

Evaluation of Serum Alanine aminotransferase, Aspartate aminotransferase and Alkaline phosphatase in Adult Obese Ninava People.

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Abstract

Obesity is a well known cause of a lot of health problems, these problems can be further evaluated by biochemical studies. In the present study 3 biochemical parameters represented as: Alanine aminotransferase (ALT), Aspartate aminotransferase (AST) and Alkaline phosphatase (ALP) has been measured in blood of 69 apparently healthy obese subjects (30 males & 39 females) which divided into two subgroups according to body mass index (BMI) (30- 34.9) & (35- 39.9). The control group included 32 apparently healthy with normal weight subjects. The aim of this research is to study the effect of obesity on the activity of aminotransferase enzymes (ALT & AST), and alkaline phosphatase (ALP) in Ninava compared to control group (subjects with normal weight), in addition, to study the biochemical changes of these enzymes within obese group which classified according to the BMI and sex. According to the results which recorded in this study, there was a significant increase in the activity of ALT, AST, and ALP in obese subjects when compared to controls, also there is no significant effect of BMI on these enzymes in obese group with a higher mean activities of three enzymes in class II obese group (BMI 35- 39.9). The results also showed no significant difference between male and female in obese subjects for the mean activities of these enzymes.

تقدير إنزيمات ناقل الأمين الالانين, ناقل الأمين الاسبارتيت وإنزيم الفوسفاتيز القاعدي في مصل دم الأشخاص البالغين المصابين بالسمنة في نينوى

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المستخلص

السمنة هي سبب معروف للعديد من المشاكل الصحية, واغلب هذه المشاكل الصحية يمكن تقديرها بواسطة القياسات الكيموحيوية. في هذه الدراسة تم قياس 3 متغيرات كيموحيوية والمتمثلة في إنزيمات ناقل الأمين الالانين (ALT), ناقل الأمين الاسبارتيت (AST) وإنزيم الفوسفاتيز القاعدي (ALP) في مصل دم 69 متطوع من فئة الأشخاص المصابين بالسمنة (30 رجل, 39 امرأة) وقد تم تقسيم هذه الفئة إلى مجموعتين اعتمادا على معامل كتلة الجسم (30-34.9) & (35-39.9). مجموعة السيطرة تضمنت 32 متطوع من الأصحاء ذو الأوزان الطبيعية. الهدف من البحث دراسة تأثير السمنة على فعالية الإنزيمات ناقل الأمين الالانين, ناقل الأمين الاسبارتيت وإنزيم الفوسفاتيز القاعدي في نينوى بالمقارنة مع مجموعة السيطرة (الأشخاص ذو الأوزان الطبيعية), بالإضافة إلى دراسة التغيرات الكيموحيوية لهذه الإنزيمات في مجموعة الأشخاص المصابين بالسمنة المصنفين اعتمادا على معامل كتلة الجسم والجنس. من النتائج المستحصلة من هذا البحث وجد أن هناك ارتفاعا معنويا في فعالية الإنزيمات ناقل الأمين الالانين, ناقل الأمين الاسبارتيت وإنزيم الفوسفاتيز القاعدي في مجموعة الأشخاص

المصابين بالسمنة بالمقارنة مع مجموعة السيطرة، كما لوحظ أن تأثير معامل كتلة الجسم على فعالية هذه الإنزيمات في مجموعة الأشخاص المصابين بالسمنة إحصائيا غير معنوي مع أعلى معدل فعالية للإنزيمات الثلاثة في مجموعة المصابين بالسمنة ذوي معامل كتلة الجسم (35-39.9). وكذلك أظهرت النتائج انه لا يوجد اختلافا معنويا في معدل فعاليات هذه الإنزيمات بين الرجال والنساء المصابين بالسمنة.

