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Assessment of Hyperlipidemia Prevalence in Patients with Coronary Heart Disease

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ABSTRACT

Background: Coronary heart disease (CHD) is closely associated with several risk factors, and hyperlipidemia is one of the most significant contributors. Hyperlipidemia is characterized by elevated levels of low-density lipoprotein (LDL), total cholesterol, and triglycerides, as well as decreased high-density lipoprotein (HDL) levels. **Objective:** To assess the lipid profile abnormalities (triglycerides, total cholesterol, HDL, and LDL) among patients with coronary heart disease and to evaluate gender-based differences in these parameters. **Study Design:** Cross-sectional study. **Settings:** Tertiary care hospital in Peshawar Pakistan. **Duration:** February to October, 2023. **Methods:** A total of 300 blood samples were collected from patients visiting the pathology laboratory. Samples were aseptically collected via venipuncture and stored at -20°C for analysis. The serum was extracted and analyzed within one week for total cholesterol concentration using a diagnostic kit. **Results:** The results revealed that 16% (n=32) of male patients and 23% (n=23) of female patients with coronary heart disease (CHD) exhibited elevated triglyceride levels. There were higher levels of total cholesterol in 35 % (n=70) of the males and 28 % (n=28) of the females. The prevalence of high HDL was found at 8% (n=16) among males and 12% (n=12) among females, whereas that of high LDL was found at 31% (n=62) among males and 38% (n=38) among females. The highly significant gender disparities were found in triglycerides (p=0.042) and LDL (p=0.034). **Conclusion:** The results indicate a higher prevalence of hyperlipidemia among CHD patients in Peshawar, with females showing a higher percentage of lipid abnormalities compared to males. The area is identified as a higher endemic region for CHD in Pakistan.

Keywords: *Coronary heart disease, Hyperlipidemia, Cardiovascular risk factors.*

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INTRODUCTION

Coronary artery disease (CAD), or coronary heart disease (CHD), is a condition characterized by insufficient oxygen and blood supply to the heart.[1] Atherosclerosis, responsible for plaque formation in arterial walls, is the primary etiology of coronary heart disease (CHD).[2] These plaques mostly consist of lipids that accumulate underneath the endothelial lining of the coronary artery.[3]

The discovery that dyslipidemia is a distinct indicator of many cardiovascular and cerebrovascular illnesses around the world has led to recent calls for prevention and management. Emerging evidence indicates that adults with coronary heart disease (CHD) are at an increased risk of developing additional acquired cardiovascular conditions.[4,5] Dyslipidemias may be genetic (primary or familial dyslipidemias) or induced by other health conditions such as diabetes, obesity, or unhealthy. The subsequent kind is more common.[6]

Chest pain, angina pectoris, abrupt myocardial infarction (MI), cardiac arrest, and chronic ischemic heart disease with congestive heart failure show what coronary heart disease looks like.[7] High blood pressure, high lipoprotein levels, and changes in lipid profiles are all signs of heart disease.[8] Both HDL and LDL are important lipid markers. Lower levels of HDL, which is sometimes called "good cholesterol," are closely linked to a higher risk of heart disease. High levels of LDL, which is sometimes called "bad cholesterol," make atherosclerosis worse.[9] High triglyceride levels raise the risk of heart attacks and strokes, both of which constitute cardiac events.[10]

Checking your lipid profile, including HDL, LDL, cholesterol, and triglycerides, is a good approach to see how healthy your

heart.[3,11] When high cholesterol levels are combined with other risk factors, such as consuming high cholesterol levels, they can cause atherosclerosis and make it more probable that a heart attack will happen. Cholesterol is an instance of a sterol that is present in most tissues in the body.[12] It is especially vital for the synthesis of hormones and cellular membranes. Excessive cholesterol can lead to plaque accumulation in the arteries, hence increasing the likelihood of coronary artery disease. Increased total cholesterol (TC), LDL, and non-elevated high-density lipoprotein (HDL) cholesterol were found to be directly correlated with mortality. In the Asia-Pacific region, a predominant factor was coronary heart disease.[13]

The alteration in lifestyle variables, such as physical inactivity and eating choices, has emerged as a public health problem. Addressing dyslipidemia may result in a reduction in cardiovascular disease burden.[14] Thus, dyslipidemia in women may go undiagnosed or untreated until it is advanced, increasing the risk of cardiovascular complications. This emphasizes the need for early identification and management, as dyslipidemia therapy started early has far better results than later treatments.[15]

This study aim was to determine the frequency of hyperlipidemia among patients with coronary heart disease at a tertiary care hospital in Peshawar and to assess gender-based differences in its occurrence.

