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Serum Vitamin D Status in Children with Pancreatitis

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Abstract

Introduction and Objective: *The incidence of pancreatitis in children has significantly increased in the past two decades. Fat-soluble vitamin deficiencies (A, D, E, K) can be seen in pancreatitis. This study evaluate serum vitamin D status in children with Pancreatitis.* ***Methods:*** *This cross sectional analytical study was conducted at the Department of Pediatric Gastroenterology and Nutrition, BMU, Dhaka, from January, 2022 to December, 2022. A total of 30 children with the diagnosis of Pancreatitis was included as cases (Group I) and 20 children with the diagnosis of functional constipation was included as control (Group II) in the study. Serum 25-hydroxyvitamin D levels <15, 15 to 19 and ≥20 ng/ml were defined as vitamin D "deficiency", "insufficiency" and "sufficiency" respectively.* ***Results:*** *Mean age of case was 8.48±4.16 years and control was 9.88± 2.68 years. Acute pancreatitis (AP) was 30%, acute recurrent pancreatitis (ARP) was 26.7% and chronic pancreatitis (CP) was 43.3% among the 30 patients. In AP, serum vitamin D level was 10.32-24.5 ng/ml and mean value was 15.06±4.33 ng/ml. In ARP, serum vitamin D was 9.4-26.1 ng/ml and mean value was 16.54±5.56 ng/ml. In Chronic Pancreatitis, serum vitamin D level was 4.24-15.4 ng/ml and mean value was 8.21±3.61 ng/ml. In controls, serum vitamin D level was 11.15-23.28 ng/ml and mean value was 16.15±3.55 ng/ml. Mean vitamin D level in pancreatitis patients were 12.49±5.73 ng/ml, compared to 16.15±3.55 ng/ml in controls (p = 0.014), it was found statistically significant. Vitamin D deficiency found in 66.7% patients in case (group I). Serum calcium was found to have statistically significant positive correlation with vitamin D level (r=0.633; p=0.001).* ***Conclusion:*** *Serum vitamin D level was low in patients with pancreatitis compared with control group.*

Keywords: *Children, Pancreatitis, acute pancreatitis, acute recurrent pancreatitis, chronic pancreatitis, Vitamin D, Serum 25-hydroxyvitamin D.*

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Introduction:

Pancreatitis is an inflammatory condition of the pancreas characterized by the infiltration of acute inflammatory cells, edema, and necrosis, which may lead to organ damage or fibrosis[1]. In most patients, the

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inflammation is self-limited and reversible, resulting in a single episode of acute pancreatitis (AP). However, in some cases, AP advances to acute recurrent pancreatitis (ARP) or chronic pancreatitis (CP)[2]. Chronic pancreatitis is a progressive inflammatory disorder that causes irreversible structural changes and permanent loss of pancreatic function— exocrine and/or endocrine. Endocrine insufficiency may eventually lead to diabetes mellitus, typically developing later in the disease course[3]. Exocrine insufficiency causes maldigestion and malabsorption of fats, proteins, and carbohydrates, leading to significant nutritional deficiencies[4]. Fat malabsorption, in particular, results in deficiencies of fat-soluble vitamins—A, D, E, and K[5].Vitamin D deficiency is common among individuals with pancreatitis. As a critical regulator of bone metabolism, vitamin D deficiency manifests clinically as hypocalcemia, hypophosphatemia, tetany, osteomalacia, and rickets[6]. Beyond its skeletal role, vitamin D also modulates cell growth, neuromuscular and immune functions, and reduction of inflammation[7]. Vitamin D (calciferol) exists in two main forms—vitamin D2 (ergocalciferol) and D3 (cholecalciferol). Its absorption requires micellar solubilization, which is impaired in pancreatitis due to the deficiency of pancreatic enzymes. Both forms are hydroxylated in the liver to form 25-hydroxyvitamin D (calcifediol), the major circulating form. Calcifediol is further hydroxylated in the kidneys to produce 1,25-dihydroxyvitamin D (calcitriol), the biologically active form[8]. Due to exocrine pancreatic insufficiency, patients with pancreatitis are unable to adequately absorb fat and fat-soluble vitamins, including vitamin D. The American Academy of Pediatrics and the Pediatric Endocrine Society recommend a serum 25(OH)D level of ≥20 ng/mL to meet physiological needs in children[9,10]. Older studies reported a prevalence of fat-soluble vitamin deficiency in up to 75% of chronic pancreatitis patients[11]. These deficiencies warrant clinical attention and appropriate supplementation[12,13]. Given the important role of vitamin D in overall health, assessing its status in pediatric patients with pancreatitis is essential. Despite its significance, only limited studies have addressed this topic. In Paediatric age group there is lack of study related to this subject. This study aims to evaluate vitamin D status in children with pancreatitis, which may guide better clinical management and help reduce disease-related morbidity.

