COMPARISON OF TOTAL CHOLESTEROL AND HDL CHOLESTEROL RATIO BY TERTILE OF WAIST HIP RATIO IN POSTMENOPAUSAL WOMEN

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The waist hip ratio (WHR)is a useful parameter to determine the distribution of fat. In women the fat is predominant in gluteal and femoral regions under the effects of oestrogen. After menopause oestrogen deficiency occurs and women become prone to masculine type of adipose tissue distribution that is high waist /hip circumference ratio.

In addition to this the relative 'immunity' from CHD in female gender finishes at menopause. This study was aimed at determining a relation between WHR and TC/HDL-C ratio in postmenopausal women. The results of this study indicate that most (64%) postmenopausal women of the study population were having a large WHR and also showed TC/HDL-C ratios that were significantly more than the postmenopausal women with less WHR. In addition, the mean TC/HDL-C ratio in this group was above the danger limit for this value, which suggests that a large percentage of our postmenopausal women are at a higher risk of CHD.

INTRODUCTION

Epidemiological studies and clinical trials have provided valuable information about the risk factors associated with development of coronary heart disease (CHD) and the ways by which the risk of the disease can be reduced[1]. Some risk factors for CHD are irreversible like aging, male sex and genetic traits while some of the others are reversible such as cigarette smoking, hypertension and obesity[2]. Obesity cannot be described solely as fat mass but that the location of fat deposition must be considered when studying the association between obesity and disease[3]. The women have more body fat than men at the same relative body mass index[4]. Women however, show a relative preponderance for gluteal and femoral regions for fat deposition[5], which is under the influence of oestrogen and gives a woman feminine figure[6]. After menopause oestrogen deficiency occurs due to menopausal ovarian involution[7] and women become prone to masculine type of adipose tissue distribution that is high waist/hip circumference ratio[8]. Waist Hip ratio (WHR) is a practical and simple index of adipose tissue distribution[5]. The WHR can serve as an easy screening device used in conjunction with other proven measures to detect those at elevated risk for coronary heart disease(CHD)[9].

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Total serum cholesterol level is a major indicator of risk of CHD in both sexes[10]. VLDL-C and LDL-C are "bad cholesterols" which accumulate in serum and cause an increased risk of CHD while HDL-C is a good "cholesterol"[11] and has an inverse relationship with CHD[12].

Serum total cholesterol/ HDL-C ratio is important in indicating risk of CHD. Ratios j> 4.5 are dangerous while optimal ratios are around 3.5[11,13]. This study was designed to evaluate the relationship of different tertiles of WHR with the total cholesterol and HDL Cholesterol ratio in postmenopausal women of the same weight and height.

MATERIALS AND METHODS

This study was carried out at Department of Biochemistry, Basic Medical Sciences Institute, Jinnah Postgraduate Medical Centre, Karachi. The postmenopausal subjects of same age, weight and height ranges were randomly selected from women attending different units of Jinnah Postgraduate Medical Centre, Karachi. The age range was from 60 to 62 years, the height range was from 5'3" to 5'4" and the weight range was from 60 kg to 65 kg.

Fifty (50) women were included in the study after taking a detailed medical history and observing the exclusion criteria that included the diseases likely to alter lipid profile. Five (5) ml venous blood was collected from each subject after an overnight fast of 12-14 hours. Serum was separated within one hour of blood collection and stored at -20°C until analyzed for lipid profile.

Waist circumference was measured in centimeters, one inch above umbilicus, while hip circumference was measured at the level of iliac crest in standing position[3-9]. The ratio between the two was calculated. The subjects were then divided into three tertiles

(subgroups) according to WHR. The tertiles were as follows:

Tertile-1: WHR <_ 0.76 Tertile-2: WHR > 0.76-<0.84 Tertile-3: WHR 0.84

The serum total Cholesterol(TC) was estimated by the enzymatic colorimetric method using kit Cat No: 1001092 supplied by Spinreact, S.A. Spain. Serum HDL-Cholesterol (HDL-C) was determined by using Kit Cat No: 1001095 supplied by Spinreact, S.A. Spain. The total cholesterol and HDL-Cholesterol ratio (TC/HDL-C ratio) was calculated from the two values. The values for each tertile of WHR were then subjected to student 't' test for determining the statistical significance.

