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Original Research Article

Study of vitamin D level in patients with different etiologies of chronic liver disease and its correlation with Child Pugh class in a tertiary care centre in North India

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ABSTRACT

Background: Skeletal manifestation in liver diseases represents the minimally scrutinized part of the disease spectrum. Vitamin D has a central role in developing hepatic deficiency of osteodystrophy in patients with chronic liver disease. This study aimed to investigate vitamin D levels and their and their relationship with disease advancement in these patients according to child Pugh-score. Aims and Objectives were study of vitamin D level in patients with different aetiology of chronic liver disease and its correlation with child Pugh score.
Methods: This was a cross sectional study conducted over 200 patients after applying inclusion and exclusion criteria in patients with different etiology of chronic liver disease.
Results: In our study total (N=200), 152 patients of alcoholic liver disease 41 patients having deficient vitamin D, 79 having insufficient vitamin D level and 32 patients having normal vitamin D level. Patients of chronic liver disease also have negative correlation on vitamin D level with Child Pugh score. In our study it was found that patients having higher Child Pugh score there is more chance of having vitamin D deficiency and insufficiency than the patient's low Child Pugh score.
Conclusions: The prevalence of vitamin d deficiency in patients with CLD was found to be having a significant correlation with increasing CTP score with p value <0.001.

Keywords: Chronic liver disease, CTP score, Serum vitamin D

INTRODUCTION

Chronic liver disease in the clinical context is a disease process of the liver that involves a process of progressive destruction and regeneration of the liver parenchyma leading to fibrosis and cirrhosis. "Chronic liver disease" refers to disease of the liver which lasts over a period of six months.[1] It consists of a wide range of liver pathologies which include inflammation (chronic hepatitis), liver cirrhosis, and hepatocellular carcinoma. Skeletal manifestation due to liver diseases is not studied well so its potential topic for research.[2] Vitamin D deficiency play a central role in developing bone disease in patients with chronic liver disease. This study aimed to investigate vitamin D levels and their relationship with disease advancement in these patients according to Child Pugh-score.[3]

Vitamin D is an important corticosteroid hormone having important role on calcium homeostasis, but in recent studies it is found that vitamin D also is involved in cell proliferation and differentiation, has immunomodulatory and anti-inflammatory properties.[4] The role of vitamin D in the pathogenesis of NAFLD, alcoholic liver disease, chronic hepatitis B and CHC is not completely known, but it seems that vitamin D have some role in the activation and regulation of both innate and adaptive

immune systems and its antiproliferative effect may explain its importance in these liver diseases.[5]

The effect of vitamin D deficiency on skeletal system in terms of osteoporosis, osteopenia and increased fracture risk is well known.[6] Furthermore, the development of infections, cardiovascular, autoimmune and degenerative diseases and several types of cancer (colon, prostate and breast cancer) in patients having vitamin D deficiency has also been reported.[7] These effects are noted in the pathogenesis and treatment of many chronic liver diseases. In this review, we will focus on vitamin D functions involved in the development of chronic liver disease and on the relationship between vitamin D deficiency and the main causes of chronic liver disease: alcoholic liver disease, chronic hepatitis B, chronic hepatitis C (CHC) virus infection, cryptogenic and non-alcoholic fatty liver disease (NAFLD).[8]

The most specific screening test for vitamin D deficiency in healthy individual is a serum 25 (OH) D level.[9] The Institute of Medicine has defined vitamin D sufficiency as a vitamin D level >50 nmol/l (>20 mg/ml) although higher level may be required to optimize in technical calcium absorption elderly and those with underlying disease state.[10]

Aims and objectives

The present study was conducted with the following aim and objectives to check the prevalence of vitamin D level in different etiologies of chronic liver disease and its correlation with Child-Pugh score.

METHODS

This was a cross-sectional observational study conducted in KPS Post Graduate Institute of Medicine, GSVM Medical College, Kanpur from December 2020 to October 2022. Ethical clearance for this study was taken from Ethics Committee, GSVM Medical College, Kanpur.

