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STUDY THE SERUM VITAMIN D LEVELS IN PATIENTS OF CHRONIC KIDNEY DISEASE

Biochemistry

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ABSTRACT

INTRODUCTION: Chronic Kidney Disease (CKD) is defined as a disease characterized by alterations in either kidney structure or function or both for a minimum of 3 months duration. Chronic kidney disease (CKD) is a type of kidney disease in which there is gradual loss of kidney function over a period of months or years. Early on there are typically no symptoms. [1] Later, leg swelling, feeling tired, vomiting, loss of appetite, or confusion may develop.[1] Complications may include heart disease, high blood pressure, bone disease, or anemia. **AIM AND OBJECTIVES:** Study of Prevalence of hypovitaminosis D in patients of chronic kidney diseases. Search for commonest etiology of hypovitaminosis D in CKD. **MATERIAL AND METHOD:** A Cross-sectional study on 100 cases of newly diagnosed Chronic Kidney Disease patients and matched control subjects is undertaken to study the prevalence of Vitamin D deficiency in CKD population and correlation between their serum 25-OH-vitamin D level. 100 Patients who are newly diagnosed as CKD are selected after proper initial screening at Midnapore Medical College, Paschim Medinipur. **RESULT AND ANALYSIS:** Our study showed that in non-dialysis Syndrome the mean VitD (mean± s.d.) of patients was 25.6620 ± 8.5476. In dialysis the mean VitD (mean± s.d.) of patients was 10.9476 ± 2.6508. Difference of mean VitD in Dialysis vs Non-Dialysis was statistically significant (p<0.0001). In eGFR 1 (<15) the mean VitD (mean± s.d.) of patients was 11.1130 ± 2.9562. In eGFR2 (15-30) the mean VitD (mean± s.d.) of patients was 24.0750 ± 8.2995. In eGFR3 (31-45) the mean VitD (mean± s.d.) of patients was 26.8296 ± 7.3646. In eGFR4 (>45) the mean VitD (mean± s.d.) of patients was 36.3167 ± 4.9898. Difference of mean VitDin eGFR was statistically significant (p<0.0001). **SUMMARY AND CONCLUSION:** Vitamin-D deficiency more pronounced in advanced stages of CKD. Vitamin-D deficiency was most prevalent in female gender, younger age group and connective tissue disorder. Vitamin-D deficiency was more marked in hemodialysis patients compared to non-dialysis CKD patients.

KEYWORDS

Correlate Serum, Vitamin D And Chronic Kidney Disease

INTRODUCTION

Chronic Kidney Disease (CKD) is defined as a disease characterized by alterations in either kidney structure or function or both for a minimum of 3 months duration. Chronic kidney disease (CKD) is a type of kidney disease in which there is gradual loss of kidney function over a period of months or years. Early on there are typically no symptoms. [1] Later, leg swelling, feeling tired, vomiting, loss of appetite, or confusion may develop.[1] Complications may include heart disease, high blood pressure, bone disease, or anemia. [2] Vitamin D has been proven to modulate the immune system through the stimulation of expression of anti-microbial peptides (AMPs) are integral in defence mechanism. Several studies have shown that hypovitaminosis D to be associated with respiratory tract infections including TB .[3] Vitamin D has been shown to be important in maintaining B cell homeostasis therefore may be useful in the treatment of B cell-mediated autoimmune disorders.[4] Hypovitaminosis D is associated with an increased risk of cardiovascular disease as shown by the Framingham study. It increases the risk of myocardial infarction independent of diabetes, hypertension and dyslipidaemia and other known cardiovascular risk factors. Vitamin D is proven to prevent nephrosclerosis and retard CKD progression through its anti inflammatory and anti proliferative properties and inhibition of renin production. In patients with established CKD, treatment with calcitriol was associated with a trend towards a lower incidence of dialysis initiation and a decrease in overall mortality rates. Interestingly, vitamin D also has anti cancer properties by promoting cell differentiation and inhibiting cell proliferation and angiogenesis. Studies have shown patients with low levels of vitamin D to be associated with increased cancer incidence.[5]

Currently, Vitamin D status is categorized based on Endocrine society guidelines as deficiency, insufficiency, andsufficiency based on serum 25-OH Vitamin D levels below20 ng/ml (50 nmol/L), 21–29 ng/ml (52.5–72.5 nmol/L), and30–100 ng/ml (75–250 nmol/L), respectively. With these definitions, it has been estimated that one billion people worldwide have either vitamin D deficiency or insufficiency.[6] It was reported that among 15,390 adults in the United State, half had vitamin D deficiency.[7]

a) Study of Prevalence of hypovitaminosis D in patients of chronic kidney diseases.
b) Search for commonest etiology of hypovitaminosis D in CKD.
c) Search for commonest age group involved with hypovitaminosis D in CKD.

