

# Role of Triglyceride to High Density Lipoprotein Cholesterol Ratio as a Risk Factor of Coronary Artery Disease in Women

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## ABSTRACT

**Aim:** To assess the role of Triglyceride to High Density lipoprotein cholesterol (TG/HDL\_C) ratio as a risk factor of coronary heart disease in women

**Study design:** Cross sectional study.

**Place and duration of study:** The study was conducted in Ayub teaching Hospital, Abbottabad, for 8 months from January to August, 2010.

**Methods:** The study was conducted in 100 females known cardiac patients and 50 controls who were referred for Exercise tolerance test (ETT) for assessment of angina. The lipid profile for total cholesterol (TC), Triglyceride (TG), high density lipoprotein cholesterol (HDL\_C), Low density lipoprotein cholesterol (LDL\_C) levels were determined in fasting blood samples and analyzed for correlation.

**Results:** Lipid profile (TG, and HDL\_C) of the patients were deranged. Serum Triglyceride to High density lipoprotein cholesterol (TG/HDL\_C) ratio was found to be a risk factor for coronary heart disease in women.

**Conclusions:** The results of the investigation indicated that Triglyceride to high density lipoprotein cholesterol is associated with coronary heart disease.

**Keywords:** Coronary artery disease, cholesterol, triglyceride

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## INTRODUCTION

Coronary heart diseases (CHD) is one of the common cause of death in women, particularly in developed countries like the USA<sup>1</sup>. Pakistanis are part of an ethnic group that suffers from the highest prevalence rates of coronary artery disease compared to any throughout the world. CAD manifests at a younger age with a significant narrowing of the sex difference<sup>2</sup>. There is significant increase in the frequency of CAD in the local population, more so in the female population with a similar mortality over a decade<sup>3</sup>. Various risk factors have been identified, of which the important modifiable risk factors include diabetes mellitus, hypertension obesity and elevated serum cholesterol<sup>4</sup>.

Several studies have been carried out in Pakistan which show that the probability of CHD increases continuously due to different risk factors. In postmenopausal women decrease in estradiol level and associated decrease in HDL-C have been observed and may be responsible for the increased risk of coronary heart disease after menopause<sup>5</sup>. A low level of high density lipoprotein cholesterol

(HDL-C) is important in coronary heart disease development and has been widely accepted, whereas the role of hypertriglyceridemia remains controversial. Recent analysis shows that hypertriglyceridemia is an independent predictor of Coronary heart disease and it can be a stronger risk factor among women than among men<sup>6,7</sup>.

Limited data is available on prognostic utility of the TG/HDL-C ratio. Gaziano et al.<sup>8</sup> were the first to conduct a case control study and reported that, this ratio strongly predicts risk of Myocardial infarction in both sexes. The importance of abnormal TG/HDL-C ratios is highlighted further by the first ever study on TG/HDL-C related mortality published in August 2009, where the authors have shown that the TG/HDL-C ratio is a risk factor for mortality in women with suspected myocardial ischemia<sup>9</sup>.

Despite these studies globally, no studies on the TG/HDL-C ratio in predicting worse outcome in women have been carried out, although women represent a significant number of patients suffering from CHD. The present study is carried out to determine whether TG/HDL-C ratio is a predictor of CHD in women.

## PATIENTS AND METHODS

The study was conducted in the CCU and Cardiology OPD of Ayub Teaching Hospital for 8 months from January to August, 2010. Samples were collected

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from 150 patients referred for Exercise Tolerance Test (ETT) and those admitted in Coronary Care Unit (CCU). The patients were divided into two groups as follows;

**a) ETT group (Females referred for ETT)** based on a female prevalence of CHD of 56% (Khan et al., 2005) and a beta error of 10%, the calculated sample size according to the formula  $Z^2 (p) (q) / E^2$  is 95 cases. 100 cases of female patients admitted for myocardial infarction in CCU. Inclusion criteria was patient of any age referred for ETT because of angina/chest pain, having both positive and negative ETT results and without prior history of MI. Patients were not on any lipid altering medicine for the last two weeks.

**b) CCU group** Females suffering from Myocardial infarction (MI) were admitted to CCU. The females included in this group were not on any lipid altering medicine.

Data was collected on predesigned Performa. Variables of study included basic demographic data, reproductive history, nutritional assessment, past history, present complaints for both groups. Results of ETT, whether positive or negative and outcome of MI patients, whether survived or deceased, was noted to enable comparisons between groups.

Blood was collected from female patients that came for ETT in fasting condition and female patients admitted in CCU having MI in Ayub Teaching Hospital Abbottabad by using standard aseptic technique. The blood was withdrawn and quickly transferred by gentle ejection into clean centrifuge tubes. Then these were placed in centrifuge machine and centrifuged to get clear serum. This serum was used for lipid profile measurements including Serum /plasma total cholesterol, HDL-C and triglycerides. All these measurements were determined by using standard kits whereas LDL-C was calculated by using the Friedewald formula. The chi square test was used for comparing frequencies while T test was used for comparing means between two groups. A  $p \leq 0.05$  was taken significant.

