

ORIGINAL RESEARCH

Study of Analysis of Risk factors of vitamin D insufficiency disease in CKD Patients at a Tertiary Care Hospital

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ABSTRACT

Background: The present study was undertaken for evaluating the risk factors for vitamin D insufficiency disease in CKD.

Materials & Methods: A total of 100 CKD subjects who had 2 estimated glomerular filtration rate (eGFR) values <60 mL/min/1.73 m² were enrolled. Blood samples were obtained and Serum 25(OH)D levels were measured by radioimmunoassay. All the patients were categorized as vitamin D deficient and vitamin D adequate. Risk factors of vitamin D insufficiency were evaluated. All the results obtained were subjected to statistical analysis using SPSS software.

Results: A total of 100 subjects were analyzed. Mean vitamin D levels were found to be 12.9 ng/ml. Out of 100 CKD subjects, 29 percent of the subjects were diabetic. Significantly lower levels of CKD were seen among subjects with higher severity of CKD. Dyslipidemia and presence of diabetes were found to be significant risk factors associated with vitamin D insufficiency in CKD patients.

Conclusion: There is significant prevalence of vitamin D insufficiency among CKD patients. Higher prevalence of vitamin D insufficiency was also found to be associated with increasing severity of CKD.

Key words: Vitamin D, Chronic kidney disease

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INTRODUCTION

Chronic kidney disease (CKD) is defined as the presence of kidney damage or an estimated glomerular filtration rate (eGFR) less than 60 ml/min/1.73 m², persisting for 3 months or more, irrespective of the cause.¹ Among individuals diagnosed as having CKD, staging and new risk assessment tools that incorporate GFR and albuminuria can help guide treatment, monitoring, and referral strategies.² The diagnosis of CKD is made by laboratory testing, most often by estimating glomerular filtration rate (GFR) from a filtration marker, such as serum creatinine or cystatin C, using various formulas, or by testing urine for the presence of albumin or protein (or a combination of these).³

In the Western world, the main risk factor for CKD development is diabetes, which is present in 30%–

50% of CKD patients. Instead, in India, Asia, and Sub-Saharan Africa, the leading cause of CKD is glomerulonephritis, followed by CKD of unknown genesis, probably prompted by soil pollution with heavy metals and pesticides and excessive use of herbal-based traditional medicines.^{4, 5} Emerging evidence suggests that the progression of CKD and many of the cardiovascular complications may be linked to hypovitaminosis D. Patients with CKD have an exceptionally high rate of severe vitamin D deficiency that is further exacerbated by the reduced ability to convert 25-(OH)vitamin D into the active form, 1,25 dihydroxy-vitamin D.⁶ Hence; under the light of above-mentioned data, the present study was undertaken for evaluating the risk factors for vitamin D insufficiency disease in CKD.

MATERIALS & METHODS

The present study was undertaken for evaluating the risk factors for vitamin D insufficiency disease in CKD. A total of 100 CKD subjects who had 2 estimated glomerular filtration rate (eGFR) values <60 mL/min/1.73 m² were enrolled. Complete demographic and clinical details of all the patients was recorded. Various hemodynamic and biochemical variables were evaluated. Weight, height and BMI was also calculated. Blood samples were obtained and Serum 25(OH)D levels were measured by radioimmunoassay. All the patients were categorized as vitamin D deficient and vitamin D adequate. Risk factors of vitamin D insufficiency were evaluated. All the results obtained were subjected to statistical analysis using SPSS software. Univariate analysis, chi-square test and

student t test were used for evaluation of level of significance. P-value of less than 0.05 was taken as significant.

RESULTS

A total of 100 subjects were analyzed. Mean age of the subjects was 62.3 years. Among them, 66 percent of the patients were males while the remaining were females. Mean vitamin D levels were found to be 12.9 ng/ml. Out of 100 CKD subjects, 29 percent of the subjects were diabetic. Significantly lower levels of CKD were seen among subjects with higher severity of CKD. Dyslipidemia and presence of diabetes were found to be significant risk factors associated with vitamin D insufficiency in CKD patients.