MATERIAL AND METHOD

a) Study Design:

A Cross-sectional study on 100 cases of newly diagnosed Chronic Kidney Disease patients and matched control subjects is undertaken to study the prevalence of Vitamin D deficiency in CKD population and correlation between their serum 25-OH-vitamin D level at Midnapore Medical College, Paschim Medinipur.

b) Sample size:

100 Patients who are newly diagnosed as CKD are selected after proper initial screening.

c) Inclusion criteria:

1. Patient should be eighteen years or older.
2. eGFR value <50ml/min/1.73m2

d) Exclusion criteria:

1. Patients who were on medications known to affect vitamin D absorption metabolism such as anticonvulsants, isoniazid, rifampicin, theophylline, glucocorticoids.
2. Taking vitamin D supplements
3. eGFR>50ml/min/1.73m2

RESULT AND ANALYSIS

Our study showed that in age ≤40, the mean VitD (mean± s.d.) of patients was 16.4750 ± 10.0414. In age 41-50, the mean VitD (mean± s.d.) of patients was 19.0571 ± 10.1468. In age 51-60, the mean VitD (mean± s.d.) of patients was 21.9839 ± 9.7920. In age 61-70, the mean VitD (mean± s.d.) of patients was 23.8400 ± 7.0447. In age 71-80, the mean VitD (mean± s.d.) of patients was 25.1333 ± 12.1578. Difference

of mean VitD vs. age was not statistically significant (p=0.2463). In female, the mean VitD (mean± s.d.) of patients was 20.2682 ± 9.7235. In male, the mean VitD (mean± s.d.) of patients was 24.3821 ± 9.4856. Difference of mean VitD vs. sex was statistically significant (p=0.0357). In non-hypertensive, the mean VitD (mean± s.d.) of patients was 23.4688 ± 8.3359. In hypertensive, the mean VitD (mean± s.d.) of patients was 21.7442 ± 10.9286. Difference of mean VitD vs. HTN was not statistically significant (p=0.3801).

We found that in non-diabetic, the mean VitD (mean± s.d.) of patients was 22.8273 ± 10.8883. In diabetic, the mean VitD (mean± s.d.) of patients was 22.3714 ± 8.8710. Difference of mean VitD vs. DM was not statistically significant (p=0.8180). In Scleroderma the mean VitD (mean± s.d.) of patients was 11.0000 ± .0000. In SLE the mean VitD (mean± s.d.) of patients was 13.8333 ± 3.2934. Difference of mean VitD vs. CTD was statistically significant (p=0.0338). In Prostatomegaly the mean VitD (mean± s.d.) of patients was 24.0750 ± 13.5091. In PUJ Obstruction the mean VitD (mean± s.d.) of patients was 9.5000 ± .0000. In PUJ Obstructn the mean VitD (mean± s.d.) of patients was 13.7000 ± .0000. Difference of mean VitD vs. Obstructn was not statistically significant (p=0.4383).

We showed that in Alport Syndrome the mean VitD (mean± s.d.) of patients was 29.7000 ± .0000. In CTD the mean VitD (mean± s.d.) of patients was 13.4286 ± 3.1915. In DM the mean VitD (mean± s.d.) of patients was 24.2950 ± 8.3662. In HTN the mean VitD (mean± s.d.) of patients was 25.9179 ± 10.6171. In HTN+DM the mean VitD (mean± s.d.) of patients was 18.1000 ± 8.4983. In Obstruction the mean VitD (mean± s.d.) of patients was 18.2778 ± 11.4650. Difference of mean VitD vs. Etiology was statistically significant (p=0.0046). In Alport Syndrome the mean VitD (mean± s.d.) of patients was 29.7000 ± .0000. In B/L Renal Art stenosis the mean VitD (mean± s.d.) of patients was 9.5000 ± .0000. In Polycystic Kidney Ds the mean VitD (mean± s.d.) of patients was 17.7500 ± 13.9300. Difference of mean VitD vs. others was statistically significant (p=0.4218).

