

## Assessment of Liver Enzymes Level Among Obese Sudanese Individuals in Khartoum State - Sudan

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Overweight and obesity prevalence continues to increase and worldwide growing epidemic health problems. Obesity imposes a significant effect on liver functions that may be associated with a substantial risk factor for the development of several non-communicable diseases, considerable disability, and premature death. To estimate and compare serum activity of ALT, ALP, and GGT among healthy and obese Sudanese individuals. A total number of 80 participants were enrolled in this cross-sectional study, and they were categorized into 40 obese and 40 normal-weight individuals. Serum liver enzyme activity was measured for each participant. A significant increase was found in ALT, ALP, and GGT levels among the obese group. There is a statistical difference of GGT level mean between gender within the obese group. A positive correlation was observed between the BMI and serum level of ALT ( $r=0.343$ ,  $p=0.002$ ), ALP ( $r=0.503$ ,  $p<0.001$ ) and GGT ( $r=0.237$ ,  $p=0.034$ ) and positive correlation between obesity duration and GGT level ( $r=0.461$ ,  $p=0.003$ ). Study results revealed that obesity was associated with a substantial elevation in liver enzymes that considered risk factors for liver diseases in Sudanese individuals.

**Keywords:** Liver enzymes, Obesity, Liver diseases, Sudanese individuals.

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Obesity is a significant health problem correlated with hepatic dysfunctions such as non-alcoholic fatty liver disease and other metabolic diseases associated with increased levels of liver enzymes<sup>1</sup>. Obesity is an increasing health concern that strongly linked to morbidity and mortality

through its associated health risks worldwide<sup>1</sup>. Body mass index (BMI) most commonly used as anthropometric measures to predict metabolic disorders related to obesity. Obesity is an abnormal condition of increased body fat; therefore, body fat distribution plays a vital role in obesity-

related comorbidities such as hypertension, coronary heart disease, hyperlipidemia, type-II diabetes, insulin resistance, stroke, cancers, sleep disorders, and several others. Likewise, obesity considered potential risk factors for alterations in liver histology like macrovesicular steatosis, steatohepatitis, fibrosis and cirrhosis, hepatomegaly, and increased liver biochemistry values<sup>2</sup>. Association between liver enzymes levels and obesity was a good document in literature, and the accumulation of fat in the abdominal region represents a stronger predictor of elevated liver enzymes<sup>3,4</sup>. Although liver enzymes are metabolic enzymes that catalyze the interconversion of amino acid, they were used in the assessment of liver diseases. Most of the liver diseases characterized by distinctly abnormal values of one or more enzymes in serum and liver enzymes that are commonly used in evaluating liver function are alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), lactate dehydrogenase (LD), and  $\alpha$ -glutamyl transferase (GGT)<sup>5</sup>. In clinical practice, the estimation of liver enzyme activity provides assistance that helps in the differential diagnosis, monitoring, and management of different liver diseases<sup>6</sup>. Whereas abnormalities of liver enzymes are found in asymptomatic healthy individuals, recent studies proved that ALP activity enhanced and anticipated disproportionate intracellular fat depots and released from adipose tissue into the blood circulation in excessive amount<sup>7</sup>. In comparison with non-obese individuals, the liver function tests, including enzyme activity derangements, been noticed to be more frequent in obese ones due to the high prevalence of non-alcoholic fatty liver disease<sup>6</sup>. This study aims to estimate and compare serum activity of ALT, ALP, and GGT among healthy and obese Sudanese individuals.

## MATERIALS AND METHODS

In the present cross-sectional study, a group of 40 (19 females and 21 males) obese participants and 40 (19 females and 21 males) healthy participants with BMI 18.5-24.9 were randomly selected. The obese participant who were studied in the age group of 18-35 years with BMI > 30, apparently healthy who had BMI value stable for at least one year and lean or healthy participant in the age group of 18-35 years with BMI 18.5-24.9 who had stable BMI value. Individuals with liver diseases, bone diseases, and cardiac diseases or any disease affect the serum activity of ALT, ALP, and GGT were excluded from the study.

The study was approved by the clinical chemistry department scientific committee to estimate the liver enzyme level among obese and healthy individuals in Khartoum city during the period from January to May 2017. After getting their informed consent, venous blood samples were taken from participants in the morning after a minimum of 8 hours of overnight fasting. Then specimens were centrifuged at 3000 rpm for 5 minutes to separate the serum. Kinetic colorimetric methods measured serum activity of ALT, ALP, and GGT.

Statistical analysis of the data was performed using the SPSS program to the arithmetic mean, standard deviation, t-test, and Pearson's test of correlation. The level of confidence ( $P \leq 0.05$ ) was considered as a cutoff value for significance.

