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Patients with Coronary Heart Disease with Lipid Profile

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ABSTRACT

Background: The lipid profile and their ratio are important in management and follow up of patients with coronary heart disease. We studied the lipid profile and their ratios with proven coronary artery disease. Methods: It was retrospective study to determine the lipid profile and their ratios in patients with proven coronary artery disease at Shakuntala Pathology Lab., Nagpur. 200 patients were studied. Results: Out of 200 patients studied, 126 (63%) were males while 74 (37%) were females. out of 126 males,12 (9.52%) had raised cholesterol values of >200 mg/dL. 20 (15.87%) had raised triglyceride values of >200 mg/dL. 30 (23.80%) had lower HDL values of 150 mg/dL. 90 (71.42%) had raised values of >3.5 for cholesterol to HDL ratio. Out of 74 female patients, 20 (27.02%) patients had raised cholesterol values. 12 (16.21%) patients had raised triglycerides values. 13 (17.56%) patients had lower HDL values. 6 (8.10%) patients had raised LDL values. 50 (67.56%) patients had raised values for cholesterol to HDL ratio. Conclusions: Our study shows more prevalence of coronary heart disease in males than females. Hypercholesteremia and hypertriglyceridemia was more prevalent in females. HDL values were lowered in more number of males than females. LDL values were raised in more number of females than males. Total cholesterol to HDL ratio was raised in more number of males than females.

Keywords: Coronary heart disease, LDL, HDL, Triglycerides

INTRODUCTION

The present study was undertaken with an objective to frame out the lipid and lipoprotein profile in coronary heart disease patients who are on treatment and come for follow up investigations Dyslipidemia is one of the primary causes for coronary artery disease (CAD). Elevated total cholesterol (TC), triglycerides (TG), low-density lipoprotein-cholesterol (LDL-C) and lowered high-density lipoproteincholesterol (HDL-C) are conventional risk factors in myocardial infarction patients.[1] The prevalence and mortality rates of coronary artery disease have been known to be higher in the Indian than the western population.[2] Isolated hypercholesterolemia was defined as serum cholesterol over 200 mg/dL with normal serum triglyceride levels (≤200 mg/dL); isolated hypertriglyceridemia was defined as serum triglyceride level over 200 mg/dL with normal serum cholesterol levels (≤200 mg/dL). Isolated low high-density lipoprotein was defined as one below 35 mg/dL with normal serum triglyceride levels. Isolated high low-density lipoprotein cholesterol was defined as one over 150 mg/dL with normal serum triglyceride levels. Normolipidemia was defined as serum cholesterol and serum triglyceride both up to 200 mg/dL, HDL 35 mg/dL or above and LDL up to 150 mg/dL.[3] The National Institutes of Health

Consensus Development Conference on lipid lowering has recommended that cholesterol levels be reduced to 200 mg/dl in all persons.[4]

In the United States, coronary heart disease is the major cause of death and disability in women and in men.[5] Genetic determinants, dietary cholesterol, dietary fat, total caloric intake, alcohol consumption, cigarette smoking, and physical activity are known to influence concentrations of lipids in women.5 The few studies that have examined the association of total cholesterol with coronary heart disease occurrence and mortality in women have consistently shown that women have much lower rates of coronary heart disease than men at the same values for cholesterol, and clearly elevated risk for coronary heart disease in women is evident only at relatively high values of total cholesterol (i.e., greater than 260 mg/dL). There also appears to be an age effect, with total cholesterol concentrations being more predictive in older than in younger women.[5]American Heart Association/American College of Cardiology guidelines recommend adherence to a set of dietary and lifestyle habits including body weight control and physical activity.[5] Excess intake of saturated fatty acids associated with decreased cereals, fruit and vegetables does not only alter the lipid profile but also increases the risk of coronary disease. An elevated total/HDL cholesterol ratio and the presence of lipoprotein constitute significant risk factors for coronary events. On the other hand, high HDL cholesterol levels (>45 mg/dl) are considered to be protective in women.[5] Diabetes definitely increases the effects of the other risk factors and modifies the protective effect by estrogens.[5]

A body mass index <24.9 kg/m2 and a waist circumference <80 cm are recommended so as to decrease the likelihood of developing a menopausal insulin-resistance syndrome.[5] In men, a sedentary lifestyle is correlated with a higher cardiovascular and all-cause mortality.

