

# The Prevalence Of The Elevation Serum Alanine Amino Transaminase At Gorgan In Northern Iran

AZAD R MANSOURIAN, AKHTAR SAIFI, GHOLAM R VEGHARI

## ABSTRACT

The elevation of serum alanine aminotransferase levels is associated most commonly with some forms of liver diseases. The aim of this study was to determine the prevalence of elevated serum alanine aminotransferase levels and the possible liver damages in this region.

This was a clinical laboratory based study. The data was obtained from the Danesh Medical Diagnostic Laboratory at Gorgan in northern Iran. The aminotransferase activity was measured by the pyridoxal -5-phosphate reaction. Values over 31 and 41 U/L were considered as indicative of elevated enzyme activity in females and males respectively.

The findings of this study indicated that 16% of our population

in general and of those who were aged 18-40 years in particular, had a form of liver disorder due to elevated enzyme, with a higher incidence among the female subjects, which seemed to be slightly higher than that reported by other studies earlier. The incidence was slightly higher among females.

It seemed that high proportions of people (16%) in this region had an elevated serum enzyme activity of alanine aminotransferase and according to well-documented reports, it might probably be associated with non-alcoholic fatty liver disease. A comprehensive study is recommended to elaborate carefully the state of liver diseases in this region of Iran.

**Key Words:** Alanine Aminotransferase, Liver disease, Iran

## INTRODUCTION

Alanine transaminase(ALT) is an enzyme which is present mainly in the liver and the status of this enzyme predicts the liver function. ALT is one- of the best markers whose levels can be evaluated to assess the liver damage, and the serum elevation of ALT is mostly clinically significant for the diagnosis of liver lesions such as hepatitis bile duct disorder. This enzyme is predominantly found in the liver and also the kidney, heart and pancreas contain smaller amounts of this enzyme, which is accompanied by ALT elevation within the blood. Any damage to the liver is accompanied by ALT elevation within the blood. Another enzyme, aspartate aminotransferase is usually simultaneously assessed, although the proper biochemical tests for the detection of liver damage include the evaluation of alkaline phosphatase lactate dehydrogenase (LDH) and bilirubin. Due to the high specificity of ALT, its serum activity is usually assessed for the diagnosis of a wide variety of liver lesions, particularly cirrhosis and hepatitis.

In case of the serum elevation of bilirubin, the measurement of the ALT activity can help to diagnose whether the bilirubin elevation is due to blood or liver diseases. The determination of the ALT activity can also be used to follow up any liver damage which can occur due to some medication which was prescribed by clinicians in order to prevent the arteriosclerosis which is caused by elevated cholesterol levels within the blood circulation.

Although ALT is a liver specific enzyme and is well recommended, alkaline phosphatase and creatine kinase have to be measured to distinguish liver cell damage versus biliary duct or myopathy lesions. Liver damage and particularly, chronic liver damages such as fatty liver of non-alcoholic origin and viral hepatitis, occur in people all over the world [1].

The activity of serum ALT is mostly measured to evaluate the liver damage [2], [3], although liver biopsy is an excellent method to diagnose the liver damage confidently. But, due to the invasive

nature of this method, it cannot be used for a population based study and therefore, the serum ALT measurement can be a useful method to evaluate the liver damage [4]. On the basis of the above facts, the present study was carried out at Gorgan in northern Iran to find out the prevalence of ALT elevation with the subsequent estimation of liver diseases in this region of Iran.

## MATERIALS AND METHODS

The ALT data of the sample population for this present study were collected from patients who were referred to the Danesh Medical Diagnostic Laboratory at Gorgan which is located in northern Iran. In this study, the data of 573 subjects, who were referred to the above laboratory during one year (2009-10), was obtained. On collecting the data on the serum ALT activity, each patient's name was replaced with a code name to maintain the anonymity of the patients.