Table 1: Demographic and biochemical variables

Variable	Number (Mean)	Percentage (SD)
Age (years)	62.3	15.7
Males	66	66
Females	34	34
25(OH)D (ng/ml)	12.9	4.7
Total cholesterol (mg/dL)	188.3	35.4
HDL (mg/dL)	58.4	12.6
LDL (mg/dL)	105.7	28.1
Blood glucose (mg/dL)	99.6	25.8
Diabetic	29	29

Table 2: Correlation of vitamin D levels with CKD staging

CKD staging	Mean (ng/ml)	p-value
Stage 3	14.9	0.001 (Significant)
Stage 4	13.3	
Stage 4	11.2	

Table 3: Risk factors of Vitamin D insufficiency

Risk factors	Vitamin D insufficient (<15 ng/ml) (n=55)	Vitamin D sufficient (>15 ng/ml) (n=45)	p-value
Mean age (years)	63.5	61.7	0.75
Total cholesterol (mg/dL)	218.3	170.9	0.042 (Significant)
HDL (mg/dL)	53.6	60.7	0.22
LDL (mg/dL)	101.7	112.3	0.93
Blood glucose (mg/dL)	100.3	98.3	0.61
Diabetic	20	9	0.012 (Significant)

DISCUSSION

Chronic kidney disease is a progressive disease with no cure and high morbidity and mortality that occurs commonly in the general adult population, especially in people with diabetes and hypertension. Preservation of kidney function can improve outcomes and can be achieved through non-pharmacological strategies and chronic kidney disease-targeted and kidney disease-specific pharmacological interventions.^{7, 8} The true incidence and prevalence of CKD are difficult to

determine because of the asymptomatic nature of early to moderate CKD. The prevalence of CKD is around 10% to 14% in the general population. Similarly, albuminuria (microalbuminuria or A2) and GFR less than 60 ml/min/1.73 m² have a prevalence of 7% and 3% to 5%, respectively. Worldwide, CKD accounted for 2,968,600 (1%) of disability-adjusted life-years and 2,546,700 (1% to 3%) of life-years lost in 2012.^{9, 10} Renal osteodystrophy is the spectrum of histological changes, which occur in bone architecture of patients

with CKD. The kidney is the primary site for phosphate excretion and 1- α -hydroxylation of vitamin D. CKD patients develop hyperphosphatemia as a result of inadequate 1, 25 dihydroxy-vitamin D levels that reflect reduced synthesis from parenchymal scarring.^{11, 12} Hence; the present study was undertaken for evaluating the risk factors for vitamin D insufficiency disease in CKD.

In the present study, mean vitamin D levels were found to be 12.9 ng/ml. Out of 100 CKD subjects, 29 percent of the subjects were diabetic. Significantly lower levels of CKD were seen among subjects with higher severity of CKD. Dyslipidemia and presence of diabetes were found to be significant risk factors associated with vitamin D insufficiency in CKD patients. Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a similar study conducted by Echida Y et al, authors identified the risk factors for vitamin D deficiency in predialyzed patients with chronic kidney disease (CKD). The 25(OH)D-deficient group had a higher body mass index, and had more diabetic patients. The multivariate analysis revealed that body mass index, the presence of diabetes, lower hemoglobin concentration, higher serum levels of non-HDL cholesterol and triglyceride were the factors associated with low 25(OH)D levels.¹³ In normal individuals, hyperparathyroidism develops as a compensatory response to 25(OH)D deficiency. Several studies have found a high incidence of vitamin D deficiency in patients with CKD in the range in which resultant secondary hyperparathyroidism is expected to occur. Vitamin D deficiency had been thought to be uncommon because of the widespread supplementation of food products; however, over the past few years, studies have uncovered a high incidence of vitamin D deficiency across the globe.¹⁴⁻¹⁶

Our findings complement recent observations suggesting that vitamin D deficiency is strongly associated with greater stages of CKD among adult participants. Among 14,679 US adult participants in the Third National Health and Nutrition Examination Survey (NHANES III), mean serum 25-hydroxyvitamin D level was lower in patients with stage 4-5 CKD compared with those with normal kidney function.¹⁷ Similarly, another study measured serum 25-hydroxyvitamin D levels in patients with CKD. The overall mean serum level of 25-hydroxyvitamin D was 19 \pm 14 ng/mL and only 29% of the 65 patients with stage 3 CKD and only 17% of 113 patients with stage 4 CKD had vitamin D insufficiency and deficiency.¹⁸ It is well known that vitamin D deficiency is a more prevalent and severe issue in patients with CKD, and in particular in those on dialysis, than in the general population. Both experimental and clinical studies have demonstrated that 25(OH)D is a suppressor of renin

biosynthesis, and that vitamin D deficiency can be the risk factor for CKD progression. Also, several studies have argued that vitamin D deficiency is a significant predictor for mortality in subjects with CKD.¹⁹⁻²¹

CONCLUSION

There is significant prevalence of vitamin D insufficiency among CKD patients. Higher prevalence of vitamin D insufficiency was also found to be associated with increasing severity of CKD.

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