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RESEARCH ARTICLE

PREVALENCE OF VITAMIN D DEFICIENCY INPRE-DIALYTIC CHRONIC KIDNEY DISEASE PATIENTS ATTENDING A TERTIARY CENTRE IN NORTH-EAST INDIA

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Abstract

Introduction: Vitamin D deficiency has not only been associated with bone and muscular complications but also with cancer, cardiovascular diseases, infection, maternal and neonatal complications. There are many causes of vitamin D deficiency including socio-demographic factors, the timing of sun exposure, along with drugs, skin, liver, and kidney diseases. India is closer to the equator so is considered to have a lower risk of Vitamin D deficiency but it is not so, with many studies implicating deficiency even in the general population. There are no studies done on the north-eastern Indian population document on vitamin D levels in Chronic Kidney Disease (CKD) patients.

Aim: To study the prevalence of Vitamin D deficiency in the pre-dialytic chronic kidney disease.

Material and Methods: Observational study was done. 120 CKD patients were included in the study and staging was done according to the MDRD formula. Total 25-OH Vitamin D was measured by the Enzyme Immuno Assay method. Results: 43.33% of the patients in the group were found to have vitamin D deficiency and 26.66% of patients had vitamin D insufficiency. There was a significant association between vitamin D deficiency and stages 4 and 5 CKD. There was not any significant correlation between vitamin D levels with age, sex, body mass index, serum calcium, or albumin.

Conclusion: High levels of vitamin D deficiency were seen in the CKD patients of the northeast Indian population. There were statistically significant changes in vitamin D levels and stages 4 and 5 of CKD.

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Introduction:-

Vitamin D is an important element needed for the proper functioning of the body. Vitamin D is considered a hormone as it can be synthesized endogenously. The primary source is sunlight and dietary sources include cereals and dairy products along with egg and fish. Many factors affect vitamin D levels like age, gender, culture and behaviour, the timing of the day and skin exposure, season, skin, liver, and kidney factors affecting production, drugs, etc⁽¹⁾.

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Sunlight being the primary source of vitamin D and India is near to the equator, it is expected to have a lesser prevalence of vitamin D deficiency. But this is not so and there are many studies showing vitamin D in the general population⁽²⁾.

The kidney is the major organ required for active vitamin D synthesis as the second hydroxylation occurs in the kidney. So, any disorder leading to kidney dysfunction has a risk of causing vitamin D deficiency⁽³⁾. As thought previously, vitamin D is important not only for bone and muscle functions but also for cardiovascular function. Vitamin d deficiency has been seen to be associated with osteoporosis, osteopenia, and also with autoimmune diseases and cardiovascular diseases like hypertension, heart failure, coronary heart disease, etc.⁽⁴⁾

Cardiovascular diseases are the most common cause of mortality among CKD patients and vitamin D deficiency one of the causes responsible for increasing the risk along with other markers of Mineral Bone Disorders (MBD).

There are studies available on the vitamin D status of the Indian population but there are no studies on the vitamin D status in CKD patients of the Northeast Indian population.

Methods:-

The study was conducted in the Department of Medicine, Assam Medical College and Hospital over one year from June 2019 to May 2020, after obtaining ethical clearance from the Institutional Ethics(H) Committee.

It was an observational study that had a sample size of 120. The study group consisted of CKD stages 3,4 and 5 patients according to the Modification for Diet in Renal Disease (MDRD) formula. Written and informed consent was taken from the patients.

Inclusion criteria:

1. All stage 3,4 and 5 CKD patients (Based on MDRD formula)
2. Patients aged more than 18 years and giving informed consent.

Exclusion criteria:

- 1) patients who had received any calcium supplements, steroids, anti-convulsants, bisphosphonates, or any other drug which was known to interfere with the calcium and Vitamin D metabolism.
- 2)Patients not giving valid consent.

