

**EFFECT OF INCREASING BMI ON ENZYMES USED FOR ASSESSMENT OF LIVER
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ABSTRACT

WHO: Expert Committee Recommended that obesity is emerging as worldwide epidemic. Present study describes the effect of increasing Body Mass Index (BMI) on enzymes used for assessing liver function. This study is based on 50 healthy and 190 obese subjects of age group 20-50 years. Obese subjects were selected on the basis of BMI and were divided into three categories according to BMI viz overweight, obese and morbid obese. These were further divided on the basis of gender. Serum Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) level were estimated. It was observed that serum ALT level of control male was 26.67 ± 6.5 IU/L and of control female was 22.73 ± 7.5 IU/L. Serum ALT level in overweight, obese and morbid obese males were 32.73 ± 13.2 (p value < 0.10), 1.45 ± 13.5 (p value < 0.0005) and 72.19 ± 14.05 IU/L (p value < 0.0005) respectively and in overweight, obese and morbid obese females were 43.47 ± 18.33 (p value < 0.005), 44.59 ± 12.31 (p value < 0.0005) and 72.96 ± 11.2 IU/L (p value < 0.0005). Serum AST level in control, overweight, obese and morbid obese males were 12.27 ± 8.17 , 15.97 ± 7.46 (p value < 0.10), 17.1 ± 8.19 (p value < 0.10) and 27.51 ± 7.58 IU/L (p value < 0.0005) and in females were 18.93 ± 8.65 , 20.56 ± 9.52 (p value < 0.10), 25.57 ± 12.57 (p value < 0.10) and 45.45 ± 7.11 IU/L (p value < 0.0005) respectively. Thus in females, with increase in BMI the level of ALT also increase eventually. Similarly males also show increased ALT level with increase in BMI. However in overweight males rise in ALT level is not significant. While comparing the AST level it was found that significant variation occur only in morbid obese males and females, which may be due to liver dysfunction.

KEYWORDS: Obesity, Overweight, Morbid Obese, Alanine Aminotransferase, Aspartate Aminotransferase.**INTRODUCTION**

Obesity is an epidemic in nearly every country in the world. The possible explanation for this health problem is substantial lifestyle changes from more reliance on automobiles and less on everyday physical activity, to the increasing availability of processed foods. Obesity is complex multi functional disorder characterized by an excess of adipose tissue. National health and nutrition examination survey (NHANES) have been using BMI (Body Mass Index) to access the prevalence of overweight and obesity provide the statistics that are often cited.

Whenever there is significant rise in level of non-functional plasma enzyme in plasma then it indicates damage of the tissue where enzyme is highly localized. The enzymes viz ALT and AST are used as markers of function of liver. 17 out of 60 (83%) obese otherwise healthy volunteers had elevated serum ALT, AST and alkaline phosphatase at least once in course of 12 weeks clinical trials.^[1] Overweight and obese are most common findings in adolescent with elevated ALT levels.^[2] Excess weight is more common than excessive alcohol

consumption in the community and confers a greater risk of elevated aminotransferase level.^[3]

Thus various researches have been done in last few years to study effect of excess weight on liver enzymes. Our work on serum AST and ALT levels can be utilized to study the effect of increasing BMI on liver function.

MATERIAL AND METHOD

50 healthy and 190 obese subjects of age group 20-50 years were enrolled from the community. Demographic data was collected and hypertensive individuals were excluded. The parameter used for selecting obese was BMI (also called Quetlet Index) and was calculated using formula-

$$\text{BMI} = \text{weight (kg)} / [\text{height (m)}^2]$$

On the basis of BMI subjects were divided in three categories-

- i. BMI > 25 were considered overweight,
- ii. BMI > 30 were considered obese, and
- iii. BMI > 34 were considered morbid obese.

These individuals were further divided on the basis of their gender. Venous blood samples were obtained after 12 h fast with consent of subjects. Incubating blood sample at 37°C for one hour and then centrifuging it at 3000 rpm for 10 minutes separated serum.

Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) were estimated in serum using colorimetric method.^[4]

Statistical Analysis: Results are expressed as mean \pm SD. p-value was calculated to observe significant variations.

RESULTS AND DISCUSSION

Table I describe the demographic status & biochemical data related with control, overweight, obese and morbid obese subjects.

Table no. I.

Parameter	Control		Overweight		Obese		Morbid Obese	
	Male	Female	Male	Female	Male	Female	Male	Female
No of Individuals	25	25	30	30	35	35	30	30
Age	33.33 \pm 11.71	26.99 \pm 11.68	42.5 \pm 8.85	34.83 \pm 10.28	39.33 \pm 12.32	34.66 \pm 7.68	40.75 \pm 12.63	46.00 \pm 9.16
BMI	21.88 \pm 1.76	19.81 \pm 1.1	28.36 \pm 1.12	27.07 \pm 1.36	31.62 \pm 0.95	32.07 \pm 1.2	38.31 \pm 3.84	37.32 \pm 1.54
ALT in IU/L	26.67 \pm 6.5	22.73 \pm 7.5	32.73 \pm 13.2	43.47 \pm 18.33*	51.45 \pm 13.5*	44.59 \pm 12.31**	72.19 \pm 14.05*	72.96 \pm 11.2**
AST in IU/L	12.27 \pm 8.17	18.98 \pm 8.65	15.97 \pm 7.46	20.56 \pm 9.52	17.1 \pm 8.19	25.57 \pm 12.57	27.51 \pm 7.58**	45.45 \pm 7.11**

Note: Values are expressed as mean \pm SD of number of observation. * indicates significant variation. ** Indicates highly significant variation.

BMI (Body Mass Index) - BMI related results showed increased value of all the three groups viz overweight, obese and morbid obese as compared to control. In experimental group highest BMI 38.31 \pm 3.84 was observed in morbid obese males while lowest value 27.07 \pm 1.36 was in overweight females.

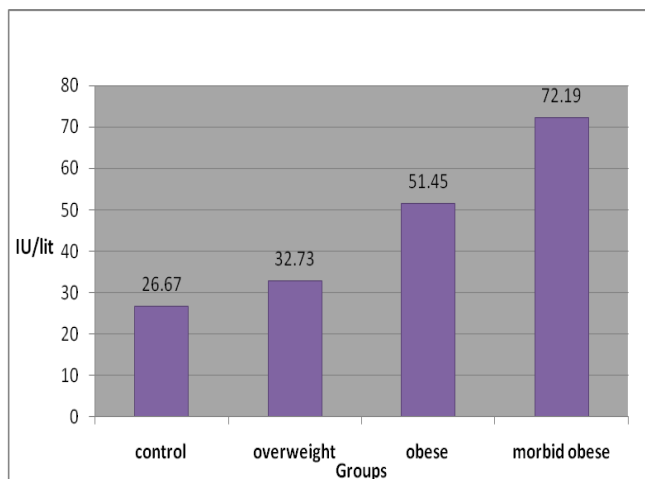


Figure 1 showing Serum ALT level in males.

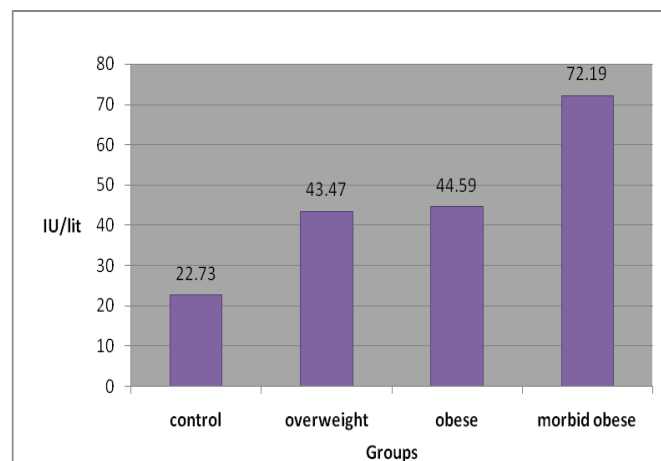


Figure 2 showing serum ALT level in females.

