

Research Article

Study of Vitamin D Level in Pre-dialysis Chronic Kidney Disease (CKD) Patients

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ABSTRACT

Chronic Kidney Disease (CKD) is emerging as one of the most powerful predictors of premature cardiovascular disease. It has been reported that progression of CKD and many of the cardiovascular complication is linked to vitamin D. The study group consisted of 50 predialysis CKD patients and 50 age and sex matched healthy control. The serum 25-OH Vitamin D, Calcium, phosphorous, urea, creatinine, plasma glucose were estimated by standard enzymatic method and eGFR by calculated method. Vitamin D and eGFR were found to be significantly decreased in pre-dialysis CKD patients whereas other biochemical parameters were significantly increased in pre-dialysis patients when compared to healthy control. A positive correlation between vitamin D and eGFR were observed. Therefore the study of the vitamin D level in CKD patients when detected early can halt the growing epidemic of the deficiency particularly in high risk patient.

Key words: Chronic Kidney Disease (CKD), Glomerular Filtration Rate (GFR), 25-OH Vitamin D

INTRODUCTION

Chronic Kidney Disease (CKD) is a common disease associated with increased mortality. CKD is defined as dysfunction of kidney lasting longer than 3 months with or without reduced Glomerular Filtration Rate (GFR). Vitamin D undergoes sequential hydroxylation through the liver and kidney to reach its final active form 1,25-(OH)₂ vitamin D¹. The kidney is the only site of 1^α-hydroxylation catalyzed by 1^α-hydroxylase. In the human body the storage form is 25-(OH) D is the predominant circulating form of vitamin D in the blood and it is considered to be the most reliable index of vitamin D status². It has been reported that the progression of CKD and many of the cardiovascular disease (CVD) complication is linked to vitamin D. Thus the present study aims to determine the Vitamin D level in pre-dialysis CKD patients.

MATERIALS AND METHODS

The study consisted of 50 predialysis CKD patients attending the Nephrology unit of SRM hospital and 50 age and sex matched healthy controls. Venous blood drawn from the subjects following 12-14 hours fasting. Serum 25-OH vitamin D estimated by ELISA method. Serum urea, creatinine, calcium, phosphorus, and plasma glucose were measured by Beckman Coulter auto analyser using enzymatic kits and eGFR calculated by using CKD-EPI formula. The study was approved by the institutional ethical committee. An informed consent was taken from all the participants.

STATISTICAL ANALYSIS

Statistical analysis was performed by unpaired t-test. All values presented are two tailed and probability values < 0.05 were considered to be statistically significant. The correlation was performed by using Pearson's correlation analysis.

RESULTS

Table 1 shows the comparison of biochemical parameters between pre-dialysis CKD patients and control. The serum urea and creatinine levels were significantly increased ($p < 0.001$) in pre-dialysis CKD patients when compared to control. Whereas the levels of Vitamin D, calcium, phosphorus, eGFR were found to be significantly decreased ($p < 0.001$) in pre-dialysis CKD patients than controls. Serum Vitamin D showed significant positive correlation with eGFR ($r = 0.158$ respectively) in pre-dialysis CKD patients.

DISCUSSION

Vitamin D deficiency has been linked to increased prevalence of hypertension, metabolic syndrome, insulin resistance, CVD and albuminuria. Serum 25(OH) D is regarded as the best indicator of vitamin D status in individual without kidney disease, because it is the substrate for the renal and non-renal production of calcium and also regulates the synthesis and secretion of parathyroid hormone³.

In our study the vitamin D levels were significantly reduced in predialysis patients compared to control. Low circulating 25(OH) D concentration predicts increased risk in CKD patients is reported in large cohort studies⁴. Vitamin D plays a important role in infection associated

Table 1: Comparison of biochemical parameters in pre-dialysis CKD patient and in controls

Parameters	Control (n=50) Mean±SD	Pre-dialysis CKD patients (n=50) Mean±SD	p-value
Urea (mg/dl)	32 ± 5.7	83 ± 27	<0.001**
Creatinine (mg/dl)	0.7 ± 0.4	2.2 ± 0.5	<0.001**
Calcium (mg/dl)	9.8 ± 1.5	7.9 ± 1.2	<0.001**
Phosphorus (mg/dl)	3.8 ± 0.6	7.2 ± 0.8	<0.001**
Vitamin D (ng/dl)	34.9 ± 4.3	12.9 ± 12	<0.001**
eGFR (ml/min)	102 ± 12	32 ± 8.7	<0.001**

Data are expressed as Mean±SD. p value <0.05 is considered as significant.

(* p<0.05; ** p<0.01)

morbidity and mortality which is significantly greater among patients with CKD. Higher rate of infection associated mortality has been linked to severe vitamin D deficiency particularly in ESRD⁵. The levels of eGFR were significantly decreased in predialysis patients compared to controls. Low eGFR is strongly associated with lower circulating levels of 25(OH) D concentration in CKD population⁶. Increased tubular secretion of creatinine is seen in patients with renal dysfunction. The decreased calcium and increased phosphorus level is associated with higher PTH levels⁷. Vitamin D deficiency progresses the parathyroid gland are maximally stimulated causing secondary hyperparathyroidism without adequate calcium phosphorous formation and thereby diminishes the mineralization of collagen matrix⁸. The reason for marked 25(OH) D deficiency in early CKD is multifactorial which may be due to nutritional deficiency as well as increased loss of vitamin D binding protein as a result of proteinuria commonly seen in CKD patients⁹.

CONCLUSION

The study of vitamin D status in pre-dialysis CKD patients will help to halt the growing epidemic of vitamin D deficiency particularly in highly susceptible CKD population.

Conflict of Interest: None

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