ALT is a liver enzyme which is elevated during the occurrence of liver lesions and is released into the blood circulation. Its activity can subsequently be determined by laboratory methods. The determination the ALT activity in this study was based on IFCC without the addition of pyridoxal-5-phosphate. ALT catalyzes the following reaction:

$L\text{-Alanine} + 2\text{-Oxyglutarate} \rightarrow L\text{-Glutamate} + \text{Pyruvate}$   
which is a reversible reaction.

$\text{Pyruvate} + \text{NADH} + \text{H}^+ \rightarrow L\text{-Lactate} + \text{NAD}^+$

The reference ranges of ALT in this method were < 31U/L and <41 U/L for females and males respectively and the ALT values above these figures were considered as elevated ALT activity [5].

## RESULTS

In this study, 93 persons (52 females and 41 males) out of 573 subjects who were referred to the Danesh Medical Diagnostic Labora-

tory showed elevated ALT levels, which may have been associated with some sort of liver damage [4], although there were contradictory reports in this area of research. The ALT elevation cannot be accepted universally as a marker for assessing liver damage. In this study, the patients were divided into 4 major groups. Out of 93 patients [5], [70], [13] and [5] subjects in the age groups of <18, 18-40, 40-65, >65 years had elevated ALT levels. The gender prevalence among the various age groups were as follows (3,2), (29,41), (7,6) and (2,3) males and females respectively. The lowest incidence of the ALT elevation was observed among the <18 and >65 year age groups (5%). The 18-40 years age group showed the highest prevalence (75%), which was slightly higher among females than among the males (78% versus 70%). The age group of 40-65 years showed an elevated (14%) ALT prevalence. On the whole, a total of 93 out of 573 patients showed an elevated ALT prevalence (16%), which was slightly higher than that which was seen in some other studies [4].

The demographical characteristics of this part of Iran are as follows: This area consists of a cosmopolitan society of different races and ethnic groups. The diet mostly consists of fatty foods which are mainly fried in cooking oils of an unsaturated nature and are baked in general, although in recent years, the unsaturated start to have a good place but those of about 40 years of age already had enough fat. This is mainly an agricultural region and generally the level of education is good as a whole, but some people with higher education also reside in this region. The men and women participate in sports, but it seems, most men they do the practice. This region is also located at the south east of the Caspian sea, and consists of forests and agricultural lands and so, herbicides are used there occasionally. [Table/Fig 1]

Gender	Total No	Total No	Total No	Total No	Total
	<18 years	18-40	40-65	>65	
Men	3(7%)	29(70%)	7(17%)	2(4%)	41(44%)
Women	2(3%)	41(78%)	6(11%)	3(5%)	52(56%)
Total Men,					
Women	5(5%)	70(75%)	13(14%)	5(5%)	93/573 (16%)

[Table/Fig 1]: The prevalence of elevated ALT and possible liver disease at south-east Caspian Sea of northern Iran

## DISCUSSION

In our study, we also found that the ALT elevation correlated with age, but not with the increasing chronological age among the middle age group of 18-40 years. We found that the prevalence of the ALT elevation was slightly higher among the female patients. In our study, we found that except for the <18 years age group, the prevalence of ALT was inversely correlated with the chronological age as follows: 12%, 2.2% and 0.9% for the 18-40, 40-65, and >65 years age groups respectively.

We argue that it is advisable that the ALT measurement among the 18-40 years age group should be followed by further careful para-medical examinations to confirm the high prevalence of the ALT activity and its association with liver diseases.

