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"Correlation of Serum Triglyceride with Body Mass Index"

A. S. M.Shamim Al Azad[1], Md. Zahidul Islam[2], Shah Md. FazlayRahaman Khan[3], Md. Moshiour Rahman[4]

[1]*Jonior Consultant, Cardiology, 250 Bed Sadar Hospital, Patuakhali, Bangladesh*
[2]*Medical Officer, Medical Department, Power Development Board, Bangladesh*
[3]*Assistant professor, Medicine, Sher-E-Bangla Medical College, Barishal, Bangladesh*
[4]*Associate professor, Medicine, Patuakhali medical College,Patuakhali, Bangladesh*
Corresponding Author:*A. S. M Shamim Al Azad*

Abstract
Background: *In Bangladesh, obesity is emerging as an important health problem particularly in urban areas. The prevalence of obesity is rising to epidemic proportions at an alarming rate in both developed and less developed countries around the world [6]. This study was conducted to determine the association between serumTriglyceride with Body Mass Index (BMI) group (underweight, normal, overweight& obese) in patients seen in outpatient & inpatient department of cardiology, Patuakhali medical college hospital, Patuakhali, Bangladesh.*
Method*s: This cross sectional study was conducted over a period of 1 year (June2018 to July 2019) on a sample of 127 conveniently selected patients between 30-70 years of age.*
Results: *The total participants were 127 patients' males and females seen in outpatient & inpatient department of cardiology, Patuakhali medical college hospital, Patuakhali, Bangladesh. Based on the value of BMI subjects were classified as underweight (BMI < 18.5 kg/m^2), normal weight (BMI 18.5-24.9 kg/ m^2), overweight (BMI>25 kg/m^2)& obesity (30 and above). Mean serum Triglyceridein 127 patients was 178.57 ± 26 mg/dl, mean LDL-C was 92.64 ±25.9 mg/dl, mean HDL-C was 35.43±4.93 mg/dl and mean total Cholesterol was182.18 ±24.7 mg/dl. The mean BMI of the patients was 22.1 kg/m2 ±4.1. Among 127 patients, 33 were underweight that is their BMI was less than 18.5 kg/ m^2, 58 were normal that is their BMI was between 18.5-24.9 kg/m2 and 36 were overweight that is their BMI was more than 25Kg/ m^2. There was significant correlation found between any of the lipid profile variables specially serum triglyceride with BMI.*
Conclusion: *It was found in our study that high prevalence of overweight is the major driving forces in the development of hyperlipidaemia specially hypertrigyceridaemia which is linked to cardiovascular disease(CVD), diabetes mellitus and metabolic syndrome. We concluded from this study that obesity prevalent in significant number in our study population. This prevalence may be due to lack of awareness and unhealthy lifestyles, so health education and more preventive measures should decrease the prevalence of obesity and cardiac risks in our population by modifying their lifestyle.*
Keywords: *Body Mass Index, Lipid Profile.*

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I. Introduction

In Bangladesh, obesity is emerging as an important health problem particularly in urban areas. The prevalence of obesity is rising to epidemic proportions at an alarming rate in both developed and less developed countries around the world [6].Almost 17% of adult urban Bangladeshis are either overweight or obese or have abdominal obesity – according to The Institute for Health Metrics and Evaluation (IHME) of University of Washington. The rising prevalence of obesity in Bangladesh has a direct correlation with the increasing prevalence of obesity-related co-morbidities:cardiovascular disease (CVD), hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus (T2DM). Obesity is defined as an excess accumulation of fat in the body resulting in adverse effects on health of the individual [1]. Obesity is now estimated to be the second leading cause of mortality and morbidity, causing an estimated 2.6 million deaths worldwide and 2.3% of the global burden of disease [3]. There is an overall consensus that obesity poses a significant risk for the development of cardiovascular disease, alterations in glucose metabolism and reduces life expectancy [4]. According to 2019 ACC/AHA guideline on Primary Prevention of Cardiovascular disease high serum triglyceride is well known risk enhanchingfactors for ischemic heart disease. Elevated levels of triglyceride, cholesterol and LDL-C are documented as risk factors for atherogenesis[13]. LDL-C in its oxidized or acetylated form has been identified as a major atherogenic particle, as it not only load macrophages with

