BLOOD LIPID DISORDER IN MEN WITH INCREASED WAIST CIRCUMFERENCE COMPARED TO MEN HAVING NORMAL WAIST CIRCUMFERENCE WITHIN THE SAME CATEGORY OF BMI

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Abstract

Background: No local studies have been performed yet to investigate the influence of central or abdominal obesity on serum lipids in men having increased Waist Circumference (WC) compared to men with normal Waist Circumference values within the same BMI (Body Mass Index) category.

Objective:To examine whether the prevalence of dyslipidemia, (defined as Hypercholesterolemia (Total Cholesterol level ≥240 mg/dl), high LDL-C level (≥160 mg/dl), low HDL-C level (<35 mg/dl), or Hypertriglyceridemia (TG level ≥200 mg/dl)), is higher in men having high Waist Circumference compared to others with normal WC values within the same BMI category.

Methods: The study was conducted between September 2013 and July 2014. Eighty-eight overweight men (BMI = 25-29.9) were grouped by WC as follows: 28 with high values (>102 cm) and 60 with normal values (≤ 102cm). Blood samples were drawn and assayed for total cholesterol, triglyceride, HDL-C, and LDL-C,at the department of Laboratory in the Faculty of Public Health, Lebanese University. All assays were performed by enzymatic colorimetric methods using Hitachi-704.

Results: Overweight men with high WC values (according to cutoff points internationally adopted) were the most likely to have dyslipidemia with its subsequent increased health risk compared with those having normal WC values.

Conclusion: we showed in this study that the prevalence of dyslipidemia in men with high WC values is greater compared to those with normal WC values within the same BMI category. This finding leads us to the importance of the incorporated evaluation of WC in addition to the BMI in clinical practice.

Keywords: Waist circumference (WC), waist to hip ratio (WHR), World Health Organization (WHO), cholesterylester transfer protein (CETP).

Introduction

Obesity is defined as an excessive accumulation of energy in the body in the form of fat and can lead to many illnesses. Those are classified using three factors: fats' amount in the body, fats' distribution and presence of other risk factors.

To start with fat distribution, modern medicine uses the "terms central" and "peripheral" to describe the models of obesity(other names might be used such as Apple shaped obesity to describe the central obesity and Pear shaped to describe peripheral obesity). Other criteria like the waist circumference (WC), waist to hip ratio (WHR), CT scans, and magnetic resonance were recently added to estimate the proportion and shape of this

distribution besides the BMI. The two models are different in the pattern of distribution of accumulated fat, and in the adipose modality itself. In central obesity, metabolically active brown adipocytes prevail over while in peripheral obesity less metabolically active white adipocytes form the majority. In addition, many studies have confirmed that there is a direct relation between central obesity and insulin resistance, blood lipid disorders, hypertension, heart disease and atherosclerosis.

There have been several hypotheses which attempted to explain these results noting that some of them are connected with the increased secretion of several Mediators from brown adipocytes (Leptine and TNF) or the increased rate of fat hydrolysis inside the brown abdominal adipocytes to the hyper flow of free fatty acids to the liver. These mediators may cause a decrease in the sensitivity of peripheral tissues to insulin, and the free fatty acids can lead to decrease the hepatic uptake of insulin and decrease hepatic glucose production. It also affects the sensitivity of peripheral tissues to insulin. The sharp decrease in the level of leptin following liposuction operations of accumulated fats in the subcutaneous tissue of the abdominal area supports this interpretation. We should also shed light on the role of some abnormalities in the gene responsible for the formation of β adrenergic receptors located mainly on the surface of the brown adipocytes (abdominal) causing obesity, specifically central obesity.

Table 1: World Health Organization (WHO) classification of obesity according to BMI and WC and associated risks, as shown by the following table:

Class	BMI Kg/m2	Obesity degree	Risk factor (WC)	
			<or=102cm	>102cm
Underweight	<18.5		-	-
Normal	18.5-24.9		-	-
Overweight	25-29.9		increased	High
Obesity	30-34.5	I	high	Very high
	35-39.9	II	Very high	Very high
Severe obesity	>40	III	Extremely high	Extremely high

Assessment of central obesity

1. Measuring waist circumference: at the horizontal level above the upper iliac spine in the thinnest region of the trunk, at the end of normal exhalation when the patient has an empty stomach.

