Frequency and Pattern of Dyslipidaemia in Pakistani Females with Coronary Artery Disease

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Abstract

Objective: To determine the frequency and pattern of lipid abnormalities in diagnosed female patients of coronary artery disease in a tertiary care hospital of Karachi.

Methods: This cross-sectional study was conducted from January 2016 to August 2016. A total of 300 female patients of Coronary Artery Disease (CAD), diagnosed on the basis of angiography were included in the study. For detection of lipid profile abnormalities five ml of fasting venous sample of 10-12 hours was obtained from the left median cubital vein under aseptic conditions. The blood was centrifuged for 5 minutes. Automated chemistry analyzer was used for lipid profile measurement via kits of the CYPRESS Laboratory (Langdorp, Belgium). Statistical analysis was done via SPSS version 17 and results were expressed as percentage and mean ± standard deviation.

Results: Mean age of recruited females was 51.36 ± 13.71 years. About 81.39% of patients were found with abnormal lipid profile. The frequency of low high-density lipoprotein cholesterol in studied population was 61.66%, high triglycerides 19.33% whereas; high low-density lipoprotein cholesterol was 17.33% respectively. Combined two parameter dyslipidaemia patterns was found in 41.32% followed by mixed dyslipidaemia in 19.33%, while isolated high-density lipoprotein hypocholesteraemia in 12.00% of study population.

Conclusion: We conclude that low levels of high-density lipoprotein cholesterol and hypertriglyceridemia, in both combined and isolated pattern, are more prevalent in Pakistani females with CAD. The data from the current study may increase the knowledge of the guidelines for lipid lowering need in females.

Keywords: Coronary artery disease, dyslipidaemias, cholesterol.

Introduction

Coronary Artery Disease (CAD) is the major cause of morbidity and mortality in females of both developed and developing countries especially in south Asian population[1]. It has been established by

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Date of Submission: 11th March 2019
Date of Acceptance: 25th July 2019

various studies that one in every two women die of a heart disease, which personifies more expiries than due to cancer, renal or hepatic failure, and accidents combined[2-3]. Dyslipidaemia is one of the clearly identified, independent and modifiable risk factor for CAD, prevailing among women in high ratio[4]. Dyslipidaemia is a metabolic irregularity that leads to a persistent change in the plasma levels of one or more out of four parameters including; total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C). All the cholesterol and lipids are not bad. Categorically, cholesterol is an essential fat. It provides stability in every cell of body. While traveling through the bloodstream, cholesterol needs some transporters called lipoproteins. Each lipoprotein has its own preferences for choles-

terol, and each acts differently with the cholesterol it carries[5]. Atherosclerosis is an inflammatory process which starts in the wall of blood vessels. There is accumulation of oxidized LDL-C in vascular endothelial cells of coronary arteries. LDL is made up of an outer rim of lipoprotein and a cholesterol centre. It is considered as bad cholesterol because it becomes part of plaque. Although Heart attacks are unpredictable, however, higher levels of LDL-C may raise odds of heart disease[6]. Atherosclerosis begins with damage to the wall of blood vessels, starts even in first decade of life. Hypertension, smoking, or high cholesterol levels enhance the formation of plaque in blood vessels. The pathophysiology of atherosclerosis includes increased concentration of free fatty acids, insulin sensitive pathways variation and low-grade inflammation[7]. The National Cholesterol Education Adult Treatment Panel suggests that HDL-C levels are considered to be a significant CAD risk factor in women if it is less than 50 mg/dl; this is 10 mg/dl higher than the indorsed level for men.HDL cholesterol is considered as the well-behaved and friendly scavenger in blood also known as "good cholesterol". High levels of HDL-C detoxify the harmful bad cholesterol reduce the risk for heart disease. Microscopically HDL molecule comprises of cholesterol center surrounded by lipoprotein rim. The HDC particle is dense as compared to other types of cholesterol particles, so it's called high density cholesterol[8].

In several studies, it has been noted that low HDL-C and high triglycerides were strong predictors of death in women caused by coronary artery disease[9]. Women who had HDL-C levels less than 50 mg/dl had a 30% increased risk for cardiovascular disease[10]. Although, identification and evaluation of dyslipidaemia in every population is very necessary to prevent incidence of cardiovascular diseases, there are no appropriate and detailed statistical records on the manifestation of dyslipidaemia and its defining factors in majority of nations. In past few years, a number of studies have been conducted in Pakistan to observe prevalence of dyslipidaemia in diabetic patients[11-13]. Few studies reported the association of CAD and dyslipidaemia among South Asian population and Irani population[14-16]. However, in Pakistan, there is a paucity of population-level data on lipid levels and coronary ar-

tery disease specially in females, although, heart diseases are emerging cause of number of deaths in Pakistani females, so in current study we focused on frequency of abnormal lipid profiles in females presenting with CAD in tertiary care hospital of Karachi.