Sample size

200 patients suffering from chronic liver disease in medicine department indoor and outdoor patients.

Inclusion and exclusion criteria

All the patients having chronic liver disease of different etiology having age group 18 to 60 years (male and female both) and willing to participate in the study were included. Patient not giving consent, patients having diseases such as: nephrotic syndrome, thyroid disorder (hypo and hyper-thyroidism), hypo and hyper-parathyroidism, rickets, protein losing enteropathy, chronic kidney disease, HIV, tuberculosis, malignancy etc. and patient on following drug therapy such as: antiepileptic, hypolipidemic drug, isoniazid and rifampicin, barbiturate, ketoconazole etc. were excluded from the study.

Statistical analysis

Data was entered, cleaned and coded in a MS Excel spreadsheet. Analysis of data was performed using SPSS version 20.0. Continuous variables were expressed as means and standard deviation if normally distributed and as median. Categorical variables were expressed as percentages. Comparison of percentages between the two or more groups was done using Chi-square test. Comparison of parametric continuous variables between three groups was done using one-way ANOVA. Correlation between two continuous variables was done using Pearson correlation coefficient. P value of less than 0.05 was considered statistically significant deviation if normally distributed and as median and interquartile range if not normally distributed. Categorical variables were expressed as percentages. Comparison of percentages between the two or more groups was done using Chi-square test. Correlation between two continuous variables was done using Pearson correlation coefficient. P value less than 0.05 was considered statistically significant.

RESULTS

In this study maximum patients of chronic liver disease were due to chronic alcohol intake which account for 76% patients, 2nd most common aetiology of chronic liver disease were chronic viral hepatitis and others were due to Wilson disease, Budd Chiari syndrome non cirrhotic portal fibrosis and cryptogenic. In my study on calculating Child Pugh score (N=200) 100 (50%) patients belong to CTP class B, 93 (46.5%) in class in C and 7 (3.5%) patients came under class A. Out of 200 patients only 44 (22%) patients having sufficient level of vitamin D, 102 (51%) patients having insufficient level of vitamin D and 54 (27%) having deficient level of vitamin D.

Table 1: Distribution of cases according to etiology of liver disease (N=200).

Aetiology of liver disease	Number of cases (%)
Alcoholism	152 (76)
Hepatitis B	20 (10)
Hepatitis C	12 (6)
Cryptogenic	11 (5.5)
BCS	3 (1.5)
Wilson disease	1 (0.5)
NCPF	1 (0.5)

According to aetiology mean value of vitamin D in alcoholic CLD were 26.78 ng/dl, chronic hepatitis B CLD 26 .4 ng/dl, chronic hepatitis C- CLD 26.63 ng/dl, in BCS patients 18.03 ng/dl, Wilson disease 33.9 ng/dl, and NCPF 27 ng/dl.

Table 2: Comparison of vitamin D level across etiology of liver disease (N=200).

Etiology of liver disease	Mean (SD)	P value
Alcoholism	26.78 (8.23)	
Hepatitis B	26.4 (9.52)	
Hepatitis C	26.63 (7.67)	
Cryptogenic	28.78 (8.9)	0.584
BCS	18.03 (2.97)	
Wilson disease	33.9 (0)	
NCPF	27 (0)	

In our study total 152 patients of alcoholic liver disease 41 patients having deficient vitamin D 79 having insufficient vitamin D level and 32 patients having normal vitamin D level. Patients of chronic liver disease also have negative correlation on vitamin D level with Child Pugh score.

In our study it was found that patients having higher Child Pugh score there is more chance of having vitamin D deficiency and insufficiency than the patient's low Child Pugh score.

Table 3: Association of vitamin D level with etiology of liver disease (N=200).

	Deficient vitamin D	Insufficient vitamin D	Sufficient vitamin D	P value
Alcoholism	41	79	32	
Hepatitis B	6	10	4	
Hepatitis C	2	7	3	
Cryptogenic	2	5	4	0.248
BCS	3	0	0	
Wilson disease	0	0	1	
NCPF	0	1	0	

Table 4: Association of CTP score with serum vitamin D level (N=200).