2. Measuring hip circumference: at the horizontal level and in the largest area of the hips and buttocks taking into consideration the ratio (WHR); If> 1 in men then it is a masculine (Android) body fat distribution called central obesity, and according to the WHO classification :

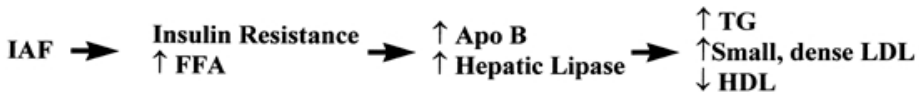
Table 2 WHO classification of the highest level of WC

Highest WC value in men				
	Level 1 (warning level)		Level 2 (indication for intervention)	
	BMI>25	1>WHR≤ 0.95	30≤ BMI	WHR>1
WC	94 cm≤		>102cm	

Studies also suggest that the risk of disease is lower in men with WC than 94 cm compared to others with WC ranges between 94 and 102 cm.

- Pathophysiological disorders of blood lipids in the case of insulin resistance (such as Central obesity):

- Introduction: The cycle of the metabolic obesity is the same in the case of insulin resistance.



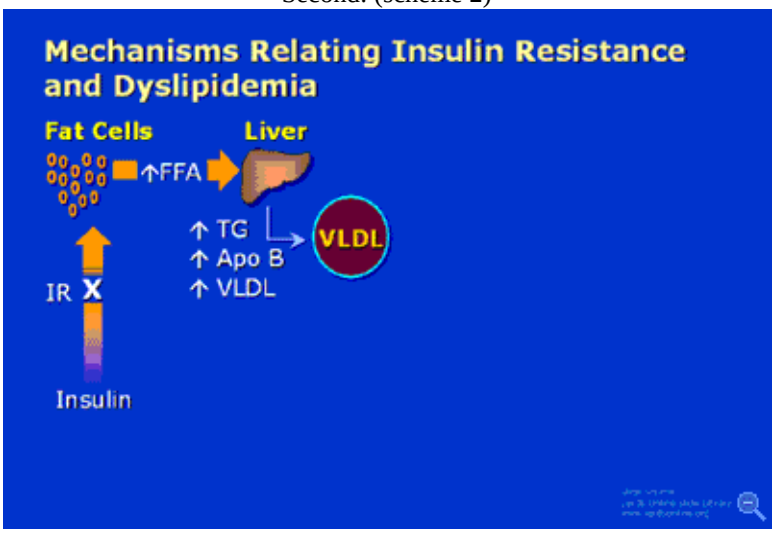
Obesity is considered another form of insulin resistance, such as high blood pressure, high fasting blood sugar, and blood lipid disorders (high triglycerides TG, and the presence of small and dense LDL particles). The excessive lipids in the body have several consequences on health, which are worse and clearer when that fat is accumulated in the abdominal area (Intra-abdominal).

Pathogenesis: shown in the four slides.

First: (scheme 1)

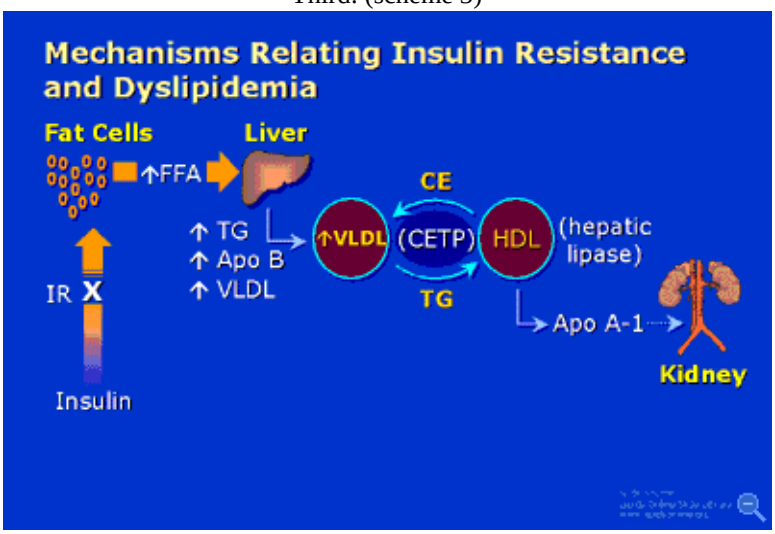
We notice that the insulin resistant adipocytes (especially distributed in the abdominal area) break down its content of triglycerides giving larger amounts of free fatty acids which lead in turn to increase the rate of hepatic uptake, and later converted into TG.