cholesterol for the formation of foam cells but also because it is chemotactic for circulating monocytes, is cytotoxic and can adversely alter coagulation pathways.[20,21] The blood level of HDL-C in contrast bears an inverse relationship of the risk of atherosclerosis and coronary heart disease that is higher the level, smaller the risk[13].In recent years, BMI has become the medical standard used to measure over weight and obesity. This is a measure of how appropriate person's weight is for his/her height [6]. BMI was calculated as weight in kilograms divided by height in meters squared as indicated by the World Health Organization [2]. The BMI is commonly used to classify individuals as underweight (less than 18.5 Kg/m2), normal weight (18.5 – 24.9 Kg/m2), overweight (25.0 – 29.9 Kg/m2), obesity class I (30.0 – 34.9 Kg/m2), class II (35.0 – 39.9 Kg/m2) and class III (more than 40 Kg/m2) (World Health Organization, 1998). It has been established that BMI is a significant predictor of cardiovascular disease and type 2 diabetes mellitus (Janssen et al., 2002). Association of lipid profiles with obesity and BMI has been reported [13,14]. Waist circumference is increasingly being accepted as the best anthropometric indicator of abdominal adiposity and metabolic risk [9,15].There is limited published data about the association of body mass index (BMI) with serum triglycerides among Bangladeshi Population.In the present study, an attempt has been made to investigate the correlation of BMI with lipid profile specially serum Triglyceride in Bangladesh context, especially in southern part of Bangladesh.

II. Objective of the Study

1. To determine the association between serumtriglyceride among the four BMI groups (underweight, normal, overweight and obesity) in Bangladeshi population.

III. Materials and Methods

This cross sectional study was conducted over a period of 12 months (June 2018-July 2019) on a sample of 127 conveniently selected patients between 30-70 years of age seen in department of cardiology,PatuakhaliMedical College Hospital, Bangladesh.

Inclusion criteria:

1).Patients are included who were willing to take part in this programme.

2).Patientswho could stand up for measurement of height and weight.

Exclusion criteria:

1) Previously diagnosed with hyperlipidaemia/dyslipidemia whose serum lipid has been modified by treatment with statins, fibrates, omega fatty acids or any other antihyperlipidaemic drugs.
2) Patients who cannot stand up for measurement of height & weight.

Data collection procedure: The following parameters are measured for all the study subjects anthropometric, and lipid profile.

Anthropometric: Body mass index (BMI)was calculated as weight in kilograms divided by height in squared meters as indicated by the World Health Organization [1,2]. Height was measured using the height meter and Weight with standardized scale.BMI between 25 -29.9 is overweight and 30.0 or higher is obese according to Centre for Disease Control and Prevention and WHO [2]

Laboratory investigations: Blood samples were collected from the antecubital vein, in the early morning, after a minimum of 12 hours of fasting period, in a supine position. Biochemical analysis serum total cholesterol(TC), triglycerides (TG), serum high density lipoprotein (HDL) were measured by International Federation of clinical chemistry (IFCC) approved enzymatic methods processed AutoanalyzerErba- 200, reagents and calibrators were used for the analysis at PatuakhaliMedical College hospital laboratory. LDL was calculated using the formula.

Statistical analysis: Statistical analysis was performed with the SPSS version 16. The differences between groups were compared using one-way analysis of variance (ANOVA). The statistical significance was set at the P value of less than 0.05.

Ethical Considerations: The study was approved by the ethical committee of Patuakhali Medical College Hospital. We obtained a written informed consent from all study subjects before enrolling them in the study. Confidentiality of data was preserved.

IV. Results

The total participants were 127 healthy young students males and females admitted in a government medical college Based on the value of BMI, subjects were classified as underweight (BMI < 18.5 kg/ m^2), normal weight (BMI 18.5–24.9 kg/ m^2), overweight (BMI>25kg/ m^2) & obese (BMI>30 kg/m2).Mean serum Triglyceridein 127 patients was 178.57 ± 26 mg/dl, mean LDL-C was 92.64 ±25.9 mg/dl, mean HDL-C was 35.43±4.93 mg/dl and mean total Cholesterol was 182.18 ±24.7 mg/dl. The mean BMI of the patients was 22.1 kg/m2 ±4.1. Mean values of serum Triglyceride, Cholesterol, LDL-C, HDL-C with their standard deviations according to three BMI groups are given in [Table-1]. There were significant correlation was found between any of the lipid profile variables specially serum triglyceride with BMI.