## RESULTS

Table 1 shows the statistics of measured serum average mean of liver enzymes activity computed for obese and healthy participants, which significantly increased for ALT ALP and GGT in

**Table 1.** Comparison of liver enzymes level between obese and normal participants

Liver enzymes	Mean $\pm$ STD (IU/L)		P- value
	Obese (n=40)	Normal (n= 40 )	
ALT	29.93 $\pm$ 13.971	21.28 $\pm$ 6.980	0.001
ALP	246.60 $\pm$ 42.15	176.25 $\pm$ 45.87	<0.001
GGT	33.70 $\pm$ 13.92	24.60 $\pm$ 8.22	0.001

P-value based on student's t-test: significant at ( $p < 0.05$ )

**Table 2.** Comparison of liver enzyme levels within study subjects

Liver enzymes	Mean $\pm$ STD (IU/L)P- value		
	Male (n=42)	Female (n= 38 )	
ALT	27.93 $\pm$ 10.92	23.03 $\pm$ 12.34	0.557
ALP	217.75 $\pm$ 53.99	204.63 $\pm$ 58.69	0.301
GGT	35.12 $\pm$ 13.18	22.55 $\pm$ 6.52	<0.001

P-value based on student's t-test: significant at (p< 0.05)

**Table 3.** Correlation between liver enzymes levels and BMI in the obese group

Pearson's correlation	ALT	ALP	GGT
r	0.343	0.503	0.237
p-value	0.002	<0.001	0.034

P-value based on student's t-test: significant at (p< 0.05)

**Table 4.** Correlation between liver enzymes levels and duration of obesity

Pearson's correlation	ALT	ALP	GGT
r	0.241	0.280	0.461
p-value	0.134	0.081	0.003

P-value based on student's t-test: significant at (p< 0.05)

obese participants when compared with healthy participants (p<0.05).

Table 2 shows a comparison of liver enzymes levels between male and female groups. The results reflect that there is a significant increase in the GGT level in male group p<0.001. For ALT and ALP levels, there is no statistical difference in the means for the two groups.

Table 3 shows Pearson's correlation results, which reflect statistically significant, positive correlation between the BMI of the obese group and liver enzymes levels (p<0.05).

Table 4 shows Pearson's correlation results, which reflect statistically significant, positive correlation between the obesity duration and GGT level (p<0.05).

## DISCUSSION

Obesity is an accumulation of abnormal or excessive fat in adipose tissue that affecting over a third of the world's population. It comprises dramatically increases the risk of several devastating diseases, significant disability, and premature death in many countries around the world<sup>8,9</sup>. Obesity-associated liver disease constitutes a clinical condition that must be carefully considered by physicians caring for obese subjects<sup>10</sup>.

In the present study, results revealed significant increases in serum ALT, ALP, and GGT

in the obese group as compared to normal. These findings were found to be similar to the Jong Weon Choi study finding who reported that a significant increase in serum liver enzymes ALT, AST, and GGT activities associated with obesity<sup>11</sup>. As well, our results following Marchesini et al. reported that liver enzymes increased with increasing obesity without any symptom, signs, and previous history of liver disease<sup>10</sup>. The obesity imposes a higher risk of liver injury, increases in liver enzymes considered the most sensitive biochemical indicator of the presence of hepatic steatosis<sup>12</sup>.

In the current study, a significant increase of GGT level was observed in males whereas, there is no statistical difference in levels of ALT and ALP in males and females. As the same as Luyckx FH. et al finding which concluded that prevalence of liver steatosis in males vs. females might be related to slightly significantly higher levels ALT and GGT<sup>13,14</sup>. In previous studies, the levels of GGT and ALT showed a significant correlation with several of obesity indices, and they accounted for useful markers for identifying metabolically unhealthy obesity, especially in male group<sup>15,16</sup>. The specificity of GGT as a marker of liver function is less, a higher GGT and ALT levels were found linked with obesity and reflects fatty changes in liver<sup>17</sup>.

Our study results showed a significant positive association between liver enzymes and

BMI in obese subjects and a significant positive correlation between obesity duration and GGT level. These findings were similar to Ruhl CE. *Et al.* study finding who reported that BMI was strongly associated with the prevalence of abnormal ALT activity<sup>18</sup>.

### CONCLUSION

Study results revealed that increases in associated with substantial changes in lipid profile that considered risk factors for liver disease among obese Sudanese individuals.

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#### Conflict of Interest

Regarding this information, all authors were declared that they have no conflict of interest and this declaration attached with the copyright form (second page). If there any other information required, please let me know.

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