Materials and Methods:

This was a cross-sectional analytical study carried out at the Department of Pediatric Gastroenterology and Nutrition, Bangladesh Medical University, from January 2022 to December 2022. A total of 30 patients diagnosed with any form of pancreatitis (Acute, acute recurrent or chronic) based on clinical features and investigations were enrolled as cases. To strengthen the study, 20 patients were enrolled as controls. These control patients attended the department for abdominal pain due to functional constipation. Inclusion criteria for cases:Children of either gender, age less than 18 years, diagnosed as pancreatitis (acute pancreatitis, acute recurrent pancreatitis and chronic pancreatitis) and Pancreatitis was clinically defined as per INSPPIRE definition. Exclusion criteria for cases: Any comorbid condition (Shock, multiorgan failure, hemorrhage and mental status change), Diagnosed case of rickets, malabsorption syndrome, Recently taking vitamin D supplementation and Refusal of the parents to give consent. Inclusion criteria for controls: Children attended in Pediatric Gastroenterology and Nutrition department with abdominal pain due to functional constipation and Functional constipation was diagnosed by ROME IV criteria. Exclusion criteria for controls: Recently taking vitamin D supplementation and Refusal of the parents to give consent. A written consent was obtained from parents and legal guardians of each child in the study. Each child underwent a detail clinical evaluation at entry. Physical examination was done by investigators and findings were recorded in a structured questionnaire. For investigation purpose venous blood was drawn aseptically for laboratory workup. Complete blood count, Serum amylase, serum lipase, serum calcium, fasting lipid panel, serum alanine aminotransferase, random blood glucose was assessed at Biochemistry Department of BMU by auto analyzer. Stool for fecal fat was done in Laboratory Medicine Department of BMU. Serum 25-hydroxyvitamin D level was done for all studied subjects in Department of Nuclear Medicine, BMU. The technique used for the plasma assay of vitamin D was the ARCHITECT 25-OH Vitamin D, which is a chemiluminescent microparticle immunoassay (CMIA) for the quantitative determination of 25-hydroxyvitamin D in human serum and plasma. Plain X ray of abdomen, USG, CT scan of abdomen and MRCP was done in Radiology Department of BMU.

- Vitamin D sufficiency: Serum 25-hydroxyvitamin D levels ≥20 ng/ml were defined as vitamin D sufficiency.

- Vitamin D insufficiency: Serum 25-hydroxyvitamin D levels 15-19 ng/ml were defined as vitamin D insufficiency.

- Vitamin D deficiency: Serum 25-hydroxyvitamin D levels <15 ng/ml were defined as vitamin D deficiency.

Statistical analysis: Data were analyzed by using Statistical Package for Social Science (SPSS 22.0 Chicago, Illinois) for Windows XP. Results were expressed as mean ± standard deviation (SD), number or percentage. Unpaired t-test and ANOVA test were used for comparison of quantitative variables. To find out the relationship between two quantitative variables, Pearson's correlation coefficient test was used. Qualitative data were analyzed by the Chi-square test and the Fisher's exact test. For all statistical tests p value of less than 0.05 was taken as significant.