Our study showed that in non-dialysis Syndrome the mean VitD (mean± s.d.) of patients was 25.6620 ± 8.5476. In dialysis the mean VitD (mean± s.d.) of patients was 10.9476 ± 2.6508. Difference of mean VitDin Dialysisvs Non-Dialysis was statistically significant (p<0.0001). In eGFR 1 (<15)the mean VitD (mean± s.d.) of patients was 11.1130 ± 2.9562. In eGFR2 (15-30) the mean VitD (mean± s.d.) of patients was 24.0750 ± 8.2995. In eGFR3 (31-45) the mean VitD (mean± s.d.) of patients was 26.8296 ± 7.3646. In eGFR4 (>45) the mean VitD (mean± s.d.) of patients was 36.3167 ± 4.9898. Difference of mean VitDin eGFR was statistically significant (p<0.0001).

DISCUSSION

This is a cross sectional, observational study of 100 cases of newly diagnosed Chronic Kidney Disease patients is admitted in Department of Medicine, at Midnapore Medical College, Paschim Medinipur, during the period of January 2017-June 2018.

Arulanantham R et al [8] found that age group comparison of the vitamin D levels among the study population had shown that as the age increases the mean level of vitamin D decreases and the difference was found to be statistically significant (p=0.037). The prevalence of vitamin D deficiency was more in the older age group than that of the younger age group patients of CRF.

We found that in age ≤40, the mean VitD (mean± s.d.) of patients was 16.4750 ± 10.0414. In age 41-50, the mean VitD (mean± s.d.) of patients was 19.0571 ± 10.1468. In age 51-60, the mean VitD (mean± s.d.) of patients was 21.9839 ± 9.7920. In age 61-70, the mean VitD (mean± s.d.) of patients was 23.8400 ± 7.0447. In age 71-80, the mean VitD (mean± s.d.) of patients was 25.1333 ± 12.1578. Difference of mean VitD vs. age was statistically significant (p=0.2463).

In female, the mean VitD (mean± s.d.) of patients was 20.2682 ± 9.7235. In male, the mean VitD (mean± s.d.) of patients was 24.3821 ± 9.4856. Difference of mean VitD vs. sex was statistically significant (p=0.0357).

Arulanantham R et al [8] found that the mean levels of vitamin D was much lower in patients with diabetes and hypertension when compared to patients without diabetes and hypertension and the difference was found to be statistically significant (p=0.003). They also found that 54.5% of the study subjects without diabetes or hypertension had normal serum vitamin D levels, whereas only 3.7% and 5.8% of diabetes and hypertension patients with CRF had normal levels of vitamin D and among the patients having both diabetes and hypertension none of the patients had normal vitamin D levels, the prevalence of vitamin D deficiency was maximum in that group (91.1%).

We found that in non-hypertensive, the mean VitD (mean± s.d.) of patients was 23.4688 ± 8.3359. In hypertensive, the mean VitD (mean± s.d.) of patients was 21.7442 ± 10.9286. Difference of mean VitD vs. HTN was not statistically significant (p=0.3801).We found that in non-diabetic, the mean VitD (mean± s.d.) of patients was 22.8273 ± 10.8883. In diabetic, the mean VitD (mean± s.d.) of patients was 22.3714 ± 8.8710. Difference of mean VitD vs. DM was not statistically significant (p=0.8180).

In Scleroderma the mean VitD (mean± s.d.) of patients was 11.0000 ± .0000. In SLE the mean VitD (mean± s.d.) of patients was 13.8333 ± 3.2934. Difference of mean VitD vs. CTD was statistically significant (p=0.0338).

