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PREVALENCE AND SEVERITY PATTERNS OF ALCOHOLIC LIVER DISEASE AT A TERTIARY HOSPITAL IN BENIN CITY, NIGERIA

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ABSTRACT

The ratio of Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) (De Ritis ratio) remains a vital biochemical marker in hepatology. Although both AST and ALT are indices of liver injury, the ratio of these two enzymes helps clarify the etiology and severity of liver disease. A retrospective analysis was conducted on 7,580 liver function test (LFT) requests received from May 2024 to May 2025 at the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. UBTH is a tertiary health facility with over 900 bed capacity, serving treatment, teaching, health, research and referral purposes for Edo State with its adjoining states. Of the 7,580 requests received, 284 (3.7%) cases demonstrated elevated levels of De Ritis Ratios (AST:ALT) greater than 2:1 indicating Alcoholic Liver Disease (ALD). These cases were further examined based on their gender, ethnicity and age. There was a marked male predominance (67.3%) compared to females (32.7%). The distribution across ethnic groups highlighted significant regional variability in which Delta (40%) was the highest, followed by Bini (24%), Ibo (15%), Yoruba (15%) and Hausa (6%). Age range of 40 to 49 (21.5%) had the highest number of De Ritis ratio. There was a higher prevalence of suspected ALD in males and a significant age-related distribution based on De ritis ratio values. The prevalence of liver disease is low (3.7%) in the population that accessed the health care facility within the period studied.

Keywords: Liver Function Test, ALD, De-Ritis Ratio, AST, ALT, Healthcare Facility

INTRODUCTION

Liver function tests are critical diagnostic tools in assessing hepatic integrity and function. Elevated serum Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) are hallmark indicators of hepatocellular damage. The De Ritis ratio, which is the ratio between the AST and ALT is a widely recognized biochemical marker which aids in differentiating between the different causes of liver injury. It aids in diagnosing and managing various diseases, particularly liver disorders (Shaikh et al, 2024).

Liver diseases due to infections are prevalent in developing countries (Ott et al, 2012) with approximately 350-400 million people suffering the chronic form globally (Portiho et al, 2012). Alcoholic Liver Disease (ALD) is one of the most common liver diseases worldwide, caused by chronic and excessive alcohol consumption and is often diagnosed with a De Ritis Ratio of greater than 2:1. Alcohol-related liver disease (ARLD), also known as ALD is prevalent, particularly in regions where alcohol consumption is high. It causes a spectrum of conditions which progresses from fatty liver (steatosis) to alcoholic hepatitis and potentially to cirrhosis, a final stage of liver damage , when unchecked (Patel & Mueller. 2023; Ayal et al. 2025).

Alcohol has a great impact on mitochondria and directly damages liver cell mitochondria. AST is more abundant in mitochondria, predominantly located in the cytoplasm. As a result, when alcohol induces liver damage, more AST is released into the bloodstream than ALT. Alcohol consumption also significantly leads to a deficiency in vitamin B6 (pyridoxine), a cofactor required for the production of ALT (Chalasani et al., 2012;). This reduces ALT activity relative to AST, further increasing the AST/ALT ratio in alcohol-induced liver injury. While the AST/ALT ratio is a valuable indicator in diagnosing alcoholic liver disease, it is not fully specific, as other liver conditions can also present with an elevated AST/ALT ratio: Chronic liver damage due to any cause (e.g., viral hepatitis, non-alcoholic steatohepatitis) can lead to cirrhosis, which also presents with an elevated AST/ALT ratio (>1). However, in cirrhosis not caused by alcohol, the ratio tends to be less elevated compared to ALD. Since AST is found in other tissues, such as muscles, elevated AST levels may also occur in the setting of hemolysis or muscle injury, which could lead to an increased AST/ALT ratio without liver damage (Chalasani et al., 2012).