METHODS

This study examined lipid profiles in patients at a tertiary care hospital in Peshawar, utilizing a cross-sectional methodology. The study included 300 patients, with the sample size calculated using the Rao-soft sample size calculator, employing a 95% confidence level and a 35% prevalence of dyslipidemia among patients with ischemic heart disease.[16] Participants aged 1–80 years were eligible for inclusion. Individuals with non-cardiac conditions such as diabetes, liver disease, renal failure, severe infections, metabolic disorders, those using lipid-lowering medications (e.g., statins or fibrates), pregnant women, and participants lacking a complete medical history or relevant diagnostic data were excluded from the study.

Blood samples were obtained through venipuncture and placed into sterile, dry, and contamination-free containers to ensure accuracy. About 5 milliliters (ml) of whole blood were collected and kept away from direct sunlight. The blood samples were centrifuged at 3500 rpm for 5 minutes to isolate the serum. Subsequently, we stored the serum at -20°C until further examination was possible. We analyzed the lipid profile utilizing diagnostic kits, including total cholesterol, triglycerides (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL) values. The tests were conducted within a week of the blood collection. We employed the American Heart Association (AHA) recommendations to delineate lipid abnormalities. Total cholesterol levels above 200 mg/dL, triglyceride levels surpassing 150 mg/dL, HDL values below 40 mg/dL in males and 50 mg/dL in females, and LDL levels beyond 100 mg/dL.[17]

We employed SPSS computer software version 25 to carry out the analysis and find the correlation between lipid levels and coronary heart disease. We also compared the lipid profiles of women versus men. We employed different statistics to display the data as tables, and we employed the cut point for statistical significance as a p-value of below 0.05.

RESULTS

A total of 300 individuals diagnosed with coronary heart disease (CHD) were included in this study, with a predominance of male participants. Overall, 66% (n=200) were male, while 34% (n=100) were female. Participants were categorized into four age groups. The largest proportion of patients, 32.67% (n=98), belonged to the 21–40 years age group, followed by 31.0% (n=93) in the 41–60 years group. Individuals aged 1–20 years accounted for 28.0% (n=84) of the sample, whereas the 61–80 years group represented the smallest proportion at 8.33% (n=25), as shown in Table 1.

Table 1: Demographic distribution of coronary heart disease (CHD) patients by gender and age group

Variable	Category	Frequency and Percentage
Gender	Male	66% (200)
	Female	44% (100)
Age	1-20 Years	28% (84)
	21-40 Years	32.67% (98)
	41-60 Years	31% (93)
	61-80 Years	8.33% (25)

A chi-square test was used to determine the gender distribution and lipid profile abnormality (triglycerides, total cholesterol, HDL, and LDL) in CHD patients' Table 2. The findings revealed that, out of patients with raised triglycerides, 16% (n=32) of male and 23% (n=23) of female CHD patients were involved, with the p-value 0.042, which signifies the gender difference was statistically significant. In the case of total cholesterol, 35% (n=70) of the males and 28% (n=28) of the females had raised levels, with the p-value 0.051, which signifies there was a trend towards significance. In the case of HDL, 8% (n=16) of male CHD patients and 12% (n=12) of the females had raised levels, with correlation of the p-value 0.265, which signifies no gender difference. Lastly, in the case of LDL, 31% (n=62) of the males and 38% (n=38) of the females had raised levels, with the p-value 0.034, which signifies that the gender difference in levels of LDL was significant.

Table 2: Gender distribution and chi-square test results for coronary heart disease (CHD) patients with abnormal lipid levels (triglycerides, total cholesterol, HDL, and LDL)

Variable	Category	Percentage and Frequency (Male & Female)	Chi-Square Value	p-value
CHD Patients with High Levels of Triglycerides (T.G.)	Male	16% (32)	4.3	0.042
	Female	23% (23)		
CHD Patients with High Levels of Total Cholesterol (T.C)	Male	35% (70)	3.7	0.051
	Female	28% (28)		
CHD Patients with High Levels of HDL	Male	8% (16)	1.2	0.265
	Female	12% (12)		
CHD Patients with High Levels of LDL	Male	31% (62)	4.6	0.034
	Female	38% (38)		

In our study, the largest number was in the 21–40 years age group (32.67%, n=98), followed by 41–60 years (31.0%, n=93), 1–20 years (28.0%, n=84), and 61–80 years (8.33%, n=25). Triglyceride levels over 150 mg/dL were noted in 21.0% (n=63) of individuals, with a notably elevated frequency in the 1–20 years cohort (18.33%, n=55), whereas the 41–60 years cohort represented just 2.67% (n=8). Elevated total cholesterol levels (>200 mg/dL) were seen in 34.0% (n=102), mostly within the 21–40 years cohort (23.0%, n=69), followed by 9.67% (n=29) in the 1–20 years group and 1.33% (n=4) in the 61–80 years category. HDL values below the gender-specific limits were seen in 9.67% (n=29) of instances, predominantly among individuals aged 21–40 years (9.33%, n=28), with just one case in the 61–80 years cohort. LDL values over 100 mg/dL were the most prevalent anomaly, identified in 35.3% (n=106) of cases, mostly within the 41–60 years cohort (31.0%, n=93), followed by 4.0% (n=12) in the 61–80 years group and 0.33% (n=1) in the 21–40 years category table-3.

