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EFFECT OF OBESITY ON LIPID PROFILE, LIVER ENZYMES AND CARDIAC ENZYMES AMONG STUDENTS (MALE) OF ALJOUF UNIVERSITY

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ABSTRACT

Introduction: The prevalence of obesity has risen dramatically in past several decades. Hormonal and genetic factor are rarely the cause of childhood obesity. Because obese adult may suffer life long physical and emotional consequences, this imperative to discuss prevention with parents during well- child examinations. Purpose of the study was to see the effect of Obesity on Lipid profile, Liver Enzymes and Cardiac Enzymes among Students (Male) of Aljouf University. About fifty male students were selected from Aljouf University.

Materials & Methods: Their age ranged from 19 to 29 years. They were divided into three groups. First group (N=20) having BMI more than 30 was considered as obese group, second group (N=20) was considered as overweight having BMI more than 25 but less than 30 and third group (N=10) was considered as normal weight group having BMI less than 25. Fasting blood samples were analyzed for Blood Cholesterol, Triglycerides, low density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C), liver enzymes and cardiac enzymes.

Results & Discussion: Independent 't' test was applied to compare mean difference. In obese group, significant higher cholesterol and triglycerides were observed. On the contrary, obese group had significant lower HDL-C concentration than the non-obese group. The adult obese has relatively larger changes in serum lipids at any given level of obesity. On the average, the more fat, the more likely an individual will be dyslipidemic and to express elements of the metabolic syndrome. Increased triglycerides level in obese impaired lipolysis which reduced the HDL-C concentrations. The obtained results for ALT and ALP are comparatively lower for obese and over weight than normal group but lie within normal range and GGT is higher in obese and over weight than normal group within normal range. Obtained results in present study are found to be within acceptable range.

Conclusion: Obesity is assumed to cause hyperlipidaemia and hypercholesterolaemia , considered a risk factor for atherosclerosis. In fact, increase in the incidence of coronary heart disease, congestive heart failure and strokes are associated with obesity.

KEYWORDS : Obesity, Serum Lipid Profile, Aljouf, HDL, LDL, AST, ALT, ALP, GGT, CK, CK-MB, LDH.

Introduction

Obesity means accumulation of excess fat on the body which is due to greater energy intake compared with energy expenditure.. It is difficult to study obesity because the abnormality is not a single disease and because the result of long-term follow up in large scale is not available in the existing literature. The knowledge that is available today is only a cross-sectional survey in the population. Obesity currently threaten the health, well- being and economic welfare of virtually every country in the world.. About 1.7 billion of the world's population is at an increased risk of other life-threatening diseases such as heart attack and stroke. Obesity is considered a chronic (long-term) disease, like high blood pressure or diabetes. It has many serious long-term consequences for health and is the second leading cause of preventable deaths in many countries.

Obesity is defined as having a body mass index (BMI) of greater than 30. The BMI is the body weight in kilograms divided by the square of the height in meters (weight /(height)2).

Underweight	(BMI <18.5)
Normal weight	(BMI = 18.5-24.9)
Overweight	(BMI = 25-29.9).
Obesity	(BMI = 30 or greater)

Although the exact biochemical mechanisms responsible for the association between obesity and the above diseases have not been completely elucidated, it is known that increase in triglyceride stores is associated with a linear increase in the production of cholesterol which in turn is associated with increased cholesterol secretion in bile and an increased risk of gall stone formation and the development of gall bladder diseases. Similarly, increased levels of circulating triacylglycerol in obesity are associated with decreased concentrations of high-density lipoprotein, which may account for the increased risks for cardiovascular disease and heart attack in obese patients. Cardiovascular risk factor reports in obese individuals have recently demonstrated a remarkable number of metabolic abnormalities that embrace differences in lipids, glycemia, insulin, blood pressure, and hematologic function.

Experts recommend that men aged above 35 and women 45 be more frequently screened for lipid profile. The lipid profile includes LDL (low-density lipoprotein cholesterol, also called "bad" cholesterol), HDL (high-density lipoprotein cholesterol, also called "good" cholesterol), Triglycerides and Total cholesterol.

LDL Cholesterol can build up on the walls of your arteries and increase chances of getting heart disease and is referred as "bad" cholesterol (Optimal Less than 100 mg/dl).

HDL Cholesterol "good" cholesterol the higher the number, the lower your risk and it protects against heart disease by taking the "bad" cholesterol out of blood (Optimal above 60 mg/dl).

Triglycerides

Triglycerides are the chemical form in which most fat exists in food and the body. A high triglyceride level has been linked to higher risk of coronary artery disease (Optimal less than 150 mg/dl).

Total blood cholesterol is a measure of LDL cholesterol, HDL cholesterol, and other lipid components. Recommend total cholesterol level is below 200 mg/dl

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Liver Enzymes

Elevated liver enzymes may indicate damage to cells in the liver that may lead to Leak of liver enzymes in bloodstream, which can result in elevated liver enzymes on blood tests such as Alanine Aminotransferase(ALT), Aspartate Aminotransaminase (AST), Alkaline phosphatase (ALP) and Gamma glutamyl transpeptidase (GGT).