In cases of uncertainty or when multiple liver conditions might coexist, a liver biopsy can provide histological confirmation of ALD, such as the presence of steatosis (fatty liver), ballooning degeneration, Mallory bodies (intracytoplasmic inclusions), and fibrosis. The AST/ALT ratio is particularly useful in early identification of patients at risk for progressing from simple fatty liver to more severe forms of ALD like cirrhosis or hepatocellular carcinoma. As the disease progresses, the ratio tends to increase, and this, along with other clinical parameters, helps in determining the severity of the liver damage (Umar & Augustini, 2025; Gan et al., 2025).

Since Liver diseases are a significant global health concern, with conditions ranging from viral hepatitis to ALD, non-alcoholic fatty liver disease (NAFLD) and hepatocellular carcinoma, early and accurate diagnosis is crucial for effective management and treatment. The De Ritis ratio (AST/ALT ratio) pathologies has been identified as a valuable biochemical marker in distinguishing various liver diseases (Schilsky & Kaplowitz, 1980; Gan et al., 2025).

The first stage of ALD is hepatic steatosis or Alcoholic Fatty Liver**.** At this stage, fat accumulates in the liver parenchyma leading to accumulation of small fat droplets under liver cells approaching the portal tracts (Hussen et al, 2018; Weiskirchen et al, 2018). As the disease progresses, marked steatosis,

hepatocellular necrosis, and acute inflammation develops leading to Alcoholic Hepatitis (Hussen et al, 2018; Weiskirchen et al, 2018). More effective treatment of ALD is needed at this stage to prevent the severe form of the disease which is life-threatening and called Alcoholic Cirrhosis. Liver damage at this stage is irreversible and leads to complications of cirrhosis and portal hypertension Ayal et al., 2025). Using the De Ritis Ratio as guide, this study analyzed the demographic and biochemical patterns associated with elevated transaminases over a 12-month period in patients assessing the University of Benin Teaching Hospital (UBTH) for diagnosis and treatment.

MATERIALS AND METHODS

Ethical Approval

Ethical approval was obtained from the Edo State Ministry of Health with number HA/737/26/C/05221208.

Study Design and Setting

A cross-sectional study was conducted using data from 7,580 Liver Function Tests (LFT) requests recorded between May 2024 and May 2025 were reviewed. Of these, 284 subjects with De Ritis Ratio greater than 2:1 were extracted. Data was categorized based on sex, age and ethnic group. Descriptive statistics were employed for data analysis.

Specimen Collection and Processing

During the period involved in this study, blood was collected into plain containers from the various clinics and sent to the clinical chemistry laboratory for Liver Function Tests (LFT). The biochemical parameters were analyzed using Selectra Pros (Vital Scientific Inc., Germany) Auto Chemistry Analyzer following the manufacturer's instructions. The De Ritis ratio was calculated from the AST and ALT ratios and value above 2 was taken to indicate Alcoholic Liver Disease (ALD).

Socio-Demographics

Age, sex, gender and ethnicity were obtained as well as the AST and ALT of the participants over the given period.

Statistical Analysis

The data obtained were analyzed with Correlation and student t- test using the statistical software INSTAT® (GraphPad Software Inc, San Diego, CA, USA). Descriptive statistics was employed.

RESULTS AND DISCUSSIONS

Table 1: Socio-demographic Characteristics of Participants

Variables	Frequency (n=284)	Percentage (%)
Age (years)		
21-30	49	17.3
31-40	41	14.4
41-50	61	21.5
51-60	39	13.7
61-70	44	15.5
71-80	50	17.6
Gender		
Male	191	67.3
Female	93	32.7

The majority of patients rated as having ALD are male (67.3%) when compared to females (32.7%). The age-range of 41-50 years topped the list as shown in Table 1, followed by 71-80 years age range.

Table 2: Distribution of De Ritis Ratio Among included Cases

Variables	Frequency	Percentage (%)
De Ritis ratio	n=284	
2.00 -2.50	195	68.7
2.51 -3.00	45	15.9
3.01- 3.50	25	8.8
3.51 -4.00	9	3.2
4.01 -4.50	7	2.5
4.51 -5.00	3	1.1

Table 2 shows that the highest percentage (%) of De Ritis ratio is the ratio of 2 to 2.5 (68.66%) with the frequency of 195 while the lowest percentage is seen in the 4.51 to 5.00 De Ritis ratio.

