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ORIGINAL ARTICLE

Frequency of Vitamin D deficiency in liver cirrhosis and its correlation with Child Pugh Score

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ABSTRACT

Objective: To determine the frequency of vitamin D deficiency in patients with liver cirrhosis and the relationship of vitamin D deficiency with Child Pugh Class in patients with cirrhosis.

Materials and Methods: Vitamin D and calcium levels were checked in patients with cirrhosis of liver aged 18 to 80 years admitted in Gastroenterology department of Lahore General Hospital. Investigations were also done to calculate Child Pugh (CTP) score and Child Class was assigned on the basis of score. Quantitative variables were expressed in terms of mean and standard deviation. Frequency and percentage were used for qualitative measures. The p-value was calculated by the contingency coefficient to find a relationship of vitamin D levels to CTP scores of liver cirrhosis. Data was analyzed using SPSS 24

Study Duration: The study was carried out from December 2019 to October 2020

Results: A total of 170 patients with mean age of 43.82 ± 9.72 (19-61) years were evaluated of which 144 (84.7%) were males, 26 (15.3%) were females. Vitamin D3 deficiency was found in 144/170 (84.7%) patients while insufficiency was found in 14/170(8.2 %). It was more common in male patients (86.1%) compared to female patients (76.9%). Mean vitamin D3 levels was 14.4 ± 9.4 ng/ ml. Patients with Child A cirrhosis 6/10 (60%) had deficiency, with child B 66/82 (80.5%) while with Child C 72/78 (92.3%) had deficiency of Vitamin D3.

Conclusion: Vitamin D deficiency is common in patients with cirrhosis and level has decreased stepwise with higher Child Pugh Class.

Keywords: Cirrhosis, Vitamin D, Child Pugh score

INTRODUCTION

Hepatitis B and C are the leading cause of cirrhosis in Asia. Cirrhosis of liver is related to many metabolic disorders in the body. It directly or in directly affects the calcium, phosphate and vitamin D metabolism thus affecting the musculoskeletal system termed as hepatic osteodystrophy, resulting in increased tendency of fractures [1, 2]

Vitamin D has two forms, vitamin D2 (ergocalceferol) is obtained from plant source while vitamin D3 (cholecalciferol) is obtained from sunlight and animal sources. Both these forms undergo hydroxylation in liver at 25 site followed by hydroxylation at 1 site in kidneys to form the biologically active 1, 25 hydroxy vitamin D. This biologically active vitamin D maintains the serum calcium levels by increasing the absorption in the duodenum and acting on osteoblast and osteoclast to mobilize the calcium. The biologically active vitamin D is regulated by parathyroid levels, calcium, phosphate levels and osteoclast activity [3]

Classically the vitamin D deficiency is associated with rickets in children and Osteomalacia in adults and there is evidence now to the wider benefits of vitamin D sufficiency in skeletal and non-skeletal disorders including low mortality[5], lower risk of diabetes[6] and infection[7]

Vitamin D deficiency in liver disease is common as the 25 hydroxylation of vitamin D is carried out in liver, moreover the decrease in appetite, reduced physical activity and decease absorption of fat soluble vitamin also contribute to it. Vitamin D deficiency has been reported in liver disease and lower levels has been reported in advance liver disease [8]. Studies have also shown low levels of vitamin D in NAFLD patients suggesting that vitamin D might have a role in developing cirrhosis due to NAFLD[9]

MATERIAL AND METHOD

All Patients with cirrhosis of liver aged 18 to 80 years admitted during December 2019 to October 2020 in Gastroenterology department of Lahore General Hospital were included. Cirrhosis was labelled based on ultrasound abdomen (Coarse texture and irregular liver borders), AST to platelet ratio index (APRI score) more than 2 or medical record suggesting decompensated cirrhosis i.e. history of ascites, variceal bleeding or hepatic encephalopathy.

Patients were excluded from study if they were on calcium, vitamin D or bisphosphonates therapy, have chronic kidney disease, HCC or any other malignancy.