Results:

In this study the patients were classified under two groups. Group I consisted of 30 patients with three types of pancreatitis. Group II consisted of 20 children with the diagnosis of functional constipation. The mean age was found to be 8.48±4.16 years in group I and 9.88±2.68 years in group II. The difference between mean age in case and control was not statistically significant (p=0.189).

Table I: Age distribution of the studied patients (n=50)

Age (Years)	Group I (n=30)		Group II (n=20)		P value
	n	%	n	%	
<5	6	20.0	0	0.0	
5-9	13	43.3	8	26.7	
10-15	10	33.3	12	40.0	
>15	1	3.3	0	0.0	
Mean±SD	8.48±4.16		9.88±2.68		0.189^{ns}
Range(min-max)	2-16		5-15		

ns= not significant

p value reached from Unpaired t-test

Group I= Case

Group II= Control

Distribution of the studied patients according to type of pancreatitis (n=30)

In this study total 30 patients with three types of pancreatitis (acute pancreatitis, acute reccurent pancreatitis and chronic pancreatitis) were enrolled. It was observed that nearly half of the patients (43.3%) had chronic pancreatitis, 9 (30.0%) patients had acute pancreatitis and 8 (26.7%) had acute recurrent pancreatitis.

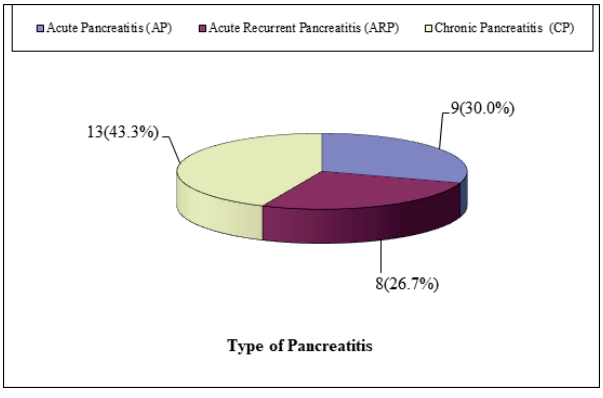

Figure 1: Pie chart showing studied patients by type of pancreatitis

Table II shows the mean hemoglobin was found 11.08±1.5 (gm/dl) in AP, 11.81±1.11 (gm/dl) in ARP and 10.98±1.55 (gm/dl) in CP. Total WBC count raised in AP, it was 13.91 ±6.67 ($X10^9/mm^3$). The mean serum lipase was found 3664.7±4144.8 (U/L) in AP, 5292±5705 (U/L) in ARP and 1638.5±2313.6 (U/L) in CP. S. Calcium was normal in all types of Pancreatitis. S. TG was raised in AP, mean value was 293.22 (±428.89) mg/ dl. p value reached from ANOVA test.

Table II: Biochemical parameters in studied patients

Laboratory test	AP (n=9)		ARP (n=8)		CP (n=13)		P value
	Mean±SD		Mean±SD		Mean±SD		
Hb % (gm/dl)	11.08	±1.5	11.81	±1.11	10.98	±1.55	0.418^{ns}
Range (min-max)	9.3	-13.8	10.3	-13.1	8.3	-13.6	
ESR (mm in 1st hr)	39.11	±31.28	32.38	±15.72	32.77	±16.62	0.759^{ns}
Range (min-max)	5	-95	10	-60	15	-70	
TWBC (X109/mm3)	13.91	±6.67	9.29	±2.7	10.59	±3.53	0.107^{ns}
Range (min-max)	7.2	-27.5	3.5	-12.1	6	-18	
PLT (X109/mm3)	271.33	±103.1	330.38	±78.91	358.23	±120.22	0.183^{ns}
Range (min-max)	150	-487	260	-500	180	-600	
HCT (L/L)	0.33	±0.04	0.36	±0.03	0.33	±0.05	0.252^{ns}
Range (min-max)	0.28	-0.41	0.32	-0.4	0.25	-0.42	
Serum lipase (U/L)	3664.7	±4144.8	5292.1	±5705	1638.5	±2313.6	0.135^{ns}
Range (min-max)	238	-10645	86	-15484	20	-7173	
Serum Amylase	603.78	±519.25	863.5	±384.62	417.92	±661.1	0.225^{ns}
Range (min-max)	99	-1763	213	-1298	39	-2214	
S. ca (mg/dl)	9.11	±0.61	9.49	±0.99	9.01	±0.71	0.379^{ns}
Range (min-max)	8.2	-9.9	8	-11.3	8.1	-9.96	
S.TG (mg/dl)	293.22	±428.89	110.13	±107.33	119.15	±50.03	0.202^{ns}
Range (min-max)	35	-1257	39	-366	83	-260	
RBS (mmol/l)	5.69	±1.57	5.81	±0.69	6.13	±1.58	0.750^{ns}
Range (min-max)	4.3	9.5	4.6	-6.7	4.3	-9.2	

