# To Evaluate the Relationship of Low HDL Level and Hip Waist Ratio as Risk of Ischemic Heart Disease

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## ABSTRACT

**Objectives:** To determine the relationship of low HDL level and waist hip ratio as a risk factor of myocardial infarction.
**Type of Study**: It is a descriptive study**.**
**Duration and Settings of Study:** This study was conducted in medical emergency, all medical wards and coronary care unitof Mayo Hospital, Lahore.from September 2009 to November 2009.
**Methods:** 50 patients of first ever acute myocardial infarction were included in the study. Fasting lipid profile was done within 48 hours in all the patients. Waist and hip circumference were also measured.
**Results**: Dyslipidaemia i.e. high total cholesterol, low density lipoprotein cholesterol and low HDL cholesterol was statistically significant in all patients of MI. 74% patients had dyslipidaemia. While WHR>1 was found in 44% patients. It was also seen that all these 44% patients who had WHR>1 also had low HDL level along with other dyslipidaemia.Incidence of IHD showed linear relation with age.
**Conclusion:** Low HDL level and truncal obesity are important for risk stratification of CAD as well as secondary prevention of CAD.
**Key words:** HDL, Ischaemic heart disease, Waist hip ratio

## INTRODUCTION

Coronary artery disease (CAD), particularly myocardial infarction secondary to atherosclerosis of coronary arteries remains the leading cause of morbidity and mortality worldwide[1]. The risk factors that the predisposes these conditions are divided into two major groups, modifiable risk factors e.g., dyslipidemia, hypertension, diabetes mellitus, smoking and obesity. Non-modifiable risk factors are age, sex and positive family history of CAD[2].

Myocardial infarction may be silent but most commonly associated with symptoms like chest pain, dyspnoea, sweating, nausea, vomiting[3]. The risk of myocardial infarction is multiplied when two or more risk factors are present in the same individual[4]. Framingham study established a clear cut relationship of dyslipidemia, obesity, LDL and low level of HDL (High density lipoproteins) are major risk factors for coronary atherosclerosis.

Correction of dyslipidemia can reduce the risk of myocardial infarction[5]. Obesity is measured by body mass index. This is calculated by dividing weight in kilograms by height in meters square[6]. Women with waist to hip ratio (WHR) more than “0.8” and men with (WHR) more than “1” have increased risk of CAD[7]. Fat deposited around the waist and flanks is greater hazard than thighs and buttocks[8].

## MATERIAL AND METHODS

This study was conducted in medical emergency, all medical wards and coronary care unit (CCU-I & II) of Mayo Hospital, Lahore. Total 50 patients with first ever acute myocardial infarction were studied

The selection of patients was made on the basis of inclusion and exclusion criteria as follows:

All patients with acute myocardial infarction were included in my study who presented with typical history of chest pain, ECG changes (ST elevation > 1mm in limb leads and > 2mm in chest leads), raised cardiac enzymes or Troponin-T positive and the patients who fulfilled at least two of the above three criteria were included in the study.

Patients with complicated heart disease like heart failure, valvular heart disease, pericardial disease, chronic renal failure and thyroid disease were excluded on the basis of history, clinical examination and relevant investigations. Special attention was given to the fasting lipid profile and waist/hip measurements.

**Dyslipidaemia:** Fasting lipid profile was investigated within 48 hours of acute myocardial infarction.

Total cholesterol HDL and triglycerides were determined on an automated system with standard kits. The enzymatic calorimetric test was performed. Serum LDL levels were determined by using following formula.

LDL=Total cholesterol – (HDL + Triglyceride / 5)

The patients were kept on fasting overnight for 14 hours before the blood sample was taken for lipid analysis. Clean venepuncture was done and the blood was drawn only when cuff was released. Prolonged venous stasis was avoided in order to get accurate cholesterol concentration.

**Obesity (Especially central obesity):** The patient's waist circumference and hip circumference were measured with following techniques by using a non-stretchable measuring tape and patients stand erect with arms at side, feet together.

Waist circumference measured at natural waist, midway between illac crest and lowest rib margins at mid-axillary line. Hip circumference measure at maximum circumference over buttocks.

Waist-to-hip ratio measures fat distribution as pear or gynaecoid obesity and apple or android obesity. Values suggested by American heart association.

Males > 1.0 confers increased risk of CAD

Female > 0.8 confers increased risk of CAD

**Relevant Investigations:** Relevant investigations which were carried out as a first line investigations were blood complete with ESR, blood sugar (random and fasting), ECG, cardiac enzymes, troponin T. Other planned investigations were as follows:

i. Serum electrolytes ($Na^+$, $K^+$)
ii. Liver function tests
iii. Blood urea
iv. Serum creatinine
v. Echocardiography in relevant cases
vi. T3 T4 TSh (if required)

## RESULTS

Out of 50 patients 37 (74%) were male 13 (26%) were females. The age of patients ranges from 30-70 years with mean age of 55 years. In males most of the patients 23 (62%) were above fifty with mean age of 53.7 (Table 1). Out of 13(26%) females (85%) were postmenopausal. In females the mean age was 56.2 (Table 1).

Majority of patients 42(84%) were diagnosed on the basis of typical chest pain and raised cardiac enzymes, while 8 (16%) have atypical chest pain with typical ECG changes, raised cardiac enzymes.

Dyslipidemia was present in 36 (72%) patients of acute MI, total fasting cholesterol was above normal i.e. > 200mg in 28(78%) males and 8 (22%) females with mean value 250mg/dl (Table 2).

