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A STUDY OF TOTAL CHOLESTEROL AND VITAMIN-D LEVELS IN PATIENTS WITH CHRONIC LIVER DISEASES.

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ABSTRACT

BACKGROUND: Numerous factors, including liver disorders, might impact plasma lipid levels. Chronic liver disorders resulting from a variety of reasons are frequently linked to markedly lower levels of plasma triglycerides and cholesterol because of diminished ability for lipoprotein biosynthesis. Vitamin D is a crucial nutrient with many pleiotropic effects on health and various chronic diseases.

AIM: To analyze the effect of total cholesterol and vitamin-D level in chronic lever patients.

MATERIAL AND METHODS: This was a 12-month cross-sectional study conducted in the Department of Biochemistry, Rama Medical College Hospital & Research Centre, Uttar Pradesh. A total of 60 patients were assessd and divided into two groups. Case group include thirty liver cirrhosis patients and control group include healthy individuals. Blood sample was collected under all aseptic conditions, for vitamin-D and total cholesterol level.

RESULTS: This study includes 60 individuals which divided into two groups, Case and control groups. Among case group, 19(63.3%) were males and 11(36.6%) were females, Their ages ranged between 15-65 years. Maximum number of chronic liver cases were observed in the age group of 46-55 (30%). In control group, 17(56.6%) were male and 13(43.3%) were females. the total cholesterol level in case and control was statistically significant as P value was less than 0.05. In case group, 16(53.3%) shows vitamin-D level <20ng/ml while 14(46.6%) patients have normal vitamin-D level. Among control group, all the individuals have normal level of vitamin-D.

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CONCLUSION: These findings underscore the need of a comprehensive metabolic assessment in the management of chronic liver disease and pave the way for additional research on targeted medications to improve patient outcomes.

KEYWORDS: Vitamin-D, liver disorders, liver cirrhosis, triglycerides, total cholesterol.

INTRODUCTION

Liver is the principal site for formation and clearance of lipoproteins. It receives fatty acids and cholesterol from peripheral tissues and diet, packages them into lipoprotein complexes and releases these complexes back into the circulation. Hence it is not surprising that liver diseases can affect plasma lipid levels in a variety of ways. Chronic liver diseases due to various causes are often associated with dramatic reductions in plasma triglyceride and cholesterol level due to reduced lipoprotein biosynthetic capacity [1]. Apart from the various complications seen in cirrhotic patients, chronic dyslipoproteinemia is one which can lead to alterations in cellular membrane lipids, that result in formation of abnormal RBCs, such as echinocytes, and alterations in membrane function with potential pathophysiologic consequences [1].

Vitamin D deficiency is extremely common in chronic liver disease (CLD) patients. Up to 93% of these patients have some degree of vitamin D insufficiency [2,3]. Even patients with mild liver disease are affected, although liver cirrhosis patients more commonly suffer from severe deficiency. Several studies in general populations have shown that low levels of 25(OH)D significantly increase the risk of mortality from all causes, including cardiovascular diseases [4,5]. Severe liver disease decreases vitamin Dihydroxylation, albumin, and vitamin D binding protein (DBP), all of which are linked to low levels of 25(OH)D. Biogenesis from epidermal cells is the main source of vitamin D. In skin, ultraviolet radiations from sun expo sure transforms 7-dehydrocholesterol into pre vitamin D3, which is transformed into vitaminD3(cholecalciferol). A small portion of vitamin D comes from dietary sources, such as eggs and milk, in the form of vitamin D2 (ergocalciferol). Vitamin D generation is a multistep process involving the skin, the liver, and the kidneys. Cholecalciferol is hydroxylated to the bioactive 25-hydroxyvitamin D3(25(OH)D) in the liver and is bound to the DBP.1a-hy droxy lase converts 25(OH)D to 1a,25-dihydroxyvitamin D3(1,25(OH)D) mainly in the kidneys.1,25(OH)D, known as calcitriol, is the most bioactive form. Nevertheless, the vitamin D deficiency in CLD is only partly the result of a synthesis dysfunction of the liver, as evidenced by the fact that vitamin D deficiency is highly prevalent in noncirrhotic patients. The levels of 25(OH)D in cirrhotic patients normalize after vitamin D treatment, which indicates that the 25-hydroxylation is preserved [6,7] and although DBP is moderately decreased in cirrhosis [8]. Vitamin D metabolites require only 5% of the DBP binding sites [9] indicating that liver dysfunction must be severe to decrease the DBP levels to contribute vitamin D deficiency. Therefore, there is a need to understand the the effect of total cholesterol and vitamin-D level in patients having chronic liver disease, so the present study was undertaken to study the total cholesterol and vitamin-d levels in patients with chronic liver diseases.