Second: (scheme 2)



The existence of a high level of TG stimulate the production and secretion of Apo-B and VLDL and the result is an increased level of VLDL particles and high levels of plasma TG.

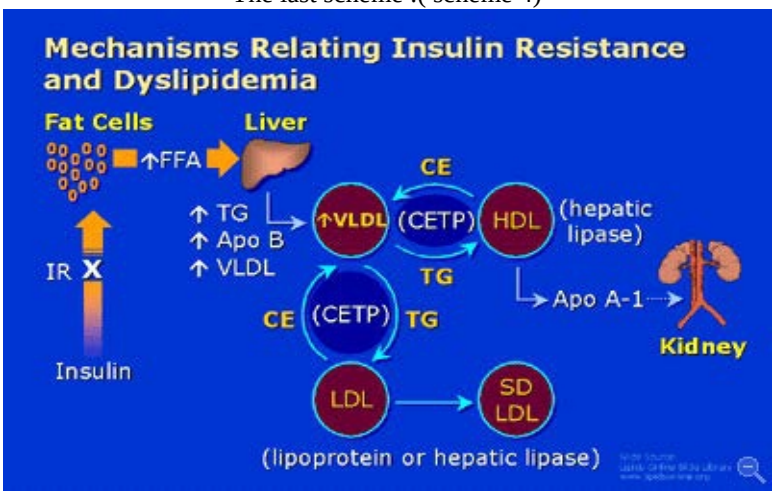
Third: (scheme 3)



The increased level of plasma VLDL with normal levels of Cholesterylester transfer protein (CETP) activates the exchange between TG

of VLDL and the HDL cholesterol, where the molecule of VLDL gets rid of the TG molecule to HDL in exchange with Cholesterylester molecules. This leads to two outcomes: (1) the remnants of VLDL rich in cholesterol predispose to the occurrence of atherosclerosis. (2) HDL molecule rich with TG and poor with cholesterol submit additional TG hydrolysis by liver lipase, leading to its separation from surfactant protein (ApoA-I) so it is filtered faster in the plasma, and one of this filtration has place in the kidneys. This leads to a decline in the proportion of HDL-C and the amount of ApoA-I and the number of particles of HDL.

The last scheme :(scheme 4)



This slide shows a similar phenomenon leading to the formation of small and dense LDL particles and the presence of high levels of TG within the VLDL predispose the transfer of TG to inside the LDL and the exit of cholesterolester out of them (in the presence of CETP). The LDL rich in TG will be exposed later to several hydration reactions by hepatic lipase (HL) or (LPL), leading to the formation of small dense LDL particles poor in cholesterol or fat in general.

Materials & methods

This research was conducted on a sample of 88 overweight men with overweight (25<BMI≤30), apparently being healthy who referred to the medical analyses center in the Faculty of Public Health, Lebanese University, for several chief complaints that do not affect the results, between the month of September 2013 and July of 2014.Results were classified according to waist circumference WC where the number of men with high WC (greater than 102 cm) is 28 men, and the number of men with normal WC (less than or equal to 102 cm) is 60 men described far ahead.

