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RESEARCH ARTICLE

Association of Body Mass Index with Dyslipidemia Among Young Adults: A Cross-Sectional Study

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ABSTRACT

Background: Dyslipidemia is increasingly prevalent among young adults and contributes significantly to future cardiovascular disease risk. Body Mass Index (BMI), a simple indicator of adiposity, has been associated with lipid abnormalities in various populations. However, limited data are available regarding this association among Indian medical students and young adults.

Objectives: To assess the association between Body Mass Index (BMI) and dyslipidemia among young adults.

Materials and Methods: A cross-sectional observational study was conducted among 113 young adults aged 19–30 years in a medical college setting. Anthropometric measurements including height, weight, BMI, and waist circumference were recorded using standard procedures. Fasting venous blood samples were collected for lipid profile analysis including total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and very low-density lipoprotein cholesterol (VLDL-C). Dyslipidemia was defined according to NCEP-ATP III criteria. Pearson correlation analysis was used to evaluate the association between BMI and lipid parameters. A p-value <0.05 was considered statistically significant.

Results: The mean BMI of the participants was 24.5 ± 4.92 kg/m². Mean total cholesterol, triglycerides, HDL-C, LDL-C, and VLDL-C were 134 ± 23.3 mg/dL, 96 ± 47.4 mg/dL, 29.8 ± 5.16 mg/dL, 85.1 ± 22.1 mg/dL, and 19.2 ± 9.48 mg/dL respectively. BMI demonstrated a statistically significant positive correlation with triglycerides (r = 0.243, p = 0.009) and VLDL-C (r = 0.243, p = 0.009). Weak positive correlations were observed between BMI and total cholesterol (r = 0.141, p = 0.137) and BMI and LDL-C (r = 0.129, p = 0.174), which were statistically non-significant.

Conclusion: BMI showed significant association with triglyceride-rich lipoproteins among young adults, suggesting early metabolic alterations related to adiposity. The findings emphasize the importance of early screening and lifestyle interventions in young populations to reduce long-term cardiovascular risk.

Keywords: Body Mass Index; Dyslipidemia; Triglycerides; Young Adults; Lipid Profile; Obesity

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Introduction

Dyslipidemia is a major metabolic disorder and an established risk factor for cardiovascular disease, which remains the leading cause of mortality worldwide. Although dyslipidemia was previously considered a condition predominantly affecting middle-aged and elderly individuals, recent evidence indicates a rising prevalence of lipid abnormalities among adolescents and young adults.[1,2] Early onset of dyslipidemia is clinically important because prolonged exposure to abnormal lipid levels accelerates atherosclerosis and significantly increases long-term cardiovascular risk.[2]

Rapid urbanization, sedentary lifestyle, unhealthy dietary habits, reduced physical activity, irregular sleep patterns, and psychological stress have contributed substantially to the increasing burden of obesity and dyslipidemia among young populations.[1,3] Young adults, particularly university and medical students, are increasingly exposed to behavioral and environmental risk factors that predispose them to early metabolic disturbances.

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Several studies have demonstrated increasing prevalence of elevated triglycerides, low high-density lipoprotein cholesterol (HDL-C), and borderline or elevated low-density lipoprotein cholesterol (LDL-C) among individuals below 30 years of age.[4-6]

Body Mass Index (BMI) is a simple, inexpensive, and widely accepted anthropometric measure used to assess adiposity and nutritional status. Numerous epidemiological studies have established a strong association between elevated BMI and dyslipidemia.[3,7] Overweight and obese individuals commonly exhibit increased triglycerides, elevated LDL cholesterol, reduced HDL cholesterol, and other atherogenic lipid abnormalities. Studies conducted in different populations have consistently shown that even modest increases in BMI are associated with worsening lipid profiles and increased cardiovascular risk.[7-10]