MATERIAL & METHODS

This was a twelve-month cross-sectional study conducted in the Department of Biochemistry, Rama Medical College Hospital & Research Centre Kanpur in which a total of 60 individuals were included in the study and divided into two groups.

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CASE GROUP: includes 30 patients of chronic liver disease.

CONTROL GROUP: includes 30 healthy individuals.

Inclusion criteria: includes patients of all age having chronic liver disease.

Exclusion criteria: includes conditions such as, malignancies, chronic kidney disease, steroid therapy and patients on vitamin-D supplements.

Ethical clearance: Ethical clearance was obtained from the Institutional Ethical Committee of RMCH&RC.

Sample collection: The 2ml of blood was collected from both the groups, then serum was separated and stored at -20ºC. This serum was used to measure Vitamin-D and Cholesterol level under all the standard protocol. Vitamin-D level was measured using Enzyme linked fluroscent assay and Total cholesterol level was estimated using enzymatic colorimetric method.

All patients and controls were subjected to clinical and laboratory evaluation. Complete blood count, blood sugar, liver function test, renal function test, coagulogram, HBsAg, anti-HCV, USG abdomen, FibroScan, and upper GI endoscopy were done in all the patients of CLD [10].

The diagnosis of chronic liver disease was based upon clinical features, liver function tests, prothrombin time, ultrasonography, upper gastrointestinal endoscopy and liver biopsy wherever feasible [1].

Statistical analysis: To compile the data, descriptive statistics were employed. The association between cholesterol and vitamin D levels was evaluated using Pearson's correlation coefficient. Statistical significance was attained when the p-value was less than 0.05.

RESULTS

This study includes 60 individuals which divided into two groups, Case and control groups. Case group include 30 patients of chronic liver disease in which 19(63.3%) were males and 11(36.6%) were females (Table 1) Their ages were ranged between 15-65 years. Maximum number of chronic liver cases were observed in the age group of 46-55 (30%) and only 13.3% cases were seen in age group 15-25.(table 2). Among control group, 17(56.6%) were male and 13(43.3%) were females.(table 1) their age were ranged between 15-75 years and maximum number of individuals were from 46-55(43.3%).(table2)

Table 1: Gender Wise distribution between Case and Control groups.

Gender	Case group(n=30)(%)	Control group(n=30)(%)
Male	19(63.3%)	17(56.6%)
Female	11(36.6%)	13(43.3%)

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In this table, it was observed that, frequency of male was high in case and control group than females.

Table 2: Age Wise distribution between case and control groups.

Age	Case group(n=30)(%)	Control group(n=30)(%)
15-25	4(13.3)	2(6.6)
26-35	4(13.3)	5(16.6)
36-45	6(20)	7(23.3)
46-55	9(30)	13(43.3)
56-65	7(23.3)	2((6.6)
66-75	0(0)	1(3.3)

In this table, it was observed that, maximum number of individuals were from age group 46-55 in both case and control group.

The total cholesterol level of case and control group, were in the range i.e.<200mg/dl. We found that, the total cholesterol level in case and control was statistically significant as p value is less than 0.05. (table 3).

Table 3: Total cholesterol level in case and control group.

Total Cholesterol level	Case group(n=30)(%)	Control group(n=30)(%)	P value
<200mg/dl	30(100)	30(100)	0.00

Vitamin-D level in case group was found low as compared to control group. In case group, 16(53.3%) shows vitamin-D level <20ng/ml while 14(46.6%) patients have normal vitamin-D level. Among control group, all the individuals have normal level of vitamin-D.(table4)

Table 4: Vitamin-D level in case and control group.

Vitamin-D level	Case group(n=30)(%)	Control group(n=30)(%)
<20ng/ml	16(53.3)	0
20-40ng/ml	14(46.6)	30(100)

In this table, it was observed that, among patients with chronic liver disease,53.3% showed low vitamin-D level.

