

The Ratio of Aspartate Aminotransferase to Alanine Aminotransferase (AST/ALT): the Correlation of Value with Underlying Severity of Alcoholic Liver Disease

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ABSTRACT

Background

Alcoholic liver disease is one of the most frequently diagnosed liver problems in the hospitalized patients in most tertiary care hospitals all over the world. The diagnosis of alcoholic liver disease is most of the time clinical. The AST/ALT ratio is a useful and reliable biochemical marker of liver injury due to alcohol. Whether the value of AST/ALT ratio correlates with clinical severity has not been studied.

Objectives

To study values of AST/ALT ratio in correlation with clinical severity of illness due to alcoholic liver disease using Child-Pugh's grading.

Methods

This is a retrospective study. Inpatient records of all the patients admitted with diagnosis of alcoholic liver disease from July 2009 to 2011 June were analyzed. Data from 174 patients with the diagnosis of alcoholic liver disease - alcoholic hepatitis or alcoholic cirrhosis were retrieved; out of 174 patients, 138 were eligible for the study. The AST/ALT ratio and Child's grading of all the patients were calculated from the documented biochemical and clinical parameters on admission. Demographic profile of all the patients were also recorded and analyzed. The data was analyzed using software SPSS 16 version.

Results

A total of 138 patients diagnosed as alcoholic liver disease since July 2009 to June 2011 were analyzed. The male-female ratio was found to be 5.34: 1. The mean age of the patients at diagnosis was found to be 47.58 ± 12.83 years. Among 138 patients, Mongolian were found to have the highest prevalence of alcoholic liver disease (38.8%), followed by Newars (33.6%), Brahmin and Chhetri (19.1%) and Dalit (7.2%). With respect to AST/ALT ratio and Child's grading of ALD, the mean AST/ALT ratio was found to be 3.03 ± 2.24 in those patients who had Child's grade C; likewise the mean AST/ALT ratio was 2.28 ± 1.14 , and 1.68 ± 0.83 in patients with Child B and Child A respectively.

Conclusion

The higher value of AST/ALT ratio is indicative of more severe liver damage due to alcohol.

KEY WORDS

Alcoholic liver disease, AST/ALT ratio

INTRODUCTION

Chronic and excessive alcohol ingestion is one of the major causes of liver disease. Alcoholic liver disease (ALD) is the most common cause of cirrhosis in the Western world.¹

In Nepal, alcohol is the most common substance of abuse. In a study carried out in 2000 AD, it was found that about 60% of the Nepalese population had experienced alcohol and 41% had taken it during the last 12 months.² In the most recent National Survey conducted in 2006, the prevalence of alcohol consumption among Nepalese adults had been found to be around 67% and also found on the increasing trend. However, the degree of harm from alcohol use in the Nepalese community is still unknown as no study has been conducted.³ The diagnosis of alcoholic liver disease is largely based on relevant clinical and biochemical findings in those who have history of chronic alcohol ingestion. An elevated serum aspartate aminotransferase (AST) in relation to serum alanine aminotransferase (ALT) has been proposed as an indicator that alcohol has induced liver damage. Thus, when AST/ALT ratio is >1.5 , this is considered as highly suggestive that alcohol is the cause of the patient's liver injury.⁴ AST and ALT are intracellular enzymes that belong to the family of transaminases or aminotransferases.^{5,6} These intracellular enzymes leak out into the extracellular fluid in tissue injury and hence are of diagnostic relevance.

Dhulikhel hospital is a university hospital which serves people from both rural and urban community, of different demographic backgrounds. Although, no data exists regarding the exact incidence of causes of chronic liver diseases, the hospital outpatient and inpatient record file reveals that the alcoholic liver disease is the most common cause of hospital visit and admission for chronic liver problem in this region. The morbidity and mortality along with socioeconomic burden due to alcoholic liver disease has been observed high in this region .

Although there are studies on increased values of AST/ALT ratio in diagnosing alcoholic liver disease, no studies have been done to examine the role of increased value of AST/ALT ratio to indicate underlying severity of liver damage. Therefore, this study was carried out to assess the increased values of AST/ALT ratio in correlation with severity of liver damage which was measured by Child-Pugh grading system.

METHOD

This is a retrospective study. Inpatient records of all the patients admitted with final diagnosis of alcoholic liver disease from July 2009 to 2011 June were analyzed. In patient discharge file from 174 patients with the diagnosis of alcoholic liver disease - alcoholic hepatitis or alcoholic cirrhosis were retrieved. Out of 174 patients, 138 were eligible for the study. The AST/ALT ratio of all the patients were calculated. To assess the severity of liver damage,

Child's grading was calculated from the given clinical and biochemical parameters at the time of admission to hospital. The means of AST/ALT ratio for Child A, B and C was calculated separately; and, the values of AST/ALT ratios and Child-pugh severity grading were compared and analyzed using SPSS 16 software. The P-value of ratios in relation to Child's grading was calculated by oneway ANOVA test. Demographic profile of all the patients were also recorded and analysed.

