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Interplay between Lipid Profile and Weight-Related Outcomes in Healthy Overweight Adults: Insights from Comprehensive Analyses

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ABSTRACT

Background: The escalating prevalence of overweight and obesity has heightened concerns about cardiovascular health. The intricate interplay between lipid profile variables and weight-related outcomes plays a pivotal role in shaping cardiovascular risks among individuals with excess body weight. This study investigates the associations between lipid profile variables and weight-related indicators in a cohort of healthy, overweight adults, shedding light on potential implications for cardiovascular risk management.

Methods: The prevalence of metabolic syndrome, risk factors, and related lifestyle in adult Myanmar citizens were examined in the Inter-University Consortium for Political and Social Research Study (ICPSR146521) using prospective data. The patient's lipid profiles and demographic data were statistically analyzed using the statistical MedCalc tool. Statistical significance was determined using a 0.05 p-value.

Results: Results demonstrate that while BMI is influenced by multiple factors beyond lipid profile variables, waist circumference exhibits moderate association with these variables. Notably, triglycerides significantly correlated with waist circumference, suggesting a potential role in visceral fat accumulation. Additionally, the study highlights the impact of high-density lipoprotein (HDL) cholesterol levels on body weight, indicating that higher HDL levels are associated with lower body weights among healthy overweight adults.

Conclusion: This study provides comprehensive insights into the complex relationship between lipid profile variables and weight-related outcomes among healthy, overweight adults. These findings underscore the importance of weight management strategies for cardiovascular health and suggest potential avenues for targeted interventions. By understanding the interplay between lipid profiles and obesity, clinicians and public health professionals can develop more effective strategies to mitigate cardiovascular risks in this demographic.

Keywords: BMI, HDL, LDL, overweight, dyslipidemia, waist circumference

1.0 INTRODUCTION

The escalating prevalence of overweight and obesity has become a global health concern due to its profound impact on cardiovascular health [1]. Accumulating evidence underscores the intricate relationship between lipid profile variables and weight-related outcomes, as both obesity and lipid metabolism play pivotal roles in cardiovascular risk assessment [2]. Understanding the interplay between these factors is imperative for designing effective interventions to mitigate cardiovascular risks in overweight individuals.

Excessive body weight is associated with alterations in lipid profiles, such as changes in high-density lipoprotein (HDL), low-density lipoprotein (LDL), total cholesterol (TC), and triglycerides (TG), all of which are key determinants of cardiovascular health [3]. The intricate connections between these lipid profile variables and various weight-related indicators, including Body Mass Index (BMI), body weight, and waist circumference, are multifaceted and subject to dynamic interactions [4].

However, the relationships between lipid profiles and weight-related outcomes are not yet fully elucidated, particularly in the context of healthy, overweight adults. While numerous studies have examined the individual impact of obesity and lipid profiles on cardiovascular health [5-8], few have comprehensively investigated their intricate interplay [9-10]. Therefore, there is a significant knowledge gap regarding the combined effects of lipid profile variables and weight-related indicators on cardiovascular risk factors within this specific demographic.

This study aims to bridge this gap by investigating the associations between lipid profile variables and weight-related outcomes in a cohort of healthy, overweight adults. Through meticulous analyses of diverse lipid profile metrics and weight-related indicators, this study seeks to unveil potential correlations, dependencies, and potential clinical implications. The findings of this study are expected to provide nuanced insights into the complex relationship between lipid metabolism and obesity, shedding light on avenues for more targeted interventions and enhanced cardiovascular risk management strategies for this unique demographic.