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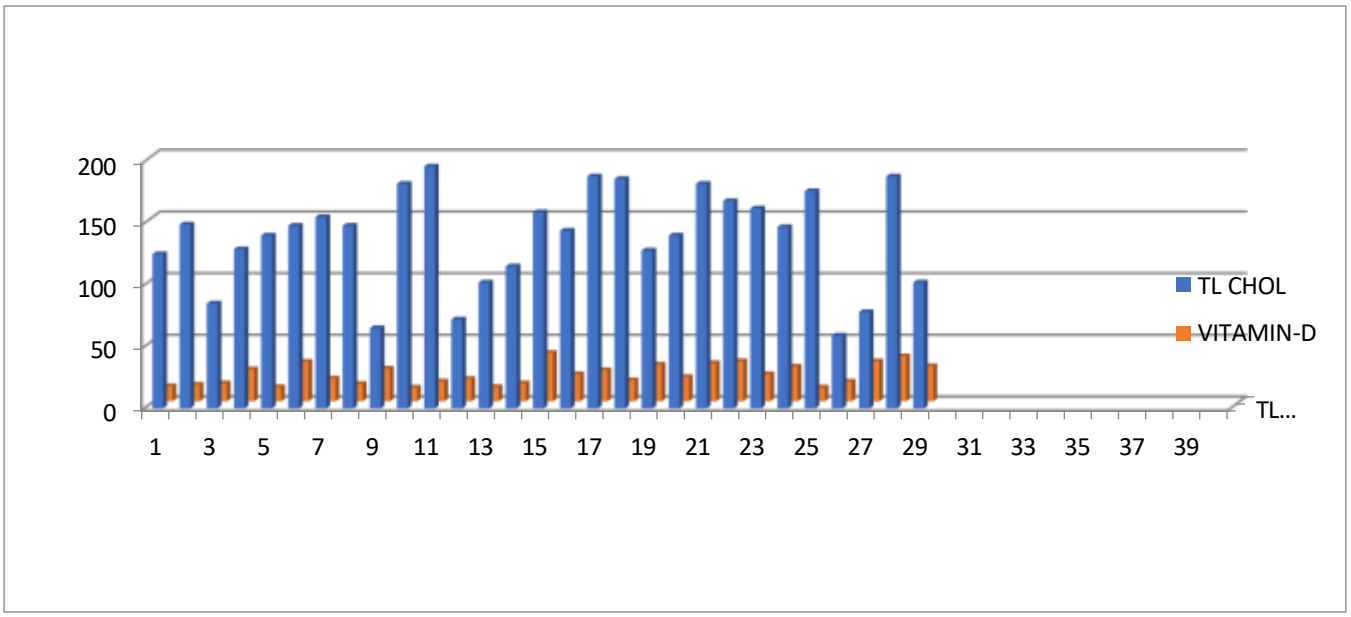
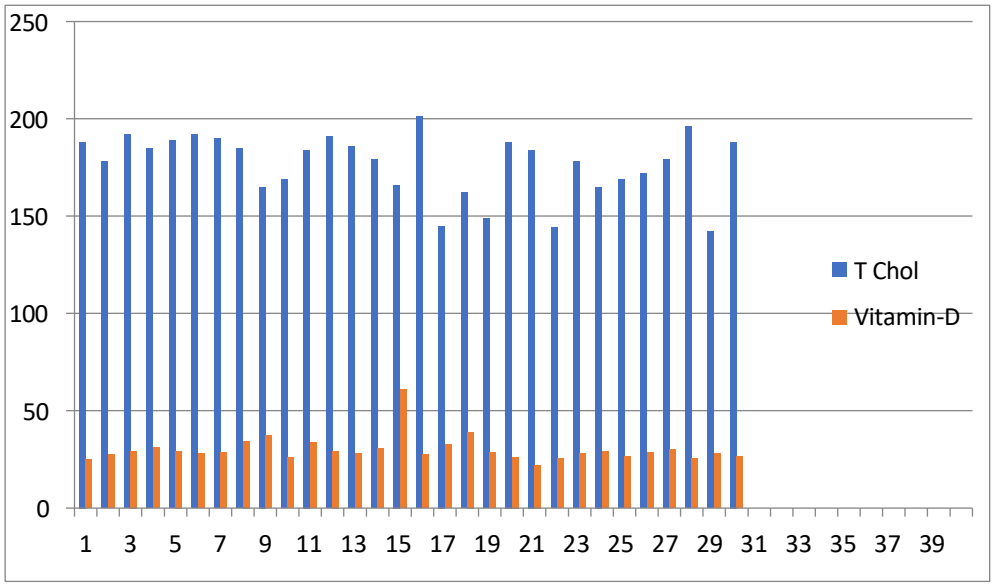


Graph: 1: Bar Chart showing frequency distribution of Total Cholesterole and Vit-D levels among Cases



Graph 2: Bar Chart showing frequency distribution of Total Cholesterole and Vit-D levels among Control group

In the present study the total cholesterol and Vit-D levels were statistically significant with Chi ^{2} : 9.84; P-value: 0.00

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DISCUSION

Vitamin D deficiency recognises multiple pathogenic factors: lower dietary uptake, altered hepatic hydroxylation of vitamin D, malabsorption, reduced production of DBP in the liver, reduced sun exposure, jaundice or chronic inflammation [11]. Several studies reported lower vitamin D serum levels in patients with chronic liver diseases [12,13].