Introduction

Obesity means deposition of excess fat in the body. It is caused by the ingestion of greater amounts of food than can be used by the body for energy. The excess food, whether fats, carbohydrates, or proteins, is then stored almost entirely as fat in the adipose tissue, to be used later for energy.⁽¹⁾ Obesity is often diagnosed using a measurement of what is called the body mass index (BMI)⁽²⁾, which is a measure of body fat, based on height and weight which is calculated by dividing the weight (in kilograms) by the square of height (in meters) (Kg/m^2).^{(3),(4)} The internationally accepted range of BMI in adults is as follows:⁽⁵⁾

- <18.5 under weight
- 18.5-24.9 normal weight
- 25-29.9 over weight
- 30-34.9 class I obese
- 35-39.9 class II obese
- > 40 extremely obese

Obesity is a risk factor for cardiovascular disease, diabetes mellitus, gallbladder disease, and some malignancies (particularly endometrial and breast cancer).⁽²⁾ The pathogenesis of liver disease associated with obesity has been remained poorly understood,⁽⁶⁾ therefore several liver enzymes are measured in obese subjects as available tests for liver disease such as serum alanine aminotransferase (ALT), Aspartate aminotransferase (AST) and Alkaline phosphatase (ALP). The aminotransferases are a reversible transfer of the α - amino group of the amino acid: aspartic acid and alanine to the α -keto group of α -ketoglutaric acid, leading to the formation of oxaloacetic acid (AST) and pyruvic

acid (ALT).^{(7),(8)} There are widely distributed in the body.⁽⁹⁾ ALT is found primarily in the liver and kidney with a lesser amounts in heart, and skeletal muscle.^{(8),(9)} The activities of ALT outside the liver are low and therefore this enzyme is considered more specific for hepatocellular damage,⁽³⁾ whereas AST is found primarily in the heart, liver, skeletal muscle and kidney.^{(8),(9)} Damage to any of these tissues may increase plasma AST, ALT level.^{(10),(11)} Aminotransferases (ALT, AST) are sensitive tests of hepatocytes injury. Although often referred to as liver function tests, they do not measure hepatocytes function but instead hepatocyte damage.⁽¹²⁾ Alkaline phosphatase (ALP) is a group of enzymes which hydrolysed phosphates at alkaline PH.^{(3),(9)} They are present in most tissues, with a significant activities in the liver, gastrointestinal, bone and placenta.^{(3),(13)} Liver and bone diseases are the most common causes of pathological elevation of ALP activity.^{(8),(14)}

Subjects, Material & Methods

The study was performed on 69 apparently healthy obese subjects which included (30 males&39 females) aged between (33-52) years with a mean of (42) years, their body mass index (BMI) range between (30.2-38.3) with a mean of (34.3). The control group was 32 apparently healthy normal weight subjects, aged between (29-45) years with a mean of 37 years, their BMI range between (20.3-24.1) with a mean of (23.1). The

obese group was divided into two subgroups according to their BMI. The first subgroup (class I obese) included 41 individuals, their BMI range between (30.2-34.4) with a mean of (32.4). The second obese subgroup (class II obese) included 28 individuals their BMI between (35.1-38.3) with a mean of (37.1). The general information was taken from each subjects including: name, age, sex, weight, height, BMI, occupation, smoking, alcohol intake, family history, and any drug intake. Subjects with a history of liver disease or any other diseases, smoking and alcohol intake were excluded from the study. The body mass index (BMI) was calculated by the following formula: $BMI = \text{weight (Kg)} / (\text{height m})^2$.⁽³⁾ Approximately 5 ml of venous blood samples were obtained from each subjects involved in this study by antecubital venepuncture, stressful vein puncture was avoided. The blood samples transferred immediately into plain plastic tubes and were placed in a 37 °C water bath for 10 minutes and centrifuged at 3000 rpm for 15 minutes to ensure complete separation of serum. The serum separated was used for the measurement of serum enzymes (ALT, AST and ALP). The aminotransferase enzymes (ALT, AST) activities was measured colorimetrically according to the method of (Reitman and Frankel, 1957),⁽¹⁵⁾ using kit supplied by (Randox / UK). Determination of serum ALP activity was based upon the colorimetric method,⁽¹⁶⁾ using kit (biomerieux / France).