Table III: Vitamin D deficiency (<15 ng/ml) was present in 20 patients (66.7%) in group I and 7 patients (35%) in group II. Vitamin D insufficiency (15-19 ng/ml) was present in 7 patients (23.3%) in group I and 10 patients (50%) in group II. Vitamin D sufficiency (≥20 ng/ml) was present in 3 patients (10%) in group I and 3 patients (15%) in group II. The difference between the two group is statistically not significant (^{a}p =0.083). Mean value of serum vitamin D in cases was 12.49±5.73 ng/ml while in controls it was 16.15±3.55 ng/ml. The difference of mean value between the two group is statistically significant (^{b}p =0.014).

Table III: Comparison of vitamin D level in studied patients (n=30) & controls (n=20)

Vitamin-D (ng/mL)	Group I (n=30)		Group II (n=20)		P value
	n	%	n	%	
<15	20	66.7	7	35.0	^{a}0.083^{ns}
15-19	7	23.3	10	50.0	
≥20	3	10.0	3	15.0	
Mean ±SD	12.49±5.73		16.15±3.55		^{b}0.014^s
Range (min-max)	4.2-26.11		11.15-23.28		

s=significant

ns= not significant

^{a}p value reached from Fisher exact test

^{b}p value reached from Unpaired t-test

Table IV: Vitamin D deficiency (<15 ng/ml) was present in 5 patients of AP (55.6%) and 7 patients (35%) of controls. Vitamin D insufficiency (15-19 ng/ml) was present in 3 patients (33.3%) in AP and 10 patients (50%) in controls. Vitamin D sufficiency (≥20 ng/ml) was present in 1 patients (11.1%) in AP and 3 patients (15%) in controls. The difference of vitamin D level between AP and controls is statistically not significant (^{a}p =0.581). Mean value of vitamin D in AP was 15.06±4.33 ng/ml while in controls it was 16.15±3.55 ng/ml. The difference of mean value of vitamin D between AP and controls is statistically not significant (^{b}p =0.481). Vitamin D deficiency (<15 ng/ml) was present in 3 patients of ARP (37.5%) and 7 patients (35%) in controls. Vitamin D insufficiency (15-19 ng/ml) was present in 3

patients (37.5%) in ARP and 10 patients (50%) in controls. Vitamin D sufficiency (≥20 ng/ml) was present in 2 patients (25%) in ARP and 3 patients (15%) in controls. The difference of vitamin D level between ARP and control is statistically not significant ([a]p =0.770). Mean value of serum vitamin D in ARP was 16.54±5.56 ng/ml while in controls it was 16.15±3.55 ng/ml. The difference of mean value of vitamin D between ARP and control is statistically not significant ([b]p =0.825). Vitamin D deficiency (<15 ng/ml) was present in 12 patients of CP (92.3%) and 7 patients (35%) in controls. Vitamin D insufficiency (15-19 ng/ml) was present in 1 patients (7.7%) in CP and 10 patients (50%) in controls. Vitamin D sufficiency (≥20 ng/ml) was present in 3 patients (15%) in controls. The difference of vitamin D level between CP and control is statistically significant ([a]p =0.005). Mean value of serum vitamin D in CP was 8.21±3.61 ng/ml while in controls it was 16.15±3.55 ng/ml. The difference of mean value of vitamin D between CP and control is statistically significant ([b]p =0.001).