RESULTS

Out of the fifty subjects no subject i.e 0% of the study population, was of tertile-1 i.e WHR j< 0.76. Eighteen (18) women, i.e. 36% of the study population, having WHR >0.76-<0.84 were included in tertile-2 and their mean(±SEM) WHR was 0.81±0.002. The rest thirty-two women, i.e. 64% of the study population, having WHR >_ 0.84 were in tertile-3, and their mean(±SEM) WHR was 0.87±0.005. These results are summarized in table-1.

Table 2 gives the ratio of total cholesterol and HDL-Cholesterol (TC/HDL-C ratio) in the three tertiles. There was no subject in tertile-1. The subjects in tertile-2 had mean (±SEM) TC/HDL-C ratio of 4.27±0.22 while the mean(±SEM) TC/HDL-C ratio for tertile-3 was 5.16±0.14. The mean(±SEM) TC/HDL-C ratio of tertile-3 was significantly//? < 0.001) higher than tertile-2.

The relationship of WHR and TC/HDL-C ratio is expressed in the figure 1.

**Table-1: Mean WHR in different tertiles of post-menopausal women.**

TERTILE	WHR (mean± SEM)	No. of Subjects	% of total (n = 50)
TERTILE-1 WHR < 0.76	0	0	0
TERTILE-2 WHR >0.76-<0.84	0.81 ± 0.002	18	36
TERTILE-3 WHR > 0.84	0.87 ± 0.005	32	64

Table-2: TC/HDL-C Ratio in different tertiles of WHR in post-menopausal women.

	TERTILE 1	TERTILE 2	TERTILE 3
	WHR < 0.76	WHR 0.76 -<0.84	WHR 0.84
TC/HDL-C RATIO (mean SEM)	(n = 0)	4.27 ±0.22 (n=18)	5.16±0.14 * (n=32)

* $p < 0.001$ when compared with tertile 2

Figure. 1: Relationship of WHR and TC/HDL-C ratio in post-menopausal women.
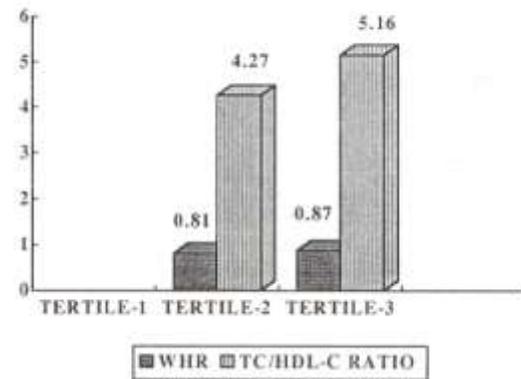
DISCISSION

Incidence of the CHD increases after menopause[14]. It has been hypothesized that the adverse changes in lipids and lipoproteins believed to occur with menopause may be in part responsible for the perceived increased risk[15][16].

The TC/HDL-C ratio estimates the net effect of the two-way traffic of cholesterol in and out of the tissues[6]. This ratio has been suggested to be the most important predictor of premature development of CHD[14].

Women with higher value of WHR are considered to have upper body fat predominance, while women with low value of WHR are considered as having lower body fat predominance. Femoral adipocytes are of same size in both upper and lower body fat predominance while in upper body fat predominance fat cells are larger[3] and morphologically different from those of hip and thigh regions.

These adipocytes are unique because they have higher rate of basal lipolysis thereby increasing free fatty acid flux into portal vein, exposing liver to high concentration of free fatty acids which in turn can cause increased triglycerides and VLDL-C production by liver [5,9]. WHR is thought to be a much stronger predictor of incidence of cardiovascular disease[8]. Landin et al.,[17] have proposed that obese people with a high WHR have an increased risk of CHD. Our results are very significant as they show absolute absence of tertile-1 of WHR, which is so peculiar of the female sex. The other finding of very high significance is a very high TC/HDL-C ratio found in the tertile-3. This value is even higher than the accepted dangerous limit of >_4.5 where the intervention is required [11,13] and indicates a very high, to date unnoticed risk of CHD in our postmenopausal

population. The results of this study are in agreement with Soler et al.,[9] who suggested that WHR is significantly and directly associated with TC/HDL-C ratio. Similarly, the highest percentage of the women studied was of tertile-3, which indicates that a majority of our postmenopausal population is at a very high risk of CHD.

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