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EFFECT OF ALCOHOL INTAKE ON SERUM ENZYME ACTIVITIES

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ABSTRACT

Alcohol is present in our blood in small amounts because of its anaerobic production by intestinal flora. When ingested in large quantity, alcohol causes tissue damage that raises enzyme activities like serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvate transaminase (SGPT) and serum alkaline phosphatase. The present study deals with the observed significant changes in activities of SGOT, SGPT and alkaline phosphatase after alcohol intake by 25 middle aged males ranging between 30-50 years age group. SGOT and SGPT activities showed a significant rise while serum alkaline phosphatase activity remained in the upper normal limit when other biochemical parameters like urea, creatinine and bilirubin were found in the serum samples to be within the normal range. After alcohol withdrawal, SGOT and SGPT activities returned to normal values. Duration of time also affects alcohol drinkers as metabolism of alcohol is increased in alcohol drinkers who become accustomed to its ingestion and decreased in patients with liver disease.

KEYWORDS: enzyme activities, Aspartate transaminase, Alanine transaminase, Alkaline phosphatase, alcohol metabolism, alcohol withdrawal.

INTRODUCTION

AST and ALT(Aspartate transaminase (EC.2.6.1.1) & Alanine transaminase (EC.2.6.1.2) are amino transferases that catalyse the interconversion of Amino Acids and α – keto acids by transfer of amino groups with the help of Pyridoxal 5' phosphate as coenzyme. AST (EC.2.6.1.2) was previously known as GOT and ALT (EC.2.6.1.1) was previously known as GPT. AST is present in cytoplasm as well as in the mitochondria of the hepatic cell cytoplasm. In amino transfer reaction called transamination reaction, α- ketoglutarate and L-glutamate couple serves as one amino group acceptor and donor pair. Transamination plays an important role in the intermediary metabolism because it functions in the synthesis and degradation of amino acids in the endoplasmic reticulum of the cell. The three amino acids L- glutamic acid, L- alanine and L aspartic acid can be transmitted to their keto-acids which then enter the citric acid cycle and become a source of energy. ALT and AST are present in liver, heart, skeletal muscle and kidney in high activity with lesser amount in many other organs. ALT and AST peak activities occur at ages 30 and 40 for men and ages 50 and 60 for women, The half life of ALT in serum is 50 hours while AST has half life of 12 hours. The transaminase serves as liver function tests which reflects necrosis of hepatic cells.[1] Alcohol ingestion is able to cause injury to hepatic cells. The permeability of hepatic cell membranes increase and degeneration of the cell may cause raised levels of serum transaminase to increase upto 300 IU/l with AST greater than ALT.[2]

Alkaline phosphatase (ALP) designates a group of phosphate estrases having low substrate specificity. ALP from all body sources is a zinc containing glycoprotein with a serine residue at the active centre. ALP is a ubiquitous enzyme and is present in the cell membranes of organs that exhibit high absorptive or excretory capacity. The organs with the highest ALP activities are placenta, small intestine, bone, kidney and liver. The function of ALP is to catalyze the transfer of a phosphate moiety between a donor and acceptor molecule. ALP hydrolyses phosphate esters, synthesizes phosphate esters and essential calcification of bone, increased serum ALP activity associated with liver disease is caused by intra or extra hepatic cholestasis and some destruction of hepatic cell membranes. Alcoholic hepatitis may be responsible for intra hepatic cholestasis. After alcohol intake and its catabolism in the liver, a number of potentially dangerous by-products are generated such as acetaldehyde and highly reactive loecules called free radicals. These products contribute to alcohol induced liver damage.

MATERIAL AND METHODS

Blood samples from twenty five male subjects ranging between 30-50 age group, examined in a private clinic at

Amritsar after alcohol intake, were received for estimation for enzymes activities like AST, ALT and Alkaline phosphatase along with estimation of blood urea, serum creatinine and serum bilirubin of these subjects. These estimations were done by standard methods after alcohol intake and then after 10 days of alcohol withdrawal.[3] These subjects were further sub divided into two groups having less than the highest normal range of enzyme activities and more than the highest normal range of enzyme activities.

RESULTS AND DISCUSSION

In the present study, the mean values for the parameters studied in 25 subjects further subdivided in the sub groups as follows.

Age < 40 years.
Age >40 years.
are depicted in Table I and Table II respectively. These subjects were found to have mean values blood urea, serum creatinine and serum bilirubin within normal range.

