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RESEARCH ARTICLE

The effect of Morbid Obesity on the Liver Function Enzymes

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ABSTRACT:

Background: The liver is the major organ in the body and it is considered as an important organ for protein manufacture and detoxification. Liver health is evaluated by study liver function (LFTs) which include TSB, AST, ALT and ALK. The current study is an attempt to understand the correlation between morbid obesity and liver function enzymes. **Method:** The research population consisted of 67 subjects that divided into two groups; morbidly obese group (41) and the control group (healthy appearance subjects) (26). The levels of serum liver enzymes activities (ALT, AST, ALK) and TSB were determined by suitable kits. **Result:** In current study no statistically significant differences were observed in AST, ALT and ALK levels between the two types of procedures. The highest differences were noted for TSB levels between obese and individual healthy. While there was an association between the BMI and both AST and ALT; there was no relationship between the body mass index BMI and TSB and ALK. **Conclusion:** This study showed a correlation between the BMI with AST and ALT of morbidly obese.

KEYWORDS: Obesity, GPT, GOT, ALK, TSB.

INTRODUCTION:

The major organ in the body is the liver; it is considered as the most significant organ for detoxification and protein synthesis, both of which are facilitated by a number of enzymes. Therefore, analyze liver health is represented by estimating the enzymes that released from liver cells and proteins that created by the liver and released into the blood stream (1).

The most common tests of liver function (LFTs) include total bilirubin, aspartate aminotransferase [AST or glutamic oxaloacetic transaminase (SGOT)], alanine aminotransferase [ALT or glutamic pyruvic transaminase (SGPT)] and alkaline phosphatase (2) Whereas, bilirubin is the break down product of hemoglobin produced within the reticuloendothelial system, emitted in unconjugated form which enters into the liver, converted to conjugated forms bilirubin mono and diglucuronides by the enzyme UDP-glucuronyl transferase (3). While ALT is presence fundamentally in the liver, with clinically small quantities create in the skeletal muscle, kidneys and heart. AST is found, in tapering, order of concentration, in the liver, cardiac muscle, skeletal muscle, kidneys, pancreas, brain, leukocytes, lungs and erythrocytes (4).

As AST can be rise in diseases affecting other organs, involve acute hemolytic anemia pancreatitis, myocardial infarction, burns, muscular skeletal diseases and acute kidney injury. Thus, ALT is more specific for liver inflammation and disease than AST. In addition to that, clearance of serum aminotransferases involves

catabolism by the reticuloendothelial system, and in that assessment, is comparable to the clearance of other serum proteins. AST is consumption more rapidly than ALT, and the major site of clearance is the hepatic sinusoidal cell (5). At the same time, alkaline phosphatase is important enzyme in the subject, which represents a group of isoenzymes created by liver, kidneys, bones, placenta and small intestine (6). The serum ALP level signifies the total quantities of isoenzymes that are released from the specialized tissues into the blood stream and its major function is thought facilitate transport across cell membranes and assistance in metabolism (7). A number of researchers including Meyer *et al.*, and Donaldson *et al.* they suggested that liver enzymes abnormalities have relationship with obesity, hormone therapy or autoimmunity (8,9).

Obesity is one of the most significant public health in the worldwide. Furthermore, an extreme phenotype morbid obesity (MO) has damagingly become a global problem (10). Where through the course of the disease that adipocyte hypertrophy lead to hypoxia, inflammation and oxidative stress which increase morbidity and mortality of this complex endocrine and metabolic disease (11,12). The changes in plasma levels of various hormones and vitamins in obese patients were occurred because functioning of adipose tissue as an endocrine organ. These functions were produced metabolic changes in many organs (13).

MATERIAL AND METHODS:

Samples were collected from 67 Individuals at the Marjan teaching hospital (Babylon province/Hilla city/ Iraq), in February 2018 for aged 17 to 70 years, they were divided into in two groups as morbidly obese groups (41) and the control as healthy appearance groups (26). The formula BMI= weight (kg)/ height (meter)^2 using for the calculated the body mass index (BMI). The serum liver enzymes levels of alanine amino transaminase (ALT) (GPT), aspartate amino transaminase (AST) (GOT), alkaline phosphatase (ALK) and total serum bilirubin (TSB) were determined by kits that purchased from randox and biomerieux company.

