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Comparative Study of Total Cholesterol and Triglyceride in Obese and Non-Obese Subject

Bushra Zainab [1], Sana Mobeen [2], Tehmina Tariq [3], Muzafar Islam [4] Sufia Jawwad [5]

[1] BS MLS Institution: Superior University Lahore Email: bushrazainab.1111@gmail.com
[2] BS MLS Institution: Superior University Lahore Email: ch0440393@gmail.com
[3] M. Phil Biochemistry Institution, Superior University Lahore Email: tehmina.tariq@superior.edu.pk
[4] B.SC (Hons) MLT, Quality Control Manager, Chaudhary Muhammad Akram Teaching & Research Hospital Email: muzafar.islam888@gmail.com
[5] BS MLS, Medical Lab Technologist , Chaudhary Muhammad Akram Teaching & Research Hospital Email: sofiajawad128@gmail.com

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Abstract

Objective: To assess the possible effects on cardiovascular health by comparing the levels of triglycerides and total cholesterol in obese and non-obese people.

Methodology: At Ghurki Hospital in Lahore, a comparative cross-sectional study was carried out. One hundred participants in all were classified as either non-obesity (BMI < 30) or obese (BMI > 30). Following an 8–12 hours fast, blood samples were drawn, and enzymatic colorimetric tests were used to determine the levels of total cholesterol and triglycerides. SPSS software was used to statistically analyze the data.

Results: The results showed a strong correlation between changed lipid profiles and obesity. The levels of triglycerides and total cholesterol were considerably greater in fat people than in non-obese people. Obesity and hyper-cholesterolemia were shown to be strongly correlated (p = 0.000), with 44% of the study population having high cholesterol levels (≥200 mg/dL). Likewise, hyper-triglyceridemia and obesity were statistically significantly correlated (p = 0.000), with 62% of subjects having increased triglyceride levels (≥150 mg/dL).

Conclusion: Increased levels of triglycerides and total cholesterol are closely linked to obesity, which may raise the risk of cardiovascular disorders. These results emphasize the necessity of early screening and focused interventions, such as dietary and lifestyle changes, to control lipid abnormalities linked to obesity and avoid related health issues.

Keywords: Obesity, Total Cholesterol, Triglycerides, Lipid Profile, Cardiovascular Risk, BMI, Dyslipidemia

Introduction

An excessive accumulation of bodily fat causes obesity, a chronic disorder. It can increase the risk of heart disease, type 2 diabetes, and numerous types of cancer. The World Health Organization (WHO) defines obesity as having a body mass index (BMI) of 30 or higher. According to the CDC, adults are deemed obese if their BMI is 30 or more. The prevalence of overweight and obesity is rising worldwide.(1) Numerous cancers, diabetes mellitus, cardiovascular disease, chronic kidney disease, and a range of musculoskeletal disorders have all been associated in epidemiologic studies with high body-mass index (BMI), which is determined by dividing weight in kilograms by height in meters squared.[2, 3]

Another serious health issue is malnutrition. Malnutrition is linked to sociocultural factors as well as ignorance and inattention.[4] Serum cholesterol, triglycerides, and blood sugar are all strongly associated with obesity. Diabetes, heart disease, and high blood pressure can all be exacerbated by obesity.[5] The etiology of abnormal lipid profiles in obese individuals is complicated. Reduced peripheral free fatty acid trapping, decreased triglyceride lipolysis, increased VLDL synthesis, and increased release of free fatty acids from adipocytes to the liver and other tissues all contribute to the pathophysiology of the obese population.[6]

The BMI is the sole basis for the current analysis. Both children's and adults' height and weight are imprecise indicators of how various environmental influences, such as diet and infections, alter a person's genetic development potential across both short and long time periods, which in turn affects a variety of health results [7] Based on the available data, preliminary analyses of the global burden of disease linked to higher BMI indicated that the distribution of BMI values for men and women in each age group offered more useful information than just the percentages of the population that are overweight or obese. The public, policymakers, and physicians all heavily rely on these classifications of overweight and obesity when making decisions about patient care. Therefore, although though this data was not utilized in the computation of the contribution of various BMI values to the illness burden, the percentages of overweight and obese individuals in the population are included in this study. [7]

This approach allows for a more nuanced understanding of how BMI impacts health outcomes across different demographics, ultimately leading to more targeted interventions and policies.[8]Furthermore, it underscores the significance of considering socioeconomic factors and lifestyle choices that may influence these classifications, ensuring that interventions are not only effective but also equitable. [9]

Total cholesterol and triglyceride levels are closely associated with obesity, presenting significant challenges in the management of cardiovascular health within affected populations. The relationship between elevated lipid levels and obesity is multifaceted, as excess body weight often contributes to dyslipidemia, characterized by imbalanced cholesterol and triglyceride levels.[10] The relationship between cholesterol and triglyceride levels in individuals who are obese and non-obese subjects is characterized by distinct physiological mechanisms and health implications.