Table I indicates the relation between Enzyme activities of AST, ALT and alkaline phosphatase in serum samples of 25 subjects grouped as less than 40 years (sub group I) and more than 40 years (sub group II). These groups are sub divided depending upon the enzyme activities lying within normal range and beyond normal range.

TABLE I.

RELATION BETWEEN ENZYME ACTIVITIES (AST, ALT AND ALP) IN SERUM SAMPLES OF SUBJECTS AFTER ALCOHOL INTAKE

S.No.	Groups	N (no. of subjects)	AST activity (IU/l)	ALT activity (IU/l)	ALP activity (IU/l)
I	Subjects After Alcohol Intake Age group <40 years	10	104.93	108.15	188.82
	Subjects having enzyme activities of AST & ALT				
	i) <40 IU/l	4	36.5	29.63	-
	ii) >40 IU/l	6	150.78	135.44	-
	Subjects having enzyme activities of ALP				
	i) <275 IU/l	9	-	-	165.91
	ii) >275 IU/l	1	-	-	395
II	Subjects After Alcohol Intake Age group >40 years	15	113.68	117.7	210.7
	Subjects having enzyme activities of AST & ALT				
	i) <40 IU/l	2	28	34.32	-
	ii) >40 IU/l	13	114.48	104.03	-
	Subjects having enzyme activities of ALP				
	i) <275 IU/l	13	-	-	141.72
	ii) >275 IU/l	2	-	-	484.2

Table II indicates the relation between Enzyme activities of AST, ALT and alkaline phosphatase after withdrawal of alcohol for 10 days in the 25 subjects of two sub groups. Sub group I represents enzyme activities of subjects aged less than 40 years and sub group II represents enzyme activities of subjects aged more than 40 years after withdrawal of alcohol for 10 days. Further these groups are sub divided depending upon the enzyme activities lying within normal range (i) and beyond normal range (ii).

TABLE II.

RELATION BETWEEN ENZYME ACTIVITIES (AST, ALT AND ALP) IN SERUM SAMPLES OF SUBJECTS AFTER WITHDRAWAL OF ALCOHOL FOR 10 DAYS

S.No.	Groups	N (no. of subjects)	AST activity (IU/l)	ALT activity (IU/l)	ALP activity (IU/l)
I	Subjects After withdrawal of Alcohol for 10 days Age group <40 years	10	50.92	56.97	168.62
	Subjects having enzyme activities of AST & ALT				
	i) <40 IU/l	5	35.8	33.64	-
	ii) >40 IU/l	5	66.04	80.3	-
	Subjects having enzyme activities of ALP				
	i) <275 IU/l	10	-	-	168.62
II	Subjects After withdrawal of	15	52	48.62	197.84

	Alcohol for 10 days Age group >40 years				
	Subjects having enzyme activities of AST & ALT				
	iii) <40 IU/l	6	35	28.86	-
	iv) >40 IU/l	9	63.38	67.34	-
	Subjects having enzyme activities of ALP				
	i) <275 IU/l	13	-	-	181.26
	ii) >275 IU/l	2	-	-	305.6

Normal range
AST: 0 to 40 IU/l.
ALT: 0 to 40 IU/l.
ALP: 100 to 275 IU/l.

Taking the values after alcohol intake and then after withdrawal of alcohol for 10 days, it was observed that the mean values of AST and ALT were found to increase from the normal range i.e. 104.93 IU/l and 108.15 IU/l respectively. Subjects of sub group < 40 years were found to have these enzyme activities within normal range i.e. 36.5 IU/l and 29.63 IU/l respectively, in contrast to these subjects of age >40 years having mean enzyme activities of AST and ALT outside the normal range 150.78 IU/l and 135.44 IU/l respectively (Table I). The increase in the activity of AST was frequently noted in patients with liver diseases and the degree of elevation is considered to correspond to increase of damaged liver cells.[4] The increase in the mean values of enzyme activities of AST and ALT returned to within normal range after 10 days of alcohol withdrawal in the sub group I (age <40 years) while in the subjects of sub group II (age >40 years) enzyme activities lowered to 66.03 IU/l and 80.3 IU/l but still showed an increase. Age factor may be responsible for this increase.

Alkaline phosphatase activities remained within the range in these subjects of sub group I i.e. 168.91 IU/l and sub group II i.e. 181.26 IU/l and sub group II (ii) enzyme activities was found to be 305.6IU/l.

CONCLUSION

This study suggests that alcohol intake causes transaminase to increase beyond the normal range of their activities with increase in AST greater than increase in ALT levels in subjects over 40 years due to release of M- AST (mitochondrial AST).[5]

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