ALT test measures the amount of this enzyme in the blood. ALT is found mainly in the liver, but also in smaller amounts in the kidneys , heart and muscles. ALT was formerly called serum glutamic pyruvic transaminase (SGPT). When the liver is damaged or diseased, it releases ALT into the bloodstream, which makes ALT levels go up.

The normal reference range of ALT 7 to 55 U/L.

AST test measures the amount of this enzyme in the blood. AST is normally found in red blood cells, liver, heart muscle . AST formerly was called serum glutamic oxaloacetic transaminase (SGOT).Low levels of AST are normally found in the blood. When body tissue or an organ such as the heart is diseased or damaged ,AST is released into the bloodstream. The amount of AST in the blood is directly related to the extent of the tissue damage. The normal reference range of AST: 8 to 48 U/L.

ALP measures the amount of alkaline phosphatase enzyme in bloodstream. Abnormal levels of ALP in blood most often indicate a problem with liver, gall bladder or bones. The normal range of ALP varies from person to person and depends on age. The normal reference range of ALP 45 to 115 U/L

GGT enzymes are necessary for chemical reactions in body. GGT functions in the body as a transport molecule, helping to move other molecules around the body. It plays a significant role in helping the liver metabolize drugs and other toxins. The normal reference range of GGT 9 to 48 U/L.

Cardiac Enzymes

Present study is to identify the consequences of obesity which may lead to heart muscle injury and increases the risk for heart failure. These disorders can be measured using cardiac enzymes which include Creatine kinase (CK) , Creatine Kinase-MB(CK-MB), Lactate dehydrogenase (LDH) and Aspartate Aminotransferase (AST).

CK is assayed as a marker of myocardial infarction, severe muscle breakdown, and other cardiac muscle disease. The normal reference range of CK 25-200 U/L.

CK-MB test may be used as a follow-up test to an elevated CK in order to determine whether the increase is due to heart damage or skeletal muscle damage. The test is most likely to be ordered if a person has chest pain or if a person's diagnosis is unclear.
The normal reference range of CK-MB 7-28 U/L.

LDH catalyzes the conversion of lactate to pyruvate. This is an important step in energy production in cells. Some of the organs relatively rich in LDH are the heart, kidney, liver and muscle. The normal reference range of LDH 45-90 U/L.

AST test measures the amount of this enzyme in the blood. AST is normally found in red blood cells, liver, heart muscle . AST formerly was called serum glutamic oxaloacetic transaminase (SGOT).The normal reference range of AST 8 to 48 U/L.

Materials and Methods

The present study was carried out as a Perspective Analytical Cross Sectional Study during the period September – January2016.The study was conducted in the clinical biochemistry lab in College of Applied Medical Sciences ,Aljouf University and Prince Motaeb bin Abdulaziz Hospital, Aljouf, Kingdom of Saudi Arabia.

Samples collection: Samples were collected from 40 - 50 individuals from Aljouf University (male students) comprising three groups as group 1(twenty Obese person) ranged in age 19-29 years old , group 2(twenty Over weight) ranged in age from 19-29 years old and group 3 (ten Control group) as normal healthy weight at the same age range of the obese and over weight one. About 6ml of blood overnight fasting collected from the antecubital vein, by venipuncture without venous stasis in a tube without additives which was then allowed to clot at room temperature. Serum fraction was separated after 20minutes by centrifugation (3000RPM/5min). Kept in the deep freeze at -20°C for longer storage.12 Hours Fasting serum was collected because triglycerides might increase in fed state. Rest for 30 minutes, since exercise might affect lipid concentrations. Prolonged tourniquet application was avoided, because it might increase plasma lipid concentration. In this study a no-probability sample equation (n= N/1+ N (e) 2) was used to determine sample size.

Methods

The concentration of total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C) were measured using (BS-300 Chemistry Analyzer), low density lipoprotein cholesterol (LDL-C) was calculated indirectly by the method of friedwald et al. (1972) as shown below.

LDL-C= total cholesterol – HDL-C +TG/5
Liver enzymes and cardiac enzymes were assayed in lab of Prince Motaeb bin Abdulaziz hospital, Sakaka, Aljouf.

Results

The data obtained in this study were presented using descriptive statistics in order to test whether or not significant differences exist between groups.

Table1 and Figure 1 show the mean differences of lipid profiles between obese, over weight and normal weight groups. The obtained results reveal that obese and over weight group had higher Total cholesterol, triglycerides and LDL-C and lower HDL-C than the normal group ($p<0.05$).

Table 2 and Figure 2 show the mean differences of liver enzymes for above mentioned groups. The obtained results for ALT, AST and ALP are comparatively lower for obese and over weight than normal group but lie within normal range and GGT is higher in obese and over weight than normal group within normal range ($p<0.05$).

Table 3 and Figure 3 show the mean differences of cardiac enzymes for above mentioned groups. Lower value of CK is obtained for obese and over weight than normal group within normal range. AST value is lower for obese and over weight than normal group within normal range. CK –MB value lies in normal range without any set of pattern ($p<0.05$)

DISCUSSION

When various parameters of blood lipid profile were compared it was observed that there was significant difference between obese, over weight and normal weight in relation to total cholesterol triglycerides, low density lipoprotein and high density lipoprotein.