Informed consent was taken, detailed history and examination was performed. Blood samples were taken for Complete blood counts, Liver function tests with Albumin, Prothrombin time (PT)/ International normalization ratio (INR), Renal function tests (RFTS), Serum Electrolytes(Including Calcium), 25 Hydroxy Vitamin D3 levels, Viral marker for Hepatitis B and C. Ultrasound abdomen was also done. Patients were categorized into class A, B or C on the basis of child Pugh score. Vitamin D3 deficiency was defined as levels <20 ng/ml, Insufficiency was defined as levels 21 to 30 ng/ml while levels more than 30 ng/ml was labelled as normal.

Quantitative variables were expressed in terms of mean and standard deviation.

Frequency and percentage were used for qualitative measures. The p-value was calculated by the contingency coefficient to find a relationship of vitamin D levels to CP scores of liver cirrhosis and also with other variables. Data was analyzed using SPSS 24

RESULTS

A total of 170 patients with mean age of 43.82 ± 9.72 (19-61) years were evaluated. 144 (84.7%) were males, 26 (15.3%) were females with mean weight of 69.8 ± 11.8 (48-97) Kgs.10/170(5.9%) were Child Pugh Class A, 82/170(48.2%) were class B and 78/170(45.9%) were class C (Figure1).

Vitamin D3 deficiency was found in 144/170 (84.7%) patients while insufficiency was found in 14/170(8.2 %). 124/144(86.1%) males had Vitamin D3 deficiency while 20/26 (76.9%) female had vitamin D3 deficiency. 10/144(6.9 %) males while 4/26(15.4 %) females had vitamin D3 insufficiency.

Hypocalcemia (after correcting for low Albumin) was found in 28/170(16.5%) of the patients. 22/144(15.3%) males had hypocalcemia while 6/26 (23.1%) female had hypocalcemia. Overall Mean calcium (corrected for low Albumin) levels was 9.2 ± 0.57 (7.7-10.6) mg/dl, 9.4± 0.78 (8.3-10.5) ng/ml in Child A cirrhosis, 9.1 ± 0.52 (7.9-10.3) mg/dl in Child B cirrhosis while in Child C cirrhosis mean calcium levels was 9.2 ± 0.59 (7.7-10.6) mg/dl

Patients with Child A cirrhosis 6/10 (60%) had deficiency, with child B 66/82 (80.5%) while with Child C 72/78 (92.3%) had deficiency of Vitamin D3.While Patients with Child A cirrhosis 2/10 (20%) had insufficiency, with child B 10/82(12.2%) while with Child C 2/78 (2.6%) had insufficiency of Vitamin D3 (Figure2).

Overall Mean vitamin D3 levels was 14.4 ± 9.4 ng/ (4.2-60.4)ml, in patients with Child A cirrhosis mean Vitamin D 3 levels was 19.3 ± 10.6 (11-37) ng/ml, while in Child B cirrhosis mean Vitamin D 3 levels was 15.3 ± 10.9 (4.2-60.4) ng/ml, while in Child C cirrhosis mean Vitamin D 3 levels was 12.9 ± 7.2 (5.3-39.7) ng/ml.

Figure 1:

