

An Association between Serum Cholesterol level and BMI in BICH Young Adult Students: A study in a tertiary care hospital, Dhaka, Bangladesh.

Dr. Nilufa Akhter¹, Prof. Bilquis Banu², Mr. Lotifur Rahman³

¹Associate Professor, Department Of Physiology, Bangladesh Institute Of Child Health (BICH), Dhaka Shishu(Children) Hospital, Dhaka, Bangladesh

²Professor, Department of Clinical Pathology, Bangladesh Institute Of Child Health (BICH), Dhaka Shishu(Children) Hospital, Dhaka, Bangladesh

³Medical Technologist, Department of Pathology, Bangladesh Institute Of Child Health (BICH), Dhaka Shishu(Children) Hospital, Dhaka, Bangladesh

Corresponding Author: Dr. Nilufa Akhter

Abstract:

Background: Obesity is a potential risk factor for cardiovascular morbidity and mortality. Non-communicable disease like cardiovascular disease is becoming a public health problem that it is already present in more developing countries. As certain cardiovascular disorders are often coexist in obese person. The increased risk of associated with higher serum cholesterol levels and obesity in middle-aged group has been clearly established but young adult age group yet not known. So, the aim of this study was to determine the relationship between body mass index (BMI) and total serum cholesterol in young adult age group. **Objectives:** To observe serum cholesterol level in young adult students of Bangladesh institute of child health (BICH) & its association with BMI. **Materials & Method:** This cross sectional study was carried out on 127 young adults students aged 18-29 years in the department of physiology, Bangladesh institute of Child health (BICH) from January 2018 to January 2019. Fasting serum cholesterol levels was estimated by using the enzymatic spectrophotometer cholesterol oxidase/peroxidase method. BMI was calculated as weight (kg)/height (m²). **Results:** The study result found that mean \pm SD serum cholesterol levels were 150.1 ± 28.31 in group-A (BMI < 18.49), 167 ± 25.25 in group-B (BMI > 18.5-24.9) and 217.6 ± 48.91 in group-D (BMI > 30). Though serum cholesterol level was within normal range but total cholesterol were positively co-related with BMI ($p < 0.05$). We found a positive association between underweight (Group-A) and Obese (Group-D). We performed regression analysis and found ($y = 0.1071x + 17.3$, $R^2 = 0.88$, $P\text{-value} = 0.54$) p value is greater than 0.05. **Conclusion:** From the study it can be concluded that, there is a positive correlation between BMI and serum cholesterol. BMI which is non-invasive is recommended as a screening tool for cardiovascular risk in setting where serum cholesterol cannot be routinely estimated.

Key Words: Physiology, Body Mass Index (BMI), Serum Cholesterol, Weight.

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I. Introduction

Obesity is a nutritional health problem which is gradually rising and affecting a major section of young adult population. Due to industrialization and urbanization, presently one of the major health challenges is rapid rise of non-communicable diseases in both developed and developing countries. 80% death has been observed in developing countries due to non-communicable diseases. Standard of living continues to rise particularly in developing countries. This has led to weight gain and obesity, which are posing a threat to the health of citizens. Obesity is perhaps the most prevalent form of malnutrition in developing countries, among young adults. Body Mass Index (BMI) is a statistical dimension which is considered through measuring body weight and height of an individual. BMI comprises the body weight in kilograms and height in meter squares. It specifies the health problems like underweight, healthy weight, overweight and obese. BMI is commonly used for the dimension of individual's fitness related to obesity. It likewise represents the upcoming risks of individual if he/ she comes under obese category. BMI acts as a concerning link between current and upcoming health of a person. BMI might be a measured as a fine indicator for measuring the health status of an individual but there might be some biochemical parameters which may be either definitely or harmfully connected with BMI. For example, there might be some straight or unintended relation between glucose, cholesterol and blood pressure with BMI. A study reproduces a clue that BMI might be directly related with random blood sugar and cholesterol. But due to