In present study, the vitamin-D level was comparatively low in patients with chronic liver disease (case group) than healthy individuals (control group). It was observed that 16 (53.3%) patients with chronic liver disease have vitamin-D level less than <20ng/ml while 46.6% showed vitamin-D level in the range 20-40ng/ml. The present study was similar with the other study conducted by Khan et al in which vitamin D deficiency (<20 ng/dl) was found in 31 (41.4%) patients; out of them, 14 (18.7%) suffered from severe vitamin D deficiency (<10 ng/dl). Vitamin D insufficiency (21–29.9 ng/dl) was found in 30 (40%). Thus, vitamin D level was subnormal in 61 (81.4%) patients and was normal (>30 ng/dl) only in14 (18.7%) cases [10]. Similar results were observed by Miroliaee A et al.[14] in which vitamin D deficiency (<50 nmol/l) was observed in 46 (51.1%) patients and vitamin D insufficiency (50–80 nmol/l) in 15 (16.7%) patients. Fisher L et al. [3] also recorded that Serum 25(OH)D levels were inadequate in 91% patients. Vitamin D deficiency (<50 nmol/L) was observed in 68% patients and vitamin D insufficiency (50–80 nmol/L) in 23% patients. Similarly, Finkelmeier F et al [15] also found very low $25(OH)D_3$ levels (<10 ng/ml) in 68.9% the of cases (173 out of 251), 23.5% patients had low levels (10–20 ng/ml), and 7.6% patients had normal $25(OH)D_3$ levels (>20 ng/ml). on the contrary, vitamin-D level in healthy individuals (control group) was in the range between 20-40ng/ml. the p value of case and control group was <0.05 which is statistically significant.

Possible explanations of vitamin D deficiency in CLD could be severe liver disease decreases vitamin D hydroxylation, albumin and DBP production, inadequate sun exposure, insufficient food intake, steroid use, jaundice-related deterioration of vitamin synthesis on the skin, and decreased vitamin D absorption caused by intestinal edema secondary to portal hypertension or to cholestasis-induced bile salt disruption [16].

In the present study, the total cholesterol level in case and control group was less than <200mg/dl. It was statistically significant as P value is less than 0.05(p value=0.00). Contrary to our study, Selimoglu and colleagues [17] in their study showed that with the exception of serum triglyceride levels, other variables like serum HDL, LDL level decreased in cirrhotics. Similar studies were conducted by Edith N. Okeke [18] and Mohammad Reza Ghadr showed significant derangement of lipid level in cirrhotic and a negative relation to extent of liver damage. Hypolipidemia is also seen in various other medical conditions like malnutrition, malabsorption, hyperthyroidism, renal failure, malignancy and immunoglobulin disorders [19].

Vitamin D is an important secosteroid hormone with known effect on calcium homeostasis, but recently there is increasing recognition that vitamin D also is involved in cell proliferation and differentiation, has immunomodulatory and anti-inflammatory properties. Vitamin D deficiency has been frequently reported in many causes of chronic liver disease and has been

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associated with the development and evolution of non-alcoholic fatty liver disease (NAFLD) and chronic hepatitis C (CHC) virus infection.

The results show that in patients with chronic liver disorders, there is a substantial correlation between total cholesterol and vitamin D levels. The observed inadequacies are probably a result of the liver's impaired ability to synthesise in advanced stages of the disease. These findings highlight the importance of timely consideration of treatment strategies to control dyslipidemia and vitamin D deficiency, as well as the need for routine monitoring of these biomarkers in Chronic liver patients.

CONCLUSION

This study shows that in patients with chronic liver disorders, there is a direct relationship between total cholesterol and vitamin D levels. These results open the door for more studies on targeted medicines to enhance patient outcomes and highlight the significance of thorough metabolic assessment in the management of chronic liver disease.

Declarations:

Conflicts of interest: There is no any conflict of interest associated with this study

Consent to participate: We have consent to participate.

Consent for publication: We have consent for the publication of this paper.

Authors' contributions: All the authors equally contributed the work.