Men and women share some risk factors, including high serum cholesterol levels, adverse lipoprotein profile, smoking, hypertension, diabetes, obesity, advanced age, and according to some studies sedentary life style. Additional factors that may affect women more than men are elevated serum triglyceride levels, natural or surgical menopause, use of oral contraceptives (OCs), and possibly hormonal substitution therapy.[6] Average total cholesterol and LDL cholesterol are higher in men than in premenopausal women, but women's levels rise after menopause until they eventually exceed those of men.[6]

Several studies have shown that high serum concentrations of total and LDL cholesterol and relatively low levels of HDL cholesterol are correlated with development of atherosclerotic lesions and increased cardiovascular risk in men, and that lowering cholesterol reduces the risk.6 Many studies have demonstrated that postmenopausal use of estrogens alone result in a decrease in LDL and an increase in HDL levels.[6]

Low density lipoprotein cholesterol levels rise with age in both men and women. HDL levels decline after menopause. Special aspects of coronary risk in women include the stronger role of diabetes, hyper-triglyceridemia and HDL.[7]

The focus of medical intervention is to reduce LDL cholesterol levels to at least 160 mg/dl, and ideally to below 130 mg/dl, either through dietary changes or cholesterol lowering drugs such as niacin.7 Researchers are seeking to identify a regimen that maintains the positive impact of the estrogen-progestin combination on uterine mucosa while preserving the beneficial effects of estrogen in circulating lipoproteins.[7]

Aims and objectives

- To frame out the lipid and lipoprotein profile in coronary heart disease patients who are on treatment and come for follow up investigations.
- To determine the relative importance of isolated hypercholesterolemia, isolated hypertriglyceridemia, isolated high low-density lipoprotein and isolated low high-density lipoprotein in coronary artery disease.

METHODS

The present study was undertaken with an objective to frame out the lipid and lipoprotein profile in coronary heart disease patients who are on treatment and come for follow up investigations to Shakuntala Pathology Lab., Nagpur.

The relative importance of isolated hypercholesterolemia, isolated hypertriglyceridemia, isolated high low-density lipoprotein and isolated low high-density lipoprotein in coronary artery disease was also assessed.

It was a retrospective study of 200 patients from January 2017 to April 2017.

Selection criteria

Men and women between 35 to 75 years of age were selected.

Inclusion criteria

Men and women proved to have coronary heart disease were included.

Exclusion criteria

Men and women without proven heart disease who came for routine screening were excluded.

Permission from the director of pathology lab was taken. He is one of the authors of this paper.

Following investigations were done during follow up-

- Total cholesterol-N- ≤200 mg/dL, >200 mg/dL as abnormal level.
- Triglycerides-N- ≤200 mg/dL, >200 mg/dL as abnormal level.
- HDL cholesterol- N- up to 35 mg/dL, <35 mg/dL as abnormal level.
- LDL cholesterol-N- up to 150 mg/dL, >150 mg/dL as abnormal level.
- Cholesterol: HDL ratio- N- <3.5 to 1, >3.5 as abnormal level.