Table 3: Distribution of De Ritis Ratio According to Gender among Included Cases

Variables De Ritis ratio	Male (n=191)	Female (n=93)	P value
2.00 - 2.50	126	69	0.2055
2.51 – 3.00	37	8	0.0308*
3.01 - 3.50	14	11	0.3019
3.51 – 4.00	7	2	0.7769
4.01 - 4.50	4	3	0.8655
4.51 – 5.00	3	0	0.5508

*Significant at $p< 0.05$; NA=not available; ND=not done

Table 3 indicated that there was a significant ($p< 0.05$) difference in the ratio between the males and females as the De ritis ratio advances into the range of 2.5-3.0.

Table 4: Relationship(Correlation) between Age/Sex and Hepatic Parameters

	AGE	*GENDER*	*AST*	*ALT*	*AST/ALT*
AGE	1				
GENDER	-0.08645	1			
AST	0.037071	0.003526	1		
ALT	0.062486	0.008306	0.913465**	1	
AST/ALT	-0.08712	-0.00506	-0.24486**	0.58567**	1

**p<0.001

Table 4 shows the correlation relationship between age, gender, and hepatic parameters (AST, ALT, and AST/ALT ratio). Age demonstrated very weak correlations with AST (r = 0.037071), ALT (r = 0.062486), and AST/ALT ratio (r = -0.08712), indicating that age had little or no influence on hepatic enzyme levels in the study population. Similarly, gender showed negligible correlations with AST (r = 0.003526), ALT (r = 0.008306), and AST/ALT ratio (r = -0.00506), suggesting no meaningful association between sex and hepatic parameters.

A very strong positive correlation was observed between AST and ALT (r = 0.913465, p < 0.001), indicating that increases in AST were strongly associated with increases in ALT. In contrast, the AST/ALT ratio showed a weak negative correlation with AST (r = -0.24486, p < 0.001) and a moderate negative correlation with ALT (r = -0.58567, p < 0.001). These findings suggest that as AST and ALT levels increase, the AST/ALT ratio tends to decrease.

Table 5: Ethnic Distribution

Ethnic	**Distribution (%)**
Delta	40
Bini	24
Igbo	15
Yoruba	15
Hausa	6
Total	100%

Table 5 showed the percentage distribution of the patients, where Delta ethnic group had the highest percentage (40 %), followed by Bini (24 %) while Igbo and Hausa ethnicities had the same percentage (15 %) with Hausa ethnic group having the lowest percentage (6 %).

Discussion

Alcohol consumption remains a major risk factor for liver disease in Nigeria, contributing significantly to hospital admissions. The predominance of male patients may be attributed to the higher rates of alcohol use among men (Lasebikan and Ola, 2016) which is consistent with our findings. In this study, a higher proportion of males presented with elevated De Ritis ratio, particularly within the age range of 41 to 50 years. The predominance of males within this age range may be attributed to sociocultural and behavioural factors that predispose men to prolonged and excessive alcohol intake compared to female. In many societies, including Nigeria, alcohol consumption is more rampant among men, and heavy drinking often begins in early adulthood, which can progress to liver disease in the fourth or fifth decade (Rehm et al., 2013; Odunola et al., 2013). Both AST and ALT are enzymes found mainly in hepatocytes. When liver cells are damaged or stressed, their membranes become more permeable, allowing these enzymes to escape into the circulation, leading to elevated serum levels (Chalasani et al., 2012; Botros and Sikaris, 2013). Elevated levels of Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT) in the blood are frequently encountered markers that can signal potential damage or stress to the liver. When these enzymes, crucial for metabolic processes, leak into the bloodstream, their high levels raise a warning for healthcare professionals (Chalasani et al., 2012; Botros and Sikaris, 2013).

