

# **PREVALENCE OF DYSLIPIDEMIA IN YOUNG ADULTS.**

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## **Body**

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Key words: Dyslipidemia, Hyperlipidemia, LDL, HDL, Triglyceride, Young Adults.

### **INTRODUCTION**

The term dyslipidemia signifies abnormal lipid or fat content in the blood, including triglycerides, phospholipids, cholesterol, lipoprotein, and other fats. Lipoproteinemia denotes fatty substances that circulate in the blood attached with proteins and when they exceed the normal level it is called hyperlipoproteinemia.<sup>1</sup> Similarly, when cholesterol or triglycerides are increased, the term given to this condition is Hypercholesterolemia and Hypertriglyceridemia, respectively. Non-optimal levels of Low-density lipoprotein(LDL) and High-density lipoprotein(HDL) cholesterol in young adults are independently associated with coronary atherosclerosis two decades later.<sup>2</sup>

The causes of hyperlipidemia are multiple that includes genetic factors, as in certain cases of familial hyperlipidemia; besides, other factors like cigarette smoking, alcohol, hypothyroidism, chronic kidney disease, obesity, medications, and dietary influences may also alter plasma lipid level. Plasma lipid levels are linked with normal functioning of heart, brain, and kidneys when present in normal range and when they become high, health implications of atherosclerosis, heart disease, stroke, and pancreatitis may occur.<sup>3</sup> One study done on Hispanics that compared the old and young people presenting with Acute myocardial infarction(AMI) and to whom, percutaneous coronary intervention was done, it was concluded that high triglyceride level was the reason behind acute myocardial infarction.<sup>4</sup>

Another study was done in young adults of Assam, to determine the serum Total cholesterol(TC) level in blood and association of that cholesterol level with body mass index(BMI), concluded that young adults, especially who are overweight should be advised routine cholesterol testing so that preventive measures can be adopted to avoid hypercholesterolemia and its complications in future life.<sup>5</sup>

In a study done in Chongqing, China, to estimate the frequency and risk factors of dyslipidemia, 5375 residents aged  $\geq 18$  years were selected. They found 35.5% prevalence of dyslipidemia(34.4% among men and 37.6% among women). Out of these 2009 participants, 44.2% of the participants had isolated hypertriglyceridemia, 14.7% had isolated hypercholesterolemia, 13.2% had mixed hyperlipidemia, and 28.0% had isolated low HDL cholesterol. The age group in males having the most cases of dyslipidemia was of 30-39 years(48.2%). In a nutshell, they advised conducting proper intervention programs for reducing risk factors and routine screening programs to check for blood lipid levels.<sup>6</sup>

Another study conducted in three states of India where young people(age greater than 20 years) were selected, 13.9% had raised cholesterol level, 72.3% had decreased HDL, 11.8% had raised LDL, 29.5% had hypertriglyceridemia, and 79% had abnormalities in one of the lipid parameters. This is a huge percentage that was

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observed during this study. The high prevalence rate of dyslipidemia in states of India called for urgent lifestyle intervention strategies so that preventive measures are taken at a larger scale.<sup>7</sup>

Nowadays, undiagnosed underlying dyslipidemia is the most common cause of mortality and morbidity in young adults and that's because of atherosclerotic related changes leading to stroke, myocardial infarction, hypertension, and other metabolic syndromes.<sup>8</sup>

Although several studies have been done worldwide, there is variability in those publications. Assuming the high lipid levels in our population similar to what we found in literature, the results of this study will help us to understand what lipid profile is normally present in our population, if abnormal, timely screening, education, and proper management can be done. Stress should be given in national health care policies to prevent in order to prevent the hazards of Stroke, Myocardial infarction, and Metabolic Syndrome because of dyslipidemia.

### MATERIAL and METHODS

This is a descriptive, cross-sectional study conducted in the outpatient department of medicine, Jinnah Postgraduate Medical Centre, Karachi, Pakistan, from November 2018 to April 2019. Both male and female young adults (defined in this study as those aged 21-39 years) after taking informed consent were included in the study. Pregnant women, patients with diagnosed liver diseases, familial hyperlipidemias, diabetes, hypertension, nephrotic syndrome, and those using any lipid-lowering agents like statins were excluded from the study. Those not willing to participate were also excluded. 112 patients were gathered in the assigned duration. Limited information was collected i.e. their age, gender, and the parameters of their fasting lipid profile including total cholesterol, triglycerides, HDL, and LDL cholesterol.

For the lipid profile, intravenous blood samples were collected in testing bottles (containing an anticoagulant agent) after overnight fasting of 9-12 hours and sent to the institutional laboratory for testing by an automated spectrophotometer and enzymatic colorimetric method according to the guidelines of National Committee for Clinical Laboratory Standards.<sup>9</sup>

Dyslipidemia was defined according to the National Cholesterol Education Project (NCEP) Adult Treatment Panel III as abnormal levels of any of the following components of the lipid profile. TC of less than 200 mg/dL was considered "desirable" while that of >240 mg/dL was termed as hypercholesterolemia. HDL was considered as "low" when it was <40 mg/dL while LDL was considered as "optimal" when it was less than 100 mg/dL. Triglycerides level >150 mg/dL was identified as hypertriglyceridemia.<sup>10</sup> We defined isolated dyslipidemias as abnormal levels of any one of these factors. However, mixed dyslipidemia was the term given to abnormalities in more than one of these. Although borderline levels are alarming, we did not consider those in the classification of hyperlipidemias.

