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ORIGINAL RESEARCH

Assessing the Role of Vitamin D Levels in Predicting Severity of Chronic Liver Disease

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Abstract

Background: Vitamin D is an important secosteroid hormone with known effect on calcium homeostasis. It has immunomodulatory and anti-inflammatory properties. Vitamin D deficiency has been frequently reported in many causes of chronic liver disease and has been associated with of non-alcoholic fatty liver disease (NAFLD) and chronic hepatitis C (CHC) virus infection.

Aims & Objectives: To assess the role of Vitamin D Levels in Predicting Severity of Chronic Liver Disease and investigate the relationship between serum vitamin D levels and the severity of chronic liver disease.

Materials & Methods: An observational study was conducted for a period of 6 months among adults aged18years and above with a confirmed diagnosis of chronic liver disease. The severity of liver cirrhosis was assessed using Modified Child Pugh Score (CPS). By enhanced chemiluminscence technique values of vitamin D were obtained. Association among different variables were calculated using Chi-Square Test and One Way ANOVA

Results: Majority of patients had sufficient Vit D levels i.e 36 among 100. 24 had insufficient vitamin D levels and 30 had deficiency.P value of < 0.001 showed highly significant correlation between CPS Score and Vitamin D levels

Conclusion: Low levels of Vitamin D are correlated with severity of liver dysfunction irrespective of the etiology.

Keywords: Child-Pugh Score, Chronic liver disease, Vitamin D

Introduction

Chronic liver disease (CLD) represents a significant global health burden, contributing to morbidity and mortality worldwide. It encompasses a spectrum of liver pathologies, including but not limited to chronic hepatitis, cirrhosis, and hepatocellular carcinoma. The severity and progression of CLD vary widely among affected individuals, influenced by multiple factors such as etiology, comorbidities, and genetic predisposition. Despite medical understanding and therapeutic advancements, CLD remains a significant public health challenge.[1-2]

Vitamin D is a fat-soluble and secosteroid hormone with a pleiotropic effect on human health and many chronic diseases. It is synthesized in the body and found in foods activated by UV radiations.[3] The major dietary sources of vitamin D are fortified dairy products. Other dietary sources include egg yolks, fish oils, and fortified cereal products. Vitamin D provided by plant sources is in the form of vitamin D2, whereas that provided by animal sources is in the

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form of vitamin D3. These two forms have equivalent biological potencies and are activated equally efficiently by the hydroxylases in humans[4.] It plays a role in the inhibition of zinc-dependent endoproteinases, specifically matrix metalloproteinases (MMP), which degrade extracellular matrix components. Hence, a reduced concentration of vitamin D is associated with an increased circulation of MMPs, and liver fibrosis is associated with the over-accumulation of extracellular components.[5]

In recent years, emerging evidence has suggested a potential link between vitamin D status and the pathogenesis of Chronic Liver Disease. Vitamin D exhibits immunomodulatory, anti-inflammatory, and anti-fibrotic properties which makes it intriguing candidate for influencing the Course and severity of CLD. [6-8]

In thisobservational study we have addressed this gap in the literature by systematically evaluating the association between vitamin D levels and the severity of CLD in a diverse patient population.

Aims & Objectives

1. To assess the role of Vitamin D Levels in Predicting Severity of Chronic Liver Disease
2. To investigate the relationship between serum vitamin D levels and the severity of chronic liver disease.

Materials & Methods

The observational study was conducted for a period of 6 months in the Department of Medicine, Dr PDMMC, Amravati among Patients with Chronic Liver Disease

Inclusion Criteria

- Adultsaged18years and above with a confirmed diagnosis of chronic liver disease.
- Patients with available data on serum vitamin D levels.

Exclusion Criteria

- Patients with acute liver disease or acute liver failure.
- Patients with end-stage liver disease require liver transplantation.
- Patients with conditions known to affect vitamin D metabolism, such as renal failure, malabsorption syndromes, or use of medications affecting vitamin D levels (e.g., corticosteroids, anticonvulsants).
- Patients with incomplete medical records or missing data are necessary for analysis.
- Patients with significant comorbidities that could confound the relationship between vitamin D levels and chronic liver disease severity.

Sample size

Sample size will be collected taking prevalence rate of chronic liver disease 59% taken from a review published by Cheemerla S [9] absolute allowable error as 10%, confidence level 95%. N(sample size)came out to be 96 rounding off to nearest zero 100 sample size will be taken in order to get better results.

Data Collection

Clinical data, including demographic information, medical history, liver function tests, imaging findings, and vitamin D levels was recorded. Serum vitamin D levels was measured using standardized laboratory assays, with values expressed in ng/mL. Disease severity was assessed using Child-Pugh classification. Data on potential confounding variables, including

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age, sex, body mass index, alcohol consumption, smoking status, and comorbidities, was collected.