RESULT

A total of 138 patients diagnosed as alcoholic liver disease since July 2009 to June 2011 were analyzed. The male-female ratio was found to be 5.34 : 1. The mean age of the patients was found to be 47.58 ± 12.83 years. Among 138 patients, Mongolian were found to have the highest prevalence of alcoholic liver disease(38.8%), followed by Newars (33.6%), Brahmin and Chhetri (19.1%) and Dalit (7.2%). With respect to AST/ALT ratio and Child's grading of liver disease, the mean AST/ALT ratio was found to be 3.03 ± 2.24 in those patients who had Child's grade C; likewise the mean AST/ALT ratio was 2.28 ± 1.14 , and 1.68 ± 0.83 in patients with Child B and Child A respectively.

Table 1. Mean values of AST /ALT Ratio in relation to Child's grade.

Child's Grading	AST/ALT Ratio	P Value
A	1.68 ± 0.83	
B	2.28 ± 1.14	.001
C	3.03 ± 2.24	

DISCUSSION

Alcoholic liver disease (ALD) is one of the major public health problems related to alcohol use in the community. The diagnosis of ALD is based on the clinical and biochemical evidence of liver injury in the setting of chronic alcohol ingestion history. Among the specific biochemical change due to alcohol induced liver injury, the AST/ALT ratio has been found to be a useful diagnostic marker.^{7,8}

As in most other studies, the alcoholic liver disease is mostly diagnosed in middle aged people - which also reflects relatively younger age at which the onset of alcohol consumption starts. The mean age of ALD diagnosed in this study was 47.58 ± 12.83 years.^{9,10}

In a study from a teaching hospital in western Nepal, among 181 cases of alcoholic liver disease 87.7 % were found to be males, and the mean age of diagnosis of alcoholic liver disease (ALD) was found to be 52 years.¹¹ This study also showed the prevalence of ALD more common in male gender reflecting alcohol consumption less common among the Nepalese women. Although the mortality and the development of ALD in females is claimed to be higher than in the male counterparts, the low incidence in our study and other studies could be due to variation in drinking

pattern between sexes and also due to the differences in health care seeking behavior among female patients.

With respect to ALD prevalence to different ethnic population, Mongolian and Newars were the most affected. Nevertheless, Brahmin and Chhetri were affected as the third most common ethnic group. In a study at Bir hospital, alcohol was also found to be the cause in significant percentage (33.3%) of Brahmin population.¹² This also reflects the change in the drinking habits irrespective of his or her cultural or ethnic background considered prevalent in Nepal.

In this retrospective study of 138 patients diagnosed to have alcoholic liver disease, the AST/ALT ratio has been found to be more elevated as the Child's grading of liver failure increased (Table 1). The mean of AST/ALT ratio appears progressively rising as the Child-pugh's grading of liver damage increases (Fig 1). Although, there are a number of studies done on diagnostic values of AST/ALT ratio in alcoholic liver disease, there appears to be no study to assess the value of this ratio to correlate with the

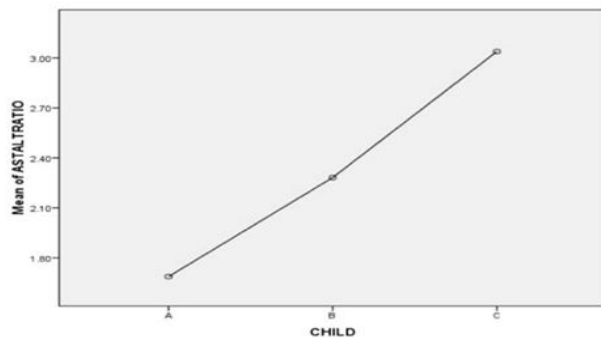


Figure 1. Means Plot of AST/ALT ratio to Child grading.

underlying severity of liver damage. Although, in one study a significantly high level of AST/ALT ratio was found in a group of patients having advanced alcoholic liver damage compared to patients with chronic alcohol intake with less severe or no evidence of liver damage.¹³ The excess alcohol leads to increased oxidative stress, cell membrane permeability, cell necrosis and leakage of mitochondrial AST into the blood.¹⁴

Following are the reasons that have been reported for the high AST/ALT ratio in alcoholic liver

disease:

- i) A decreased hepatic ALT activity¹⁵
- ii) Pyridoxal 5' phosphate depletion in the liver of alcoholics.¹⁶
- iii) Mitochondrial damage leading to an increase in the serum activity of mitochondrial aspartate in patients with high alcohol consumption.¹⁷ There may also be some contribution of the direct toxic effect of alcohol on the AST/ALT ratio.¹⁸

CONCLUSIONS

To conclude, this study supports the value of AST/ALT ratio not only in the diagnosis of alcoholic related liver injury, but, the rising value of AST/ALT may also indicate more severe damage of liver due to alcohol. However, the result of this study was based on a retrospective data. Further, prospective data in a larger population would be needed to refute or support this study.

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