effect of age, sex and health status this correlation was reduced.² BMI can be used as the standard method for the measurement of individual's body fat.³ Usually varied parameters area unit want to estimate whether or not an individual is healthy or not. Since blood could be a circulatory connective tissue, therefore it is used as an honest marker of assorted health connected problems. Blood is employed in several clinical trials e.g. Cholesterolestimation etc. Serum Cholesterol could be a waxy, fat like substance that is found in all the body cells. The most sources of cholesterol are a unit liver and food sources. It's synthesized within the liver within the body and is circulated through blood. It's found in food like meat, poultry and dairy farm things. It's carried within the sort of lipoproteins though blood. There are a unit differing kinds of compound proteins like high density lipoprotein (HDL), rarity compound protein (LDL), Intermediate density lipoproteins (IDL) and extremely low-density lipoproteins (VLDL). HDL cholesterol is additionally called smart cholesterol because it helps us to keep building cholesterol in the blood vessel. It prevents the adipose tissue (blockage in arteries) formation within the body. Low density lipoprotein cholesterol is identified as unhealthy cholesterol. It's concerned in interference the veins and is main cause for vessel diseases. The additional amount of LDL cholesterol and there will be more chances of danger to health. The most factors answerable for affecting the sterol levels area unit diet, weight, physical activity, smoking, age, gender, case history etc. Sex variations contribute in association of BMI with total sterol and LDL cholesterol that ends up in the lower risk of developing chronic heart diseases in ladies as that of men.⁴ Excessive body weight is a major health problem in industrialized and developed countries where it could be considered epidemic (Seidell, 1995a; World Health Organization, 1998; National Institute of Diabetes and Digestive and Kidney Diseases, 2000)^{5,6,7} and a key determinant of health-care costs (Seidell, 1995b)⁸. Overweight and obesity have been related to increased morbidity and mortality rates due to diabetes mellitus, several forms of cancer, digestive diseases and CHD (Colditz et al. 1990; Manson et al. 1990; Pi-Sunyer, 1993;)^{9,10,11}. However, waist circumference is one of the main issues which is used aimed to differentiating between healthy individuals from overweight and obese individuals other than BMI.¹² The process which is used for the assessment of adiposity is waist dimension which is related with the visceral fat mass. It is also considered as a better marker for abdominal obesity. According to WHO, the usual waist circumference for men is less than 40 inches and for women is 35 inches. A strong optimistic association was observed between waist circumference and body fat. It could act better for the estimation of central obesity as well as for the identification of overweight and obese individuals.¹³ In this study, the age group of 18-30 had examined the serum cholesterol level and compared the statistical relationships of BMI, body weight and serum cholesterol level in healthy Individuals.

II. Objectives

To evaluate the serum cholesterol level in Bangladesh institute of child health (BICH) young adult students & its association with BMI.

III. Methodology And Materials

The present cross sectional study was carried out on 127 young adults students aged 18-29 years in the department of physiology, Bangladesh Institute of Child health (BICH) from January 2018 to January 2019. The protocol was approved by the Ethical Committee of Bangladesh Institute of Child Health, Dhaka Shishu Hospital. On the basis of BMI study group was divided into Underweight (BMI < 18.5-24.9), Normal weight (BMI > 18.5-24.9), Over weight (BMI 25-29.9) and Obese (BMI > 30). The height was measured by medical height machine having height rod with (to the nearest of 0.01cm) and weight was measured by medical weighing machine (to the nearest of 0.05kg) weighing machine was adjusted to "0" level before measuring weight of each subject. During the weight measurement subjects was asked to wear light cloths only. Body mass index was calculated from measured (without shoes) height and weight by using the formula weight in kg/ height in m².

The purpose and expected outcome of the study were explained to each subject. They were encouraged for voluntary participation. Written informed consent was obtained from each subject. With all aseptic precaution 2ml of venous blood was drawn by a disposable plastic syringe then blood was transferred in a de ionized plastic test tube without anticoagulant. The test tube will be kept in standing position till formation of clot. Then it was centrifuged at a rate of 3000 r.p.m. for 10 minutes and supernatant serum will be separated. Then the serum will be drawn from the test tube into an eppendorf tube for estimation of cholesterol. Cholesterol level was estimated by using Automatic Biochemistry Analyzer Dimension (Model no. ExL. With LM, USA) in the department of Biochemistry, Dhaka Shishu Hospital. Data were entered in computerized SPSS program version 22. All the data were expressed as mean \pm SD. For analytical tests 95% confidence limit ($p < 0.05$) was taken as level of significance, also performed regression analysis.

IV. Results

Age and sex distribution of the study subjects are given in table-I & table-II

The study result found that 13.39 % (n=17) of the participants have underweight (BMI<18.5-24.9), 17.32% (N=25) of the participants have over weight (BMI 25-29.9) and 19.68% (n=25) of the participants have obese (BMI >30). Among the groups, the underweight (BMI<18.49) mean serum cholesterol level was, 150.1 ± 28.31 , normal weight group (BMI >18.5-24.9) mean serum cholesterol level was 160.3 ± 24.14 . In Over weight group (BMI 25-29.9) mean serum cholesterol level was 167.7 ± 25.25 . Obese group (BMI >30) mean serum cholesterol level was 217.6 ± 48.91 . Though serum cholesterol level was within normal range but Total cholesterol were positively co-related with BMI ($p < 0.05$). We found a positive association between underweight (Group-A) and Obese (Group-D). We performed regression analysis and found ($y = 0.1071x + 17.3$, $R^2 = 0.88$, $P\text{-value} = 0.54$) p value is greater than 0.05

Table I: Sex Distribution of the study participants. (n=127)

Sex	n	%
Female	48	37.79
Male	79	62.20
Total	127	100

Table II: Age Distribution of the study participants. (n=127)

Age	n	%
18-20	13	10.23
21-23	40	31.49
24-26	32	25.19
27-29	42	33.07
Total	127	100

Table III: Mean and SD in the study participants. (n=127)

Variable	n	Mean	Std. Dev
Age	127	18.38	2.22

Table IV: Health status according to BMI in the study participants. (n=127)

