



Evaluation of De Ritis Ratio (AST/ALT) in Diagnosis of Alcoholic Liver Disease

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ABSTRACT

Human body liver organ is involved in the metabolism of fats, proteins and carbohydrates and storage of several vitamins. Chronically excessive intake of alcohol leads to development of alcoholic liver disease (ALD) and is one of the important reasons of liver diseases. ALD represents a spectrum of clinical illness and morphological changes that ranges from fatty liver to hepatic inflammation and necrosis (alcoholic hepatitis) to progressive fibrosis (alcoholic cirrhosis). The ALD patients are managed in hospitals by establishing the diagnosis, estimating the severity of the disease, concluding the disease stage and management for the same. There are many diagnostic modalities are available like ultrasonography, CT scan, liver biopsy, biochemistry markers, which have accuracy but are expensive. De Ritis ratio is a noninvasive, cost-effective biochemical test which is utilized for diagnosis liver disorder. The aim of this study was to estimate utility of De Ritis ratio in diagnosis of ALD. The prospective study was done in Pathology Laboratory of tertiary care hospital in the period from April 2021 to March 2022 for the period of one year. The study included 100 subjects-50 healthy controls and 50 cases with ALD. The estimation of serum AST and ALT was done with semi-autoanalyser. De Ritis ratio calculated, by dividing the serum levels of AST by ALT. The comparison of De Ritis ratio value was done for case group of ALD cases and control group. The cut off of De Ritis ratio of greater than 2 was used for diagnosis of ALD cases. In the present study, it was found that there was significant increase in the serum levels of AST as compared to ALT in ALD cases. There was highly significant (p- value 0.001) increase AST/ALT in ALD cases as compared to non- ALD control cases. The cut off of De Ritis ratio of > 2 gave accuracy of 100 % for detection of ALD cases as compared to control cases. Hence, it was concluded that De Ritis ratio is a reliable, economic marker for the diagnosis of ALD cases.

Keywords: De Ritis ratio, ALD, AST, ALT.

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INTRODUCTION

Excessive alcohol consumption for longer duration is one of the most common causes of liver disease. The liver damaging quantity of is about 80 grams per day.¹The clinical presentation, radiological investigations and laboratory tests results helps for the diagnosis of ALD. Several tests are done under the heading of Liver function tests (LFT) - bilirubin, AST, AST, alkaline phosphatase, albumin, total protein and prothrombin time. There are many biochemical tests like carbohydrate deficient transferrin (CDT), gamma glutamyl transferase (GGT) and aspartate aminotransferase (AST), which are used in the diagnosis of ALD; amongst which, De Ritis ratio was found to be more reliable, cost-effective marker for the diagnosis of ALD.^{2,3}

The liver cell injury assessed with the estimation of AST (also known as glutamic oxaloacetic transaminase - SGOT) and ALT (also known as glutamic pyruvic transaminase -

SGPT). AST is present at both places- hepatocyte cytoplasm (cAST) and mitochondria (mAST). On the contrary, ALT is found in liver cytoplasm only. Thus, ALT is more specific in comparison to AST in cases of hepatic necrosis. In the total AST level, approximately 80% is contributed by liver cells.⁴

The 'De Ritis ratio' was described by Fernando De Ritis in 1957 and is the ratio of serum activities of AST and ALT. The De Ritis ratio was initially used as useful indicator of hepatitis and said work was confirmed by Wroblewski.⁴In majority acute liver diseases like acute viral hepatitis the De Ritis ratio is less than 1 and it is more than 1 in chronic disorders like chronic hepatitis. The De Ritis ratio more than 2 is suggestive ALD.^{5,6}

The present study was conducted to assess the usefulness of De Ritis ratio in the detection of ALD.

MATERIALS AND METHODS

The prospective study was conducted in tertiary care hospital Pathology Laboratory in the period from April 2021 to March 2022.

The 50 ALD cases and 50 non- ALD control cases were included in this study. ALD cases suffering with diseases like diabetes mellitus, cardiac diseases, renal diseases and any prolonged illness were not included in the study. 50 non- ALD control cases were healthy person without suffering from any disease. Blood from all the participating



cases in plain vacutainer and the separated serum utilized for AST and ALT tests. The serum AST and ALT results obtained from semiautomatic biochemistry analyzer. De Ritis ratio calculation was done by dividing the serum levels of AST by ALT for all study cases. The cut off of De Ritis ratio of > 2 was used for diagnosis of ALD cases.^{5,6}

The statistical analysis was done by using SPSS software. The significance of difference of De Ritis ratio between ALD cases and non- ALD control cases was assessed with

students t test. The p value < 0.05 was considered as statistically significant. The De Ritis ratio cut off of 2, was utilized to analyse this parameter, for its accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), for detection of ALD cases.