ALT has been considered as a specific enzyme which is related to liver disease. The simultaneous determination of ALT and aspartate aminotransferase (AST) can be useful in the differential diagnosis of heart and muscle versus liver damages. Although ALT is a liver specific enzyme, it has been well recommended that alkaline phosphatase and creatine kinase should also be measured to distinguish liver cell damage versus biliary duct or myopathys lesions. Liver damage and particularly chronic liver damages such as fatty liver of non-alcoholic origin and viral hepatitis are involved in people all over the world [1]. Our findings from this study indicated that the ALT activity was most prominently elevated among the 18-40 years age group. We also may simultaneously argue that perhaps this latter age group was most frequently visited by the clinicians.

and as this study was not a population-based study and as the elderly and children did not consist of a large sample size, we cannot argue for sure that the liver disorder was predominantly seen among the middle age group of upto 40 years of age. This can be considered as a limitation of our study.

Considering the cost-effectiveness of any laboratory test, ALT has been accepted as the best single enzyme test for the prediction of liver damage and as the first step of any multiple enzyme measurement or other para-clinical tests [5]. It should be also mentioned that the ALT/AST ratio is a valuable index in the differential diagnosis of minor or severe chronic liver damage if the latter ratio is less than one or more than one respectively. There are many reports on the role of ALT in assessing liver function and hence, the measurement of ALT has been widely applied in the determination of fatty liver damages which are accompanied by other disorders [6]. Although ALT measurement is commonly considered to be a result of fatty liver damage, other organ abnormalities such as type-2 diabetes may also exist [7].

In the real sense, it seems that the ALT/AST ratio which is widely used to evaluate the severity and prognosis of the damage which is done to the liver and the clinical utility of the ratio has extensively been studied [8], [9]. ALT elevation can most probably be associated with liver malfunction [13]. It seems that there is some intervention by some other factors such as insulin resistance and its related factors such as obesity and elevated triglycerides which can manipulate the usefulness of ALT elevation, in the clear cut diagnosis of liver damages. The non-alcoholic fatty liver seems to be at the top of the ALT elevation and it might be correlated with the latter disorder. The fatty liver itself can be caused by some metabolic disorders which have been mentioned earlier. Hepatitis is the other main cause of ALT elevation which has been reported in some studies [1] and it seems that as it is an age related syndrome, its prevalence has increased with the chronological age [1], [10].

Due to some controversial reports about the role played by the serum ALT activity alone, there are studies suggesting that the confirmation of the ALT factor should be accompanied by molecular biological methods such as the PCR technique, particularly for hepatitis. There are also many reports indicating that serum ALT cannot be used in the diagnosis of hepatitis, but it seems that it is an applicable method in studying fatty liver lesions [11], [12], [13], although there are some studies which even suggest that the ALT elevation does not correlate with fatty liver disease as well [14].

## CONCLUSION

The main concept behind this present study was to assess the prevalence of elevated ALT levels in this region, regardless of the type of liver disease. A comprehensive literature review about the role of ALT was present with controversial findings and at some point there are reports that are in agreement and those that are overlapping with the conclusions of one another.

From all these contradictory results and from our present study we can conclude that in northern Iran, the prevalence of serum ALT levels is about 16%, regardless of the origin of the disorder, which caused this elevation. On the basis of the acceptable facts in the literature, it can be suggested that the serum ALT levels are usually elevated due to any liver damage, particularly non-alcoholic fatty liver damage (NAFLD). Therefore, ALT determination is a single non-invasive laboratory test which gives its very first clue to the medical team to further examine the patients for other more specific medical and para-medical investigations for any liver damage and particularly, NAFLD assessment.

In conclusion, according to our findings that about 16% of our population might have a type of liver damage and considering the extensive report in this area of research, particularly NAFLD should carefully be investigated.

## ACKNOWLEDGMENT

The authors wish to thank the Danesh Medical Diagnostic Laboratory for its sincere cooperation in this research project.

