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SERUM FERRITIN LEVELS-A PROGNOSTIC MARKER IN ASSESING THE SEVERITY OF ALCOHOL INDUCED CHRONIC LIVER DISEASE"- A CROSS SECTIONAL STUDY

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ABSTRACT **Background:** Alcohol-induced chronic liver disease (CLD) is a progressive disorder characterized by hepatic inflammation and necrosis lasting over six months. It is a major cause of morbidity and mortality in South-East Asia, including India, where alcohol accounts for nearly 38% of liver cirrhosis cases. Both iron overload and iron deficiency anemia may occur in these patients. Persistent inflammation due to bacterial translocation further contributes to disease progression. Serum ferritin, a marker of iron metabolism and an acute-phase reactant, may reflect both iron status and inflammatory activity, making it a potential non-invasive indicator of disease severity. **Objectives:** To correlate serum ferritin levels with the severity of alcohol-induced chronic liver disease using the Child-Turcotte-Pugh (CTP) score. **Materials and Methods:** A hospital-based observational study was conducted for six months in the Department of General Medicine, Shridevi Institute of Medical Sciences and Research Hospital, Tumkur. Patients aged 18–65 years with ultrasonographically or elastographically confirmed alcohol-induced liver cirrhosis were included. Those with cardiovascular, renal, or viral liver diseases, non-alcoholic fatty liver disease, or nutritional anemia were excluded. After obtaining informed consent, clinical history, including alcohol consumption details, was recorded, and serum ferritin levels were measured. The severity of CLD was assessed using the CTP classification, and statistical correlation was performed. **Results:** Mean serum ferritin levels increased progressively with disease severity: 36.92 ± 28.84 ng/mL in Child-Pugh class A, 257.34 ± 279.87 ng/mL in class B, and 650.64 ± 369.7 ng/mL in class C, showing a significant positive correlation ($p < 0.001$). Older males predominated among study participants. **Conclusion:** Serum ferritin levels correlate strongly with the severity of alcohol-induced chronic liver disease. Ferritin estimation offers a simple, cost-effective, non-invasive method for assessing disease severity and guiding early intervention.

KEYWORDS : Chronic Liver Disease, Serum Ferritin, Child-Turcotte-Pugh Score, Alcohol-induced Cirrhosis.

INTRODUCTION

Chronic liver disease represents a series of liver disorders of varying causes and severity in which hepatic inflammation and necrosis continue for at least 6 months, which is an important leading cause of mortality and morbidity in India.

As per the global burden of disease study in 2020,approximately 200,000 deaths occured in India due to CLD.This constituted 6% of the total deaths worldwide due to liver cirrhosis and other CLDs.Among persons aged 45-64 yrs of age,CLD is the third leading cause of mortality.Alcohol being the commonest cause of liver cirrhosis accounting for 38%,among all other causes.1 Alcohol liver disease prevalence is increasing globally,including India,with alcohol with alcohol being the primary cause of liver fibrosis and cirrhosis.

In alcohol induced liver cirrhosis, both iron overload and iron deficient anemia can occur.3 At the same time, inflammation might be continuously present in cirrhosis patients due to bacterial translocation and patients' susceptibility to infections.

Ferritin is an intracellular protein shell containing about 4000 iron atoms.A reflection of body iron stores is the ferritin measured in the serum,and is directly proportional to it.

Serum ferritin has a reference range of 30-300ng/ml for men and postmenopausal women,15-200ng/ml for premenopausal women.

Serum ferritin being an acute phase reactant is a marker of pathophysiological events and is increased in patients with elevated body iron stores,systemic inflammatory states and in hepato necro-inflammatory activity.These causes of increased ferritin may be associated with an increased risk of progressive liver dysfunction and clinical deterioration.

Currently, there is no single objective marker used to predict the severity of CLDs. This study aims to find out if serum ferritin can play that role.

The advantages of using serum ferritin are its ease of availability, it being capable of being monitored easily and most importantly, it being an objective parameter.

The association between elevated serum ferritin and disease severity may have prognostic value if the study proves to establish a positive correlation.

MATERIALAND METHODS

It is a hospital based cross-sectional study.