Normally, any AST:ALT ratio greater than 2 is considered to be ALD. Severity of the disease can be ascertained by increased ratio. Between the ratio of 3.0 to 5.0, we had a total of 44 participants, showing how advanced the ALD had gone before the assessment of medical help began. According to our findings, 3.7% presented with high AST and ALT with a De Ritis ratio of 2:1 suggesting alcoholic liver disease (ALD), non-alcoholic steatohepatitis (NASH) with advanced fibrosis or cirrhosis or other forms of hepatocellular damage. Chronic alcohol abuse can lead to alcoholic hepatitis and cirrhosis. The mechanism is thought to involve the metabolism of alcohol, which can deplete pyridoxal 5' phosphate, a cofactor for AST but not ALT, leading to proportionally higher AST levels. Studies by researchers (Vyankatesh et al., 2023; Odunola et al., 2013; Botros and Sikaris, 2013) have extensively documented the biochemical changes associated with alcoholic liver injury, including this characteristic ratio. In non-alcoholic steatohepatitis (NASH), an increased AST/ALT ratio is associated with the development of cirrhosis. The De-Ritis ratio has been used for over 60 years as a liver function test to differentiate causes of liver damage or hepatotoxicity. It represents the progression and severity of the disease, with an elevated ratio predicting long-term complications such as fibrosis and cirrhosis in chronic viral illnesses such as chronic viral hepatitis and chronic alcoholism. The ratio has also been associated with mortality in adult trauma patients, highlighting its potential as a prognostic marker (Shaikh et al., 2024).

A significant ratio exists between the males and females as the De Ritis ratio advances into the range of 2.5-3.0. This may be explainable considering that women more easily access healthcare than their male counterparts when unwell. Studies have demonstrated that men are more likely to delay seeking medical care, often presenting at tertiary healthcare facilities

with more severe biochemical abnormalities (O'Shea et al., 2010).

Liver disease incidence is on the rise worldwide, posing an increasing risk of illness. Inspite of heightened global public health interventions, liver diseases continue to represent a large part of world disease burden, highlighting the complexity and multidimensionality of liver disease epidemiology. The shift towards lifestyle-associated liver diseases, such as ALD, is particularly alarming. This trend is closely linked to changes in global dietary habits (Gan et al., 2025; Qishu and Wei, 2025).

Usifo et al. (2018) reported the prevalence of the consumption of alcohol in Delta state which might explain the findings of highest Delta State incidence (40%) in our study. Religious and cultural acceptance also influences the consumption of alcohol. The use of herbal beverages using alcohol as solvent also has a huge role to play in the consumption of alcohol by this ethnic group (Idonije and Okojie, 2012; Ordinioha et al., 2015; Usifo et al., 2018). Moreover, geographical proximity and religious belief may account for the variations of ethnic groups in the results obtained from this research and this corroborates the reports of Akinyemiju et al. (2022).

The treatment principles of ALD include abstinence and adequate nutritional support which delays the progression of the disease. Complete abstinence from alcohol enhances survival at all stages of ALD (Gan et al., 2025).

CONCLUSION

The research demonstrated a predominant De Ritis ratio among patients in this study indicating a significant hepatocellular damage associated likely with alcohol-related liver disease. Notably, most affected patients were males from Delta ethnic group where the consumption of alcoholic beverages such as *ogogoro* is highly prevalent and culturally entrenched. Moreover, the elevated De Ritis ratio of 2:1 and above especially in males maybe partly explained by the delayed health-seeking behaviour of among males, likely contributing to late presentation, thereby increasing disease severity.

Limitations

Even though De Ritis ratio is generally accepted as a clinical biomarker and a ratio greater than or equal to two generally suggestive of ALD, it should be noted that other factors that contribute significantly to the development, progression and disease severity of ALD include quantity and duration of alcohol use, nutritional status, genetic pre-disposition, viral hepatitis, oxidative stress and inflammation that were not captured in this assessment.

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