In **obese individuals,** there is often a dysregulation of lipid metabolism, leading to elevated levels of both total cholesterol and triglycerides. This dyslipidemia is primarily due to several factors **Increased VLDL Production**: Obesity is associated with the overproduction of VLDL by the liver, which contributes to higher triglyceride levels in the bloodstream. [11]

Impaired Lipolysis: In obese individuals, the process of breaking down triglycerides (lipolysis) is often diminished, leading to higher circulating triglyceride levels. [12] **Insulin Resistance**: Obesity frequently leads to insulin resistance, which can exacerbate lipid abnormalities, including elevated triglycerides and altered cholesterol levels. [13]

Inflammation and Adipokines: Increased adipose tissue in obesity releases pro-inflammatory cytokines and adipokines that can further disrupt lipid metabolism and promote dyslipidemia. [14]

In contrast, **non-obese individuals** typically exhibit more balanced lipid profiles. Their cholesterol and triglyceride levels are generally lower, and they are less likely to experience the same degree of dyslipidemia as those who are obese. Factors contributing to this healthier lipid profile include: **efficient lipid metabolism, lower insulin resistance, and healthier lifestyle choices. [15]** Obesity has a complicated genetic makeup. The gene most strongly linked to obesity, the fat-mass and obesity associated gene (FTO) is found in the general population [16].In addition to these poorly known polygenic interactions, only a small percentage of obese patients may be classified as having a monogenic or syndromic obesity disorder.[17]. Main causes of obesity are Rapid meal intake, Sugary Drinks, Snack Foods, Activity Level, Environmental Factors, Socio-cultural factors, Family Factors and Depression and Anxiety.

Methodology

At Ghurki Hospital in Lahore, a comparative cross-sectional study was carried out. One hundred participants in all were classified as either non-obesity (BMI < 30) or obese (BMI > 30). Following an 8–12 hours fast, blood samples were drawn, and enzymatic colorimetric tests were used to determine the levels of total cholesterol and triglycerides. Data was analyzed using SPSS software. Depending on variables different statistical technique will be performed including standard deviation (SD), mean median, mode, T-test, and correlation coefficient, Criteria of significance i.e. -value etc.

Results

The chi-square test shows a significant association (p = 0.000) between obesity and high cholesterol. Obese individuals are more likely to have high cholesterol levels, confirming a strong link between obesity and lipid metabolism issues.

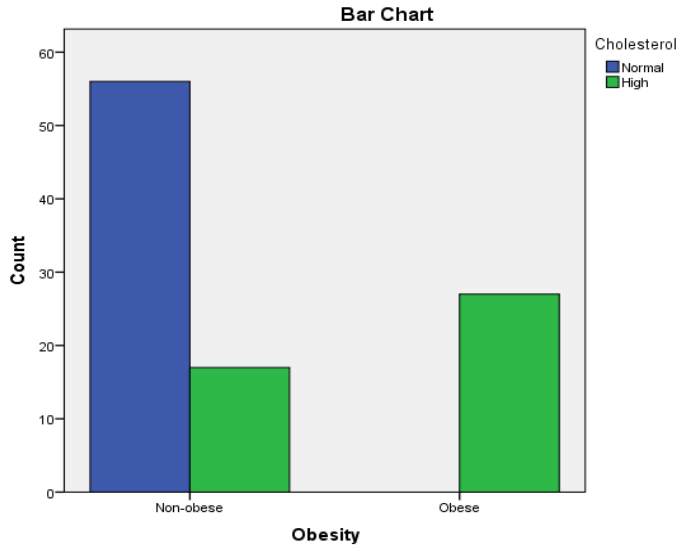
Association between Obesity and Cholestrol:

The test indicates a strong association (p = 0.000) between obesity and high cholestrol levels. Obese individuals have a much higher risk of elevated cholestrol, which increases the risk of cardiovascular disease.