In fact, from table 1 significant higher cholesterol and triglycerides were observed and a relative small increase in LDL-C. On the contrary, obese and over weight group had significant lower HDL-C concentration than the normal weight group. Individual with more fat, the more likely will be dyslipidemic and to express elements of the metabolic syndrome. In obese, impaired lipolysis which reduces the HDL-C concentrations is caused by increased triglycerides levels.

Increase in liver enzymes in serum are indication of liver cells damage. Obtained results in present study are found to be within normal range in all the three groups. So it can be interpreted as accumulation of fats is not the cause of cells damage in liver.

Cardiac enzymes elevated in serum with myocardial infarction or other cells injury to hearts. Obtained results in present study are found to be within acceptable normal range in all the three groups.

CONCLUSION

Obesity is assumed to cause hyperlipidemia and hypercholesterol aemia , considered a risk factor for atherosclerosis. In fact, increase in the incidence of coronary heart disease, congestive heart failure and strokes are associated with obesity.

1- To elucidate the differences between complexes pathogenesis of the dyslipidemia of obesity, more human studies are still needed. Within the limitation of the present study, it is concluded that obesity leads abnormalities in plasma lipids level.
2- Though results for liver and cardiac enzymes in present study is not much conclusive which may be due to less no of samples and/ or some other factors like age etc.

Table 1. Comparison of lipid levels (mg/dL) on Obese, Over weight and Normal groups

	Normal weight (n=7)		Over weight n=(10)		Obese (n=10)		Normal Value
	Mean	± SD	Mean	± SD	Mean	± SD	
TotalCholesterol	162.45	±5.88	175.01	±5.94	188.13	±6.55	<200 mg/dL
Triglycerides	105.37	±5.54	121.31	±6.23	145.55	±6.17	<200 mg/dL
LDL	108.42	±5.28	116.71	±7.26	130.46	±6.28	<100 mg/dL
HDL	43	±3.57	40.02	±2.98	32.84	±2.03	> 40 mg/dL

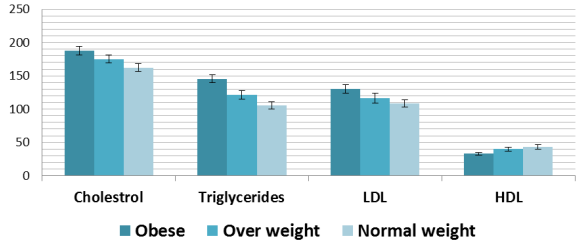

Figure 1. Comparison of lipid levels (mg/dL) on Obese, Over weight and Normal groups

Table 2. Comparison of liver enzyme levels (U/L) on Obese, Over weight and Normal groups

	Normal weight (n=7)		Over weight n=(10)		Obese (n=10)		Normal Value
	Mean	± SD	Mean	± SD	Mean	± SD	
ALT	39.48	±4.68	39	±2.14	28.24	±5.66	7 – 55 U/L
AST	28.53	±8.99	24.03	±6.28	20.4	±3.88	8-48 U/L
ALP	78.17	±3.97	66.2	±7.07	61.3	±11.69	45 - 115 U/L
GGT	17.33	±4.23	23.4	±2.59	33.7	±4.06	9 to 48 U/L

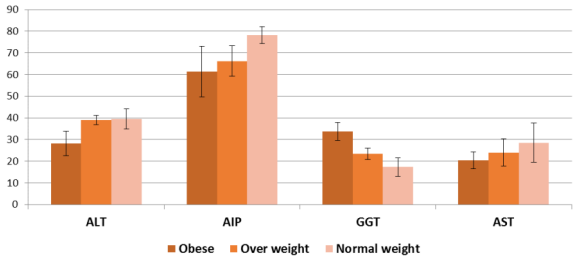

Figure 2. Comparison of liver enzyme levels (U/L) on Obese, Over weight and Normal groups

Table 3. Comparison of cardiac enzyme levels (U/L) on Obese, Over weight and Normal groups

	Normal weight (n=7)		Over weight n=(10)		Obese (n=10)		Normal Value
	Mean	± SD	Mean	± SD	Mean	± SD	
CK	170.33	±4.32	159.9	±7.39	150.5	±6.45	25-200 U/L
CK-MB	19.28	±6.84	12.95	±3.01	15.11	±2.94	7-28 U/L
AST	28.53	±8.99	24.03	±6.28	20.4	±3.88	8-48 U/L

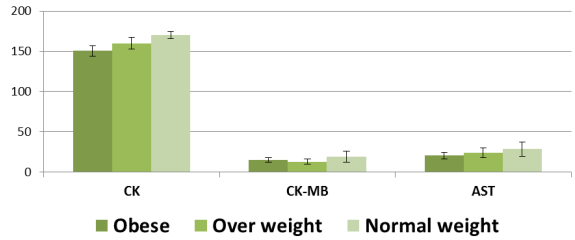

Figure 3. Comparison of cardiac enzyme levels (U/L) on Obese, Over weight and Normal groups

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