## REFERENCES:

- [1] Pendiano GM, Marino A, Surace P et al, Prevalance and etiology of altered liver testes: a population-based survey in Mediterranean town. *Hepatology* 2005; 41:1151-9
- [2] Katlov WN, Friedman LS, Cody H, et al, Elevated serum alanine aminotransferase levels in blood donors: the contribution of hepatitis. *C. Ann. Intern. Med.* 1991; 115:882-4.
- [3] Chang CJ, Ko YC, Liu HW. Serum alanine aminotransferase levels in relation to hepatitis and C- virus infections among drug abusers in an area hyperendemic for hepatitis B. *Dig. Dis. Sci.* 2000; 45:1949-52.
- [4] Chien- Hua Chen, Min-Ho Huang, Jee-Chun Yang, Chiu-Kue Nien, Chi-Chieh Yang, Yung-Hsiang Yeh, Sen-Kou Yueh. Prevalance and etiology of elevated serum alanine aminotransferase level in an adult population in Taiwan, *Journal of Gastroenterology and Hepatology* 2007; 22: 1482-1492
- [5] Bergmeyer HU, Horder M, Rej R, .International Federation of Clinical Chemistry(IFCC), On IFCC methods for the measurements for alanine aminotransferase. *J Clin Chem Clin Biochem* 1996; 24:481-95
- [6] Roger K. Shindhelm, Michaela, Diamant et al Alanine aminotransferase, as a marker of non alcoholic fatty liver disease, in relation to type-2 diabetes mellitus and cardiovascular disease. *Diabetes metabolism Research and Reviews* 2006; 22(6),437-443
- [7] Yamada J, Tomiyama H, Y, H, Yambe M, et al Elevated serum level of alanine amino transferase and gamma glutamyltransferase are marker of inflammation and oxidative stress independent of the metabolic syndrome. *Atherosclerosis* (in press)
- [8] Gitlin M. The serum glutamic oxaloacetic transaminase/ serum glutamic pyruvic transaminase. ratio as a prognostic in sever acute viral hepatitis. *Am .J. Gastroenterol* 1982; 77:2-4.
- [9] Williams, ALB, Hoofnagle JH. Ratio of serum aspartate to alanine aminotransferase in chronic hepatitis: relationship to cirrhosis *Gastroenterology* 1988; 95: 734-739.
- [10] Chen DS, .Natural history of chronic hepatitis B viruses infection: new light on an old story. *J. Gastroenterol. Hepatol.* 1993; 8: 470-5.
- [11] Hayashi N, Kanto T, Takehara T, Immunopathogenesis of type C hepatitis dendritic cell in HCV infection *J Gastroenterol. Hepatol.* 2004; 19:S84-S87.
- [12] Fiore G, Fera G, Napoli N, Valia F, Schiraldi O. Liver steatosis and chronic hepatitis C: a aspurious association. *Eur. J. Gastroenterol. Hepatol.* 1996; 8:125-9.
- [13] Sanyal AJ, Contos MJ, Sterling RK. Etal Nonalcoholic fatty liver disease in patients with hepatitis C is associated with features of the metabolic syndrome. *Am. J. Gastroentrol* 2003; 98:2064-71.
- [14] Saadeh S, Younossi ZM, Remer FM, et al .The utility of radiological imaging in non alcoholic fatty liver disease. *Gastroenterology* 2002; 123:745-50

### AUTHORS:

1. Dr. AZAD R MANSOURIAN
2. Dr. AKHTAR SAIFI
3. Dr. GHOLAM R VEGHARI

### NAME OF DEPARTMENT(S) / INSTITUTION(S) TO WHICH THE WORK IS ATTRIBUTED:

Golestan University of Medical Sciences. Biochemistry and metabolic Disorder research center. Gorgan Medical School. Gorgan-IRAN

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Azad Reza Mansourian, Biochemistry and metabolic Disorder research, Golestan university of medical sciences, Gorgan-IRAN. E-Mail: azad\_r\_mansourian@yahoo.com

**DECLARATION ON COMPETING INTERESTS:** No competing Interests

Date of Submission: **Nov 16, 2010**  
Peer Review Completion: **Dec 10, 2011**  
Date of Acceptance: **Feb 24, 2011**  
Date of Publication: **Apr 11, 2011**