Triglyceride-rich lipoproteins appear particularly sensitive to increasing adiposity and insulin resistance. Previous studies among young adults have demonstrated significant positive associations between BMI and triglycerides or very low-density lipoprotein cholesterol (VLDL-C), while associations with total cholesterol and LDL cholesterol are often weaker or inconsistent.[5,8,11] Furthermore, South Asian populations are known to develop metabolic abnormalities at comparatively lower BMI values because of increased visceral adiposity and genetic susceptibility to insulin resistance.[12]

Medical students constitute a unique subgroup among young adults due to high academic stress, irregular eating habits, sedentary behavior, sleep disturbances, and reduced physical activity, all of which may predispose them to metabolic disorders despite greater health awareness.[13] However, limited studies have specifically evaluated the relationship between BMI and dyslipidemia among Indian medical students and young adults.

Early identification of obesity-related dyslipidemia provides an opportunity for lifestyle modification and prevention of future cardiovascular disease. The aim of the present study was to assess the association between Body Mass Index and dyslipidemia among young adults in a medical college setting.

Materials and Methods

Study Design and Setting

A cross-sectional observational study was conducted in a medical college campus and associated diagnostic laboratory. Anthropometric measurements and blood sample collection were performed using standard protocols.

Study Population

The study included 113 young adults aged 19–30 years who voluntarily consented to participate.

Inclusion Criteria

- Young adults aged 19–30 years
- Apparently healthy individuals
- Participants willing to provide written informed consent

Exclusion Criteria

- Individuals receiving lipid-altering medications such as statins, steroids, or hormonal therapy
- Known cases of diabetes mellitus, hypertension, thyroid disorders, renal disease, cardiovascular disease, or polycystic ovarian syndrome
- Participants with acute illness or infection during the study period

Sampling Technique

Convenience sampling method was used.

Anthropometric Measurements

Height was measured using a standard stadiometer and recorded to the nearest 0.1 cm. Weight was measured using a calibrated digital weighing machine and recorded to the nearest 0.1 kg.

BMI was calculated using the formula:

BMI = Weight (kg) / Height² (m^2)

Participants were categorized according to WHO classification:

- Underweight: <18.5 kg/m^2
- Normal weight: 18.5–24.9 kg/m^2
- Overweight: 25–29.9 kg/m^2
- Obese: ≥30 kg/m^2

Waist circumference was also measured using a non-stretchable measuring tape.

Blood Sample Collection and Laboratory Analysis

Participants underwent overnight fasting for 8–12 hours prior to blood collection. Approximately 5 mL of fasting venous blood was collected under aseptic precautions. Serum was separated following centrifugation and analyzed for lipid profile parameters including:

- Total cholesterol (TC)
- Triglycerides (TG)
- High-density lipoprotein cholesterol (HDL-C)
- Low-density lipoprotein cholesterol (LDL-C)
- Very low-density lipoprotein cholesterol (VLDL-C)

LDL-C was calculated using Friedewald's formula when triglyceride values were below 400 mg/dL.

Dyslipidemia was defined according to NCEP-ATP III criteria:

- Total cholesterol ≥200 mg/dL
- LDL-C ≥130 mg/dL
- HDL-C <40 mg/dL
- Triglycerides ≥150 mg/dL

Participants fulfilling any one criterion were considered dyslipidemic.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation. Pearson correlation analysis was performed to evaluate associations between BMI and lipid parameters. Statistical significance was considered at $p < 0.05$.

Results

A total of 113 participants were included in the study.

Anthropometric Characteristics

The mean BMI was 24.5 ± 4.92 kg/m², ranging from 15.1 to 37.3 kg/m². The mean weight was 65.9 ± 15.4 kg and the mean height was 1.64 ± 0.09 m.

Lipid Profile Characteristics

The mean total cholesterol was 134 ± 23.3 mg/dL. Mean triglycerides were 96 ± 47.4 mg/dL, while mean HDL-C was 29.8 ± 5.16 mg/dL. Mean LDL-C and VLDL-C were 85.1 ± 22.1 mg/dL and 19.2 ± 9.48 mg/dL respectively.