Assessment of Vitamin D

5 ml of whole blood sample was taken in plain (red) vial. It was centrifuged and processed. By technique of enhanced chemiluminscence values of vitamin D was obtained.

Deficient-<20 ng/dl
Insufficient-20-30 ng/dl
Sufficient-30-100ng/dl
Toxicity->100 ng/dl

Results

Table 1: Age wise Distribution of Patients

Age in years	No.of patients	Percentage
18-30	01	1%
31-40	13	13%
41-50	49	49%
51-60	27	27%
>60	10	10%
Total	**100**	**100%**

Table 1 shows majority of patients 49% were in age group of 41-50 years, 27% i.e 27 were in age group of 51-60 years,10 patients were >60 years of age and 13 patients were in age group of 31-40years. Only 1 was in age group of 18-30 years. Mean age was 48.2 years.

Graph 1: SHOWING AGEWISE DISTRIBUTION OF PATIENTS

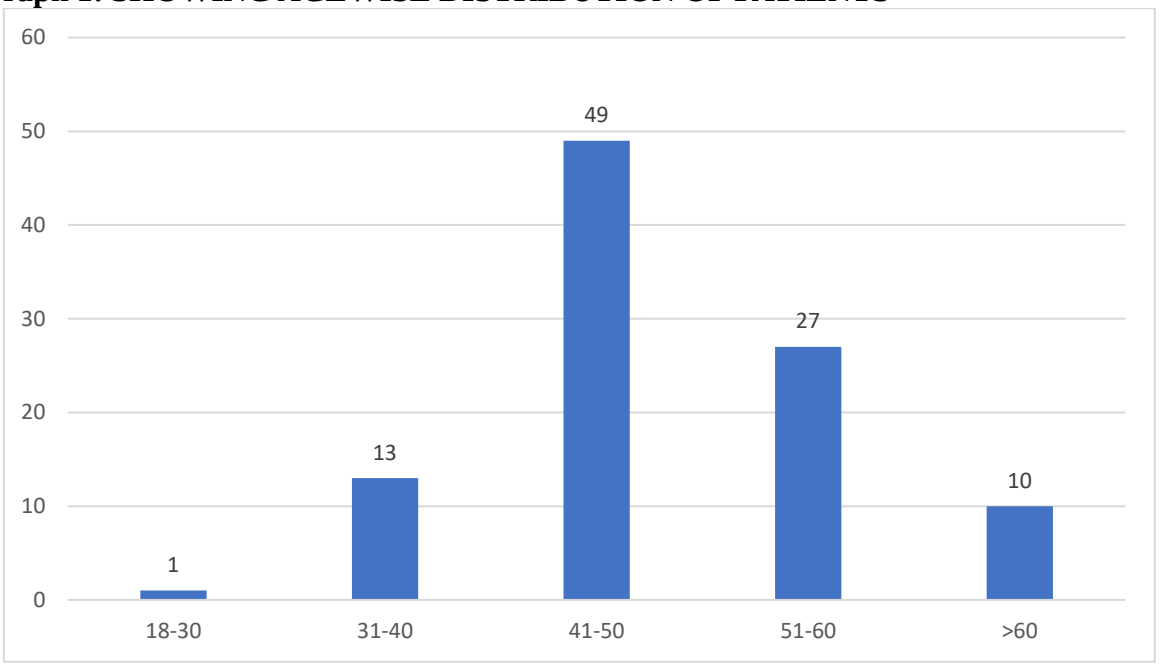

Table 2: Mean Vit D levels among patients with Chronic Liver Disease

Vitamin D levels	No.of patients	Percentage
Deficient-<20 ng/dl	30	30%
Insufficent-20-30 ng/dl	24	24%
Sufficient-30-100ng/dl	36	36%
Toxicity-100 ng/dl	0	00

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Majority of patients in our study had sufficient Vit D levels i.e 36 among 100. 24 had insufficient vitamin D levels and 30 had deficiency.

Table 3: Mean Vit D levels in relation to Child Pugh Score

Child pugh score	Deficient	Insufficient	Sufficient	Toxicity
A	00	01	32	00
B	07	16	03	00
C	23	07	01	00
Total	**30**	**24**	**36**	**00**

Chi square=83.54 p value:<0.05

Table 3 shows that Child-Pugh Class A out of 33 patients, 1 patient had insufficient Vitamin D, 32 patients had sufficient Vitamin D. In Child-Pugh Class B out of 26 patients 07 were deficient in Vitamin D, 16 had insufficient and 03 patients had sufficient Vitamin D levels. In Child-Pugh Class C out of 31 patients 23 were deficient in Vitamin D levels, 07 had insufficient and 01 patients had sufficient Vitamin D. P value of 0.001 showed highly significant correlation between CPS Score and Vitamin D levels