2.0 METHODOLOGY

2.1 Description of Retrieved Datasets

The information for this investigation came from the Inter-University Consortium for Political and Social Research Study on the Prevalence of Metabolic Syndrome, Its Risk Factors, and Associated Lifestyle in Adults in Myanmar (ICPSR146521) [11]. The researcher, data collectors, and participants all used COVID-19 preventative measures, which led to a five-day home visit data collection process in November 2020. Five registered nurses with experience in community health were trained and rechecked to minimize observer bias when collecting sociodemographic, lifestyle, and anthropometric measurements in the community. Three phlebotomists took blood samples to analyze blood glucose levels and lipid profiles. By using the convenience sampling method, adults over the age of [12] who have resided in the study area for at least one year and are free of pregnancy-related issues and medical conditions like cardiac diseases, diabetes, and renal disorders were chosen from three municipal wards of the chosen township. This study excluded participants who were on anti-diabetic, anti-hypertensive, and lipid-lowering medications and could not participate in anthropometric measures. The objective of the investigation, body size measures, and the invasive blood-drawing procedure were fully explained to prospective participants who indicated an interest in participating in the study. All persons available for physical examinations and blood testing provided informed written consent. Those who weigh 18.5 kg are underweight. Between 18.5 kg and 24.9 kg is the healthy weight range, while 25 kg and 29.9 kg are overweight. 30 kg or over the obese range [27].

The ICPSR website's data on the prevalence of metabolic syndrome, its risk factors, and the associated lifestyle in adult Myanmar citizens were downloaded [13-14]. The following variables are included in this data set: occupation, age, sex, HbA1c, fasting blood sugar, total cholesterol, triglycerides, HDL, and LDL; body weight, height, BMI, waist circumference; systolic and diastolic blood pressures; and waist circumference [15-16]. Our regional institutional review board determined that this study was exempt.

2.2 Statistical Analysis

Statistical analyses were performed on the patient's lipid profiles and demographic data using the statistical MedCalc program [16-17]. A chi-square test was employed to determine the significance of the relationship between categorical variables. Statistics were considered significant when the P-value was less than 0.05. Correlation was utilized to determine any associations between continuous variables.

3.0 RESULTS

The descriptive statistics in Table 1 provide an overview of the lipid profile variables (Total Cholesterol, Triglycerides, HDL, LDL) and weight-related indicators (Body Weight, BMI, Waist Circumference) within the studied cohort of healthy overweight adults. Notably, the mean values and standard deviations offer insights into these variables' central tendencies and variabilities, forming the foundation for subsequent analyses.

Table 1. The Group Mean Values SD of Different Variables

Variables	Mean	SD
Total Cholesterol (mmol/L)	200.9	37.966
Triglycerides (mmol/L)	156.22	79.875
High density lipoprotein (mmol/L)	56.144	13.325
Low density lipoprotein (mmol/L)	113.63	33.279
Body weight (kg)	66.594	7.7939
Body mass index (kg/m2)	27.268	1.5138
Waist circumference (cm)	85.908	7.5286

Table 2. Statistics Based on Waist Circumference as the Dependent Variable

Sample size	97
Coefficient of determination R^2	0.1423
R^2-adjusted	0.1050
Multiple correlation coefficient R	0.3772
Residual standard deviation	7.1224

Table 2 highlights the statistical measures derived from analyzing the association between lipid profile variables and waist circumference. The coefficient of determination (R^2) of 0.1423 indicates that the variability in lipid profile variables can explain approximately 14.23% of the variation in waist circumference. This suggests a moderate relationship between these variables and waist circumference, though other factors may also contribute.

Table 3 presents the outcomes of a multiple linear regression analysis where waist circumference is the dependent variable. Among the lipid profile variables, triglycerides (TG) exhibit a statistically significant positive association with waist circumference. This finding suggests that higher levels of triglycerides are associated with larger waist circumferences among the studied group of healthy overweight adults.

Complementing the regression analysis, Table 4 provides correlation coefficients that reveal the relationships between waist circumference and lipid profile variables. Notably, the positive correlation between waist circumference and triglycerides is consistent with the regression findings, highlighting the potential influence of triglyceride levels on waist circumference.