Correlation between BMI and Lipid Parameters

BMI and Total Cholesterol (Table 1 & Fig 1)

The Pearson correlation analysis between body mass index (BMI) and total cholesterol levels in this young adult population revealed a weak positive correlation of r = 0.141 (N = 113, df = 111). This modest correlation coefficient represents a small but measurable linear relationship between body adiposity and circulating cholesterol concentrations. The borderline p-value of 0.137 and weak correlation magnitude of 0.141 indicate this finding should be interpreted cautiously.

BMI and Triglycerides (Table 2 & Fig 2)

The Pearson correlation analysis between body mass index (BMI) and triglyceride levels in this young adult population revealed a weak-to-moderate positive correlation of r = 0.243 (N = 113, df = 111). This correlation coefficient demonstrates a notably stronger relationship between body adiposity and triglyceridemia compared to the BMI-cholesterol association, representing a clinically meaningful metabolic relationship. The p-value of 0.009 is substantially below the conventional significance threshold of 0.05, indicating that this correlation is statistically significant.

Table 1: Correlation between BMI and Total Cholesterol

		BMI	*Cholesterol*
BMI	Pearson's r	—	
	df	—	
	p-value	—	
Cholesterol	Pearson's r	0.141	—
	df	111	—
	p-value	0.137	—

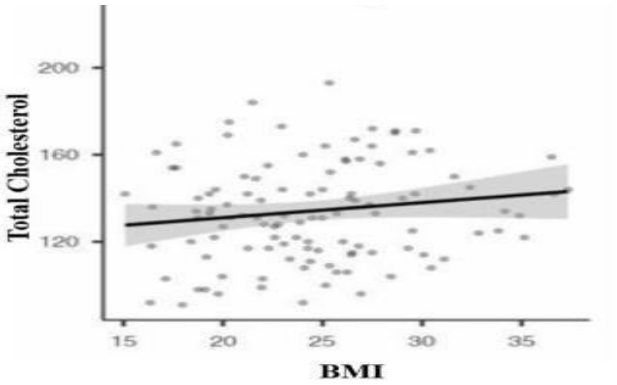

Figure 1: Scatter plot showing correlation between BMI and Total Cholesterol

BMI and LDL Cholesterol (Table 3 & Fig 3)

3The Pearson correlation analysis between body mass index (BMI) and low-density lipoprotein (LDL) cholesterol levels in this young adult population revealed a weak positive correlation of r = 0.129 (N = 113, df = 111). This correlation coefficient represents a minimal linear relationship between body adiposity and circulating LDL cholesterol concentrations. Statistical Interpretation and Significance The p-value of 0.174 substantially exceeds the conventional significance threshold of 0.05, indicating that the observed correlation is not statistically significant.

BMI and VLDL Cholesterol (Table 4 & Fig 4)

The Pearson correlation analysis between body mass index (BMI) and very low-density lipoprotein (VLDL) cholesterol levels in this young adult population revealed a weak-to-moderate positive correlation of r = 0.243 (N =

Table 2: Correlation between BMI and Triglycerides

		BMI	*TGL*
BMI	Pearson's r	—	
	df	—	
	p-value	—	
TGL	Pearson's r	0.243	—
	df	111	—
	p-value	0.009*	—