RESULTS AND DISCUSSION

Out of 50 ALD cases, 45 cases were male and 05 were female and their age ranges from 41 to 67 years.

Table 1: Mean serum levels of AST, ALT in ALD Cases and non- ALD cases

Group	No. of cases	Serum AST (IU/L) Mean \pm SD	Serum ALT (IU/L) Mean \pm SD	De Ritis ratio (AST/ALT ratio) Mean \pm SD
ALD Cases	50	177.3 \pm 13.78	83.4 \pm 6.83	2.13 \pm 0.07
Non- ALD cases (Control)	50	25.38 \pm 2.49	23.05 \pm 1.92	1.10 \pm 0.04
p- value	-	<0.001 S	<0.001 S	<0.001 S

S = statistically significant

The ALD Cases in this study showed statistically significant increase ($p < 0.001$) in the serum levels of AST and ALT as compared to control cases. The De Ritis ratio also showed statistically significant increase in ALD cases ($p < 0.001$) in as compared to control cases. (Table 1)

Table 2: De Ritis ratio evaluation for ALD cases

	ALD Cases	Non- ALD cases (Control)	Total	Predictive value (PV)
De Ritis ratio > 2	50	00	50	PPV (100.00 %)
De Ritis ratio < 2	00	50	50	NPV (100.00 %)
Total	50	50	100	
	Sensitivity (100.00 %)	Specificity (100.00 %)	Accuracy (100.00 %)	

The De Ritis ratio with cut off of 2 showed Sensitivity, Specificity, Accuracy, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of 100 %, 100 %, 100 %, 100 %, and 100 % respectively for detection of ALD cases. (Table 2)

Aminotransferases are increased tremendously after hepatic injury and hence, they acts as sensitive marker of hepatocyte cell injury. This principle is utilized in De Ritis ratio.⁴The excessive alcohol consumption in acute or chronic manner leads liver disorders and is labeled as ALD cases. There are several reasons for more increase in serum AST levels as compared to serum ALT level leading to high AST/ALT ratio in ALD cases. a) Hepatic ALT activity is decreased in ALD cases.⁷ b) vitamin B6 dependent PLP (pyridoxal phosphate) level which acts as coenzyme for aminotransferases is decreased by alcohol in ALD cases.⁸ c) Alcohol damages mitochondria, which leads to mitochondrial damage resulting in increase in mitochondrial AST in ALD cases.⁹

Harinasuta et al (1967) reported first time the increase of AST over ALT in ALD cases.¹⁰ In this study, it was found that there was statistically significant ($p < 0.001$) increase in De Ritis ratio (AST/ALT) in ALD cases when compared with non-

ALD control cases. Also, The De Ritis ratio with cut off of 2 showed accuracy of 100% for detection of ALD cases. The researchers Cohen JA et al (1979),¹¹ Correia JP et al (1981),¹² Alves PS et al (1981),¹³ Salaspuro M et al (1987),¹⁴ Sharpe PC et al (2001),⁶ Hietala J et al (2005),¹⁵ Gupta S (2010),¹⁶ Pujar et al (2010)¹⁷ and Hyder A et al (2013)¹⁸ had submitted the De Ritis ratio (AST/ALT) was > 1.5 or > 2.0 , in ALD cases.

There are published researches where it is submitted that non-hepatic alcohol related conditions can increase the De Ritis ratio of 2 or more than 2. The esophageal cancer¹⁹, commonly used drugs like paracetamol laden acute hepatic toxicities, mitochondrial damage laden drugs induced hepatitis also showed De Ritis ratio of more than 2.²⁰Hence, Clinical correlation is necessary while detection ALD cases.

The small sample size is the limitation of this study. More studies with large sample size and comparison with other parameters are needed for validation of De Ritis ratio, for its incorporation in routine laboratory diagnostic tests for ALD cases diagnosis.



CONCLUSION

The De Ritis ratio (AST: ALT ratio) is useful diagnostic and statistically significant marker in differentiating alcoholic and nonalcoholic hepatic diseases. De Ritis ratio is more than 2, in ALD cases and is less than 2, in most of the non-ALD cases. It is low cost marker, when compared to, conventionally used battery of tests in liver function tests (LFT) and liver ultrasonography. Thus, De Ritis ratio is reliable, non- invasive, cost- effective marker for detection of ALD cases.

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