		Cholesterol level		Total
		Normal	High	
Obesity	Non-obese	56	17	73
	Obese	0	27	27
Total		56	44	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	47.073[a]	1	.000		
Continuity Correction[b]	44.012	1	.000		
Likelihood Ratio	57.948	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	46.603	1	.000		
N of Valid Cases	100				



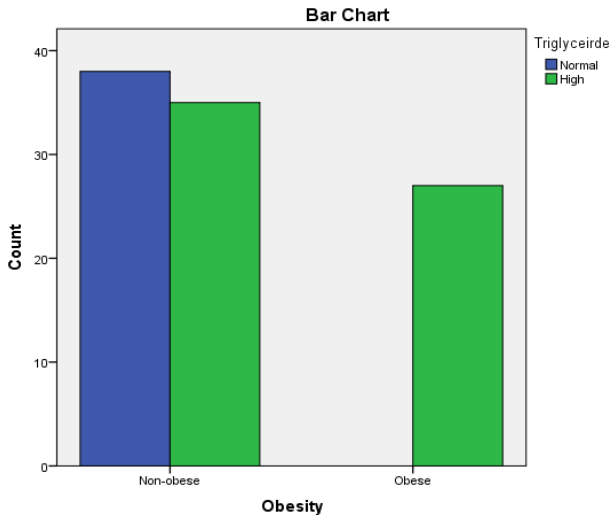
Graph No 7: Chi square test for association between obesity and Cholesterol

Association between Obesity and Triglyceride:
The test indicates a strong association (p = 0.000) between obesity and high triglyceride levels. Obese individuals have a much higher risk of elevated triglycerides, which increases the risk of cardiovascular disease.

		Triglyceride		Total
		Normal	High	
Obesity	Non-obese	38	35	73
	Obese	0	27	27
Total		38	62	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	22.669[a]	1	.000		
Continuity Correction[b]	20.513	1	.000		
Likelihood Ratio	31.737	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	22.442	1	.000		
N of Valid Cases	100				



Graph No 8: Chi square test for association between obesity and Triglyceride

Discussion

The present study aimed to compare total cholesterol and triglyceride levels in obese and non-obese individuals to assess the impact of obesity on lipid metabolism. The results demonstrated a significant association between obesity and dyslipidemia, as obese individuals exhibited higher total cholesterol and triglyceride levels compared to their non-obese counterparts. These findings align with previous research studies, which have consistently reported that obesity is a major risk factor for lipid metabolism disorders and cardiovascular diseases.

Obesity is characterized by excessive adipose tissue accumulation, which contributes to metabolic disturbances, including dyslipidemia. Several physiological mechanisms can explain the elevated cholesterol and triglyceride levels observed in obese individuals:

The strong association between obesity and dyslipidemia underscores the importance of early screening and intervention strategies to prevent obesity-related cardiovascular complications. Given that 62% of the study participants had high triglyceride levels, the findings highlight the need for targeted lifestyle modifications, including dietary changes, increased physical activity, and weight management programs.

Additionally, healthcare professionals should consider routine lipid profile assessments for individuals with high BMI to facilitate early detection and management of dyslipidemia. Pharmacological interventions, such as statins and fibrates, may be necessary for individuals with persistent lipid abnormalities despite lifestyle modifications.

Conclusion

This study aimed to compare total cholesterol and triglyceride levels in obese and non-obese individuals to assess the impact of obesity on lipid metabolism. The findings demonstrated a strong association between obesity and elevated lipid levels, with obese individuals exhibiting significantly higher total cholesterol and triglyceride concentrations than their non-obese counterparts.

The statistical analysis revealed a significant correlation ($p = 0.000$) between obesity and dyslipidemia, highlighting obesity as a major risk factor for cardiovascular diseases. The pathophysiological mechanisms underlying this association include increased very low-density lipoprotein (VLDL) production, impaired triglyceride metabolism, insulin resistance, and chronic inflammation. These findings align with previous research that has consistently shown obesity as a key contributor to metabolic disorders and cardiovascular complications.

Given the growing prevalence of obesity worldwide, this study underscores the urgent need for early screening and intervention strategies to prevent obesity-related dyslipidemia and associated health risks. Lifestyle modifications, including dietary adjustments, regular physical

activity, and weight management, should be prioritized to mitigate the impact of obesity on lipid profiles.

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