Table-1: Triglycerides, Cholesterol, LDL-C, HDL-C according to four BMI groups (Mean ±SD) (N=127)

Variables	Under weight (BMI<18.5kg/ m^2)	Normal (BMI 18.5-24.9kg/ m^2)	Overweight (BMI>25kg/ m^2)	p-value*
Cholesterol(mg/dl)	163.83 ±21.9	178.57 ±26.1	186.91 ±21.5	0.037
LDL (mg/dl)	86.91 ±20.9	92.64 ±25.9	90.23 ±21.4	0.043
VLDL (mg/dl)	15.43±3.68	16.43±4.93	17.24±5.8	0.06
Triglycerides (mg/dl)	144.2 ±18.4	150.18 ±24.7	190 ±29.14	0.06
HDL-C (mg/dl)	38.48 ±5.6	36.5 ±5.1	34.43 ±4.5	0.044

*p-value calculated by ANOVA comparing the means of the variables for the three BMI groups P<0, 05 Considered Significant

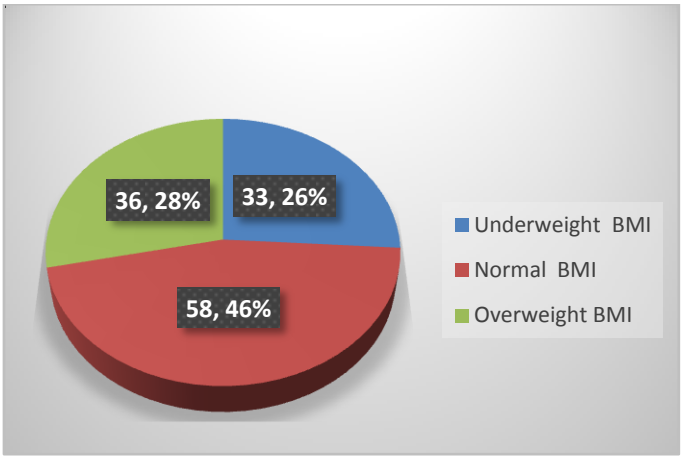

Figure 1: BMI groups (underweight, normal and overweight) of patients.

Among 127 patients, 33 were underweight that is their BMI was less than 18.5 kg/ m^2, 58 were normal that is their BMI was between 18.5- 24.9 kg/m2 and 36 were overweight that is their BMI was more than 25Kg/ m^2[Figure 1].

V. Discussion

In this study, comparison of four BMI groups (underweight, normal and overweight& obese) with regards to serum Triglycerides, total Cholesterol, LDL-C& HDL-C were examined. We found significant difference in serum total Cholesterol (P=0.037), LDL-C (P= 0.043), Triglycerides (P=0.06) and HDL-C, (P=0.044) in four BMI groups. Findings of our study are consistent with the previous studies [1,3]. Being overweight or obese can lead to adverse metabolic effects on cholesterol and triglycerides [21]. Free fatty acids (FFA) are released in abundance from adipose tissue mass. As a consequence, FFA increases the liver production of TG and secretion of VLDL. Hypertriglyceridaemia and VLDL reduce HDL cholesterol [22]. Circulating FFA, may contribute to the induction of hypertension [22]. These findings can be explained by the results of certain studies that showed that hyperinsulinemia and insulin resistance are strongly correlated with obesity.[6,16] It has been estimated that risk of myocardial infarction is 35% to 55% less in adults and normal weight as compared to obese adults [12]. However, the influence of obesity on cardiovascular risk begins before adulthood and overweight & obesity is associated with an increased risk of coronary heart disease in male and female subjects [3,12]. As 20% participant of our total study population are overweight, so number of at-risk individuals is much higher. Therefore, strategies designed to limit cardiovascular risk should address weight reduction of the population by increasing physical activity& modifying their dietary habit.

VI. Conclusion

It was found that high prevalence of overweight is the major driving forces in the development of cardiovascular disease (CVD), diabetes mellitus and metabolic syndrome. We concluded from this study that obesity is prevalent in significant number in our population. This prevalence may be due to lack of awareness and unhealthy lifestyles, so health education and more preventive measures should decrease the prevalence of obesity and cardiac risks in our patients by modifying their lifestyle. From our study we have drawn the following suggestions, to decrease the prevalence of cardiovascular disorders, metabolic syndrome and diabetes mellitus optimum weight should be maintained. "We recommend to governments to create environments that allow for lifestyle changes. This will require a coordinated approach across all sectors including health, education, sports and agriculture, but it is the only way we can curb the burden of cardiovascular disease (CVD) and type 2 diabetes."

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