Low HDL-C is also a risk factor of MI, out of 50patients. HDL C was less than normal (<35mg/dl) in total 27 (54%) patients, 22 (59.45%) were male and only 5 (38.46%) were females while in 23 (46%) it was normal.(Table 3)

All females patients i.e., 13(26%) of total patients have WHR within normal range except two who have WHR > 1 (Table 4). Among males patients only 10 (27.2%) have WHR>1 while 27 (72.8%) have within normal range i.e. ≤1.

Table 1: Age distribution among male and female with MI (n = 50)

| Age in Years | Male | Female | Total | %age |
|---|---|---|---|---|
| 0-19 | 0 | 0 | 0 | 0 |
| 20-39 | 9 (18.92%) | 1(7.69%) | 8 | 16 |
| 40-49 | 7 (18.92%) | 1 (7.69%) | 8 | 16 |
| >50 | 23 (62.16%) | 11 (84.62%) | 34 | 68 |
| Total | 37 (74%) | 13 (26%) | 50 | 10 |

Table 2: Mean values of serum lipids in patients with altered WHR (n = 50)

| Variables | Male | Female | Total (Mean value in mg/dl) |
|---|---|---|---|
| Total | 227.05 | 210.5 | 218.6 |

| | | | |
|---|---|---|---|
| cholesterol | | | |
| LDL-C | 164.40 | 154.30 | 159.35 |
| HDL-C | 34.32 | 35.15 | 34.73 |
| Triglycerides | 170.94 | 140.36 | 155.85 |

Table 3**:** HDL cholesterol level in patients with MI (n = 50)

| **HDL-C mg/dl** | **Male** | **Female** | **Total** | **%age** |
|---|---|---|---|---|
| < 35 | 22 (59.45%) | 5 (38.46%) | 27 | 54 |
| 35&> 35 | 15 (40.55%) | 8 (61.54%) | 23 | 46 |
| Total | 37 (74%) | 13 (26%) | 50 | 100 |

(P>0.05)

Table 4: Waist hip ratio in male and female with MI (n = 50)

| **WHR** | **Male** | **Female** | **Total** | **%age** |
|---|---|---|---|---|
| > 1 | 20 (27.2%) | 2 (8%) | 22 | 44 |
| ≤1 | 17 (72.98%) | 11 (92%) | 28 | 78 |
| Total | 37 (74%) | 13 (26%) | 50 | 100 |

(P>0.05)

In this study 27 (54%) patients had low HDL and out of them 22 (44%) had > 1 WHR. All the patients with increased WHR had decreased HDL level . It was also observed that these patients had high total cholesterol as compared to those with WHR < 1.

Patients having altered WHR had mean values of total cholesterol 218.6mg/dl, LDL-C was 159.35mg/dl, triglycerides were 155.85 and HDL – C was 34.73mg/dl (Table 2).

## DISCUSSION

Risk factors for myocardial infarction are well established .we have made an effort to exclude the high risk population on the basis of non-invasive investigations described in our study.

Most of the risk factors are age dependent and interrelated. Modifiable risk factors includes dyslipidemia, DM, HTN, smoking and central obesity[2]. The incidence of MI definitely increases with the increasing age. According to the results of our study there was a linear relation between age and IHD risk, 8 patients (16%) were less than 40 years as compared to 42 patients (84%) who were between 40-70 years of age.

Obesity is a recognized risk factor for cardiovascular diseases. As evaluated by body mass index (BMI), obesity is associated with increased morbidity and mortality due to chronic diseases, like type 2 diabetes, coronary artery disease and stroke .[9]. Body mass index is actually the amount of adipose tissue present in body. It does not differentiate between upper body obesity (waist and flanks) and low body obesity (thighs and buttocks). Waist hip ratio (WHR) is devised to make such differentiation. Increased WHR means waist measurements extending hip circumference. It is regarded as predictive of dyslipidemia and CAD. Having higher WHR there is increased risk of developing dyslipidemia, insulin resistance and CAD[10,11].

Study conducted by Gupta et al[12], the WHR was measured and it was observed that males having WHR of more than 0.9 and females having WHR more than 0.8 had dyslipidemias, high cholesterol level, (male 37% and females 4%) low HDl level (males 37% and females 45%). In our study the patients included had median values same as that of Gupta et al i.e. >0.85 for females and > 0.9 for males.

The common dyslipidemias were high total cholesterol (78% in males and 22% in females), LDL was high in 73% males and 27% females, low HDL level in about 60% males and 40% females. These observations were quite similar to internationally acceptable studies[12].

Another Indian study by Gupta et al [13] registered patients with WHR less than 0.88 as group A and more than 0.88 as group B. It was found that the group B had high prevalence of low HDL level and high triglycerides level with CAD. In our study we had found high total cholesterol, low HDL-C and high LDL-C level.

When Gupta et al [13] did study it was observed that all the patients with altered WHR were having decreased HDL however, 8 patients had increased HDL and a normal WHR, whereas other dyslipidemia were also observed.

A study comparing waist to high as a predictor of CAD was conducted by Akhtar et al[14]. That showed significant deaths as well as CAD risk factors in those who had high waist circumference and WHR had similar significant prediction of the risk as well deaths by CAD.

## CONCLUSION

WHR is the most suitable parameters for primary as well as secondary prevention of IHD. WHR can be used as marker of impending CAD similar to dyslipidemia. Moreover, lower abdominal fat around thighs and buttocks (pear like) as in females is associated with relative low risk of CAD as compared upper abdomen fat around flanks & abdomen in males.

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