RESULT:

In the current study, there was a significant difference in the mean age between morbidly obese and normal individuals (32.00 $\pm$14.95 vs. 23.92 $\pm$ 9.78) (years). The TSB also had significant difference at a significant level (0.81± 0.39 vs 0.69± 0.18 µmol/L; P≤ 0.5). There were significant differences in the rate of GPT, GOT, ALK between morbidly obese and healthy individuals (19.09 ±7.30 vs 14.41 ± 6.86 U/L), (22.09 ± 9.67 vs. 24.35 ± 11.36 U/L) and (53.00 + 20.74 vs 53.73 + 20.35 LU/L) respectively in table (1).

Table 1 The mean differences between morbidly obese patients and control groups in parameters study.

Parameters	Group	N	Mean	Std. Deviation	p value
Age(years)	control	26	23.92	9.78	**0.03***
	obese	41	32.00	14.95	
BMI(Kg/m^2)	control	26	21.19	1.78	**0.05***
	obese	41	38.58	2.63	
GPT(U/L)	control	26	14.41	6.86	0.63
	obese	41	19.09	7.30	
GOT(U/L)	control	26	24.35	11.36	0.24
	obese	41	22.09	9.67	
Alk(U/L)	control	26	53.73	20.35	0.82
	obese	41	53.00	20.74	
TSB (µmol/L)	control	26	.69	.18	**0.04***
	obese	41	.81	.39	

BMI: Body Mass Index, GPT: alanine amino transaminase, GOT: aspartate amino transaminase, ALK: alkaline phosphatase, TSB: total serum bilirubin.* significant levels at p value ≤ 0 .05.

In Figure (1) there was a relationship between BMI (Kg/M^2) and GPT (U/L) of morbidly obese (p value level is significant ≤ 0 .05). According to the equation of the straight line Y=2.5+0.75*X. There was also a relationship between the BMI (Kg/M^2) and GOT (U/L) of morbidly obese equation of the straight line Y= 3.33+ 96.66 * X; as shown in figure (2).

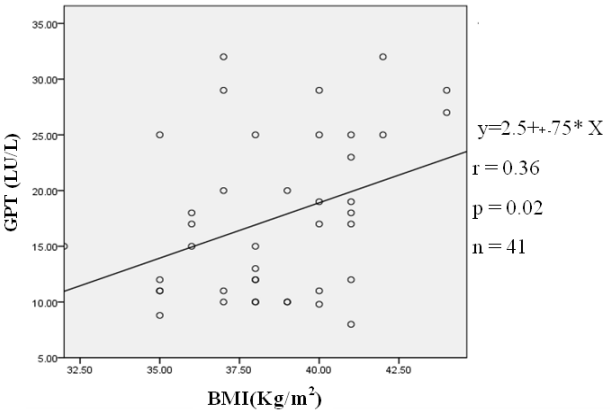

Figure (1): The correlation between BMI (Kg/M^2) and alanine amino transaminase (ALT)[GPT] LU/L of morbidly obese group

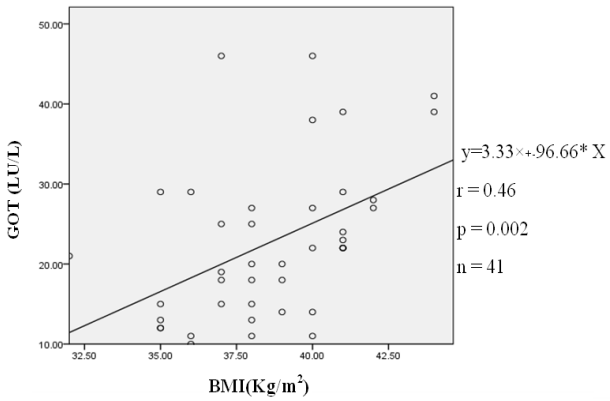

Figure (2): The correlation between BMI (Kg/M^2)and aspartate amino transaminase (AST, GOT) U/L of morbidly obese group

While there was no correlation between the BMI (Kg/m^2) and ALK (U/L) of morbidly obese as in figure (3). Also, in figure (4) there was no correlation between body mass index (Kg/m^2) and TSB µmol/L of morbidly obese according to the equation of the straight line Y=5.83+166.66*X and Y=0.16+5.33 *X respectively.

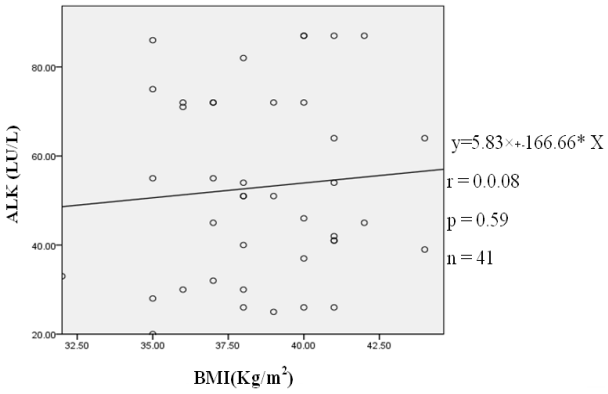

Figure (3): The correlation between BMI (Kg/m^2) and alkaline phosphatase (ALK) U/L of morbidly obese group.