## RESULTS

A total of 150 subjects selected as per inclusion and exclusion criteria were investigated. Out of these 100 were cases that had a positive history of Coronary heart diseases (CHD) and rest of them were controls (50).

The mean  $\pm$ SD concentration of serum Triglycerides of control(ETT referred) and cases (CCU patients) was  $2.14 \pm .80$  and  $1.68 \pm .55$ mmol/dl respectively. The mean SD concentration of triglyceride was significantly ( $p = 0.01$ ) decreased in case group.

The mean  $\pm$ SD concentration of serum HDL\_C of control(ETT referred) and cases (CCU patients) was  $1.029 \pm .36$  and  $0.930 \pm .238$ mmol/dl respectively. The mean SD concentration of HDL\_C was significantly ( $p = 0.03$ ) decreased in case group.

The mean  $\pm$ SD ratio of TG/ HDL\_C of control (ETT referred) and cases (CCU patients) was  $2.32 \pm 1.17$  and  $1.88 \pm .652$ mmol/dl respectively. The mean SD of TG/HDL-c RATIO was significantly ( $p = 0.002$ ) decreased.

The mean  $\pm$ SD concentration of serum LDL\_C of control (ETT referred) and cases (CCU patients) was  $3.55 \pm 1.42$  and  $3.20 \pm 1.22$ mmol/dl respectively. The mean SD concentration of LDL\_C was insignificantly ( $p = 0.06$ ) decreased.

The mean  $\pm$ SD concentration of serum Total cholesterol of control (ETT referred) and cases (CCU patients) was  $5.60 \pm 1.55$  and  $4.89 \pm 1.29$ mmol/dl respectively. The mean SD concentration of triglyceride was insignificantly ( $p = 0.17$ ) decreased in case group.

Table: Comparison of mean  $\pm$ standard deviation and p value of triglyceride, HDL\_C, ratio of TG/HDL\_C, LDL\_C and total cholesterol between controls (ETT group) and cases (CCU Patients).

Variables	Controls (ETT)	Cases (CCU)	P value
Triglyceride in mmol/dl	$2.14 \pm .805$	$1.689 \pm .552$	0.010
High Density lipoprotein cholesterol in mmol/dl	$1.029 \pm 0.368$	$0.930 \pm .238$	0.033
TG / HDL-C Ratio	$2.32 \pm 1.17$	$1.88 \pm .652$	0.002
Low density Lipoprotein in mmol/dl	$3.55 \pm 1.49$	$3.20 \pm 1.22$	0.065
Total cholesterol in mmol/dl	$5.606 \pm 1.55$	$4.899 \pm 1.29$	0.175

## DISCUSSION

In under developed countries, coronary heart disease is the leading cause of death<sup>10</sup>. In 2002 about one hundred thousand individuals suffered an acute myocardial infarction in Pakistan<sup>11</sup>. The strong association between lipid profile and coronary heart disease has been proved in several studies and hypercholesterolemia, hypertriglyceridemia and decreased HDL-C are considered as the classical factors for the atherosclerosis<sup>12</sup>. According to Framingham heart study half of the risk for coronary events results from known risk factors especially high LDL levels<sup>13</sup>. Of the modifiable risk factors reduction in LDL levels is associated with decrease in the incidence of coronary artery disease<sup>14</sup>.

The main pathological lesions identified in coronary artery disease patients have strongly been related to dyslipidemia and recently is now considered an inflammatory process<sup>15</sup>. Factors promoting atherogenesis include hypertension and dyslipidemia<sup>16</sup>.

In view of fact that very less data related to the TG /HDL was available in the Pakistani population and particularly not for Hazara division, this study was conducted to explore the association of TG /HDL ratio in female patients with CHD.

In the present study, 100 cases of CHD and 50 age and gender matched controls were investigated for their serum lipid profile i.e. TC, TG, HDL-C , LDL-C and fasting glucose levels. This study shows that Lipid profile of the coronary heart disease (CHD) patient is in above normal ranges and the principle finding of TG/HDL-C is also abnormal but cholesterol and LDL\_C was in normal range due to unknown reasons. Same study was conducted by Bittner et al<sup>9</sup>(2009) in America. According to his study lipid profile i.e. total cholesterol, TG, LDL and HDL of coronary heart patients increases from the normal range.

According to our study, Triglyceride/HDL\_C ratio is associated with incidence of Coronary heart disease in women. TG/HDL\_C ratio was found to be a risk factor of coronary heart disease in women but total cholesterol and LDL\_C were found to be in normal range.

## CONCLUSION

Based on results and comparison with contemporary studies which confirms the importance of serum TG/HDL-C ratio as a risk factor of CHD and other complication of atherosclerosis, it is concluded that routine screening for abnormal TG to HDL\_C ratio is highly specific and should be recommended, however serum total cholesterol and LDL\_C were not predictive of CAD in this study. Screening TG/HDL-C may be advisable for females who manifest atherothrombotic disease without their traditional risk factor or who have a family history of premature CHD.

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