These values were taken as standard as these values are cited in large number of patients.3 The study group comprised of 17,885 patients.3

Isolated hypercholesterolemia was defined as serum cholesterol over 200 mg/dL with normal serum triglyceride levels (≤200 mg/dL); isolated hyper-triglyceridemia was defined as serum triglyceride level over 200 mg/dL with normal serum cholesterol levels (≤200 mg/dL). Isolated low high-density lipoprotein was defined as one below 35 mg/dL with normal serum triglyceride levels. Isolated high low-density lipoprotein cholesterol was defined as one over 150 mg/dL with normal serum triglyceride levels. Normolipidemia was defined as serum cholesterol and serum triglyceride both up to 200 mg/dL, high-density lipoprotein 35 mg/dL or above and low-density lipoprotein up to 150 mg/dL.3

Data was collected in Microsoft excel 2007. Statistics was taken out in numbers and percentages.

RESULTS

In present study, out of 200 patients studied, 126 (63%) were males while 74 (37%) were females. This shows more prevalence of coronary heart disease in males than females (Table 1).

In present study, out of 126 male patients, maximum patients i.e. 38 (19%) were between 40-50 years, 32 (16%) patients were between 50-60 years, 30 (15%) were above 60 years of age while 26 (13%) were below 40 years of age

Table 1: Age and sex distribution.

Agein years	Totalno. of males	%	Total offemales	no.%
<40	26	13	8	4
40-50	38	19	20	10
50-60	32	16	26	13
>60	30	15	20	10
Total	126	63	74	37

Inourstudy, out of 74female patients, maximumpatients i.e.26(13%) were between 50-60years,20(10%)were between 40-50 years, 20 (10%) were above 60 years of age while 8 (4%) patients were below 40 years of age (Table 1).

Table2:Total cholesterol and triglyceridevalues.

	Total no.of males	%	Total no. of females	%
Totalcholesterol				
>200	12	9.52	20	27.02
Normalvalues	114	90.47	54	72.97
Triglycerides				
>200	20	15.87	12	16.21
Normalvalues	106	84.12	62	83.78

In present study, out of 126 males, 114 (90.47%) had normal values for cholesterol, 12 (9.52%) had raised cholesterol values of >200 mg/dL (Table 2).

In our study, out of 74 female patients, 54 (72.97%) patients had normal values for cholesterol while 20 (27.02%) patients had raised cholesterol values of >200 mg/dL. So in all, 168 (84%) patients including males and females had normal values for cholesterol. Total 32(16%) patients including males and females had raised values for cholesterol. Hypercholesteremia was more prevalent in females.

In present study, out of 126 males, 106 (84.12%) had normal values for triglycerides, 20 (15.87%) had raised triglyceride values of >200 mg/dL.

In our study, out of 74 female patients, 62 (83.78%) patients had normal values for triglycerides while 12 (16.21%) patients had raised triglycerides values of >200 mg/dL. 168 (84%) patients including males and females had normal values for triglycerides. Total 32 (16%) patients including males and females had raised valuesfor triglycerides. Hypertriglyceridemia was more prevalent in females.

In present study, out of 126 males, 96 (76.19%) had normal values for HDL, 30 (23.80%) had lower

HDL values of <35 mg/dL (Table 3).

Table3: HDLandLDLvalues

	Totalno. of males	%	Total no. offemales	%
Total HDL				
<35 mg/dL	30	23.80	13	17.56
Normal values	96	76.19	61	82.43
Total LDL				
>150 mg/dL	5	3.96	6	8.10
Normal values	121	96.03	68	91.89

In our study, out of 74 female patients, 61 (82.43%) patients had normal values for HDL while 13 (17.56%) patients had lower HDL values of <35 mg/dL. 157 (78.5%)patientsincluding males and females had normal values for HDL. Total 43 (21.5%) patients including males and females had raised values for HDL (Table 3). HDL values were lowered in more no. of males than females.

In present study, out of 126 males, 121 (96.03%) had normal valuesfor LDL,5(3.96%)hadraised LDLvalues of >150 mg/dL. In our study, out of 74 female patients,68 (91.89%) patients had normal values for LDL while 6 (8.10%) patients had raised LDL values of >150 mg/dL. 189 (94.5%) patients including males and females had normal values for LDL. Total 11 (5.5%) patients including males and females had raised values for LDL (Table3).LDLvalues wereraisedinmore no.offe males than males.