Table IV: Comparison of vitamin D level in three types of Pancreatitis and controls

Vitamin-D (ng/mL)	Group I (n=30)		Group II (n=20)		P value
	n	%	n	%	
Acute Pancreatitis					
<15	5	55.6	7	35.0	[a]0.581[ns]
15-19	3	33.3	10	50.0	
≥20	1	11.1	3	15.0	
Mean ±SD	15.06	±4.33	16.15±3.55		[b]0.481[ns]
Range (min-max)	10.32	-24.5	11.15-23.28		
Recurrent Acute Pancreatitis					
<15	3	37.5	7	35.0	[a]0.770[ns]
15-19	3	37.5	10	50.0	
≥20	2	25.0	3	15.0	
Mean ±SD	16.54	±5.56	16.15±3.55		[b]0.825[ns]
Range (min-max)	9.4	-26.1	11.15-23.28		
Chronic Pancreatitis					
<15	12	92.3	7	35.0	[a]0.005[s]
15-19	1	7.7	10	50.0	
≥20	0	0.0	3	15.0	
Mean ±SD	8.21	±3.61	16.15±3.55		[b]0.001[s]
Range (min-max)	4.24	-15.4	11.15-23.28		

s=significant

ns= not significant

[a]p value reached from Fisher exact test

[b]p value reached from Unpaired t-test

Vitamin D deficiency (<15 ng/ml) was present in 5 patients of AP (55.6%) and 12 patients of CP (92.3%). Vitamin D insufficiency (15-19 ng/ml) was present in 3 patients of AP (33.3%) in and 1 patients (7.7%) in CP. Vitamin D sufficiency (≥20 ng/ml) was present in 1 patients of AP (11.1%). No patient of chronic pancreatitis had vitamin D sufficiency. The difference of vitamin D level between AP and CP is statistically not significant ([a]p =0.1175). Mean value of serum 25-hydroxyvitamin D in AP was 15.06±4.33 ng/ml and in CP was 8.21±3.61 ng/ml. The difference of mean value of vitamin D between AP and CP is statistically significant ([b]p =0.004).

Table V: Comparison of vitamin D level in Acute Pancreatitis (AP) & chronic Pancreatitis (CP)

Vitamin-D	AP (n=9)		CP (n=13)		P value
	n	%	n	%	
<15	5	55.6	12	92.3	[a]0.117[ns]
15-19	3	33.3	1	7.7	
≥20	1	11.1	0	0.0	
Mean ±SD	15.06	±4.33	8.21	±3.61	[b]0.004[s]
Range (min-max)	10.32	-24.5	4.24	-15.4	

s=significant

ns= not significant

[a]p value reached from Fisher exact test

[b]p value reached from Unpaired t-test

Vitamin D deficiency (<15 ng/ml) was present in 3 patients of ARP (37.5%) and 12 patients of CP (92.3%). Vitamin D insufficiency (15-19 ng/ml) was present in 3 patients of ARP (37.5%) in and 1 patients (7.7%) in CP. Vitamin D sufficiency (≥20 ng/ml) was present in 2 patients of ARP (25%). No patient of chronic pancreatitis had vitamin D sufficiency. The difference of vitamin D level between ARP and CP is statistically significant (ap =0.022). Mean value of serum 25-hydroxyvitamin D in ARP was 16.54±5.56 ng/ml and in CP was 8.21±3.61 ng/ml. The difference of mean value of vitamin D between ARP and CP is statistically significant ([b]p =0.001).