A thorough history was taken and then physical examination was done. This was followed by laboratory investigations which included serum creatinine, urea, Total vitamin 25-OH vitamin D level, serum albumin, total calcium. The calcium levels were corrected according to the albumin levels. Serum creatinine was estimated by the enzymatic analysis. Serum calcium was calculated by Arsenazo III end point chemistry. Serum creatinine, calcium, and albumin were measured by the VITROS 5600 automated analyzer. Total 25- OH Vitamin D was measured by Enzyme Immunoassay. The vitamin D level below <12ng/mL was considered as deficiency and levels between 14ng/mL - 20ng/mL was taken as vitamin D insufficiency⁽⁵⁾.

All the results obtained were expressed as mean \pm Standard Deviation and statistical analysis was performed by the Statistical Package for Social Sciences (SPSS for windows, version 21.0). results on continuous measurements were compared using Analysis of Variance (ANOVA). Pearson's correlation coefficient was used to measure the associations among continuous variables. For all analyses, the statistical significance was fixed at 5% level (p-value <0.05).

Results:-

Out of 120 CKD patients, the mean age of the patient in our study was 48.01 ± 13.88 years. The age group with maximum number of patients was in the group of 51-60 years. Minimum number of patients were in the elderly age group 71-80 years, and more than 80 years (Fig 1). The minimum age of the patient with vitamin D deficiency was 19 years and, the maximum age of the patient was 72 years. The study had 55% (n=66) males and 45% (n=54) females (Fig 2). The mean vitamin D levels was 19.64 ± 14.75 ng/mL. 26.67% (n=32) of the patients had vitamin D deficiency and 43.33% (n=52) of the patients had vitamin D insufficiency. 27.5% (n=33) patients had normal vitamin D levels. 2.5% (n=3) patients had vitamin D levels more than normal (Fig 3). Vitamin D deficiency was

seen in more in males than females with 78.13%(n=25) of the males with vitamin D deficiency and 21.83%(n=7) of the females with deficiency of vitamin D. Females accounted for a greater number of cases in Vitamin D insufficiency with 55.7%(n=29) females and 44.2%(n=23) males with vitamin D insufficiency. The mean age of the patients in the study was 48.01 ± 13.88 years. The majority of the patients were in 41-60 years age group and maximum Vitamin D deficiency was also reported in the same age group of 41-60 years.

The low vitamin D levels were seen in 3.5%(n=3), 33.33%(n=28), and 63%(n=53) of the patients in CKD stages 3, 4, and 5 respectively. There was correlation between vitamin D levels and Stages 4 and 5 CKD. With the progression of CKD, Vitamin D deficiency deteriorated. The mean albumin level was 3.36 ± 0.66 G/dL. The mean calcium levels were 7.95 ± 0.91 mg/dL, and mean corrected calcium was 8.72 ± 0.85 mg/dL. There was no significant correlation between vitamin D and albumin, calcium, and corrected calcium levels.