Subjects and Methods

A cross-sectional study was done to analyse the pattern and prevalence of dyslipidemia in diagnosed female patients of coronary artery disease in tertiary care hospital of Karachi, during Jan 2016-Aug 2016. The sample size was calculated by open-epi-formula. The study population included 300 female patients. Diagnosis of CAD was done on the basis of angiography. The diagnostic criterion was blockage of more than 50% of one or more coronary arteries. All patients were informed about the protocol and significance of study. Written consents were obtained. Information about participants' age, life style, occupation and family history of heart disease was recorded. Female patients of coronary artery disease (CAD) were included in this study. Diagnosis was made on the base of angiography. Patients with stroke, malignancy, renal and hepatic disorders, known thyroid disorder, were excluded from the study. Pregnant females were also not included in current study. Acute or chronic infection and pregnant women were excluded from the study. Blood samples of patients were taken, after overnight fasting, from medial cubital vein under aseptic measures. Total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) and serum triglycerides (TG), were determined by an enzymatic method via commercial kits of the CY-PRESS Laboratory (Langdorp, Belgium).

For the enzymatic measurement of Total Cholesterol in plasma, hydrolysis of cholesteryl esters and oxidation of the 3-OH group of cholesterol and produced, H_2O_2.

Triglycerides were measured enzymatically in the plasma by producing glycerol. Glycerol oxidase enzyme caused oxidation of glycerol and produced H_2O_2, which was measured quantitatively in a peroxidase-catalyzed reaction that produced a color. The color intensity was proportional to cholesterol

Table 1. Distribution of patients according to age and anthropometric characteristics and risk factors of coronary artery disease

Characteristics	n= 300 (%)	Mean ± SD
Age (year)	Below 40=113 (37.66%)	
	Above 40=187 (62.33%)	57.36 ± 13.7`
Height (feet/inches)	4.5-4.8 =65 (21.5%)	
	4.8-5.0= 95 (35%)	
	5.0-5.2= 84(29%)	
	5.2-5.5= 53(14%)	4.7 ± 2.7
Weight (kgs)	45-55= 37 (8%)	
	56-65= 77 (29%)	
	66-75= 96 (40%)	
	76-85= 69 (23%)	74.05 ± 10.13
BMI	Below 18.5= 22 (7.33%)	
	Between 18.6-24-9= 89 (29.66%)	
	Above 25 = 146 (48.66%)	
	Above 30 = 43 (14.33%)	26.99 ± 3.97
Hypertension	Yes= 106 (28%)	
	No=194 (72%)	
Diabetes mellitus	Yes= 168 (56.00%)	
	No=132 (44.00%)	
Smoking	Yes= 91 (43%)	
	No=164(57%)	
Regular exercise(walk)	Yes= 30 (10%)	
	No=270 (90%)	
Family history of heart disease	Yes=173(61.5%)	
	No=127 (38.5%)	

Table 2. Serum levels of lipids and distribution of female patients of CAD according to lipid profile abnormalities

Serum lipid levels	Mean ± SD
HDL-C	43.76 ± 6.89
LDL-C	132.08 ± 13.98
Triglycerides	512.75 ± 14.66

Parameters	Values mg/dl	n=300 (%)
Total cholesterol	Low<200	61(15.90%)
	Normal=200-239	232(80.70%)
	High > 240	29(3.40%)
HDL-C	Low< 50	124(41.33%)
	Normal =50	115(38.33%)
	High >50	10(3.33%)
LDL-C	Low 100	65(21.66%)
	Normal 100-190	193(64.33%)
	High > 190	52(17.33%)
TG	Low < 100	132(44.00%)
	Normal 100-150	110(36.60%)
	High > 150	58(19.33%)

LDL: Low Density Lipoprotein, HDL: High Density Lipoprotein, TG: triglycerides, TC: total cholesterol