Blood samples withdrawal in dry tubes after a fasting period of at least 12 hours, taking into consideration all the recommendations of the NCEP Adult Treatment Panel III, 2001 then serum analysis for blood sugar, TG, total cholesterol, LDL-C, HDL-C, uric acid, blood urea, creatinine, and albumin. Assays were done by color enzymatic colorimetric assay device (Hitachi 704).

Test	Target		
Total cholesterol	<200mg/dl	200-239	≥240
LDL-C	<130mg/dl	130-159	≥160
HDL-C	>35		
TG	>160	161-200	>200

Table (3) the used criteria (according to the recommendations of the NCEP)

As for the uric acid, urea, albumin, creatinine, we used a special laboratory measurements of the Central sympathy marginal standards.

And the number 102 cm was considered a Cutoff Point for waist circumference knowing that it is considered as high risk if the patient had a higher value.

Results

After collecting the results of the study and dividing them into two groups depending on the measurement of WC, the statistical results appeared as follows:

- Prevalence:

WC	High total cholesterol(≥240mg/dl)	Low HDL-C (<35mg/dl)	High LDL-C (≥160mg/dl)	High TG (≥200mg/dl)
Normal(≤102cm)	17.24%	24.13%	15.5%	24.13%
High risk(>102cm	42.3%	46.15%	38.4%	46.2%

Table (4) the spread of blood lipid disorders rate with the WC

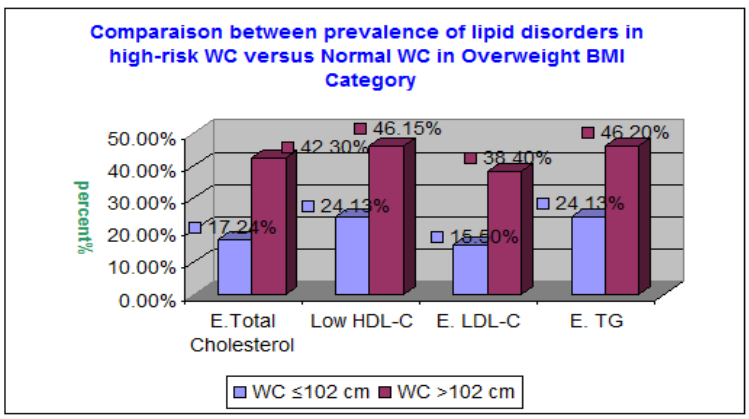


Chart (1) the prevalence of blood lipid disorders in high WC men compared to normal WC in Overweight BMI category

According to the mean value of the results:

WC	Total cholesterol (mg/dl)	HDL-C (mg/dl)	LDL-C (mg/dl)	TG (mg/dl)
Normal (≤102cm)	*41.4±204.73	*10.3±47.25	*39.2±129.24	*67.6±164.49
High risk (<102cm)	*38.8±233.25	*7±41.62	*36.2±152.7	*77.9±212.49