Statistical Analysis

Data were analysed using unpaired t-test. The results were expressed as

mean \pm standard deviation (SD). $P \leq 0.05$ was considered as statistically significant.⁽¹⁷⁾

Results

The comparison between the results of serum ALT, AST and ALP in obese group and control group (normal weight subjects) as shown in table (1), there was a significant elevation of serum ALT, AST and ALP activity in obese subjects (17.10 ± 4.14), (18.0 ± 4.67) and (67.0 ± 10.4) respectively in comparison with normal weight subjects (10.69 ± 4.22), (11.12 ± 3.71) and (48.8 ± 10.3) respectively; as in figure (1). The effect of BMI on the activity of serum ALT, AST and ALP within obese group as shown in table (2), there are no statistically significant effects of BMI value on the activity of these enzymes in obese group (within the two group classification) with a higher mean activity of ALT, AST and ALP in class II obese subjects (18.07 ± 4.10), (18.89 ± 4.43) and (69.79 ± 9.45) respectively than those found in class I obese subjects (16.44 ± 4.08), (17.39 ± 4.77) and (65.1 ± 10.6) respectively; as in figure (2). Also the current study show the differences of serum ALT, AST and ALP between male and female obese subjects as shown in table (3), there was slightly elevations in the mean activities of serum aminotransferases and ALP in male obese subjects (17.53 ± 4.07), (18.60 ± 4.63) and (68.0 ± 10.7) respectively in compared with female obese subjects (16.77 ± 4.21), (17.54 ± 4.70) and (66.2 ± 10.2) respectively but its statistically not significant; as in figure (3).

Table(1): Comparison of serum ALT, AST and ALP between obese and control groups.

Parameters	Mean±SD		P-value
	Control group (No.=32)	Obese group (No.=69)	
Serum ALT (U/L)	10.69±4.22	17.10±4.14	P<0.001
Serum AST (U/L)	11.12±3.71	18.0±4.67	P<0.001
Serum ALP (U/L)	48.8±10.3	67.0±10.4	P<0.001

P<0.001= High significant difference.

Table(2): Comparison of serum ALT, AST and ALP in obese group according the BMI.

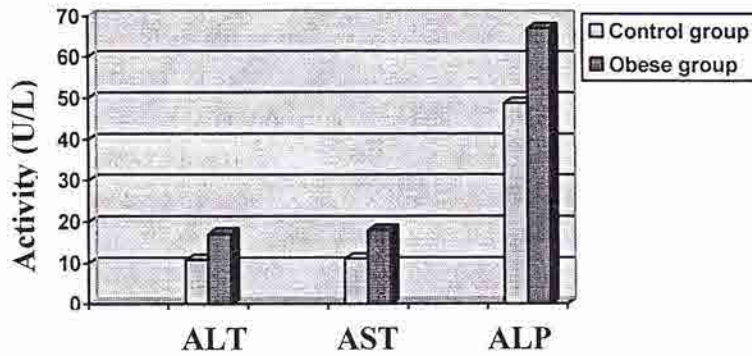
Parameters	Mean±SD		P-value
	Class I obese group(No.=41)	Class II obese group(No.=28)	
Serum ALT (U/L)	16.44±4.08	18.07±4.10	NS
Serum AST (U/L)	17.39±4.77	18.89±4.43	NS
Serum ALP (U/L)	65.1±10.6	69.79±9.45	NS

NS=No Significant difference.