Table VI: Comparison of vitamin D level in acute reccurent pancreatitis (ARP) & chronic pancreatitis (CP)

Vitamin-D	AP (n=8)		CP (n=13)		P value
	n	%	n	%	
<15	3	37.5	12	92.3	[a]0.022[ns]
15-19	3	37.5	1	7.7	
≥20	2	25.0	0	0.0	
Mean ±SD	16.54	±5.56	8.21	±3.61	[b]0.001[s]
Range (min-max)	9.4	-26.1	4.24	-15.4	

s=significant

[a]p value reached from Fisher exact test

[b]p value reached from Unpaired t-test

Correlation between serum vitamin D level and serum calcium

In the scatter diagram, serum vitamin D (ng/ml) plotted in X-axis and S.ca (mg/dl) plotted in Y-axis. The value of Pearson's rank correlation coefficient was 0.633, which is positive significant correlation (p = <0.001). Therefore, there was linear positive moderate correlation between S. ca and serum vitamin D.

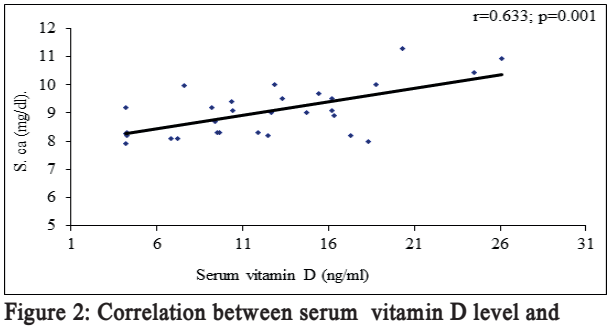

Figure 2: Correlation between serum vitamin D level and

serum calcium Correlation between serum vitamin D level and serum triglyceride

In the Scatter diagram, serum vitamin D (ng/ml) plotted in X-axis and S.TG (mg/dl) plotted in Y-axis. The value of Pearson's rank correlation coefficient was -0.329, which is negative not significant correlation (p=0.076). Therefore, there was linear negative correlation between S.TG and vitamin D.

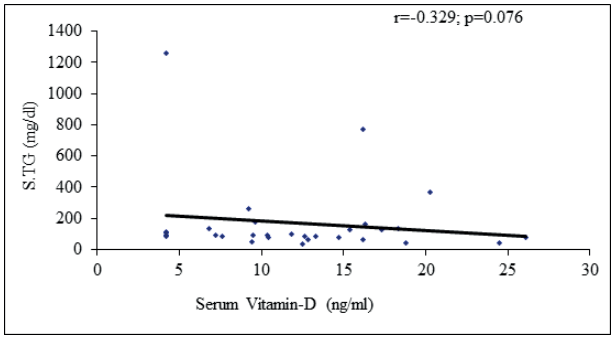

Figure 3: Correlation between serum vitamin D level and serum triglyceride level

Discussion:

Although relatively uncommon in children, pancreatitis is a potentially life-threatening condition that can present acutely or chronically, typically with symptoms such as epigastric pain, vomiting, and elevated serum amylase and lipase levels[2]. Over the past two decades, the incidence of pediatric pancreatitis has been rising, currently estimated at 3.6–13.3 cases per 100,000 children[14]. The pancreas plays a crucial role in digestion, particularly in breaking down fats, proteins, and carbohydrates. In exocrine insufficiency, the pancreas fails to deliver sufficient digestive enzymes to the small intestine, resulting in malabsorption, particularly of fats and fat-soluble vitamins[15]. Studies suggest that up to 70% of children with pancreatitis may have vitamin D deficiency. Vitamin D absorption occurs mainly in the jejunum and terminal ileum, and in chronic pancreatitis, fat malabsorption leads to diarrhea-mediated wasting and vitamin D depletion[16]. In this study, 30 pediatric patients with pancreatitis and 20 controls were enrolled. The mean age of the cases was 8.48±4.16 years, compared to 9.88±2.68 years in controls—similar to findings by Zafar et al. (mean age 9.08±3.64 years)[17]. Among the cases, 30% had AP, 26.7% had ARP, and 43.3% had CP.