Table 3 Distribution of lipid levels (Triglycerides, Total Cholesterol, HDL, and LDL) across age groups

Lipid Type	1–20 Years	21–40 Years	41–60 Years	61–80 Years	Total
Triglycerides >150 mg/dL	18.33% (n=55)	0.0% (n=0)	0.0% (n=0)	2.67% (n=8)	21.0% (n=63)
Total Cholesterol >200 mg/dL	9.67% (n=29)	23.0% (n=69)	0.0% (n=0)	1.33% (n=4)	34.0% (n=102)
HDL <40 mg/dL (men) or <50 mg/dL (women)	0.0% (n=0)	9.33% (n=28)	0.0% (n=0)	0.33% (n=1)	9.67% (n=29)
LDL >100 mg/dL	0.0% (n=0)	0.33% (n=1)	31.0% (n=93)	4.0% (n=12)	35.3% (n=106)
Total Sample Distribution	28.0% (n=84)	32.67% (n=98)	31.0% (n=93)	8.33% (n=25)	100% (n=300)

DISCUSSION

The findings showed there exists a substantial difference in the lipid profiles of both men and women with CHD, especially in the triglyceride profile and the amount of low-density lipoprotein (LDL). The fact that females had increased triglycerides (23% vs. 16%) and LDL (38% vs. 31%) relative to males indicates that a gender difference could be critical in the metabolism of lipids and development of CHDs. Hypertriglyceridemia appears to be a prominent feature in CHD. In our study, its prevalence in CHD patients was found to be 28% in females and 35% In male patients, which compares well with 30% Iqbal's study and higher than a study in a Caucasian population of CAD patients.[17] In our study low level of HDL is 8% in males and 12% in females patient, which is low from the study of 30.4% and the high value of LDL in our study is 31%in males and 38% of 34.1% in female patients, which is in good agreement with the findings.[18,19]

According to the study, Pakistanis are among the ethnic groups with the highest incidence of coronary heart disease. One of the main risk factors for coronary heart disease is hyperlipidemia. Several metrics, such as blood levels of HDL and LDL, triglycerides, and total cholesterol, are used to assess hyperlipidemia in CHD patients.[20]

Elevated lipid levels in Asian populations are associated with age, sex, economic advancement, urbanization, consumption of fatty foods, and other risk factors, including diabetes mellitus.[21] In the current study, 13% of our male patients have hypercholesterolemia, which compares best with 9.5% reported by another study 23% female patients had hypercholesterolemia.[22]

Two more significant problems were also identified by this investigation. First off, all patients were referred for elective angiography following stabilization, even though the necessity of anticoagulation in CAD is widely documented. Second, the CHD group generally accepts the advantages of anti-hyperlipidemia medications, particularly statins, and the early initiation of statins. The large proportion of patients in the CHD group (35.5%) who continue to smoke is another significant factor. Given that smoking is a significant modifiable risk factor for coronary heart disease.[23]

CONCLUSION

This analysis highlights the limited availability of population-based research on hyperlipidemia among patients with coronary heart disease (CHD), particularly regarding gender-based differences in lipid abnormalities. The findings indicate that females exhibited higher levels of triglycerides and LDL compared to males, suggesting the need for gender-specific approaches in lipid management among CHD patients. Implementing targeted interventions and ensuring regular lipid profile monitoring may help reduce cardiovascular risk in this population.

LIMITATIONS

Among the limitations of the study, there is a small sample (representing only one hospital) and the inability to identify which of the mentioned factors influence the others or vice versa because of the cross-sectional nature of the study. It also did not provide data on detailed lifestyle, drugs used, and follow-up.

SUGGESTIONS / RECOMMENDATIONS

Future research ought to involve the use of a multi-centre sample that encompasses large studies with longitudinal designs, which also involve taking complete histories of patients. They should be actively monitored at regular intervals in terms of lipid levels and exhibit early interventions, especially in females, and there should be a series of initiatives on the part of the public health sector to inform CHD patients on the management of lipid levels through lifestyle modifications and prescription medicines.

CONFLICT OF INTEREST / DISCLOSURE

There is no conflict of interest.

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Not available.

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