PREVALENCE OF VITAMIN D DEFICIENCY AMONG PATIENTS WITH NEWLY DIAGNOSED CHRONIC KIDNEY DISEASE

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ABSTRACT

Objective: To determine the prevalence of vitamin D deficiency among patient with newly diagnosed chronic kidney disease

Methods: It was a descriptive cross-sectional study with consecutive sampling carried out at the division of nephrology lady Reading Hospital Peshawar from July 2019 to December 2019. We measured vitamin D levels in 152 patients with newly diagnosed chronic kidney disease.

Results: A total of 152 patients were included in this study. Out of these 85(56%) were male while 67(44%) were female. Mean age was 34 + 12.86 yrs. Duration of CKD was <1y in 109(72%) of patients while 43(28%) had a duration of CKD > 1yr with a mean duration of 1 + 8.42ys and mean weight of 75 + 12.33kgs. Vitamin D deficiency was present in 80% of the patients with newly diagnosed CKD.

Conclusions: Our study shows that the incidence of vitamin D deficiency was 80% among patients with newly diagnosed chronic kidney disease.

Keywords: Vitamin D deficiency, newly diagnosed chronic kidney disease

Introduction

Vitamin D is a secosteroid with cytosol binding sites [1]. Human genome is regulated by nearly up to 3% by vitamin D hormone and was possessing a pillar stem role in metabolism of calcium and phosphorus since long. More recently, numerous events in human population are tied with its deficiency including falls, broken bones, raised blood sugars, immune, cardiovascular and kidney diseases, as well as with tuberculosis, depressive illness, neurological diseases and different cancers [2]

The adverse effects of vitamin D deficiency are more highlighted during the past decade as it ill effects on several more organ systems in human being came to surface [3]. Vitamin D deficiency is far more prominent in older populations as more than 50% of this age group is vitamin D deficient according to the Nutritional Guidelines consensus estimates [4]. Not only older population are thought to be vitamin D deficient but younger people are also affected in higher proportions even in countries with good amount of sun exposure [5].

Renal functions have an important role to play in maintaining of normal vitamin D levels. It is important for human being to carry out its physiological activities.

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Compared to people with normal Glomerular filtration rate (GFR), low GFR had a 32% higher risk for vitamin D deficiency [6]. Indeed, the prevalence of vitamin D deficiency/insufficiency is high among patients with CKD, especially patients with end-stage renal disease (ESRD) and kidney transplant (KT) recipients [7]. In one study, higher percentage of patient with CKD were vitamin D deficient. In the aforementioned study, 42% patients with low GFR had insufficiency, 41% had vitamin D deficiency.[8] and in hemodialysis (HD) patient the percentage of deficiency is much higher than any group of patients among general population and is recorded at 76-94% [9].

Low levels of vitamin D has increased bone resorption, secondary increase in parathyroid hormone and decreased bone mineral component composition [10], muscle weakness [11], tendencies to falls [12], metabolic abnormalities and increased body mass index [13] in CKD and in patients on HD. Peritoneal dialysis (PD) population with low vitamin D levels have shown to have memory impairments and rapid decline in renal functions in KT recipients. Vitamin D deficiency has a decrease in insulin efficacy, increased in cardiac chamber size, prothrombotic process [14] and calcium deposition in arteries.[15]. Ravani et al. mentioned that vitamin D levels <15 ng/mL have increased deaths and higher rates of renal dysfunction in pre-dialysis CKD patients [16]. Along with the progression of decline in renal function, CKD patients show resistance to vitamin D replacement as well [17].

Material and Method

It is a descriptive cross-sectional study with consecutive sampling carried out at the division of nephrology lady Reading Hospital Peshawar from July 2019 to December 2019. During this study a total of 152 patients were observed.

After Informed consent from the patients and approval from the institutional ethical board, biodata of the patients who presented to the division of nephrology and diagnosed as CKD for the first time were included in this study. While patients with diabetes, chronic liver disease, malignancy, osteomalaecia, childhood rickets or having history of Tuberculosis were excluded from this study,

Data was recorded on a proforma after the informed consent. Each Patient was classified into a stage of CKD at the time of data collection. Each patient was taken to sample collection room, sample collection area was selected (arm vein), cleaned properly with spirit swab and a 10cc of blood collected and immediately taken to the laboratory for measuring he vitamin D levels. Weight, age, gender and serum creatinine values were used to measure the estimated GFR by using Cockcroft gault formula.
Data was acquired through clinical history, physical examination and relevant investigations. All information was recorded on a pre-designed structured proforma. Descriptive statistical analysis (frequency, percentage, ratio, range and mean/SD) was employed for variables of interest. Data storage, processing and analysis done utilizing SPSS version 21.0. Data presented in the form of graphs and tables.