Table4: Total cholesterol to HDLratio.

Total cholesterolto HDL ratio	Total males	no.of%	Totalno. of females	%
>3.5	90	71.42	50	67.56
Normalvalues	36	28.57	25	33.78

In present study, out of 126 males, 36 (28.57%) had normal values for total cholesterol to HDL ratio, 90 (71.42%) had raised values of >3.5 (Table 4). In our study, out of 74 female patients, 25 (33.78%) patientshad normal values fortotalcholesteroltoHDLratio, while50 (67.56%) patients had raised values of >3.5. 61 (30.5%) patients including males and females had normal values for total cholesterol to HDL ratio. Total 140 (70%) patients including males and females had raised valuesfor total cholesterol to HDL ratio. Total cholesterol to HDL ratio was raised in more no. of males than females

DISCUSSION

In present study, out of 200 patients studied, 126 (63%) were males while 74 (37%) were females. This shows more prevalence of coronary heart disease in males than females. Adak et al found that out of 599 total patients, 317 patients were male and 282 patients were female.[1] In present study, out of 126 male patients, maximum patients i.e. 38 (19%) were between 40-50 years, 32 (16%) patients were between

50-60 years, 30 (15%) were above 60 years of age while 26 (13%) were below 40 years of age.
In our study, out of 74 female patients, maximum patients i.e. 26 (13%) were between 50-60 years, 20 (10%) were between 40-50 years, 20 (10%) were above 60 years of age while 8 (4%) patients were below 40 years of age.
Adak et al found that the mean±SD (mg/dl) levels of lipid, lipoprotein and their ratio among different age group were found increased with increasing age and these were statistically significant when compared with healthy control group.1
In present study, out of 126 males, 114 (90.47%) had normal values for cholesterol, 12 (9.52%) had raised cholesterol values of >200 mg/dL.
In our study, out of 74 female patients, 54 (72.97%) patients had normal values for cholesterol while 20 (27.02%) patients had raised cholesterol values of >200 mg/dL. Hypercholesteremia was more prevalent in females.
In present study, out of 126 males, 106 (84.12%) had normal values for triglycerides, 20 (15.87%) had raised triglyceride values of >200 mg/dL.
In our study, out of 74 female patients, 62 (83.78%) patients had normal values for triglycerides while 12 (16.21%) patients had raised triglycerides values of >200 mg/dL. Hypertriglyceridemia was more prevalent in females.
In present study, out of 126 males, 96 (76.19%) had normal values for HDL, 30 (23.80%) had lower HDL values of <35 mg/dL. In our study, out of 74 female patients, 61 (82.43%) patients had normal values for HDL while 13 (17.56%) patients had lower HDL values of <35 mg/dL.
Adak M et al found desirable TC level (<200 mg/dl) in 73.0%, normal TG level (<150 mg/dl) in 59.0%, optimal level of HDL-C (<40 mg/dl) in 82.0% and normal LDL-C (<129 mg/dl) in 32.0%. Nearly 16% male and female had normal (40-60 mg/dl) HDL-C respectively.1
In present study, out of 126 males, 121 (96.03%) had normal values for LDL, 5 (3.96%) had raised LDL values of >150 mg/dL. In our study, out of 74 female patients, 68 (91.89%) patients had normal values for LDL while 6 (8.10%) patients had raised LDL values of >150 mg/dL.
Adak et al found that higher percentage of female (46.8%) than male (34.9%) had optimal level of LDL-C (<100 mg/dl). About 20.0% male had very high level of LDL-C (>160 mg/dl) while it was noted in 6.7% of female patients.1
In present study, out of 126 males, 36 (28.57%) had normal values for total cholesterol to HDL ratio, 90 (71.42%) had raised values of >3.5. In our study, out of 74 female patients, 25 (33.78%) patients had normal values for total cholesterol to HDL ratio, while 50 (67.56%) patients had raised values of >3.5
Adak et al found that the mean±SD (mg/dl) levels of lipid, lipoprotein and their ratio among different age group were found increased with increasing age and these were statistically significant when compared with healthy control group.1
Adak et al found that higher ratio of TC/HDL-C in both male and female patients was observed compared to controls and it was highest among >70 years age group. Higher ratio of LDL-C/HDL-C of all age group in male patients was observed when compared with control and it was statistically significant while in female patients the ratio was found increased significantly ($p<0.05$) after the age of 50 years.1
Adak et al found that the mean±SD (mg/dl) levels of lipid, lipoprotein and their ratio among different age group were found increased with increasing age and these were statistically significant when compared with healthy control group.1