Groups	Variable	n	%	Mean	Std. Dev
Under Weight	<18.49	17	13.38	18.93	3.68
Normal Weight	18.5-24.9	63	49.60		
Over Weight	25-29.9	22	17.32		
Obese	>30	25	19.68		
Total		127	100		

Table V: Health status according to Serum Cholesterol level in the study participants. (n=127)

Groups	Variable	n	%	Mean	Std. Dev
Under Weight	<150	21	16.53	172.76	32.34
Normal Weight	150-170	59	46.45		
Over Weight	170-190	26	20.47		
Obese	>190	21	16.53		
Total		127	100		

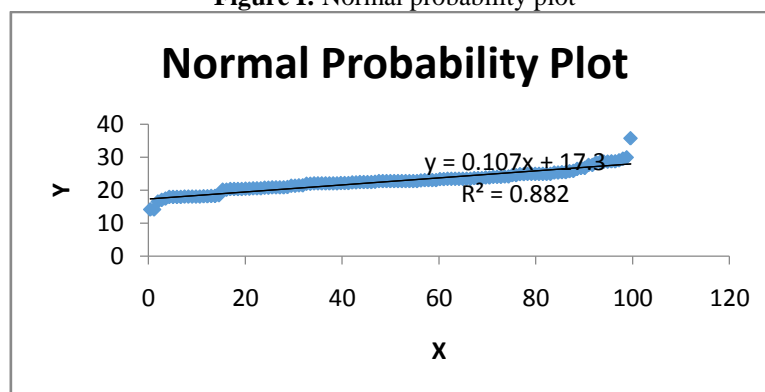
Table VI: Statistical analysis of serum and BMI of different groups. (n=127)

Groups	BMI (Mean±SD)	Serum Cholesterol level (Mean±SD)	P-Value
Under Weight (Group-A)	18.49 ± 3.68	150.1 ± 28.31	0.235
Normal Weight (Group-B)	22.35 ± 2.43	160.3 ± 24.14	
Over Weight (Group-C)	24.24 ± 3.14	167.7 ± 25.25	
Obese (Group-D)	27.67 ± 2.24	217.6 ± 48.91	

Table VII: Statistical analysis of serum cholesterol level among the groups. (n=127)

Groups	P value
Group-A & Group-B	0.67
Group-B & Group-C	0.55
Group-C & Group-D	0.13
Group-A & Group-D	0.03*

Figure I: Normal probability plot



We performed regression analysis and found ($y=0.1071y+17.3$, $R^2=0.88$, $P\text{-value}=0.54$) p value is greater than 0.05

V. Discussion

An extreme body weight is recognized to be associated with dyslipidemias, cardiovascular disease and mortality (Pi-Sunyer, 1993; Jung, 1997; National Institute of Diabetes and Digestive and Kidney Diseases, 2000)^{7,11,14}. In the ERICA study BMI was a predictor of CHD mortality only in southern Europe later adjusting for total cholesterol (Anonymous, 1991)¹⁵. Prevalence of overweight and obesity in the present cross-sectional population-based study was comparable with that observed in a recently published meta-analysis (Aranceta et al. 1998)¹⁶. The present analysis has also revealed a strong positive association between cholesterol level in Bangladesh institute of child health (BICH) young adult students and BMI. This finding corresponds well with the observations made in other cross-sectional studies such as, for example, the LRC Program Prevalence Study.¹⁷ However, several studies have failed to detect the relation between BMI and cholesterol.¹⁸⁻²¹ Obesity is a chronic condition that results of an interaction between genetic and environmental factors.²² Various lipid abnormalities have been observed in obese subjects, including elevated total cholesterol, triglycerides and lower high-density lipoprotein cholesterol levels.²³ The dyslipidemia among the obese subjects might on one hand be due to an increased intake of food rich in saturated fatty acids and cholesterol.²⁴ On the other hand, the latter was found only in obese subjects with hypercholesterolemia. In individuals with simple obesity or hypercholesterolemia, without obesity, alteration of cholesterol synthesis through this pathway was not observed. Moreover, subjects with established obesity have an increased lipogenesis in hepatocytes (not in adipocytes) that might contribute to develop and/or maintain the excessive fat mass²⁵ and, together with hyperinsulinemia, might additionally alter lipid homeostasis by promoting cholesterol synthesis.²⁶ However, the prevalence of high blood cholesterol and mean levels of cholesterol do not increase consistently with increasing BMI above 25kg/ m².

LIMITATIONS OF THE STUDY

The study has a limited sample size and preferable it considers only the same group of people who particularly studies in BICH

VI. Conclusion And Recommendations

According to study result it can be concluded that high cholesterol level was ascertained among the obese young adult students. It considers that overweight and obesity were considerably related to hypercholesterolemia. These findings would be helpful within the development of public health programs for reducing risk factors of vessel diseases, and would even be necessary for the hindrance, management, and treatment of cardio vascular diseases among adolescents. The study disclosed to focus in our body mass index and daily lifestyle. We'd like to adapt the factors related to overweight and fleshiness. It's more dangerous than under nutrition.

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