*Statistically significant

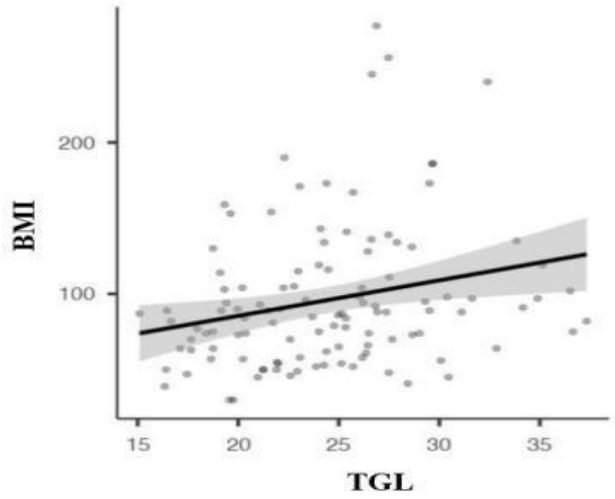

Figure 2: Scatter plot showing correlation between BMI and Triglycerides

113, df = 111). This correlation coefficient demonstrates a clinically meaningful relationship between body adiposity and circulating VLDL cholesterol concentrations, representing the strongest lipid-BMI association identified thus far in your analyses. Statistical Significance and Interpretation The p-value of 0.009 is substantially below the conventional significance threshold of 0.05, indicating that this correlation is statistically significant.

Discussion

The present study evaluated the association between Body Mass Index (BMI) and lipid profile abnormalities among young adults in a medical college setting. The findings demonstrated that BMI was significantly associated with triglycerides and VLDL cholesterol, whereas associations with total cholesterol and LDL cholesterol were weak and statistically non-significant. These observations indicate that early obesity-related metabolic alterations in young adults predominantly involve triglyceride-rich lipoproteins rather than cholesterol elevation.

Table 3: Correlation between BMI and LDL Cholesterol

		BMI	*LDL*
BMI	Pearson's r	—	
	df	—	
	p-value	—	
LDL	Pearson's r	0.129	—
	df	111	—
	p-value	0.174	—

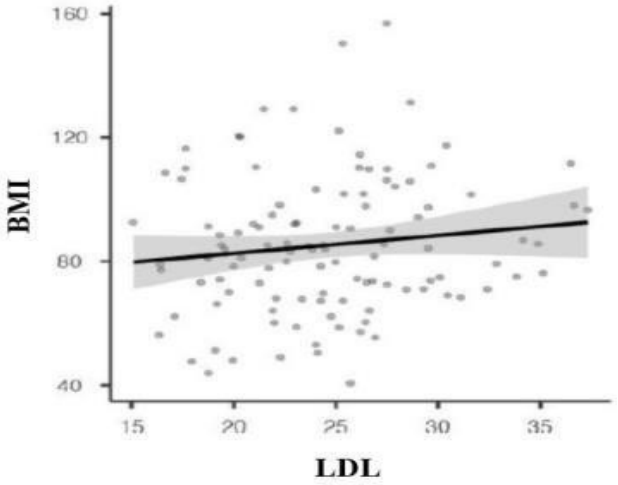

Figure 3: Scatter plot showing correlation between BMI and LDL Cholesterol

The mean BMI of the study population was 24.5 ± 4.92 kg/m², which lies near the upper limit of the normal range according to WHO classification. This finding reflects the increasing prevalence of overweight and obesity among young adults reported globally and in India.[3,4,7] Similar studies conducted among university students and young populations have shown rising BMI values associated with sedentary lifestyle, unhealthy dietary habits, reduced physical activity, and psychosocial stress.[5,8,13]

A statistically significant positive correlation was observed between BMI and triglyceride levels (r = 0.243, p = 0.009). This finding is consistent with several previous studies that demonstrated strong associations between adiposity and triglyceride-rich lipoproteins.[3,7,8,14] Shahraz et al. reported significantly higher triglyceride levels among overweight and obese young adults in the PERSIAN Guilan Cohort Study.[3] Similarly, Seo et al. observed increased triglyceride concentrations among overweight young adults in the United States.[8]

The relationship between BMI and triglycerides may be explained by obesity-associated insulin resistance.