ALT (Alanine aminotransferase) – As shown in fig.1 and fig. 2 ALT level increased rise in all the three groups viz overweight, obese and morbid obese in both male and female as compared to control. Highest ALT level 72.96 \pm 11.2** was observed in morbid obese female while lowest level 32.73 \pm 13.2 was observed in overweight male.

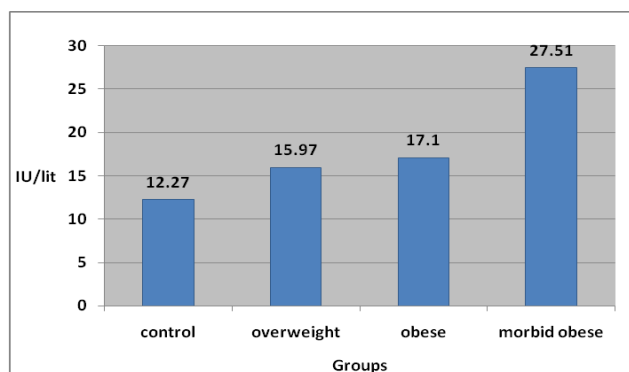


Figure 3 showing AST level in males.

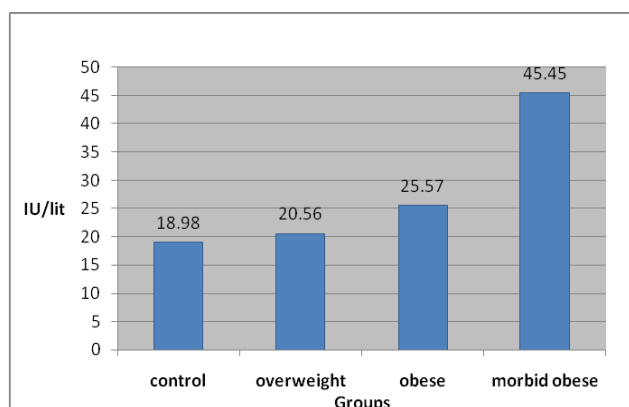


Figure 4 showing AST level in females.

AST (Aspartate aminotransferase) – As shown in fig. 3 and fig.4 level of AST also get increased in all the three categories that is overweight, obese and morbid obese male and female. Morbid obese females show highest level $45.45 \pm 7.11^{**}$ of AST while lowest value 15.97 ± 7.46 was found in overweight males.

In females with increase in BMI, the level of ALT also increase eventually thus liver dysfunction increases with increasing fat, which may be due to fatty liver. Similarly males also show increase ALT level with increase in BMI. However in overweight males rise in ALT levels is not significant.

While Comparing the AST level it is found that significant variation occur only in morbid obese in both males and females which may be due to abnormal function of liver.

ALT, AST and GGT levels showed marked increase with increasing body mass index of males.^[5] Body weight rather than alcohol consumption may be the major factor in determining the serum level of liver enzymes.^[6] Serum ALT, AST and GGT activities are

correlated significantly with total body fat in both overweight man and woman, is also supported by our finding.^[7] Effect of moderate alcohol consumption on liver enzymes increases with increasing BMI.^[8] Liver enzymes are adversely affected with simultaneous increase in alcohol intake and obesity.^[9] Our results are

contradicted by the work of Das *et al.*, according to whom ALT, AST and GGT were found in the normal reference range in all the three groups.^[10]

CONCLUSION

This study provides evidence for increase in serum ALT and AST level in both male and female with increase in BMI. This indicates that with increase in fat content in body, normal function of liver is affected.

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