Results

A total of 152 patients were studied. Out of these 85(56%) were male while 67(44%) were female. Mean age was 34 ± 12.86 yrs. Duration of CKD was <1y in 109(72%) of patients while 43(28%) had a duration of CKD > 1yr with a mean duration of 1 ± 8.42ys and mean weight of 75 ± 12.33kgs (Table. 1). Patients were also analyzed according to the stage of CKD (Figure 1).

Serum vitamin D level among 152 patients was analyzed as 122(80%) patients had a level ≤20ng/ml while 30(20%) patients had a level >20ng/ml. Mean serum vitamin D level was 30ng/ml with standard deviation ± 8.71. Stratification of vitamin D deficiency with respect to age, weight, gender, duration and stage of CKD is given in table no 2.

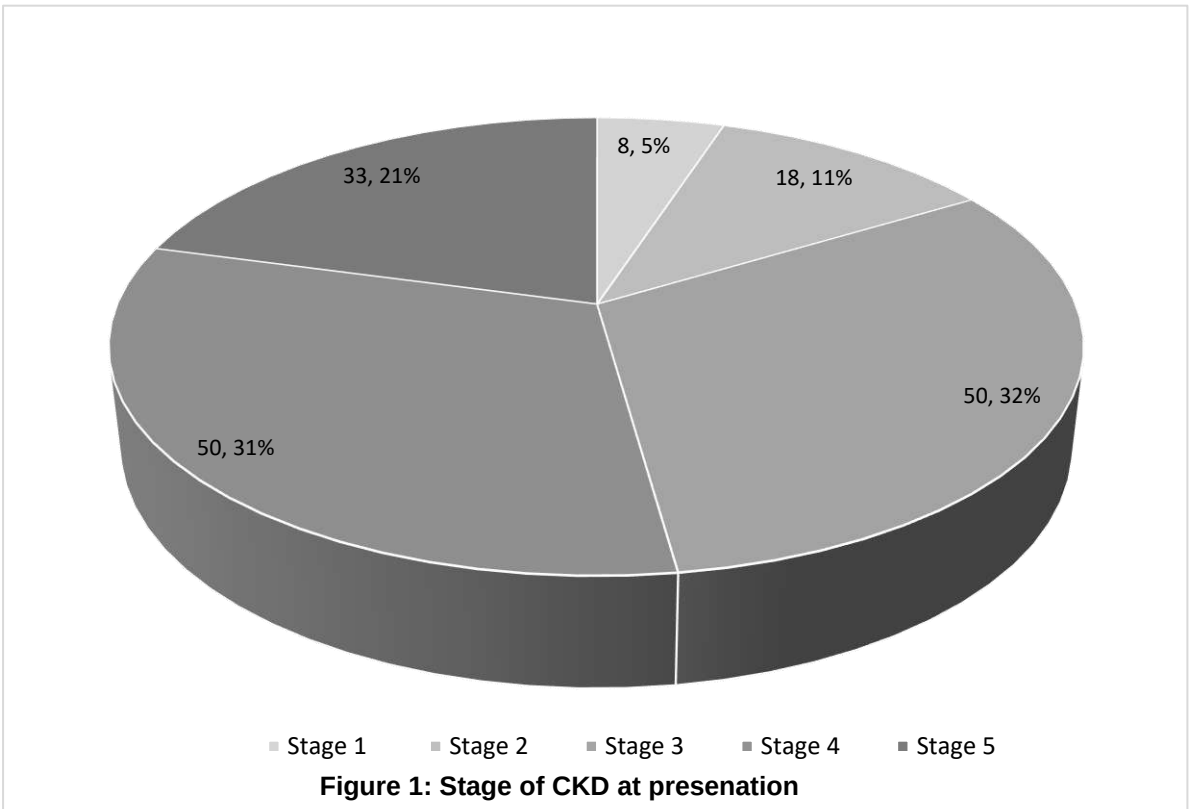

Figure 1: Stage of CKD at presenation

Table 1: Demographic Parameters of the studied population. n = 152

		Number	Percentage
Gender	Male	85	56
	Female	67	44
Age	18-30	30	20
	31-60	99	65
	>60	23	15
Weight	<75	117	77
	>75	35	28
Duration of CKD	< 1 Yr	109	72
	>1 Year	43	28

Table 2: Vitamin D Deficiency. N=152

		Yes (<20ng/ml)	No (>20ng/ml)	Total N=152
Age	18-30 Yr	24	6	30
	31-60 Yr	79	20	99
	>60 Yr	19	4	23
Gender	Male	68	17	85
	Female	54	13	67
Duration of CKD	<1Yr	88	21	109
	>1Yr	34	09	43
Weight	<75 Kg	94	23	117
	>75 Kg	28	7	35
Stages of CKD	Stage 1	6	2	8
	Stage 2	15	3	18
	Stage 3	40	10	50
	Stage 4	34	09	43
	Stage 5	27	06	33

Discussion

General population is at risk of VDD. It is a vital health related issue and its prevalence is 20-100% worldwide [18, 19]. Some population groups may be at a higher risk in comparison to others as people with increasing age group, at higher altitude, darker skin, obese and patients having compromise renal functions [20].