Table 4: Correlation between BMI and VLDL Cholesterol

		BMI	*VLDL*
BMI	Pearson's r	—	
	df	—	
	p-value	—	
VLDL	Pearson's r	0.243	—
	df	111	—
	p-value	0.009*	—

*Statistically significant

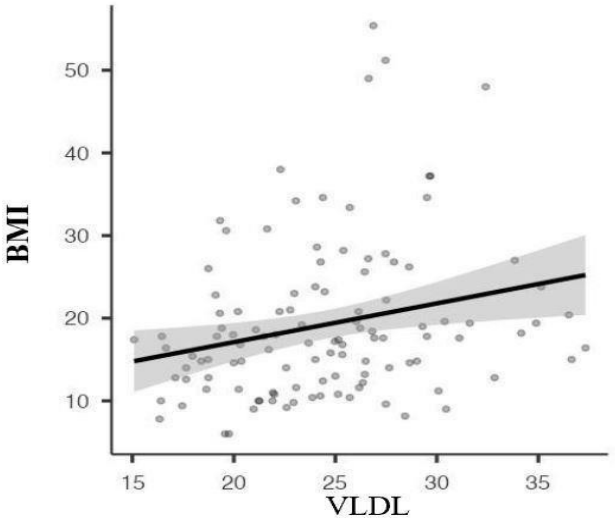

Figure 4: Scatter plot showing correlation between BMI and VLDL Cholesterol

Increased adiposity, particularly visceral fat accumulation, leads to enhanced free fatty acid flux to the liver, resulting in increased hepatic triglyceride synthesis and overproduction of very low-density lipoprotein cholesterol (VLDL-C).[15,16] Insulin resistance also impairs lipoprotein lipase activity, reducing triglyceride clearance from circulation and contributing to hypertriglyceridemia.[17]

The significant positive correlation between BMI and VLDL cholesterol observed in the present study further supports the close relationship between obesity and triglyceride metabolism. VLDL serves as the principal carrier of endogenous triglycerides, and elevated VLDL levels indicate increased hepatic lipid synthesis and early metabolic dysfunction.[15] Similar associations between BMI and VLDL have been reported among Indian, Iranian, and Korean young adults.[9,12,18]

In contrast, the association between BMI and total cholesterol was weak and statistically non-significant ($r = 0.141$, $p = 0.137$). Similar findings have been documented in earlier studies among adolescents and young adults where total cholesterol showed only modest correlation with BMI.[5,10] Total cholesterol represents the combined concentration of multiple lipoprotein fractions including HDL, LDL, and VLDL, each of which may respond differently to increasing adiposity. Consequently, opposing changes among lipid fractions may reduce the overall correlation between BMI and total cholesterol.

The correlation between BMI and LDL cholesterol was also weak and statistically non-significant ($r = 0.129$, $p = 0.174$). LDL cholesterol metabolism is influenced by multiple factors including genetic predisposition, dietary saturated fat intake, hepatic LDL receptor activity, and duration of metabolic dysfunction. Several studies have reported that LDL elevation becomes more apparent only in severe obesity or prolonged metabolic syndrome.[6,11] Therefore, the relatively young age of the participants and shorter duration of adiposity may explain the absence of a strong association in the present study.

The mean HDL cholesterol level observed in this study was considerably low (29.8 ± 5.16 mg/dL), suggesting an unfavorable lipid pattern among participants. Low HDL cholesterol is recognized as an important independent cardiovascular risk factor and is commonly reported among South Asian populations.[12] Genetic susceptibility, high carbohydrate intake, physical inactivity, and insulin resistance contribute significantly to reduced HDL levels in this population.[14]

Several studies have demonstrated that HDL cholesterol is often the earliest lipid parameter affected during the development of obesity-related metabolic abnormalities.[7,9,14] Although correlation analysis between BMI and HDL was not performed in the present study, the low HDL values observed across the cohort indicate a concerning prevalence of early dyslipidemia among apparently healthy young adults.

The findings of the present study have important public health implications. Young adulthood represents a critical period during which lifestyle behaviors become established and metabolic abnormalities begin to develop.[1,2] Early identification of obesity and dyslipidemia provides an opportunity for preventive interventions including dietary modification, regular physical activity, weight management, and stress reduction. Screening programs targeting university students and medical trainees may help reduce future cardiovascular disease burden.[13]

The present study also highlights the importance of evaluating triglyceride-rich lipoproteins in young adults, even when total cholesterol and LDL cholesterol remain

within acceptable ranges. Elevated triglycerides and VLDL may represent early indicators of metabolic dysfunction preceding overt cardiovascular disease.[15,17,18]

Limitations

The study had several limitations. The sample size was relatively small and participants were recruited from a single institution, limiting generalizability. The cross-sectional design does not establish causality. Dietary intake, physical activity, and other lifestyle variables were not quantitatively assessed. Gender-wise subgroup analysis was also not performed.

