [18]The metabolic activity of visceral fat can increase free fatty acid circulation, decrease insulin uptake by the liver, increase circulating insulin levels, and ultimately lead to glucose intolerance [19]. Furthermore, insulin resistance impairs the breakdown of triglycerides, which in turn stimulates the production of other atherogenic lipoproteins and decreases HDL cholesterol levels [19]Although visceral adipose tissue increases the chance that adults will develop metabolic syndrome [20] Besides, its value is affected by sex, age, constitution, and training. Evidence from the conducted studies has revealed that abdominal obesity (assessed based on the waist circumference) plays a very important role inthe development of metabolic disorders and in the assessment o f cardiovascular risk. According to the 2005 IDF criteria, subsequently revised in 2009, abdominal obesity is identified as the waist circumference of ≥80 cm in women and ≥94 cm in men. It is responsible for the development of insulin resistance which decreases the levels of the HDL-cholesterol fraction, increases the levels of triglycerides, and leads to the development of arterial hypertension. All of the abovementioned disorders .

3.1. Figures and Tables



(a)



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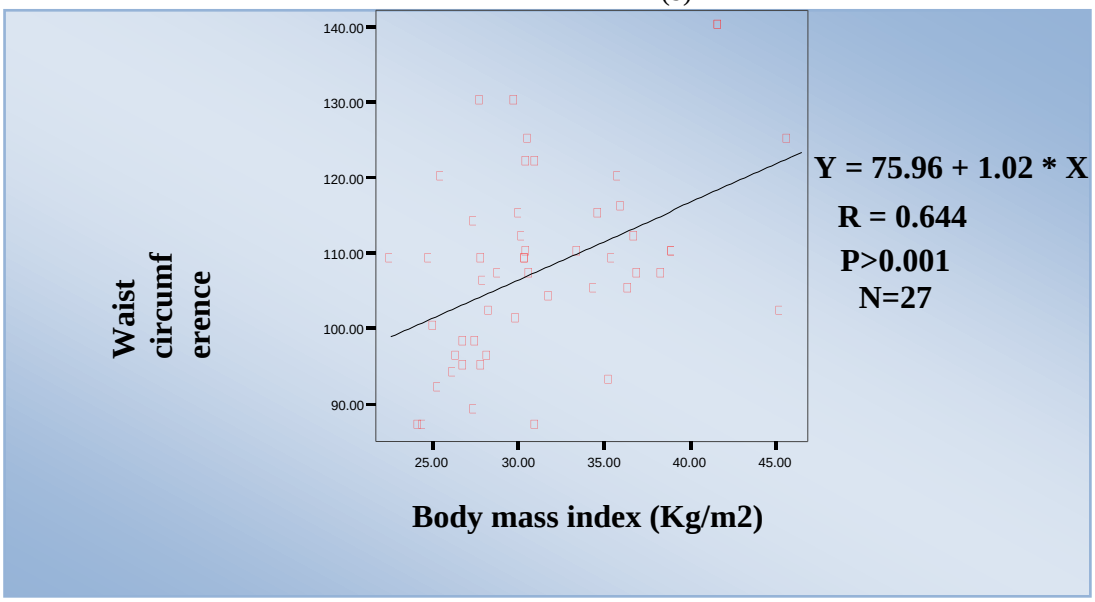

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Figure 1 : the relationship between the body mass index and Waist circumference criteria as the National Cholesterol Education Program-Third Adult Treatment Panel (NCEP:ATPIII):(a) metabolic syndrome (b) Male metabolic syndrome (c) Female metabolic syndrome

Table 1: Clinical characteristics of patients with metabolic syndrome

Variable	*N*	*Mean (St. E*)*	*Rang*
Age (years)	*51*	*54.68 (0.976)*	*(54.68-52.72)*
BMI (Kg/m2)	*51*	*31.58 (0.772)*	*(33.13-30.02)*
S. B. P. (mmHg)	*51*	*15.45 (0.234)*	*(15.45-14.98)*
D.B. P. (mmHg)	*51*	*8.85 (0.141)*	*(8.85-8.57)*
FBS (mmol/l)	*51*	*8.08 (0.568)*	*(5.22-4.46)*
Cholesterol(mmol/l)	*51*	*4.85(0.189)*	*(4.85-4.46)*
Triglycerides(mmol)	*51*	*2.016(0.102)*	*2.016-1.81))*
HDL(mmol/L)	*51*	*1.04(0.04)*	*(1.04-0.096)*
LDL(mmol/L)	*51*	*2.96 (0.19)*	*(2.96-2.96)*
WC(cm)	*51*	*108.07(1.764)*	*(111.6204.53)*

*** Standard Error**

Table 2: Clinical characteristics of patients with metabolic syndrome among both genders (male and female)