The statistical analysis was performed using SPSS version 23.0. Mean and standard deviations were recorded for age and the lipid profile parameters. The data were further categorized according to age group. Post-stratification, Chi-square and student t-test was applied. P-value <0.05 was considered significant.

### RESULTS

In this short study population of 112, we had 62 males (55.4%) and 50 females (44.6%). We only gathered participants of age less than 40 years and greater than 20 years with a mean age of 32.5 ± 5.2 years.

In this study, we found that 75.9% of young adults had dyslipidemia. We first distributed the population according to categories of lipid levels made by the NCEP Adult Treatment Panel III<sup>10</sup>, which placed 56% of the participants in the serum cholesterol range of <200 mg/dL (desirable/ low) and 21.4% in that of >239 mg/dL (high). When triglyceride levels were analyzed, 42.9% had it equal or above the critical level. 58% of participants assigned to the study had HDL levels <40 mg/dL while four of them had it above 60 mg/dL. On the other hand, on grouping LDL levels we had 31.3% of population with LDL levels <100 mg/dL, 50.0% in a range of 100-159 mg/dL, and 18.8% above >159 mg/dL (Figure-1).

Table-I. Mean serum lipid concentrations (in total and based on gender) and prevalence of dyslipidemia

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Characteristics	Total(n=112)	Male(n=62)	Female(n=50)
P-Value			
Total cholesterol mean + SD(mg/dL)	209.17 + 99.96	189.21 + 66.295	233.92 + 126.635
0.018			
Triglycerides mean + SD(mg/dL)	171.94 + 125.81	169.90 + 114.642	174.46 + 139.584
0.850			
High-density lipoprotein mean + SD (mg/dL)	38.91 + 9.89	38.98 + 9.720	38.82 + 10.213
0.934			
Low-density lipoprotein mean + SD (mg/dL)	129.54 + 80.86	125.13 + 55.293	135.00 + 104.333
0.522			
Dyslipidemia, %(95% CI)	75.9(65.9, 82.7)	74.2(61.5, 84.5)	76.0(61.8, 86.9)
0.000			
Isolated hypertriglyceridemia, %(95% CI)	7.1(3.1, 13.6)	8.1(2.7, 17.8)	6.0(1.3, 16.5)
0.000			
Isolated low HDL, %(95% CI)	18.8(12.0, 27.2)	17.7(9.2, 29.5)	20.0(10.0, 33.7)
0.000			
Mixed hyperlipidemia, %(95% CI)	46.4(37.0, 56.1)	45.2(32.5, 58.3)	48.0(33.7, 62.6)
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Table-I shows the descriptive statistics of lipid profile in total and the distribution according to male and female gender. The mean total cholesterol overall was 209.17 + 99.96 with significant differences in males and females(p = 0.018) while the differences in triglyceride levels, HDL and LDL between males and females were non-significant. In Table-I, the prevalence of dyslipidemia and the different types of hyperlipidemias is also shown with 75.9% overall, and a significantly high percentage of dyslipidemia in females(p < 0.05). 7.1% of the total had isolated hypertriglyceridemia, 18.8% had isolated low HDL levels, and 46.4% had mixed hyperlipidemia, with significant differences between males and females in the former two.

## DISCUSSION

Dyslipidemia has become a major public health concern. Its prevalence is rising at a steady pace particularly in developing countries.<sup>11</sup>

The increasing prevalence of dyslipidemia is associated with several factors of which many are modifiable and are dependent on socioeconomic, cultural, and ethnic characteristics.<sup>6</sup> Changes in lifestyle and diet contribute to a significant portion of risk factors associated with dyslipidemia. Risk factors for dyslipidemia are lack of physical

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activity, obesity particularly central obesity, metabolic syndrome, hypertension, old age, and a diet rich in saturated fats and cholesterol.<sup>12</sup> Dyslipidemia can be effectively controlled by pharmacological intervention but more importantly through dietary and lifestyle modification.<sup>13,14</sup> Unfortunately, lack of awareness and appropriate therapeutic intervention and management are emerging as barriers in preventing complications related to dyslipidemia.

Dyslipidemia is a major pathogenic risk factor for atherosclerotic cardiovascular disease(CVD). Various cardiovascular incidents reported are all associated with uncontrolled dyslipidemia.<sup>15,16</sup> Surveys conducted in China showed that the incidence of ischemic CVD is significantly reduced by controlling lipid profile among individuals, therefore decreasing the mortality and morbidity associated with it <sup>17</sup>. The asymptomatic nature of dyslipidemia is also a concerning issue. Hence, early screening and preventive measures are equally important in controlling it.<sup>18,19</sup>

A National Health and Nutrition Examination Survey was conducted in the United States(U.S.) from 2003 through 2006 in which the proportion of the U.S. population with abnormalities in the lipid profile was assessed. In this study, it was stated by Toth et al. that about 53 percent of U.S. adults have at least one lipid abnormality.<sup>12</sup> A similar survey that took place in China reported that approximately 41.9 percent of the Chinese population was found to have dyslipidemia.<sup>20</sup> These studies reflected the threat dyslipidemia pose on the general health of the population. In our study, we have succeeded to show that approximately 75.9% of young adults had dyslipidemia which is significantly greater than the prevalence described in the above countries.