Conclusion

The present study demonstrated that BMI is significantly associated with triglyceride-rich lipoproteins, particularly triglycerides and VLDL cholesterol, among young adults. In contrast, associations between BMI and total cholesterol or LDL cholesterol were weak and statistically non-significant. The findings indicate that increasing adiposity in young adults is associated predominantly with early disturbances in triglyceride metabolism. The high prevalence of low HDL cholesterol observed in the study further highlights the importance of early lifestyle intervention and metabolic screening in young populations. Early identification and preventive strategies may help reduce future cardiovascular morbidity and mortality.

References

1. Liu LY, et al. Epidemic trends of dyslipidemia in young adults: a real-world study. Lipids Health Dis. 2023; 22:101.
2. Dalal JJ, et al. Managing dyslipidaemia in young adults. Clin Cardiol. 2024;47(2):123–130.
3. Shahraz J, et al. Association between body mass index and dyslipidemia: findings from the PERSIAN Guilan Cohort Study. BMC Public Health. 2025; 25:112.
4. Chen XY, et al. Association of body mass index with dyslipidemia: a dose-response analysis. BMC Endocr Disord. 2023; 23:56.
5. R.M. Kamakshi. To Assess Cardiovascular Risk in Cases of Spinal Cord Injury by Screening Impaired Glucose Tolerance and Dyslipidemia – Prospective Study. *Asian Pacific Journal of Health Sciences*, 2025;*12*(4), 5–11.
6. Mishra S, et al. Obesity and dyslipidemia in young adults: a cross-sectional study. Clin Epidemiol Glob Health. 2023; 12:100999.
7. Yoon JY, et al. Weight change and dyslipidemia among Korean male soldiers: a retrospective cohort study. J Korean Med Sci. 2024;39: e12.
8. Seo DC, et al. The association of overweight and obesity with lipid profiles in US young adults. J Am Coll Health. 2019;67(4):311–318.
9. Kumar, A., & Singh, R. K. Association between anthropometric parameters and dyslipidemia in obese and non-obese patients. *International Journal of Health and Clinical Research*, 2020;*3*(3): 128–132
10. Freedman DS, et al. The relation of overweight to cardiovascular risk factors among children and adolescents: the Bogalusa Heart Study. Pediatrics. 1999;103(6):1175–1182.
11. Berenson GS, et al. Association of BMI and cardiovascular risk in young individuals: Bogalusa Heart Study. N Engl J Med. 1998;338(23):1650–1656.
12. Mirmiran P, et al. Association of BMI and waist circumference with dyslipidemia among young adults. Int J Endocrinol Metab. 2016;14(4):e30746.
13. Salazar MR, et al. BMI and lipid alterations among university students. Rev Med Chil. 2014;142(11):1415–1422.
14. Ghosh A. Association of body mass index with dyslipidemia in young Indian adults. Anthropol Anz. 2007;65(3):269–276.
15. Guerra PH, et al. Body mass index and cardiovascular risk factors in Brazilian students. Clinics (Sao Paulo). 2011;66(11):1921–1925.
16. Al-Shaibi KF, et al. Prevalence of dyslipidemia and its association with obesity in university students. J Clin Lipidol. 2021;15(6):882–890.
17. Ofori EK, et al. Adiposity indices and lipid profile abnormalities in young adults. BMC Public Health. 2022; 22:1389.
18. Hossain FB, et al. Overweight, obesity and lipid profile among Bangladeshi adolescents and young adults. Diabetes Metab Syndr. 2020;14(6):2101–2107.