*Mean ± SD

Table (5) changing levels of serological lipids with the WC

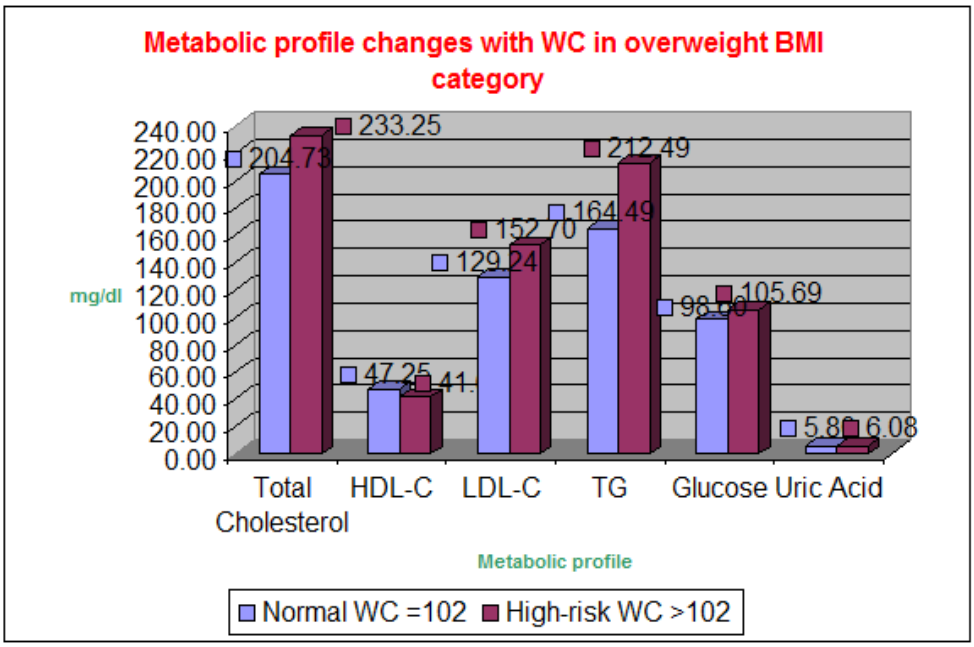


Chart (2) alterations serum lipid levels with the WC.

Interpretation of the results:

The previous two tables show that the prevalence of disorders in blood lipid disorders or Dyslipidemia (known as high blood cholesterol (TC level ≥ 240 mg / dl), high LDL-C serum level (≥160 mg / dl), low serum level HDL-C (<40 mg / dl), or high blood TG (≥240 mg / dl)) were higher in men with waist circumference (WC >102 cm) than in the other category (WC ≤ 102 cm); the average lipid profile was obviously abnormal showing a clear difference in numbers between the two categories.

By applying statistical Paired t-test on the previous results, we have in the table (5) a difference that is considered to be statistically significant in lipid serological levels between the two groups: total cholesterol was P = 0.0001, the HDL- C was P = 0.0197, the LDL-C was P = 0.0002, the TG was P = 0.039.

This indicates that the risk is higher in people with central obesity (i.e., waist circumference is greater by 102 cm) than the other group (i.e.,

waist circumference is less or equal to 102 cm) recording the obvious difference and meaningful numbers in serum levels of lipids and lipoproteins.

Comparison studies

A large study conducted by the endocrinology and metabolism department of faculties of medicine and health and physical education at Queen's University, Ontario, Canada, and published in 2002.

Results of the study:

	BMI	
	Overweight category	
	WC normal (n=2230)	WC high (n=851)
The average serology values		
Total cholesterol (mg/dl)	*40±203.3	*42.7±213.7
(LDL-C (mg/dl	*34.6±130.5	*36.2±138.5
(HDL-C (mg/dl	*12.9±44.9	*11.2±42.0
TG (mg/dl)	*108±155.4	*124.8±194.5
% ,Prevalence		
total high cholesterol	17.2	26.2
LDL-C high	19.3	27.2
HDL-C low	35.5	49
TG high	21.7	36.3

Table (6): comparison of metabolic variables and the prevalence of blood lipid disorders among men with normal WC vs. WC in the Overweight BMI Category

Discussion of the study results and comparing them to the results obtained:

The findings of the universal study carried out by a large number of men and women have shown that people with central obesity among the three categories of the BMI ratio were diagnosed with high blood pressure, diabetes type II, and blood lipid profile disorders higher compared to normal numbers for WC. The differences between the serum levels of lipids and lipoproteins between the two categories of the WC were clear, where the P Value was less than 0.05. Comparing these results to the results of our study, we found that the numbers we have obtained regarding the category Overweight BMI was convergent with those of the universal study.

Conclusion and Recommendations

Previous study concluded that central obesity has an important and independent role in the growing proportion of the health risks such as blood lipid disorder regardless of the degree of obesity.

And as a result of this research, the National Institutes of Health are recommended with the following:

1. Assess central obesity by measurement of waist circumference WC along with BMI and consider it as an Independent High-risk Factor.
2. Use Cutoff Points adopted by the NIH (National Institutes of Health).
3. Preserve a normal WC and try to have an optimal one to avoid all the health risks associated with abdominal obesity and exercise regularly knowing that it has an important role in getting rid of abdominal obesity.

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