

**Original article**

## **Prevalence of dyslipidemia in students aged 6-16 years in a private school of rural Jaipur**

**Ankit Agarwal<sup>1\*</sup>, Chaman R. Verma<sup>2</sup>, Balvir S. Tomar<sup>2</sup>, Bhagwan S. Natani<sup>3</sup>, Pardeep Goyal<sup>3</sup>,  
Sumit Bhatia<sup>1</sup>**

<sup>1</sup> Resident, Department of Pediatrics, National Institute of Medical Sciences and Research, Shobha Nagar, Jaipur, Rajasthan, India

<sup>2</sup> Professor, Department of Pediatrics, National Institute of Medical Sciences and Research, Shobha Nagar, Jaipur, Rajasthan, India

<sup>3</sup> Asst. Professor, Department of Pediatrics, National Institute of Medical Sciences and Research, Shobha Nagar, Jaipur, Rajasthan, India

\*Corresponding author: Dr. Ankit Agarwal

---

### **ABSTRACT**

**BACKGROUND:** It is estimated that 31% of deaths worldwide occurred due to cardiovascular disease in 2012. Atherosclerosis begins silently during childhood. Pathogenesis of atherosclerosis is related to total cholesterol levels, reduced HDL level and increased LDL level. Hence this study was done with the aim to determine the prevalence of dyslipidemia in students of a private school of rural Jaipur.

**METHODS :** This Observational Cross Sectional Study was done in the Department of Pediatrics, National Institute of Medical Sciences and Research, Jaipur from 1<sup>st</sup> January 2016 to 30<sup>th</sup> June 2016. Students who had any acute disease or any chronic disease were excluded from this study. Students who had history of any chronic disease in their family were also not included in this study. Students were called in the morning with at least 12 hours of fasting. Venous blood sample was collected and analyzed for Total Cholesterol, Triglyceride and HDL level. Serum LDL was calculated by Friedwal formula.

**RESULTS:** 400 students aged 6-16 years (mean 10.9±3.1 years) were accessed. 55% of the students were male. 76 students (19%) had dyslipidemia. Females (n = 40 i.e. 22.22%) had more incidence of dyslipidemia than males (n = 36 i.e. 16.36%). None of the students had hypercholesterolemia or elevated LDL. 36 students (9%) had hypertriglyceridemia and 70 students (17.5%) had low levels of HDL.

**KEYWORDS:** Lipid Profile, Dyslipidemia, Hypertriglyceridemia, HDL

---

### **Introduction**

It is estimated that 31% of deaths worldwide i.e. 17.5 million deaths occurred due to cardiovascular disease in 2012.<sup>1</sup> In India, mortality due to cardiovascular disease was expected to rise by 103% in men and by 90% in women from 1985 to 2015.<sup>2</sup>

Studies have reported that atherosclerosis begins silently during childhood.<sup>3</sup> Fatty streaks - the

precursors of mature atherosclerotic lesions - are the first visible arterial lesions as reported in autopsy studies.<sup>4</sup> Pathogenesis of atherosclerosis is related to total cholesterol levels. Reduced serum high-density lipoprotein cholesterol level and increased serum low-density lipoprotein cholesterol level are independent risk factors for cardiovascular disease.<sup>5</sup>

Considering that the number of children at risk of developing cardiovascular disease is increasing and as there has been no population-based study in school children of rural Jaipur, to determine the prevalence of dyslipidemia this study was done with the aim to determine the prevalence of dyslipidemia in students of a private school of rural Jaipur.

### **Materials and methods**

This Observational Cross Sectional Study was done in the Department of Pediatrics, National Institute of Medical Sciences and Research, Jaipur from 1<sup>st</sup> January 2016 to 30<sup>th</sup> June 2016.

Permission was initially obtained from the school authorities of a Private school in rural Jaipur after explaining to them about the study and investigations involved. Students were assessed for the presence of any acute or chronic disease. Students who had any acute disease or any chronic disease were excluded from this study. Students who had history of any chronic disease in their family were also not included in this study.

Parents or guardians of the students in the age group of 6 to 16 years were met personally or informed telephonically about the study and the investigations involved in the study. A written informed consent was taken by the parents / guardians regarding their willingness to take part in the study.