Goel et al found that in subjects with coronary artery disease and normal coronary arteries, the levels of mean total cholesterol recorded were 178.5±42.1 mg/dl v. 154.1±40.2 mg/dl (p<0.001), high-density lipoprotein cholesterol 30.6±9 mg/dl v. 27.3±6.8 mg/dl (p<0.001), low-density lipoprotein cholesterol 109.8±35.4 mg/dl v 93.6±33.9 mg/dl (p<0.001), and triglyceride 190.7±95.4 mg/dl v. 157.6±73.5 mg/dl (p<0.001), respectively. In subgroup analysis by age, the younger coronary artery disease group (≤40 years) had significantly higher total and low-density lipoprotein cholesterol levels than the older group (>40 years), viz. 194.6±51.4 mg/dl v. 176.3±40.2 mg/dl (p<0.001), and 118.3±39.6 mg/dl v. 108.7±36.1 mg/dl (p=0.001). Triglyceride levels were not significantly different [211.7±105.1 mg/dl v. 187.8±93.6 mg/dl (p=ns)], being equally high in both subgroups and, although high-density lipoprotein cholesterol levels were different, this difference was minimal, being equally low in both [32.7±9.5 mg/dl v. 30.3±9.0 mg/dl (p=ns)].2

Rajmohan found that the prevalence of coronary artery disease was significantly high among patients with isolated hypercholesterolemia (4.1%; p<0.001), isolated high low-density lipoprotein (4.5%; p<0.001) and isolated low high-density lipoprotein (3.9%; p=0.005) compared to normolipidemic individuals (2.8%), but not in those with isolated hypertriglyceridemia (3.4%). The odds ratios for coronary artery disease increased with each quartiles of isolated cholesterol, isolated low-density lipoprotein cholesterol and total cholesterol to high-density lipoprotein ratio and reached statistical significance in the last quartile (p<0.05).3

Castelli found that the level of total cholesterol proved to be an excellent predictor of coronary heart disease in those aged less than 50 years. However, in those aged over 50 years, more accurate predictors of coronary heart disease risk were serum lipoprotein measurements, including low-density lipoproteins, very-low-density lipoproteins, very-low-density lipoprotein triglycerides, and high-density lipoproteins. Both low-density and very-low density lipoproteins have a linear association with coronary heart disease.4

Haddad et al found that the mean plasma cholesterol for CAD is 231.43±57.99 mg/dl versus 202.8±36.58 in the control group (p<0.0003). High density lipoprotein 35.98±9.37 versus 44.43±8.34 (p=0.00011). Low density lipoprotein 146.75±50.93 versus 118.97±45.9 (p=0.003). Triglyceride level 246.95±142.1 versus 164 mg/l±93.78 (p=0.0002). The prevalence of high plasma cholesterol, triglycerides, LDL-C and low HDL-C was 60.9%, 68.3%, 63.5% and 48.4%.[8]