Table 4. Correlation coefficients based on waist circumference as the dependent variable

Variable	Waist circumference	HDL	LDL	TC
HDL	-0.2907			
LDL	0.01561	0.1192		
TC	0.04266	0.1654	0.5887	
TG	0.3383	-0.4118	0.1876	0.2745

Table 5. Statistics Based on BMI as the Dependent Variable

Sample size	97
Coefficient of determination R^2	0.04963
R^2-adjusted	0.008308
Multiple correlation coefficient	0.2228
Residual standard deviation	1.5075

Transitioning to BMI as the dependent variable, Table 5 outlines statistical measures representing the relationship between lipid profile variables and BMI. The coefficient of determination (R^2) of 0.04963 indicates that approximately 4.963% of the variability in BMI can be attributed to the variability in lipid profile variables. This suggests that the impact of lipid profiles on BMI is relatively limited within this population.

Table 6 further explores the relationship between lipid profile variables and BMI through regression analysis. The non-significant coefficients and associated p-values emphasize that, within this cohort of healthy overweight adults, lipid profile variables (HDL, LDL, TC, TG) are not significant predictors of BMI variation.

Table 3. Regression Equation Based on Waist Circumference as the Dependent Variable

Independent variables	Coefficient	Std. Error	t	P	rpartial	rsemipartial	VIF
(Constant)	87.8146						
HDL	-0.1026	0.06321	-1.623	0.1080	-0.1669	0.1567	1.343
LDL	-0.004299	0.02707	-0.159	0.8742	-0.01655	0.01533	1.536
TC	0.002268	0.02494	0.0909	0.9277	0.009480	0.008780	1.697
TG	0.02488	0.01082	2.300	0.0237	0.2332	0.2221	1.413

Table 6. Regression Equationbased on BMI as the Dependent Variable

Independent variables	Coefficient	Std. Error	T	P	rpartial	rsemipartial	VIF
(Constant)	29.3527						
HDL	-0.01660	0.01338	-1.240	0.2180	-0.1282	0.1261	1.343
LDL	0.004749	0.005730	0.829	0.4094	0.08608	0.08423	1.536
TC	-0.007197	0.005279	-1.363	0.1761	-0.1407	0.1386	1.697
TG	-0.001578	0.002290	-0.689	0.4923	-0.0716	0.07006	1.413

Table 7. Correlation Coefficients Based on BMI as the Dependent Variable

Variable	BMI	HDL	LDL	TC
HDL	-0.1292			
LDL	-0.03490	0.1192		
TC	-0.1661	0.1654	0.5887	
TG	-0.05309	-0.4118	0.1876	0.2745

Table 8. Statistics Based on Body Weight as the Dependent Variable

Sample size	97
Coefficient of determination R2	0.1345
R2-adjusted	0.09682
Multiple correlation coefficient	0.3667
Residual standard deviation	7.4070

Table 9. Regression Equation Based on Body Weight as the Dependent Variable

Independent variables	Coefficient	Std. Error	T	P	rpartial	rsemipartial	VIF
(Constant)	81.3610						
HDL	-0.1764	0.06574	-2.684	0.0086	-0.2695	0.2603	1.343
LDL	-0.05356	0.02815	-1.902	0.0602	-0.1945	0.1845	1.536
TC	0.01106	0.02594	0.426	0.6707	0.04442	0.04137	1.697
TG	-0.006388	0.01125	-0.568	0.5715	-0.05910	0.05508	1.413

The relationship between BMI and lipid levels is seen in Table 7. The HDL, LDL, TC, and TG levels all showed negligible negative associations with BMI. This demonstrates how these lipid levels tend to drop as BMI rises.

Using body weight as the dependent variable, Table 8 gives the sample size, R2, modified R2, R, and residual standard deviation. R2 was calculated from this result to be 0.1345. This demonstrates that the independent variables (TC, TG, HDL, and LDL values) account for 13.45% of the participants' body weight variation. This shows that factors other than TC, TG, HDL, and LDL levels account for 86.55% of the change in body weight.

The relevance of the lipid levels and the extent to which they affect body weight are shown in Table 9 along with the strength of the link. HDL levels significantly impacted body weight (t = -2.684, p=0.0086). Body weight drops by.1764 with each unit increase in HDL level. LDL levels did not significantly impact body weight (t = -1.902, p=0.0602). Body weight reduces by.05356 for every unit increase in LDL levels. Moreover, it was discovered that TC level had no discernible impact on body weight (t = 0.426, p=0.6707). Body weight increases by.01106 with each unit increase in TC level. Moreover, it was discovered that TG level had no discernible impact on body weight (t = -0.568, p=0.5715). BMI decreases by.006388 for every unit increase in TG level.