Variable	***Gender***	***N***	***Mean (St. E*)***	***Rang***
Age (years)	*Male*	*24*	*57.0 (1.34)*	*(56.09 – 53.5)*
	Female	*27*	*52.62 (1.30)*	*(52.62 -49.95*
BMI (Kg/m2	*Male*	*24*	*29.76 (0.956)*	*(29.61-28.06)*
	Female	*27*	*33.19 (1.110)*	*(33.19 -30.91)*
S.B. P. (mmHg)	*Male*	*24*	*15.15 (0.356)*	*(14.40 -13.72)*
	Female	*27*	*15.72 (0.306)*	*(15.7- 15.09)*
D.B. P. (mmHg)	*Male*	*24*	*8.83 (0.223)*	*(8.46 - 8.06)*
	Female	*27*	*8.88 (0.183)*	*(8.88 - 8.5)*
	Male	*24*	*6.62 (0.549*	*(6.63 -5.77)*
	Female	*27*	*9.38 (0.893*	*(9.38 -7.54)*
FBS (mmol/l	*Male*	*24*	*4.75 (0.249)*	*(4.79- 4.37)*
	Female	*27*	*4.92 (0.283)*	*(4.92- 4.33)*
Cholesterol (mmol/l)	*Male*	*24*	*2.11 (0.161*	*(1.97- 1.70)*
	Female	*27*	*1.92 (0.1299*	*(1.92 -1.66)*
Triglyceride (mmol)	*Male*	*24*	*1.05 (0.042)*	*(1.05- 0.98*
	Female	*27*	*1.04 (0.065)*	*(1.04 -0.91)*
	Male	*24*	*2.87 (0.239)*	*(2.95 -2.54)*
	Female	*27*	*3.03 (0.294)*	*(3.03 - 2.43)*
HDL (mmol/	*Male*	*24*	*107.8(2.122)*	*(106.06 -1.98)*
	Female	*27*	*108.2(2.786)*	*(108.29-02.56*
LDL (mmol/	*Male*	*24*		
	Female	*27*		
WC (cm)				

*** Standard Error**

References

[1] Huang, P.L. A comprehensive definition for metabolic syndrome. Dis. Model. Mech. 2009, 2, 231-237.

[2] Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) JAMA. 2001;285:2486–97.

[3] International Diabetes Federation. The IDF consensus worldwide definition of the metabolic syndrome, 2005. www.idf.org.

[4] RH Eckel, SM Grundy, PZ Zimmet. The metabolic syndrome. Lancet 2005; 365:1415-28.

[5] Burtis , C.A.and Ashwood , E.R. Teitis textbook of clinical chemistry W.B., Saunders comp. USA., **1999**,*2*, . 1500_ 1503.

[6] Trinder, P. Determination of total serum clinical Biochemistry cholesterol Analyst,. **1969**:, *6*, 27-29.

[7] Fossati, P.and prencipe. LSerum triglycerides determined colorimetrically with an enzyme that produces hydrogen peroxide. clinical chemistry., 1982, 28,2077-2080.

[8] Lopez-Virella, M. F.; Stone, P.; Ellis, S. and and high-density Colwell, J. A. Cholesterol determination in lipoproteins separated by three different methods.Clin. Chem., **1977**,*23*,882-884.

[9] Garrow, J.S. and Webster, JQuetelts index (W/H2) as.measure of afatness. Inter. J. Obesit. .**1985**, *9*,147-153

[10] Field, Andy. Discovering Statistics Using SPSS. 3rd ed. London: Sage Publications Ltd.**2009**.

[11] M. Janghorbani and M. Amini, "Incidence of metabolic syndrome and its risk factors among type 2 diabetes clinic attenders in Isfahan, Iran," *Polish Journal of Endocrinology*, vol. 63, pp. 372–380, 2012.

[12] R. H. Eckel, S. M. Grundy, and P. Z. Zimmet, "The metabolic syndrome," *The Lancet*, vol. 365, no. 9468, pp. 1415–1428, 2005.

[13] E. S. Ford, W. H. Giles, and A. H. Mokdad, "Increasing prevalence of the metabolic syndrome among U.S. Adults," *Diabetes Care*, vol. 27, no. 10, pp. 2444–2449, 2004 .

[14] Isomaa B, Almgren P, Tuomi T, Forsén B, Lahti K, Nissén M, et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care 2001;24(4):683-9 .

[15] Marcin. G; Joanna. G ;Marlena. E; Adam.A ; and Roman. J (2014). Correlation between Body Mass Index and Waist Circumference in Patients with Metabolic Syndrome ISRN .Endocrinology , Article ID 514589, 6 pages

[16]Lean ME, Han TS, Morrison CE. Waist circumference as a measure for indicating need for weight management. BMJ 1995;311:158–61. [PubMed: 7613427].

[17] Després JP, Prud'homme D, Pouliot MC, et al. Estimation of deep abdominal adipose-tissue accumulation from simple anthropometric measurements in men. Am J Clin Nutr1991;54:471–7. [PubMed: 1877502].

[18]. Wannamethee SG, Shaper AG, Morris RW, Whincup PH. Measures of adiposity in the identification of metabolic abnormalities in elderly men. Am J Clin Nutr 2005;81:1313–21. PubMed: 15941881.

[19]Cohn G, Valdes G, Capuzzi DM. Pathophysiology and treatment of the dyslipidemia of insulin resistance. Curr Cardiol Rep 2001;3(5):416-23.

[20] Despres JP. Cardiovascular disease under the influence of excess visceral fat. Crit Pathw Cardiol 2007;6(2):51-9.