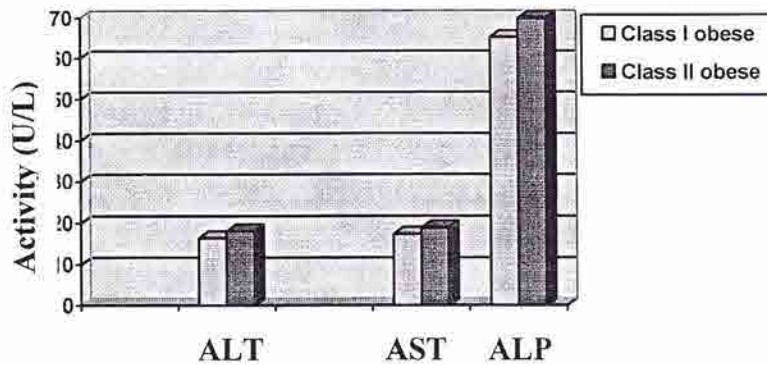
Table(3): Comparison of serum ALT, AST and ALP between males and females obese groups.

Parameters	Mean±SD		P-value
	Males obese group(No.=30)	Females Obese group(No.=39)	
Serum ALT (U/L)	17.53±4.07	16.77±4.21	NS
Serum AST (U/L)	18.60±4.63	17.54±4.70	NS
Serum ALP (U/L)	68.0±10.7	66.2±10.2	NS

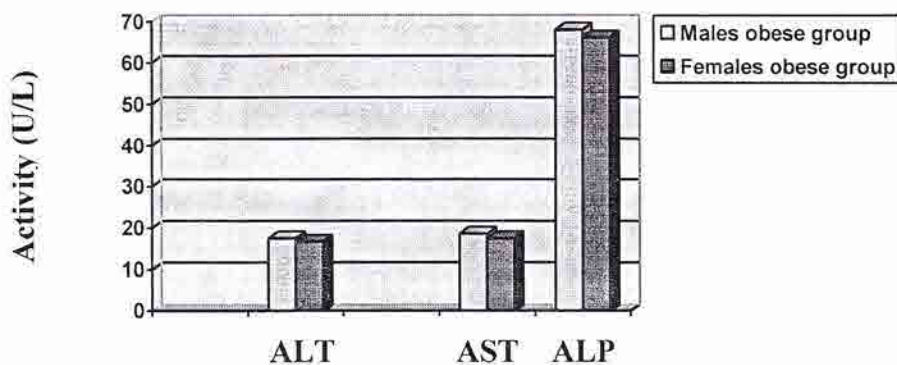
NS=No Significant difference.



Figure(1): Serum ALT, AST and ALP in control and obese groups



Figure(2): Serum ALT, AST and ALP in obese group according to BMI.



Figure(3): Serum ALT, AST and ALP in males and females obese groups.

Discussion

Regarding the effect of obesity on the activity of serum aminotransferase enzymes and alkaline phosphatase in the current study, shows a highly significant increase in the activity of both ALT and AST in obese group when compared to controls ($P < 0.001$) also the activity of serum ALP show a significant increase in obese subjects in comparison with control group ($P < 0.001$); as in table(1), figure (1). The findings of the present study are in agreement with those of Himmerch et al. 2005⁽¹⁸⁾, Quresh et al., 2006⁽¹⁹⁾ and Choi, 2003⁽²⁰⁾ and this may attributed to hepatocellular injury where the injury trigger the release of enzymes ALT and AST into the circulation.⁽²¹⁾ The degree of steatosis parallels the increase in body weight. The steatosis probably results from increased lipolysis in fat stores with mobilization to the liver that exceeds the liver's

capacity to secrete fat. The condition is benign. Liver function tests reveal trivial elevations in aminotransferase enzymes and occasionally ALP.⁽²²⁾ Furthermore, the comparison of serum liver enzymes (ALT, AST and ALP) results between class I obese group (BMI 30-34.9) and class II obese group (BMI 35-39.9) showed that the mean activities of these enzymes increased with increasing BMI but statistically not significant; as in table(2), figure (2). The statistical analysis of the activity of serum ALT, AST and ALP between males and females in obese group, showed that there was no significant difference in the activities of these enzymes has been observed between the male and female obese subjects; as in table (3), figure (3). concluded that the obesity has a significant increase in the activities of the three enzymes.

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