REFERENCES

1. Mandal SK, Sil K, Chatterjee S, Ganguly J, Chatterjee K, Sarkar P, Hazra S, Sardar D. A study on lipid profiles in chronic liver diseases. National Journal of Medical Research. 2013 ;3(01):70-2.
2. Rosen J.C. Vitamin D insufficiency. *NEJM.* 2011; 364:248–254.
3. Looker A.C., Dawson-Hughes B., Calvo M.S., Gunter E.W., Sahyoun N.R. Serum 25-hydroxyvitamin D status of adolescents and adults in two seasonal subpopulations from NHANES III. *Bone.* 2002; 30:771–777.
4. Wu S., Finch J., Zhong M., Slatopolsky E., Grieff M., Brown A.J. Expression of the renal 25-hydroxyvitamin D 24-hydroxylase gene: regulation by dietary phosphate. *Am J Physiol.* 1996; 271:F203–F208.
5. Bouillon R., Van Assche F.A., Van Baelen H., Heyns W., De Moor P. Influence of the vitamin D-binding protein on the serum concentration of 1,25-dihydroxyvitamin D3. Significance of the free 1,25-dihydroxyvitamin D3 concentration. *J Clin Investig.* 1981; 67:589–596.
6. Anty R., Tonohouan M., Ferrari-Panaia P. Low levels of 25-hydroxy vitamin D are independently associated with the risk of bacterial infection in cirrhotic patients. *Clin Transl Gastroenterol.* 2014; 5:e56.

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7. Barchetta I., Carotti S., Labbadia G. Liver vitamin D receptor, CYP2R1, and CYP27A1 expression: relationship with liver histology and vitamin D3 levels in patients with nonalcoholic steatohepatitis or hepatitis C virus. *Hepatology.* 2012; 56:2180–2187.

8. Skinner R.K., Sherlock S., Long R.G., Wilis M.R. 25-Hydroxylation of vitamin D in primary biliary cirrhosis. *Lancet.* 1977; 1:720–721.

9. Compston J.E. Hepatic osteodystrophy: vitamin D metabolism in patients with liver disease. *Gut.* 1986; 27:1073–1090.

10. Khan MA, Dar HA, Baba MA, Shah AH, Singh B, Shiekh NA. Impact of Vitamin D Status in Chronic Liver Disease. *J Clin Exp Hepatol*. 2019; 9(5):574-580.

11. Malham,M.; Peter Jørgensen, S.; Lauridsen, A.L.; Ott, P.; Glerup, H.; Dahlerup, J.F. The effect of a single oral megadose of vitamin Dprovided as either ergocalciferol (D2) or cholecalciferol (D3) in alcoholic liver cirrhosis: Eur. J. Gastroenterol. Hepatol. 2012, 24, 172–178.

12. Kitson, M.T.; Roberts, S.K. D-livering the message: The importance of vitamin D status in chronic liver disease. J. Hepatol. 2012, 57, 897–909.

13. Sandoval, C.; Farías, J.; Zamorano, M.; Herrera, C. Vitamin Supplements as a Nutritional Strategy against Chronic Alcohol Consumption? An Updated Review. Antioxidants 2022; 11, 564.

14. Crawford B.A.L., Kam C., Donaghy A.J., Mccaughan G.W. The heterogeneity of bone disease in cirrhosis: a multivariate analysis. *Osteoporos Int.* 2003; 14:987–994.

15. Barchetta I., Angelico F., Ben M.D. Strong association between non alcoholic fatty liver disease (NAFLD) and low 25(OH) vitamin D levels in an adult population with normal serum liver enzymes. *BMC Med.* 2011; 9:85.

16. Masuda S., Okano T., Osawa K., Shinjo M., Suematsu T., Kobayashi T. Concentrations of vitamin D binding protein and vitamin D metabolites in plasma of patients with liver cirrhosis. *J Nutr Sci Vitaminol (Tokyo)* 1989; 35:225–234.

17. Selimoglu MA, Aydogdu S, Yagci RV. Lipid parameters in childhood cirrhosis and chronic liver disease. Pediatr Int 2002; 44(4): 400-403.

18. Edith N. Okeke, Comfort A. Daniyam, Maxwell Akanbi, Solomon O. Ugoya, Emmanuel I. Lipid Profile of Patients with Liver Cirrhosis in Jos, Nigeria. Journal of Medicine in the Tropics. 2010; 12: 56-59.

19. Andrikoula M, Avades T. Hypolipidaemia is not always indicating liver dysfunction. A review of primary and secondary high density lipoprotein and low density lipoprotein deficiencies. Minerva Med. 2006; 97(6):487-94.