It was conducted on patients admitted to Shridevi institute of medical sciences and research hospital,Tumkur,from January 2023 to december 2023

Inclusion Criteria

1. Patients of either sex aged between 18-65 years.
2. Patients with known case of alcohol induced liver cirrhosis as evidenced by USG abdomen or ultrasound elastography.

Exclusion Criteria

1. Patients with cardiovascular disease
2. patients with renal failure
3. Infectious and inflammatory conditions of liver that include hepatitis B,hepatitis A
4. Non alcoholic fatty liver disease
5. patients on hepatotoxic drugs like allopurinol, amiodarone, amoxiclav, anabolic steroids, azathioprine, carbamazepine, methotrexate, nitrofurantoin and anti-TB drugs that include isoniazid,rifampicin,pyrazinamide.
6. Prinary or secondary malignancy of liver.
7. Patients with hemochromatosis
8. Secondary iron overload

Methodology

Signed informed consent was obtained from individual subjects after explaining the purpose of the study in their own understandable language. A detailed history was taken and clinical examination was done.

Following lab investigations were done:

1) complete blood count
2) serum ferritin levels
3) liver function tests
4) PT, INR
5) Usg abdomem

6) Renal function tests
7) ECG

Based on clinical picture and test results,the severity of chronic liver disease was graded by using Child Turcotte Pugh score.

Here, qualitative variables were compared using chi-square test, while qualitative continuous variables were compared using student's t-test and Mann-Whitney U test.

The discriminative ability of ferritin to predict outcomes was evaluated using the area under a receiver operating characteristic curve(AUC),which has true positive and false positive rates on vertical and horizontal axes.

As the AUC approches 1.0, the model approaches 100% sensitivity and specificity.

Patients' survival according to the best cutt-off point of ferritin was calculated using Kaplan-Meier analysis and compared with the log-rank sum test.A P value lesser than or equal to 0.05,was considered statistically significant.

Results:

Table 1: Gender-wise Distribution of Participants

Gender	No. of participants	Percentage
Female	3	5.45
Male	51	92.73
Others	1	1.82
Total	55	100.00

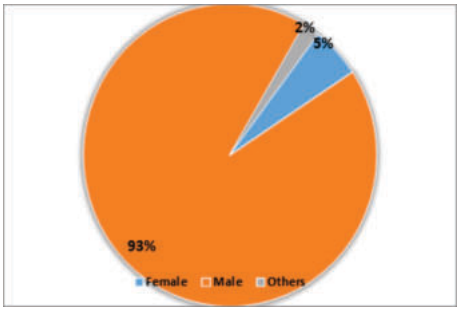

Figure 1: Gender Distribution

The table 1 and figure 1 shows that the gender distribution of 55 participants, with a significant majority being male 51 (92.73%). Females make up a small proportion 3(5.45%), while individuals identifying as "Others" constitute a minimal share (1, or 1.82%). This indicates a strong skew towards male dominance in the group, with females and other gender identities being underrepresented.

Table 2: Age-wise Distribution of Participants

Age(in years)	No. of partcipants	Percentage
Less than 30	2	3.64
31 - 40	11	20.00
41 - 50	18	32.73
More than 51	24	43.64
Total	55	100.00
Mean ± SD	48.22 ± 10.11	

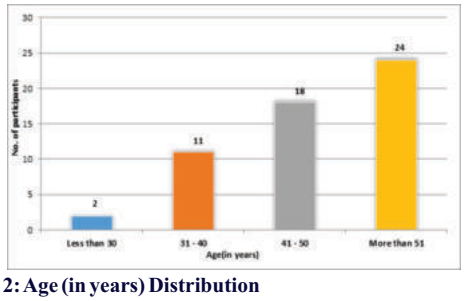

Figure 2: Age (in years) Distribution

The table 2 and figure 2 shows that age distribution of participants in the study on serum ferritin levels as a prognostic marker for alcohol-induced chronic liver disease reveals a skewed distribution towards older ages. Out of 55 participants, only 2 (3.64%) were younger than 30 years, while 11 (20%) were between 31-40 years old. The majority consisted of middle-aged individuals, with 18 (32.73%) between 41-50 years and 24 (43.64%) older than 51 years. The mean age was 48.22 years, with a standard deviation of 10.11, indicating a relatively homogeneous distribution around the mean. This age distribution suggests that alcohol-induced chronic liver disease may be more prevalent among older adults, and highlights the importance of monitoring serum ferritin levels in this demographic.