The students were then called to the Department of Pediatrics, National Institute of Medical Sciences and Research in the morning with at least 12 hours of fasting.

2ml of venous blood sample was collected in plain vials from the antecubital vein of every student for biochemical tests. Serum was extracted and analyzed

in Nanolab-150 model Auto-Analyser of Trivitron Healthcare Systems for Serum Total Cholesterol level (TC), Serum Triglyceride level (TG) and Serum High Density Lipoprotein Cholesterol level (HDL-C).

For levels of serum triglyceride below 400 mg/dL, level of Serum Low Density Lipoprotein Cholesterol was calculated by Friedwal formula (i.e., Low density lipoprotein Cholesterol = Total Cholesterol-Triglycerides/5-high density lipoprotein cholesterol).<sup>6</sup> For serum triglyceride level more than 400 mg/dL serum low density lipoprotein cholesterol levels were assessed photometrically.

Dyslipidemia was defined as a serum total cholesterol level, serum triglyceride level or serum low density lipoprotein cholesterol level higher than the levels corresponding to the standard gender and age specific 95<sup>th</sup> percentile or serum high density lipoprotein cholesterol level less than the level corresponding to the standard gender and age specific 5<sup>th</sup> percentile.<sup>7</sup>

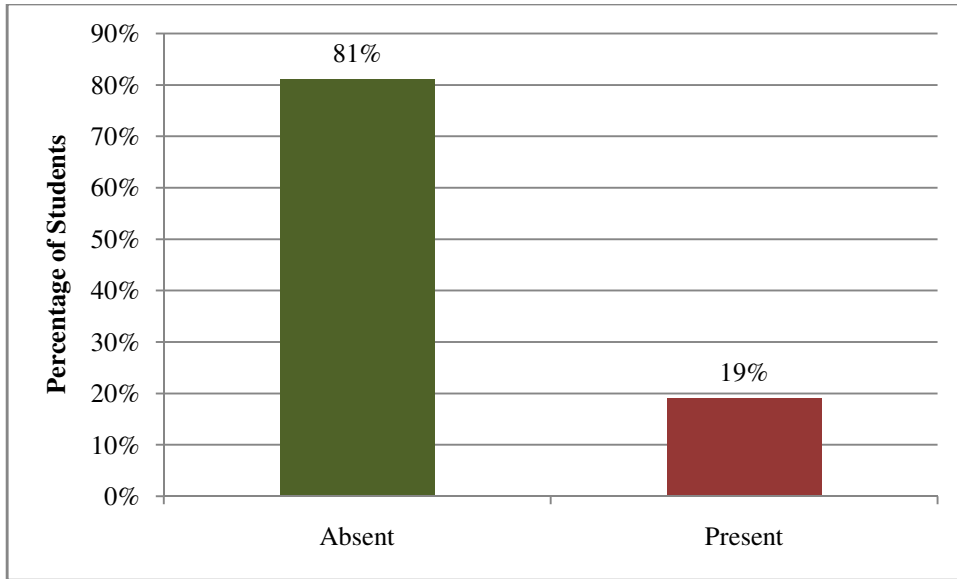
Statistical analysis was done using statistics software IBM SPSS version 23.

### **Results**

400 students aged 6-16 years (mean 10.9±3.1 years) were accessed for their Lipid Profile which included Serum Total Cholesterol levels (TC), Serum Triglyceride levels (TG), Serum Low Density Lipoprotein Cholesterol levels (LDL-C) and Serum High Density Lipoprotein Cholesterol levels (HDL-C).55% of the students were male.

We found that 76 students (19%) had dyslipidemia while the rest 324 students (81%) had a normal lipid profile as defined for their age and sex as shown in Figure 1.