Table 3. Pattern of dyslipidaemia in female patients of CAD

Combined parameters	124 (41.32%)
a) LDL> 100 mg/dl, HDL < 50 mg/dl	68 (22.66%)
(b) TG >150 mg/dl, HDL< 50 mg/dl	45(15.00%)
(c) LDL >100 mg/dl, TG>150 mg/dl	11 (3.66%)
Isolated parameters	67 (22.33%)
(a) LDL > 100 mg/dl, TG< 150 mg/dl & HDL > 50 mg/dl	18 (6.00%)
(b) LDL<100 mg/dl, TG≥150 mg/dl & HDL≥50 mg/dl	13 (4.33%)
(c) LDL<100 mg/dl, TG<150 mg/dl & HDL <50 mg/dl	36 (12.00%)
Mixed dyslipidemia	58 (19.32%)

concentration absorbance was measured at 500 nm. HDL is measured directly in plasma. The apoB containing lipoproteins in the specimen were reacted with a blocking reagent and became non-reactive with the enzymatic cholesterol reagent, thus effectively excluded from the assay and only HDL-cholesterol was detected under the assay conditions. LDL-cholesterol was calculated from measured values of total cholesterol, triglycerides and HDL cholesterol by this formula: (LDL-C) = (Total cholesterol) - (HDL-C) - (TG)/5.

Patients owing one or more parameters (TG, HDL-C, or LDL-C) outside the ranges mentioned by American heart Association were considered as victim of dyslipidaemia, which includes TG ≥150 mg/dl, LDL-C ≥100mg/dl, HDL-C ≤50 mg/dl. On the basis of data, dyslipidaemia was further classified into mixed dyslipidaemia (all three parameters abnormal; LDL≥100 mg/dl, TG ≥150 mg/dl & HDL< 50 mg/dl), combined two parameter dyslipidaemia (any two parameters abnormal), further categorized in three groups; group 1: LDL ≥100 mg/dl, HDL≤50 mg/dl, group 2: TG≥150 mg/dl, HDL≤50 mg/dl and group 3: TG ≥150mg/dl LDL ≥100mg/dl. Isolated single parameter dyslipidaemia in which one out of three parameter raise, put in three groups; group1: LDL ≥100 mg/dl, TG ≤150 mg/dl & HDL ≥50 mg/dl, group 2: LDL ≥100 mg/dl, TG ≤150 mg/dl & HDL≥ 50 mg/dl) and group 3: LDL≤100 mg/dl, TG≥150 mg/dl & HDL≥50 mg/dl 58.

All the observations were tabulated and results were expressed as percentage and mean ± standard deviation via SPSS 17.

Results

The mean age of studied population was 57.36 ± 13.71 years with a minimum of 35 years and a maximum of 75 years. In this study 37.66% (n=133) were below 40 years of age while 62.33% (n=187) were above 40 years. The mean height 4.7 ± 2.7, mean weight 74.05 ± 10.13 and mean BMI 26.99 ± 3.97 were observed respectively (Table 1). Out of 300 females suffering from coronary artery disease 28% (n= 106) patients were hypertensive, whereas 56.00% (n=168) had sedentary life style with no exercise or walk in their daily routine. Family history of heart disease was found in 173 patients (Table 1). Individual serum lipid levels of females are shown in Table 2. Mean HDL-C was 43.76 ± 6.89, mean LDL-C was 132.08 ± 13.98 and mean serum TG was 152.75 ± 14.66 observed in female patients of CAD. In current study prevalence of dyslipidaemia in female patients with CAD was 81.39%. The most prevalent lipid abnormality was low HDL-C found in 41.33% (n=124) of CAD patients, TG levels raised in 19.33% (n=58), while high LDL-C was seen 17.33% (n=52) of patients. The most prevalent combined two parameterdyslipidaemia found in current study was high LDL-C and low HDL-C 22.66% of female patients suffering from CAD. The second most common pattern high TG and low HDL 15.00% was observed. Whereas, an isolated dyslipidaemia that effects the 22.33% females was low HDL-C 12%, followed by high LDL 6% and Hypertriglyceridemia was found in 4.00% of studied population. So out of 300 patients 41.32% showed combined pattern of dyslipidaemia, 22.33% had isolated parameter dyslipidaemia whereas, mixed dyslipidaemia was found in 19.32% of studied population (Table 3).

Discussion

Surveillance and investigation of population is fundamental in monitoring different risk factors for coronary artery diseases; but there is a paucity of data about modifiable and non-modifiable risk factors of CAD. There is little information about abnormal lipid profiles on female population of Pakistan. In current study, we studied the plasma lipid trends and irregularitiesin female patients of CAD.