The mean serum vitamin D level was significantly lower in cases (12.49±5.73 ng/mL) compared to controls (16.15±3.55 ng/mL), with a statistically significant difference ($p < 0.014$). Among cases, 66.7% had vitamin D deficiency (<15 ng/mL), 23.3% had insufficiency (15–20 ng/mL), and only 10% had sufficient levels. These findings align with previous studies—Sikken et al. reported a 53% deficiency rate, while other studies have shown deficiency or insufficiency in over 90% of patients[18,19].

Further breakdown by disease type showed:

- Acute Pancreatitis (AP): Mean vitamin D = 15.06±4.33 ng/mL; 55.6% were deficient.
- Acute Recurrent Pancreatitis (ARP): Mean vitamin D = 16.54±5.56 ng/mL; 37.5% were deficient.
- Chronic Pancreatitis (CP): Mean vitamin D = 8.21±3.61 ng/mL; 92.3% were deficient, 7.7% insufficient.

Vitamin D levels in CP were significantly lower than in AP ($p < 0.004$) and ARP ($p < 0.001$). Among controls, 35% also had vitamin D deficiency, but levels were significantly higher than in CP ($p < 0.001$). Duggan et al. and Mann et al. similarly found significantly lower vitamin D levels in CP patients compared to controls[20,21].

This study also found a positive correlation between Serum vitamin D and serum calcium levels ($r = 0.633$; $p = 0.001$). Vitamin D deficiency reduces calcium absorption from the gut, which may lead to hypocalcemia. However, the mean serum calcium level among patients remained within the normal range (8.9±3.01 mg/dL; range: 8.0–11.3 mg/dL).

Conclusion:

This study found that serum vitamin D concentrations are lower than normal in the majority of studied patients with pancreatitis. Early detection and treatment of vitamin D deficiency in pancreatitis patients might prevent the development of the complications.

Conflict of Interest: None.

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References:

1. Sarles H. Definitions and classifications of pancreatitis. Pancreas. 1991 Jul;6(4):470-4.
https://doi.org/10.1097/00006676-199107000-00015
PMid:1876603

2. Bai HX, Lowe ME, Husain SZ. What have we learned about acute pancreatitis in children? Journal of pediatric gastroenterology and nutrition. 2011 Mar;52(3):262-70..
https://doi.org/10.1097/MPG.0b013e3182061d75
PMid:21336157 PMCid:PMC3626416

3. Aliye Uc. Chronic pancreatitis in children: Current knowledge in diagnosis and treatment. Journal of Pediatric Sciences. 2011 May,3(4): 1 - 14.

4. Layer P , Keller J. Pancreatic enzymes: secretion and luminal nutrient digestion in health and disease. Journal of Clinical Gastroenterology. 1999 Jan; 28(1):3-10
https://doi.org/10.1097/00004836-199901000-00002
PMid:9916657

5. Roberts I M. Enzyme therapy for malabsorption in exocrine pancreatic insufficiency. Pancreas. 1989Aug

;4(4):496-503.
https://doi.org/10.1097/00006676-198908000-00016
PMid:2668933

6. De Albuquerque Taveira AT, Fernandes MI, Galvão LC, Sawamura R, De Mello Vieira E, De Paula FJ. Impairment of bone mass development in children with chronic cholestatic liver disease. Clinical endocrinology. 2007 Apr;66(4):518-23.
https://doi.org/10.1111/j.1365-2265.2007.02765.x
PMid:17371469

7. Gupte S. Pedaitric nutrition and nutritional disorders. The Short text Book of Pediatrics. 11th edition. Jaypee Brothers. New Delhi. 2010:155-60.