In Prostatomegaly the mean VitD (mean± s.d.) of patients was 24.0750 ± 13.5091. In PUJ Obstruction the mean VitD (mean± s.d.) of patients was 9.5000 ± .0000. In PUJ Obstruction the mean VitD (mean± s.d.) of patients was 13.7000 ± .0000. Difference of mean VitD vs. Obstructn was not statistically significant (p=0.4383). We found that in Alport Syndrome the mean VitD (mean± s.d.) of patients was 29.7000 ± .0000. In CTD the mean VitD (mean± s.d.) of patients was 13.4286 ± 3.1915. In DM the mean VitD (mean± s.d.) of patients was 24.2950 ± 8.3662. In HTN the mean VitD (mean± s.d.) of patients was 25.9179 ± 10.6171. In HTN+DM the mean VitD (mean± s.d.) of patients was 18.1000 ± 8.4983. In Obstruction the mean VitD (mean± s.d.) of patients was 18.2778 ± 11.4650. Difference of mean VitD vs. Etiology was statistically significant (p=0.0046). In Alport Syndrome the mean VitD (mean± s.d.) of patients was 29.7000 ± .0000. In B/L Renal Art stenosis the mean VitD (mean± s.d.) of patients was 9.5000 ± .0000. In Polycystic Kidney Ds the mean VitD (mean± s.d.) of patients was 17.7500 ± 13.9300. Difference of mean VitD vs. others was statistically significant (p=0.4218). In non-dialysis Syndrome the mean VitD (mean± s.d.) of patients was 25.6620 ± 8.5476. In dialysis the mean VitD (mean± s.d.) of patients was 10.9476 ± 2.6508. Difference of mean VitDin Dialysis vs Non-Dialysis was statistically significant (p<0.0001).

Arulanantham R et al [8] found that the prevalence of vitamin D deficiency was much higher in stage IV (87.8%) and stage V (92.8%) CRF when compared to stage II and stage III CRF (table 4). So, as the severity of CRF increases the prevalence of vitamin D deficiency increases.

We found that in eGFR 1 (<15)the mean VitD (mean± s.d.) of patients was 11.1130 ± 2.9562. In eGFR2 (15-30) the mean VitD (mean± s.d.) of patients was 24.0750 ± 8.2995. In eGFR3 (31-45) the mean VitD (mean± s.d.) of patients was 26.8296 ± 7.3646. In eGFR4 (>45) the mean VitD (mean± s.d.) of patients was 36.3167 ± 4.9898. Difference of mean VitDin Dialysisvs Non-Dialysis was statistically significant (p<0.0001). The Positive correlation was found age vs vitamin-D level and that was statistically significant. The negative correlation was found urea and Creatinine with vitamin-D level and that was statistically significant. The positive correlation was found sodium vs vitamin-D level and that was statistically significant. The negative correlation was found potassium vs vitamin-D level and that was statistically significant. The positive correlation was found calcium vs vitamin-D level and that was statistically significant. The negative correlation was found phosphate vs vitamin-D level and that was statistically significant. The positive correlation was found eGFRvs vitamin-D level and that was statistically significant.

CONCLUSION

Both deficiency and insufficiency was higher in CKD group compared to control and that also statistically significant.

Vitamin-D deficiency more pronounced in advanced stages of CKD.

Vitamin-D deficiency was most prevalent in female gender, younger age group and connective tissue disorder. Vitamin-D deficiency was more marked in hemodialysis patients compared to non-dialysis CKD patients.

Table: Distribution of mean VitD vs. HTN, DM, CTD AND Obstructn

		Number	Mean	SD	Minimum	Maximum	Median	p.value
VitD vs. HTN	NO	48	23.4688	8.3359	8.1000	41.8000	24.8500	0.3801
	YES	52	21.7442	10.9286	7.7000	57.1000	21.7000	
VitD vs. DM	NO	44	22.8273	10.8883	7.9000	57.1000	23.8000	0.8180
	YES	56	22.3714	8.8710	7.7000	41.8000	24.2000	
VitD vs. CTD	N	93	23.2602	9.7473	7.7000	57.1000	24.8000	
	Scleroderma	1	11.0000	.0000	11.0000	11.0000	11.0000	0.0338
	SLE	6	13.8333	3.2934	9.9000	18.8000	13.1500	
VitD vs. Obstructn	N	94	22.7415	9.6288	7.7000	57.1000	24.5000	0.4383
	Prostatomegaly	4	24.0750	13.5091	9.5000	42.1000	22.3500	
	PUJ Obstruction	1	9.5000	.0000	9.5000	9.5000	9.5000	
	PUJ Obstructn	1	13.7000	.0000	13.7000	13.7000	13.7000	
Vit D	1 (<15)	23	11.1130	2.9562	7.8000	18.8000	10.2000	<0.0001
	2 (15-30)	44	24.0750	8.2995	7.9000	57.1000	24.2000	
	3 (31-45)	27	26.8296	7.3646	7.7000	41.8000	27.8000	
	4 (>45)	6	36.3167	4.9898	29.8000	42.5000	35.5000	

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