The prevalence of dyslipidemia increases with age; however, it is essential to note that it also affects younger adults.<sup>21</sup> Moreover, the process of atherosclerosis starts early in life. A compilation of various observations made by the Bogalusa Heart Study established an association between coronary atherosclerosis and cardiovascular risk factors in young people, among which serum LDL and serum triglyceride concentration were a significant factor along with many others<sup>22,23</sup> Therefore, young adults with abnormal levels of lipids are at an increased risk of developing cardiovascular complications, such as coronary heart disease later in life. Considering the lack of literature on dyslipidemias in young adults and its importance in early detection of cardiovascular risks, we have highlighted the significance of identifying dyslipidemia in young adults.

Our study showed that the prevalence of dyslipidemia is higher in females as compared to males. Our result is coherent with a cross-sectional survey conducted in Chongqing, China. In this study, the prevalence of dyslipidemia in women was 37.6% as compared to 34.4% in men. This was primarily due to differences in the frequency of overweight, obesity, and central obesity.<sup>6</sup> In a study conducted in Iran, the incidence of dyslipidemia was 37.4% for males and 55.4% for females and therefore, higher in females which is consistent with the result of our study.<sup>24,25</sup>

However, a vast literature provides evidence that the prevalence of dyslipidemia is much higher in men as compared to women. This was shown by a cross-sectional study by Pan et al. in which the incidence of dyslipidemia was higher in males than in females(41.92% vs 32.47%).<sup>19</sup> Likewise in 2002, the Chinese national nutrition and health survey concluded the prevalence of dyslipidemia in Chinese adults as 22.2% and 15.9% in males and females respectively.<sup>26</sup> Moreover, a systemic review on dyslipidemia in Chinese adults published between 2003 and 2013 stated that dyslipidemia was more common in men than in women.<sup>27</sup> Prior researches have well established that abnormal lipid profile is more prevalent in men as compared to women.<sup>28</sup> This could be due to a higher frequency of cigarette smoking and more consumption of alcohol and high cholesterol food in men.<sup>27</sup>

The prevalence of isolated hypercholesterolemia, isolated hypertriglyceridemia, and isolated low HDL cholesterol in the total population of our study was 0.9%, 7.1%, and 18.8% respectively. In the study conducted by Pan et al. this prevalence was 2.9%, 11.9%, and 7.4% respectively.<sup>19</sup> Extensive surveys in China organized from 2002 to 2010 revealed that low HDL-C and hypertriglyceridemia were the two major types of dyslipidemia in Chinese adults.<sup>29,30</sup> These findings were reinforced in a meta-analysis by Huang et al.<sup>27</sup> However, these trends are different in western countries where high cholesterol and high LDL-C were more common forms of dyslipidemia.<sup>19</sup>

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This was largely due to a high dietary fat and cholesterol intake in American residents. Furthermore, according to our study isolated low HDL was higher in females as compared to males whereas isolated hypertriglyceridemia was higher in males than females. The results are consistent with the Korean National Health and Nutrition Survey in which the large difference in HDL-C across six countries was secondary to smoking, alcohol consumption, age, fat intake, BMI and educational level. Gender difference in HDL-C is partly explained by high levels of estrogen in women. This explains the lower mortality rate due to cardiovascular diseases in the female gender. Hence HDL-C is believed to be protective.<sup>31</sup>

The early detection of dyslipidemia is important for implementing management strategies. These strategies can in return reduce the risk of cardiovascular diseases that may manifest later in life. Certain lifestyle modifications and lipid-lowering drugs can be effective on individuals with abnormal lipid profiles. However, literature regarding the benefits of early screening and initiation of treatment is sparse. A systematic review in the United States by Chou et al. stated that there was no prior study that could provide strong evidence for the effects of screening or treatment on clinical outcomes in younger adults. Moreover, the benefit of early treatment was not clear. Therefore trials conducted on a big scale are needed to find evidence for the benefits and harms of dyslipidemia screening or treatment in younger adults.<sup>21</sup>

There are some limitations to this study, first being that this is a cross-sectional study with no causal associations between any of the variables. Secondly, this survey is limited by a small sample size, and data collection in a single tertiary care setup. Another restriction was that the potential risk factors of dyslipidemia were not taken into consideration.

## CONCLUSION

Dyslipidemia, being a major risk factor for many systemic diseases should be detected early in life so that effective management is carried out before the start of actual manifestations. This study gave a high prevalence of dyslipidemia in asymptomatic young adults, with females being more frequently affected than males.

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## Classification

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