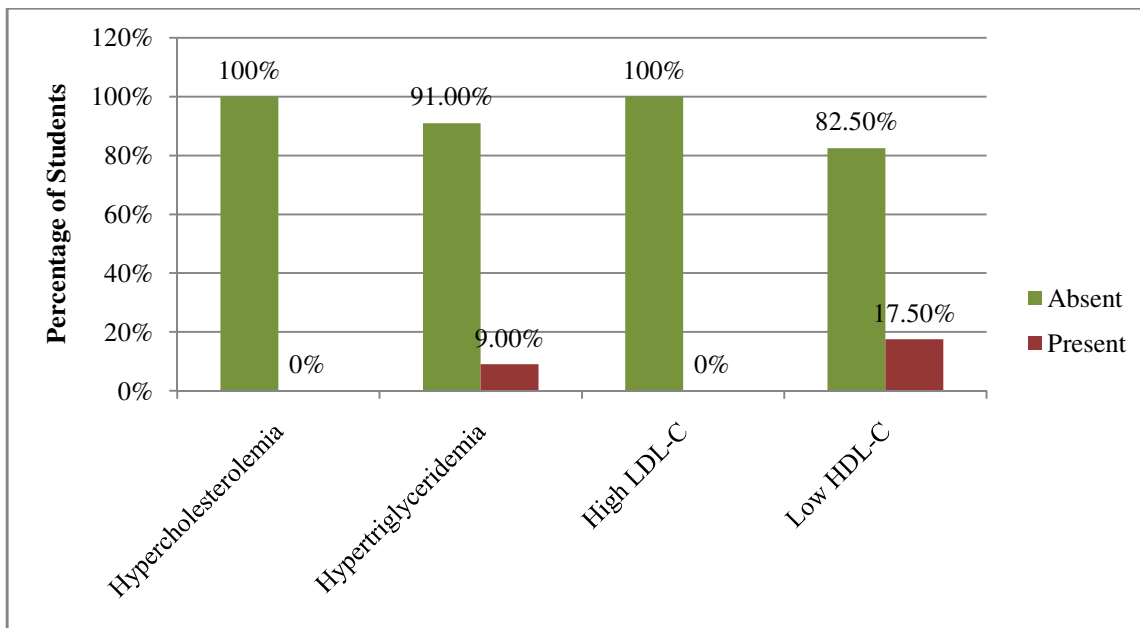
**Figure 1: Prevalence of Dyslipidemia in the students**



It was observed that female students (n = 40 i.e. 22.22%) had more incidence of dyslipidemia than male students (n = 36 i.e. 16.36%). However the difference was not statistically significant(p=0.137) On examining the abnormality in the lipid profile we found that none of the students had

hypercholesterolemia or elevated low density lipoprotein cholesterol. However, 36 students (9%) had hypertriglyceridemia and 70 students (17.5%) had low levels of High Density Lipoprotein Cholesterol as shown in Figure 2.

**Figure 2: Abnormality in lipid profile**



## Discussion

Dyslipidemia is an independent and modifiable risk factor of cardiovascular disease.<sup>8</sup> Studies have reported that risk factors of cardiovascular disease such as deranged lipid profile begins in childhood and progress into adulthood. A balanced lipid profile is an important factor to maintain health in young age and to avoid early morbidity in later life.

The objective of this study was to determine prevalence of dyslipidemia in apparently healthy school children of rural Jaipur.

In India, studies are still scarce on the prevalence of dyslipidemia in the pediatric age group. The results hence obtained in this study are important, as they show that dyslipidemia is part of a reality which is disturbing and must be investigated among the pediatric age group.

Different studies use various limits for abnormal and normal lipid profile level. Hence studies have a diverse definition of dyslipidemia. Therefore, comparison of prevalence of dyslipidemia amongst different studies is a difficult challenge. In the present study it was seen that 19% of the students had dyslipidemia. Diverse rates of prevalence of dyslipidemia have been reported by different studies. Higher prevalence of dyslipidemia was found in most studies around the world. Pereira PB et al (2010) in their study in Brazilian students found 63.8% children had dyslipidemia.<sup>9</sup> Similar, results were found in a study done by Reuter CP et al (2016) on 1,243 Brazilian students where 42.1% of children had dyslipidemia.<sup>10</sup> Taheri F et al (2015) in their study on 2,643 Iranian students reported that 34.3% students had dyslipidemia.<sup>11</sup> None of our students had hypercholesterolemia whereas, it was present in 23% students of sub-urban Delhi in study done by Puri et al(2015) and 6.1% in a study by Taheri F et al (2015)

in Iranian children.<sup>11,12</sup> Similarly none of our students reported to have elevated low density lipoprotein cholesterol but 10% students of the study done by Puri et al (2015) and 3.5% students of the study done by Taheri F et al (2015) had elevated low density lipoprotein cholesterol levels.<sup>11,12</sup> 9% of the students in our study had hypertriglyceridemia, which was reported in 18% students in the study by Puri et al (2015) and 14% students in study done by Taheri F et al (2015).<sup>11,12</sup> 17.5% of our students had reduced levels of high density lipoprotein cholesterol, whereas Puri et al (2015) reported it in 25% of the students and Taheri F et al(2015) reported it in 24.7% students.<sup>11,12</sup>