The relationship between body weight and lipid levels is seen in Table 10. The HDL, LDL, and TC levels had

Table 10. Correlation Coefficients Based on Body Weight as the Dependent Variable

Variable	Bodyweight	HDL	LDL	TC
HDL	-0.2930			
LDL	-0.2452	0.1192		
TC	-0.1486	0.1654	0.5887	
TG	0.03064	-0.4118	0.1876	0.2745

little negative associations with body weight. This demonstrates how these lipid levels tend to drop as body weight increases. Body weight and TG level had a negligible positive connection. This suggests that TG levels tend to rise as body weight increases.

4.0 DISCUSSION

The present study aimed to investigate the potential association between lipid profile variables and weight-related outcomes in a cohort of healthy overweight adults. To this end, we performed statistical analyses involving various lipid profile variables, including HDL cholesterol, LDL cholesterol, total cholesterol (TC), and triglycerides (TG), in relation to three weight-related indicators: Body Mass Index (BMI), body weight, and waist circumference.

The correlation coefficients presented in Tables 7 and 10 shed lights on the relationships between lipid profile variables and the weight-related indicators (BMI and body weight). Interestingly, a consistent trend emerges across these tables. Higher body weight and BMI are negatively correlated with HDL cholesterol levels, suggesting that

increased body weight is associated with a decrease in HDL cholesterol, which is considered a risk factor for cardiovascular health [17-18]. Similarly, higher body weight and BMI are negatively correlated with LDL cholesterol levels. These findings align with the established understanding that obesity is often accompanied by alterations in lipid profiles that contribute to an unfavorable cardiovascular risk profile [19-20].

The regression analysis results shown in Table 9 further emphasize the relationship between lipid profile variables and body weight. Among the lipid profile variables, HDL cholesterol demonstrates a statistically significant negative association with body weight. This finding is noteworthy, as higher levels of HDL cholesterol are often associated with favorable cardiovascular health [21-22]. However, the lack of significant associations for LDL cholesterol, total cholesterol, and triglycerides with body weight suggests that their impact on body weight within this cohort may be less pronounced.

The findings of this study hold several implications for both research and clinical practice. The negative correlations between body weight and HDL cholesterol, as well as between body weight and LDL cholesterol, reinforce the importance of weight management in maintaining healthy lipid profiles [23-24]. The significant negative association between HDL cholesterol and body weight suggests that efforts to maintain or improve HDL cholesterol levels could be particularly beneficial for individuals aiming to manage their weight [25-26]. These findings underscore the interconnectedness of weight-related outcomes and lipid profile variables in the context of cardiovascular health.

From a clinical standpoint, these results highlight the need for comprehensive strategies that consider both weight management and lipid profile optimization. Healthcare professionals can use this information to tailor interventions for healthy overweight adults, aiming to improve their cardiovascular risk profiles through lifestyle modifications, including diet, physical activity, and potential medical interventions.

In conclusion, the results of this study provide valuable insights into the intricate relationship between lipid profile variables and weight-related outcomes in healthy overweight adults. While the associations between lipid profiles and weight-related indicators are evident, the extent of their influence and interaction with other factors warrant further investigation. This study contributes to the growing body of knowledge regarding cardiovascular health in the context of weight management and lipid metabolism, with implications for clinical practice and future research endeavors.

Conflicts of Interest

The authors declare that there is no conflict of interests.

Authors' Contributions

LOO conceived and designed the study, reviewed the retrieved datasets and reviewed the manuscript. **OAA** contributed to study design, oversee the retrieval of data sets, supervised the retrieval of datasets and contributed to manuscript writing. **SBO, IAO, YBM** contributed to manuscript writing. All authors approved the final copy of the manuscript.

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