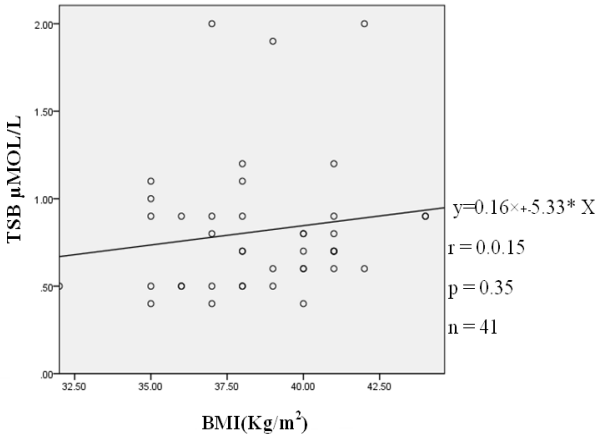

Figure (4): The correlation between BMI (Kg/m^2) and total serum bilirubin (TSB) µmol/L of morbidly obese group.

DISCUSSION:

Currently, the number of obese individuals has reached the dimensions of frightful. The alteration in dietary type of the world population via its components from sugars and fats, attached with lowering physical inactivity, and this leads to largest increased prevalence of obesity not only in advanced but also in developing countries (14). The results of the current study showed significant differences between patients with excessive obesity and healthy in age and this corresponds to the study of Skinner et al., (15) where they observed increment in the levels of severe obesity in all ages in the past 18 years (15). Another study was showed that about 20–30% of the adult population is affected by "non-alcoholic fatty liver disease (NAFLD)" (16).

On the other hand, the current study showed a relationship between the BMI with ALT and AST. The results have good agreement with the earlier study that demonstrate a relation between BMI and serum liver enzymes activity (ALT and AST)"(17). In addition, some published data were indicated that a significant combination between elevation ALT levels, metabolic syndrome, diabetes mellitus type-2, and insulin resistance (18). The study indicates severe cases of nonalcoholic fatty liver disease that causes abnormalities in serum AST and ALP levels (19). Nonalcoholic fatty liver disease has been associated with metabolic syndrome. It is concomitant with a decrease in beta oxidation and rises in free fatty acids, and as a result, increment the susceptibility to hepatic fibrosis (19,20). Also they reported that metabolism; age and BMI factors have great effects on ALT levels (21). Generality, various studies have demonstrated that ALT levels correlate with increasing BMI (22–24). Previous study that done on the Mexican population was proved that weight gain will increase ALT activity by more than 3 times (25). Another study completed in the United States of America was showed that the high prevalence of obesity will led to high incidence of "chronic liver disease and nonalcoholic fatty liver disease" (26). Jayanta *et al*., (27) were introduced an evidence to clarify the association of NAFLD in developing countries like India with the increment of obesity (27). Several studies have good agreement with our study; the results were indicated no relationship with obesity and liver enzyme levels (28). On the other hand, earlier studies in this field have contrary results to our study (29,30,31). Perhaps there are other reasons for the rise of some liver enzymes such as exercise (32), Based on that; both AST and ALT may increase with vigorous exercise (32,33). Other reasons may be related to immunogenic factors or as a result to certain treatments.

Liver enzymes abnormalities have been suggested to have relationships with therapy and/or autoimmunity (34,35). There may be some other points to be noted which may be the cause of changes in liver enzymes. In the case of older people, demolitions are more than construction, and sugars are converted into fat due to calmness, relaxation, slow movement, lack of physical exertion and lack of exercise. At the stage of youth, the body is in constant activity and due to excessive eating and increasing the calorie in the youth stage, which leads to increased production of fat cells with age, gender difference, different genotypes and nature of food and the environment surrounding the people (14).

The most important point is the method of measuring lipid since measuring the body mass index is the first method and depends on the accuracy of this method to repeat the measurement process several times during

specific periods. The layers under the skin determines the amount of body fat above the muscle where there are other methods more accurate are dual-energy x-ray absorptiometry (DAX), skinfold thicknesses (anthropometry), ultrasound, radiography and bioelectrical impedance analysis (BIA) to measure the proportion of body fat (36,37). Finally; the limitation of the present study was small sample size study. Further large sample size studies are required and include sex and genes to obtain results more comprehensive**.**

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