8. Sathe MN, Patel AS. Update in pediatrics: focus on fat-soluble vitamins. Nutrition in clinical practice. 2010 Aug;25(4):340-6.
https://doi.org/10.1177/0884533610374198
PMid:20702838

9. Misra M, Pacaud D, Petryk A, Collett-Solberg PF, Kappy M. Drug and Therapeutics Committee of the Lawson Wilkins Pediatric Endocrine Society. Vitamin D deficiency in children and its management: review of current knowledge and recommendations. Pediatrics. 2008 Aug ;122(2):398-417.
https://doi.org/10.1542/peds.2007-1894
PMid:18676559

10. Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. The Journal of clinical endocrinology & metabolism. 2011 Jul ;96(7):1911-30.
https://doi.org/10.1210/jc.2011-0385
PMid:21646368

11. Nakamura T, Takebe K, Imamura K, Tando Y, Yamada N, Arai Y, et al. Fat-soluble vitamins in patients with chronic pancreatitis (pancreatic insufficiency). Acta Gastroenterol Belg. 1996 Jan-Mar; 59(1):10-14.

12. Duggan S, O'Sullivan M, Feehan S, Ridgway P, Conlon K. Nutrition treatment of deficiency and malnutrition in chronic pancreatitis: a review. Nutrition in clinical practice. 2010 Aug; 25(4):362-70.
https://doi.org/10.1177/0884533610373772
PMid:20702842

13. De-Madaria E, Abad-González A, Aparicio JR, Aparisi L, Boadas J, Boix E, et al. The Spanish Pancreatic Club's recommendations for the diagnosis and treatment of chronic pancreatitis: part 2 (treatment). Pancreatology. 2013 Jan 1;13(1):18-28.
https://doi.org/10.1016/j.pan.2012.11.310
PMid:23395565

14. Morinville VD, Barmada MM, Lowe ME. Increasing incidence of acute pancreatitis at an American pediatric tertiary care center: is greater awareness among physicians responsible? Pancreas. 2010 Jan ;39(1):5-8.
https://doi.org/10.1097/MPA.0b013e3181baac47
PMid:19752770

15. Forsmark CE. Management of chronic pancreatitis. Gastroenterology. 2013 Jun; 144(6):1282-91.
https://doi.org/10.1053/j.gastro.2013.02.008
PMid:23622138

16. Han Z, Margulies SL, Kurian D, Elliott MS. Vitamin D deficiencies in patients with disorders of the digestive system: Current knowledge and practical considerations. Practical Gastroenterology. 2016 Jul ;40(7):36-43.

17. Fayyaz Z, Cheema HA, Suleman H, Hashmi MA, Parkash A, Waheed N. Clinical presentation, etiology and complications of pancreatitis in children. Journal of Ayub Medical College Abbottabad. 2015 Sep;27(3):628-32.

18. Sikkens EC, Cahen DL, Koch AD, Braat H, Poley JW, Kuipers EJ, et al. The prevalence of fat-soluble vitamin deficiencies and decreased bone mass in patients with chronic pancreatitis. Pancreatology. 2013 May-Jun ;13(3):238-42.
https://doi.org/10.1016/j.pan.2013.02.008
PMid:23719594

19. Pezzilli R, D'Eril GV, Barassi A. Markers of bone metabolism in patients with chronic pancreatitis and pancreatic ductal adenocarcinoma. Medicine. 2015 Oct 1;94(42):1-6.
https://doi.org/10.1097/MD.0000000000001754
PMid:26496293 PMCid:PMC4620801

20. Duggan SN, Purcell C, Kilbane M, O'Keane M, McKenna M, Gaffney P, et al. An association between abnormal bone turnover, systemic inflammation, and osteoporosis in patients with chronic pancreatitis: a case-matched study. Official journal of the American College of Gastroenterology| ACG. 2015 Feb ;110(2):336-45.
https://doi.org/10.1038/ajg.2014.430
PMid:25623657

21. Mann ST, Stracke H, Lange U, Klör HU, Teichmann J. Alterations of bone mineral density and bone metabolism in patients with various grades of chronic pancreatitis. Metabolism. 2003 May 1;52(5):579-85.
https://doi.org/10.1053/meta.2003.50112
PMid:12759887