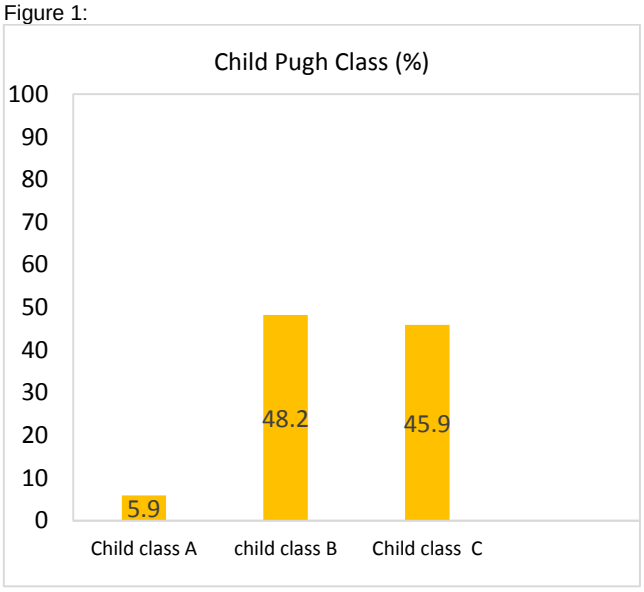
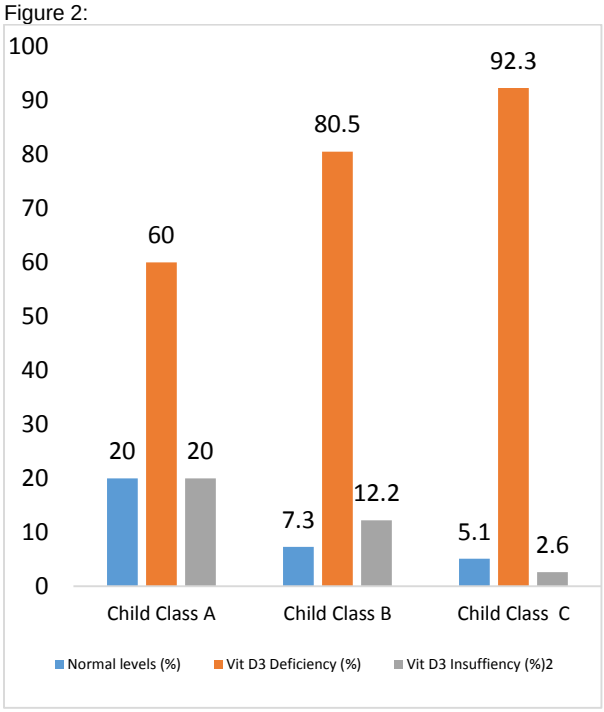


Figure 2:



DISCUSSION

Vitamin D deficiency (<20 ng/ml) is quite common world over with estimated prevalence of 24 % in US[10], 37%in Canada [11]and 40% in Europe [12] while severe deficiency(<12 ng/dl) is less common, however in India, Pakistan and Afghanistan severe deficiency is reported to be >20% of the population [13]

Certain group of patients including chronic kidney disease, chronic liver disease and post renal and liver transplant may have much higher prevalence of vitamin D deficiency ranging from 85 to 99% [14, 15, 16]. In our study Vitamin D deficiency was found in 144/170 (84.7%) patients while insufficiency was found in 14/170(8.2 %). A study published from Spain also found that vitamin D level either deficient or insufficient in 87% of the liver disease patients, with an average concentration of 18.8ng/ml [8]. While the overall mean vitamin D level in our study was 14.4 ± 9.4 ng/ml. Vitamin D deficiency was initially thought to be more common in cholestatic disorders but evidence is growing that deficiency is present in other causes of chronic liver disease as reported in a study of patients with hepatitis C [17]

Hypocalcemia was noted in 16.5 % of patients in our study however Kumar et al reported patients with chronic liver disease having normal calcium level in their study [18]. This could be related to calcium supplementation that usually liver patients are on.

In current study 124/144 (86.1%) males had Vitamin D3 deficiency while 20/26 (76.9%) female had vitamin D3 deficiency. 10/144(6.9 %) males while 4/26(15.4 %) females had vitamin D3 insufficiency. Similar gender distribution was previously reported in the literature in multiple studies [19, 20] however vitamin D deficiency was reported to be more common in females in a study conducted in Iraq [21]

Inverse relationship between severity of liver disease and vitamin D levels was reported as 55.2% of decompensated cirrhosis patients were Vitamin-D deficient compared to 13.6% in compensated cirrhosis by Falak etal [22]

In this study we found that in patients with liver cirrhosis vitamin D has inverse relationship with Child Pugh class as deficiency is more common as the Child class progresses. Patients with Child A cirrhosis 6/10 (60%) had deficiency, with child B 66/82 (80.5%) while with Child C 72/78 (92.3%) had deficiency of Vitamin D3. Low vitamin D levels were reported and its inverse relationship with Child Pugh class and MELD score in chronic liver disease patients was also demonstrated in a study by Zubia etal[23] Similar results were shown by a Chinese study that vitamin D level decreased stepwise with higher Child Pugh class [24]. Farnendez et al in his study also demonstrated inverse relation between Child class and Vitamin D levels [8]

CONCLUSION

Vitamin D deficiency is common in patients with cirrhosis and level has decreased stepwise with higher Child Pugh Class.

Limitation of the study: The impact of vitamin D replacement was not recorded during the study

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