Limbu et al found the mean age: 42.8±15.5 years. The mean level of total cholesterol, triglyceride, LDL and HDL was 184±50.7, 147.4±79.9, 111.9±42.0 and 45.0±11.7, respectively. All lipid levels except LDL were higher among 41 to 60 years age group while LDL was higher among participants aged >60 years. Desirable TC level was found in 78.0% while the normal TG and LDL was found in 61.5% and 72.0%, respectively. High TC (> or =240 mg/dl) and very high TG (> or =500 mg/dl) and LDL (> or =190 mg/dl) were found in 8.8%, 2.6% and 5.8% of participants, respectively. Higher HDL level (40 mg/dl) was seen in 60.0% of the total population. Higher percentage of women than men (65.3% vs. 52.2%) had >40 mg/dl HDL level. Normal lipid profile (TC <200 mg/dl, TG <150 mg/dl, LDL <129 mg/dl, HDL >40 mg/dl) was seen in 26.7% of participants, and was higher in females (32.1%) than in males (18.3%). The overall mean cholesterol level was within normal limit. Mean LDL level showed increasing trend with age and about one fourth of participants had normal lipid profile.[9]

Erem et al found that age-adjusted mean values of TC, LDL-C, HDL-C, [TC/HDL-C ratio], and TG were 190±0.6, 127.5±0.5, 50.3±0.3, 3.96±0.02, and 137.3±1.5, respectively. Overall, the mean levels of LDL-C, TG and TC/HDL-C ratio were higher in men than in women, whereas the mean level of HDL-C

was higher in women than in men. The prevalence of hypercholesterolemia, elevated LDL-C, low HDL-C, and hypertriglyceridemia were 37.5, 44.5, 21.1 and 30.4%, respectively. Prevalence of dyslipidemia were higher in men than in women, except for TC ($p<0.0001$). The prevalence of high TC, LDL-C, TG, and TC/HDL-C ratio increased with age, with the highest prevalence in the 60-69-year-old group, and declined thereafter. The prevalence of high TC, LDL-C and TG, a high TC/HDL-C ratio and low HDL-C increased steadily in line with BP, BMI, WC, WHR, and FBG ($p<0.0001$).[10]

Connely et al found that 46% had total plasma cholesterol levels above 5.2 mmol/L, 15% had LDL-cholesterol levels above 4.1 mmol/L, 15% had triglyceride levels above 2.3 mmol/L and 8% had HDL-cholesterol levels below 0.9 mmol/L. Total plasma cholesterol, LDL-cholesterol and triglyceride levels rose with age in men to a maximum in the 45-54 age group; in women there was little change with age up to ages 45 to 54.[12]

Maclean et al found that mean plasma total cholesterol, LDL-C, non-HDL-C and triglyceride levels increased with age in men to a peak at around age 54 years, while in women the increases were more gradual at a lower level until age 54 years, after which they increased appreciably eventually exceeding values for men. A high percentage of adults were at increased risk for coronary artery disease: 44% had elevated total cholesterol levels above 5.2 mmol/L; 14% had LDL-C levels above 4.1 mmol/L; 8% had HDL-C values below 0.9 mmol/L; and 14% had triglyceride levels above 2.3 mmol/L. Eleven per cent of adults had both total cholesterol level above 6.2 mmol/L and LDL-C level above 4.1 mmol/L.[13]

CONCLUSION

Our shows more prevalence of coronary heart disease in males than females. The most affected age group was 40-50 years in males and 50-60 years in females. Hyper-cholesteremia and hypertriglyceridemia was more prevalent in females. HDL values were lowered in more no. of males than females. LDL values were raised in more no. of females than males. Total cholesterol to HDL ratio was raised in more no. of males than females.

The study concludes that the importance of assessing the lipid profile and their ratio even in follow up of these patients as these are atherogenic factors for development of myocardial infarction and other coronary complications.

The results suggest the need for a multifactorial approach in health promotion efforts to lower blood cholesterol levels and reduce other risk factors in the population

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