Considering high LDL cholesterol(≥100mg/dl), low HDL cholesterol(≤50 mg/dl) and high TG(≥150 mg/dl), the ranges mentioned by American heart Association[16] are considered as the risk factors of coronary artery disease, in current study prevalence of dyslipidaemia in female patients of CAD was found 81.39%. This is comparable with the study where lipid abnormality was found in 84 % of diabetic females conducted in Nepal[17], while study conducted in Bangladesh by Das H has revealed 71% females having dyslipidaemia[18]. Suganthan et al has observed 68.4% females with dyslipidaemia in srilankan population[19]. Dewakar et al. detected dyslipidaemia in 89% of studied population of females suffering from diabetes[20], where as in the study by kaur et al. the prevalence of dyslipidaemia was 97.5% in female with diabetes mellitus[20]. Surfaraz et al. found 98% diabetic patients with abnormal lipid profile[12]; however, Zaid et al has observed that 63% healthy individuals of Pakistan are victims of abnormal lipid profiles[11]. In contrast, low prevalence of dyslipidaemia was found in adults ofIran by Mohammad Beige[15]. The possible contributing factors of the high frequency of dyslipidaemia in various populations may be modern life style associated with increasing urbanization, less physical activity and change of dietary habits.

The most prevalent lipid abnormality in our study was low HDL-C (41.33%) followed by high TG (19.33%). M Surfaraz et al observed high LDL (89.5%) and low HDL (70.5%) in diabetic females[12], whereas, another study by Naheed et al. found high HDL-C with high LDL-C in diabetic patients[13]. Zaid et al found the low HDL-C level (17.22%) and high TG level (11.2%).

In our study, most common pattern is combined two para-meter dyslipidaemia with high LDL-C and low HDL-C (22.6%) comparable with the study by by M Sarfaraz et al. which reported the combined dyslipidaemia with high LDL and low HDL (22.5%) in hyperglycaemic females.Kaur et al. also observed this pattern in diabetic females (33%)[21]. Borle et al. found this pattern in bhopali females (56.46%)[22].

In our study,second most common pattern of dyslipidaemia was combined, two parameter dyslipidaemia in which there was high TG with low

HDL (15 %), which was very similar to results of study in Nepal found this pattern in 13.63% of study group[5]. Whereas, in a study done by Borleet al. in Bhopal, the second most common pattern of dyslipidaemia among females was isolated low HDL affecting 32.5%, that is the third common pattern in our study group effecting 12% of study population. Kandula et al. conducted a study in Hyderabad (India) showing that prevalence of dyslipidaemia was 86%, while high total cholesterol was 41%, LDL was 64%, triglycerides was 47% and low HDL was 71%[23]. Zaid et al. revealed after isolated low HDL-C level, the most prevalent form of plasma lipid abnormity was isolated high TG level about 11.2%.

A study conducted in Nishtar Hospital Multan showed that 21% patients with diabetes had raised serum cholesterol and 34.2% had raised serum triglyceride level. While M.Surfaraz et al. found 29% patients with high serum cholesterol and 42% with high TG in hyperglycaemic patients, as compared to our results which revealed 3.4% patients with increased level of TC and 19.33% patients with high serum levels of TG. The different lipid profiles may be due to different dietary habits of people in different cities of the country.

Current study has shown that 56% of our studied females have sedentary life style with no exercise in their daily routine. The important fact observed while collecting data was unawareness about abnormal lipid levels and bad and good cholesterol. The frequency of undiagnosed dyslipidaemia was very high among female patients of CAD. Therefore, creating awareness regarding healthy life style, knowing about good and bad cholesterol, and good dietary habits may decrease the occurrence of dyslipidaemia and other associated disease. In this study, it was also found that 61.5% females had positive family history of heart disease, so screening of lipid profile for any abnormality should be done to prevent major cardiac events.

Conclusion

We conclude that frequency of both combined and isolated dyslipidaemia is very high in our study group. Low levels of HDL-C and hypertriglyceridemia are more prevalent. Controlling abnormal lipid levels from optimal to normal levels may prevent up to 50-80% of major acute coronary events. The overall prevalence of undiagnosed dyslipidaemia was higher than diagnosed dyslipidaemia. This fact is indicating the level of unawareness and negligence of lipid status in females. Therefore, our health care management system should improve its strategies to reduce the burden of this important CAD risk factor. There is a need of more research efforts in both, clinical and experimental fields for awareness and management of dyslipidaemia in Pakistani population specially females.

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