This study showed that female students had a higher incidence of dyslipidemia however the difference was not statistically significant. Studies from all over the world have shown mixed reports regarding gender and prevalence of dyslipidemia. Our study was in agreement with the study conducted by Reuter CP et al (2016) and Puri S et al (2015) which reported girls to have higher prevalence of dyslipidemia.<sup>10,12</sup> In contrast study by Dholapuria R et al (2007) from Bikaner, found all the lipid variables except high density lipoprotein cholesterol were marginally higher in boys than girls.<sup>13</sup> Similar results were seen found in the Iranian study by Taheri F et al (2015).<sup>11</sup> Our study is limited by its small sample size. Physical activity level, dietary food intake, socioeconomic status and anthropometric measurements were also not considered in this study.

## Conclusion

19% of the students of private school of rural Jaipur have dyslipidemia. Dyslipidemia is more common in female students as compared to male students. 7.25%

students had hypertriglyceridemia and 15.25% students had reduced levels of high density lipoprotein cholesterol.

## References

1. The World Health Organization. Global status report on non-communicable diseases 2014 [Internet] Available from: <http://www.who.int/nmh/publications/ncd-status-report-2014/en/>. Geneva. 2014.
2. Bulatao RA, Stephens PW. Global estimates and projections of mortality by cause, 1970-2015. Washington: Population Health and Nutrition Department, World Bank; 1992.
3. Holman RL, McGill Jr. HC, Strong JP, Green JC. The natural history of atherosclerosis. The early aortic lesions as seen in the middle of 20th century. *Am J Pathol.* 1958;34:209-235.
4. Stary HC. Evolution and progression of atherosclerotic lesions in coronary arteries of children and young adults. *Arteriosclerosis.* 1980;9(Suppl.1):119-132.
5. Gotto AM Jr. Low high-density lipoprotein cholesterol as a risk factor in coronary heart disease: a working group report. *Circulation.* 2001;103:2213-2218.
6. Friedewald WT, Levy RI, Fredrichson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clin Chem.* 1972;18:499-502.
7. Tamir I, Heiss G, Glueck CJ, Christensen B, Kwiterovich P, Rifkind B. Lipid and lipoprotein distributions in white children ages 6–19 yrs: the Lipid Research Clinics Program Prevalence Study. *J Chronic Dis.* 1981;34(1):27–39.
8. Fred P, Virginie SF, Vincent W, Pascal B. Dyslipidemia and abdominal obesity: an assessment in three general populations. *J Clin Epidemiol.* 2000;53:393-400.
9. Pereira PB, Arruda IK, Cavalcanti AM, Diniz AD. Lipid profile of schoolchildren from Recife, PE. *Arq Bras Cardiol.* 2010 Oct;95(5):606-13.
10. Reuter CP, Silva PT, Renner JD, Mello ED, Valim AR, Pasa L, Silva RD, Burgos MS. Dyslipidemia is associated with unfit and overweight-obese children and adolescents. *Arq Bras Cardiol.* 2016 Mar;106(3):188-93.
11. Taheri F, Chahkandi T, Kazemi T, Bijari B, Zardast M, Namakin K. Lipid profiles and prevalence of dyslipidemia in Eastern Iranian adolescents, Birjand, 2012. *Iran J Med Sci.* 2015 Jul;40(4):341.
12. Puri S, Puri S, Rehan HS, Sabharwal A, Nanda R, Aggarwal SK, Yadav M, Puri R. Prevalence and pattern of dyslipidemia in 2500 adolescents in suburban India. *J Am Coll Cardiol.* 2015;65(10\_S).
13. Dholpuria R, Raja S, Gupta BK, Chahar CK, Panwar RB, Gupta R, Purohit VP. Atherosclerotic risk factors in adolescents. *Indian J Pediatr.* 2007 Sep1;74(9):823-6.