It is clear from the literature by now that CKD population is at increased risk of VDD [21]. Although some studies show worrying reports as Gonzalez et al, that 97% HD population have decreased levels of vitamin D [22]. While other studies may show reports which are in consistence with most of the international studies. In a cross-sectional study where patients from 1056 dialysis units across the United States (US) by Bhan et al, showed that 79% and 57% out of 908 HD patients had vitamin D levels <30 and <20 ng/mL, respectively [23]. Furthermore, when studies looked at the different stages of CKD and levels of vitamin D from 12 regions of the US, the prevalence of VDD among patients with stage 3 and stage 4 CKD (not yet on HD) have different reports in comparison with the above-mentioned studies i.e only 29% and 17% of patients respectively with stage 3 and stage 4 CKD had sufficient levels [24]. All stages of CKD have low levels of vitamin D, its levels particularly start to decrease in individuals with CKD stage 2 [25].

Among the Asian countries Thailand clearly demonstrated that vitamin D insufficiency and deficiency are more common especially in advanced stages of CKD. The prevalence of deficiency/insufficiency increased from CKD stage 3a, 3b, 4 to 5 (66.6%, 70.9%, 74.6%, and 84.7% ($p<0.001$)). The chance of developing ESRD in patients with vitamin D insufficiency, level <30ng/ml and deficiency, level <10ng/ml, are 2.19 (95% CI 1.07 to 4.48) and 16.76 (95% CI 4.89 to 57.49), respectively, after adjustment for age, gender, hemoglobin levels, serum albumin, calcium, phosphate and alkaline phosphatase [26]. While a study from Pakistan also showed similar results as other Asian countries. Where among 150 patients with ESRD revealed more than 50% (mean serum

vitamin D levels were 18.6±13.6ng/ml) were Vitamin D deficient [27].

However, billions of people throughout the world are VDD or insufficient. Where CKD has been identified as an important risk factor for it. Indeed, patients with ESRD and KT are also more vulnerable than any other population group to vitamin D deficiency [7]. In a study from North China showed a high prevalence of vitamin D deficiency in CKD patients, and the deficiency is dependent on the levels of eGFR. Of the 207 patients, only 20.3% had blood levels > 15 ng/ml. The prevalence of its deficiency was significantly high in each group, from stage 1,2,3,4 and 5 of CKD (70.1%, 70.8%, 76.5%, 81.6%, 91.4%, $p < 0.001$). Decline in renal functions has dropping levels of vitamin D concentration [28].

In a study in Argentine from South American states, healthy populations and CKD patients were studied. Deficiency of vitamin D was detected in 12.5% of healthy controls and 32% of CKD patients ($p= 0.025$). Looking into stage wise percentage, 23% of patients in stage 2, 51% in stage 3, and 22% in stage 4 of CKD had vitamin D deficiency; the mean vitamin D level of dialysis patients was significantly lower than that of the rest of the stages. Among CKD patients, 32% had 25(OH)D deficiency, which reached 51% among those with stage 5 CKD (dialysis). Hypoalbuminemia, advanced CKD, and place of origin from the Northwest region of Argentina were some factors that predicted the VDD in advance [29].

Implications in the increased prevalence of vitamin D deficiency among CKD population may involve problems with calcium, phosphorus metabolism and in musculoskeletal health [30]. Several adverse effects have been surfaced during the past decade regarding the VDD on human organs. Many studies have demonstrated the association of increased mortality, cardiovascular, cancers, infectious diseases, increased sugars, immune disorders and kidney diseases [3].

Conclusions

Our study showed that the incidence of vitamin D deficiency was 80% among patients with newly diagnosed chronic kidney disease.

Declarations

Author's contributions

Dr Muhammad Ikram: study design, practical thinking, and over all supervision of the progress from the start to the end.

Dr Khursheed: Help in over-all study data compilation.

Dr Shad Muhammad: Practically looked for mistakes and gaps which made a practical work possible.

Dr Noor Muhammad: Follow up of the data collection

Dr Salma Ghulam: Data collection

Dr Zia Ud Din: Provided us ideas and work modification during all this process.

Conflict of interest

No conflict of interest

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