Graph 2: Showing Mean Vit D levels in relation to Child Pugh Score

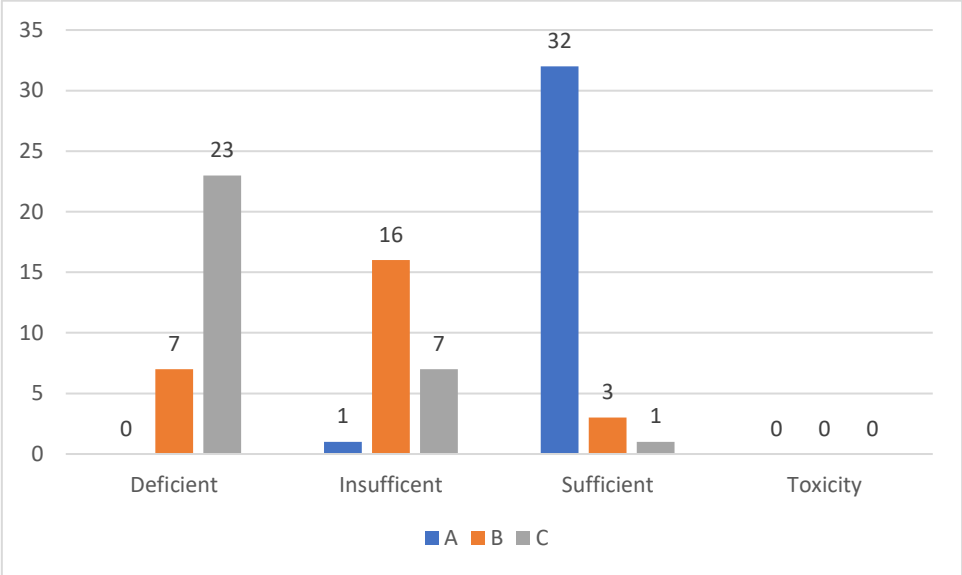

Table 4: Mean Vit D levels in comparison with various etiologies

	Etiology	Mean ±SD	P value
Vit D	Alcohol	28.91 ±20.25	0.000
	HbV	47.81± 17.82	
	HCV	39.42± 20.19	
	Others	34.80± 23.86	
CPS score	Alcohol	9.73± 2.17	0.000
	HbV	6.2±2.8	
	HCV	7.6±2.1	
	Others	8.2±2.9	

In patients with Alcoholic cirrhosis mean vitamin D was 28.91 ± 20.25, among HbV it was 47.81± 17.82 , HCV was 39.42± 20.19and other causes of Chronic kidney disease was 36.80 ± 23.86. There was no significant correlation between mean vitamin D levels and etiology of chronic liver disease.

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Mean CPS score mean vitamin D levels of 9.73 ± 2.17 among alcoholics, 6.2± 2.8 among HBV, 7.6 ± 2.1 among HCV and other causes of Chronic kidney disease was 8.2± 2.9. Statistical tests shows p value <0.05 which states that the results are statistically significant.

Discussion

Majority of patients 49% were in age group of 41-50 years, 27% i.e 27 were in age group of 51-60 years,10 patients were >60 years of age and 13 patients were in age group of 31-40years. Mean age was 48.2 years. Our study had sufficient Vit D levels i.e 36 among 100. 24 had insufficient vitamin D levels and 30 had deficiency. In our study patients with Alcoholic cirrhosis mean vitamin D was 28.91 ± 20.25, among HbV it was 47.81± 17.82 , HCV was 39.42± 20.19and other causes of Chronic kidney disease was 36.80 ± 23.86. There was no significant correlation between mean vitamin D levels and etiology of chronic liver disease.

Miroliaee et al [10]and Rode et al [11] who found that 75 percent of cirrhotic patients have 25 (OH) D levels below 20 ng/ml. In a cohort of 75 patients with cirrhosis, Putz-Bankuti et al [12] found an inverse relationship between serum 25 (OH) D levels and liver disease severity. The data reflect the subjects in Child-Pugh class C have approximately half the 25 (OH) D concentrations of class A and in most cases, the difference is statistically significant ($P < 0.001$)

A prospective cohort study was conducted by Finkelmeier et al,[13] and it showed that the levels of 25 (OH) D3 varied considerably between the Child-Pugh scores .There were significant differences among Child Pugh scores with the highest levels in Child A and the lowest levels in Child C patients ($P < 0.001$). Vitamin D levels were found to be negatively associated with both MELD and CPS in a study conducted by Jamia et al,[14] implying that vitamin D levels become deficient as the disease progress ($p < 0.05$).

Conclusion

Low concentration of 25 (OH) D is related with severity of liver dysfunction irrespective of the etiology of the disease. Vitamin D deficiency is a common problem in chronic liver disease and is closely associated with disease severity. The anti-inflammatory and immune-modulatory properties of vitamin D provide plausible mechanisms by which vitamin D may impact on disease progression and severity.

Conflict of Interest: Nil

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