Serum vitamin D	CTP=5 – 6 (n=7)	CTP=7 – 9 (n=100)	CTP=10 – 15 (n=93)	P value
Deficient	0	8 (8%)	46 (49.5%)	
Insufficient	0	60 (60%)	42 (45.2%)	<0.001
Sufficient	7 (100%)	32 (32%)	5 (5.3%)	

DISCUSSION

Regarding this topic, some studies were conducted in western population but very few studies has been documented in our Indian population who are suffering from chronic liver disease. So, the present study has been done to know the level of vitamin D in relation to chronic liver disease in northern India.

In the present study 200 cases of chronic liver disease are evaluated. These patients are classified into 3 subgroups according to the Child Pugh score into Child Pugh class A (n=7) 3.5%, B (n=100) 50%, C (n=93) 46.5%. Patients are also classified in different sub groups based on aetiology of chronic liver disease and vitamin D level evaluated accordingly. Out of 200 patient of chronic liver disease evaluated maximum patients were in between age groups 40 to 50 years which were 33% of study patients.

Non-hepatitis B, C-CLD was proved to be milder in Child-Pugh class A as compared to hepatitis B, C-CLD, but its mortality risk increases with severity, as mean MELD score was found significantly higher in Child-Pugh class C. Our research was able to identify severe biochemical markers in both types of CLD.[11]

Among patients with chronic liver disease maximum patients were male (83.5%) and 16.5% female. In the present study alcoholic liver disease was the most common cause of liver disease (71%) chronic viral hepatitis being the 2nd most common cause (16%), the other (13%) causes include Budd Chiari Syndrome, Wilson's disease, non-cirrhotic portal fibrosis and cryptogenic etc.

This study shows that total 25(OH)D levels correlate inversely with liver disease severity in adults with cirrhosis, while no correlation exists between 25(OH)D levels and albumin-corrected serum calcium levels.[12]

On classifying patients (N=200) based on their Child Pugh score 7 (3.5%) patients belong to CTP class A, 100 (50%) CTP class B and 93 (46.5%) belong to CTP class C. In this study its was found that correlation of serum vitamin D level with CPT score having strong negative correlation with the p value of <0.001. From this study it was found that at the CTP score in patients with CLD increases there is more chance of deficiency and insufficiency of vitamin D level.

CLD is associated with a significantly low level of vitamin D which was independent to patient's gender, BMI, residence and education level.[13]

In our study the mean value of serum vitamin D level in patients with CLD was 26.75 ng/ml. The deficiency and insufficiency of vitamin D is prevalent in patients with chronic liver disease, out of 200 patients, 54 (27%) patients having vitamin D deficiency and 102 (51%) patients having insufficient and 44 (22%) patients having normal vitamin D level.

In our study the mean value of vitamin D in alcoholic liver disease was 26.78 ng/dl, chronic viral hepatitis 26.5 ng/dl, Budd Chiari syndrome 28.78 ng/dl, non-cirrhotic portal fibrosis 27.3 ng/dl, and in cryptogenic 28.78 ng/dl.

Possible explanations of vitamin D deficiency in CLD could be severe liver disease which decreases vitamin D hydroxylation, albumin and DBP production, inadequate sun exposure, insufficient food intake, jaundice-related deterioration of vitamin synthesis on the skin, and decreased vitamin D absorption caused by intestinal oedema secondary to portal hypertension or due to cholestasis-induced bile salt disruption.

Certain limitation of the study was that sample size was small and we have not followed patients after supplementation of vitamin D. After completion of my study so we were not able to know impact of correction of vitamin D level in patients with chronic liver disease, which required further long term and large sample size study

CONCLUSION

In patients with chronic liver disease vitamin D deficiency and insufficiency is more and its level correlate with disease progression that is patients having higher CTP score having more prevalence of vitamin D deficiency and insufficiency. The prevalence of vitamin d deficiency in patients with CLD was found to be having a significant correlation with increasing CTP score with p value <0.001. From this study it was proven that vitamin D deficiency is a good predictor of severity of chronic liver disease.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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