Table 3: Correlation of Child–turcotte–pugh (CTP) Score with Serum Ferritin of Participants

Parameters	Mean + SD	Spearman's Correlation	p-value
Child–Turcotte–Pugh (CTP) score	9.09+2.36	0.782	0.002*
Serum ferritin	255.78+92.51		

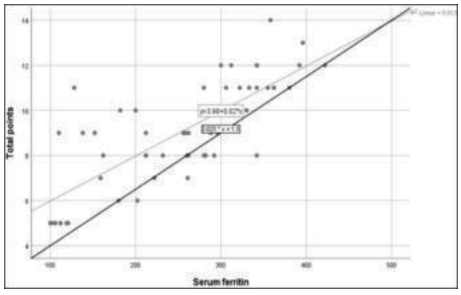

Figure 3: Correlation Between CTP Score and Serum Ferritin

The table 3 and figure 3 shows that the mean and standard deviation (SD) of two parameters, along with their correlation analysis results. The first parameter, "CTP score", has a mean of 9.09 and SD of 2.36, indicating a moderate range of values. The second parameter, "Serum ferritin", has a mean of 255.78 and SD of 92.51, indicating a wider range of values. The Spearman's correlation analysis reveals a strong positive correlation (coefficient = 0.782) between the two parameters, which is statistically significant (p-value = 0.002). This suggests that as serum ferritin levels increase, CTP score also tend to increase, and vice versa. The strength and significance of the correlation imply a notable association between the two parameters, potentially indicating a predictive relationship.

Our study was seen that patients with child pugh class A had a mean serrum ferritin value of 36.92±28.84ng/ml.Patients with child-pugh class B had mean serum ferritin value of 257.34±279.87ng/ml.Patients with child pugh score C had mean serum ferritin value of 650.64±369.7ng/ml. The mean serrum ferritin levels was noted to be higher with elevated child pugh scores.

As the serum ferritin levels increases,the Child Turcotte Pugh score also increases,suggesting that serum ferritin levels can be used to asses the severity of chronic liver disease. This was statistically significant with P=0.001.

DISCUSSION

A study by Rakhi maiwall,in 2014 titled "serum ferritin predicts early mortality in patients with decompensated cirrhosis", where serum ferritin levels were significantly different between survivors and non survivors. Ferritin was a significant predictor of early mortality on multivariate analysis along with hepatic encephalopathy. Serum ferritin levels correlate with severity of hepatic decompensation and are associated with early liver related death independent of MELD score.

A study by Arne Meier,in year 2020,titled "serum levels of ferritin and transferrin serve as prognostic factors for mortality and survival in patients with end-stage liver disease- a propensity score-matched cohort study", which concluded that serum ferritin and transferrin have independent capabilities to determine prognosis in patients with end stage liver disease.

A study by Naseer user,in 2017, titled "serum ferritin as a predictor of 30 days mortality in patients of decompensated chronic liver disease",and concluded that serum ferritin levels correlate with severity of liver disease and are associated with early mortality in patients of decompensated cirrhosis of liver.

A study by Rajiv Baijal and Praveen H R,in 2013,titled "Role of ferritin in predicting mortality in decompensated liver cirrhosis ",concluded that serum ferritin levels act as important marker in assessing the severity of liver disease, and is independent of MELD score, in assessing the severity of liver disease.

A study by Ryan Garyll, in year 2023 ,titled "correlation of serum ferritin with severity of liver disease",concluded that elevation of serum ferritin is prevalent in chronic liver disease. In patients of CLD, severity is associated with a higher serum ferritin level.

CONCLUSION

The study highlights significant gender and age disparities among participants, with a predominance of older males. The strong positive correlation between serum ferritin levels and CTP scores suggests that serum ferritin can be a valuable prognostic marker in assessing the severity of alcohol-induced chronic liver disease.

This finding underscores the need for targeted monitoring and potentially more aggressive management of individuals, particularly older males, with elevated serum ferritin levels to mitigate the progression of liver disease. The study findings corroborate the association of serum ferritin levels with the severity of alcohol induced chronic liver disease. Further large prospective studies need to be done to elucidate the association of serum ferritin with severity of CLD.

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