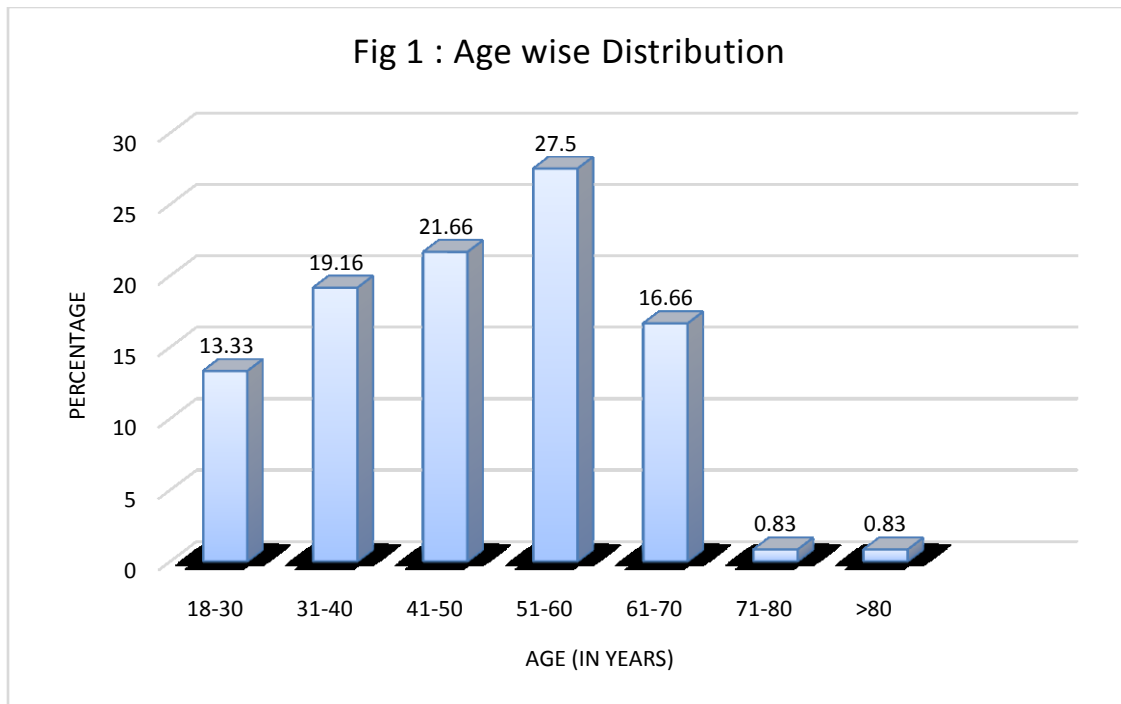


Fig 1:- Age wise distribution in the study population. 27.5% of population was seen in 51-60 years age group. Minimum number of patients (0.83%) were seen in 71-80 years and >80 years group.

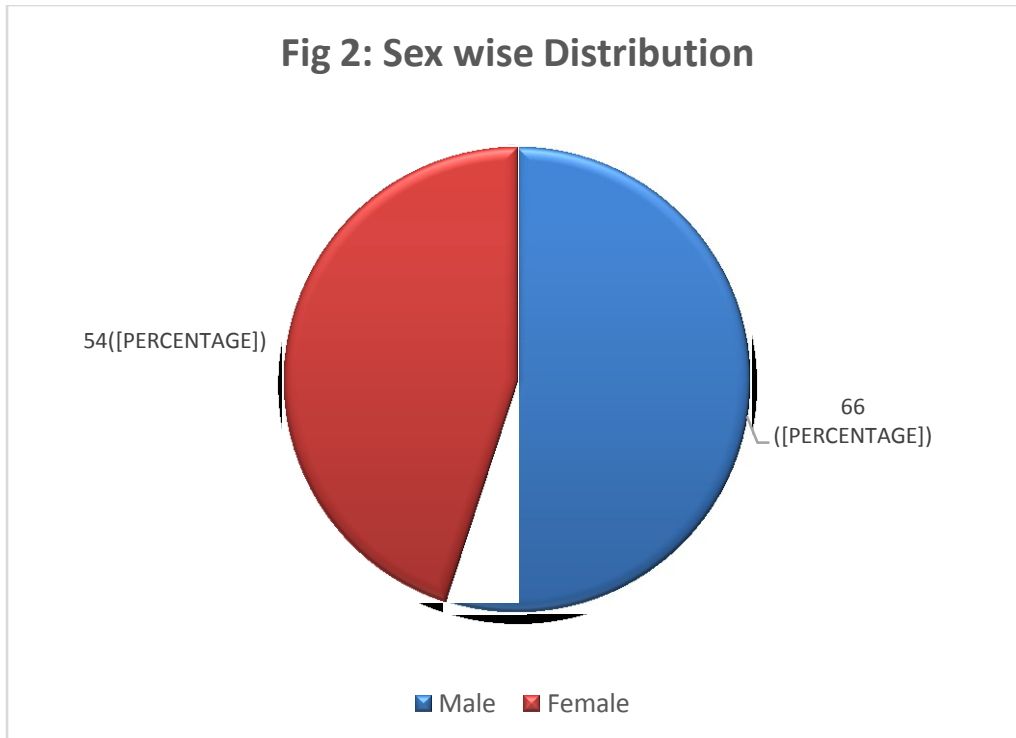


Fig 2:- Sex wise distribution of patients in the study population. The study had 55%(n=66) males and 45% (n=54) females.

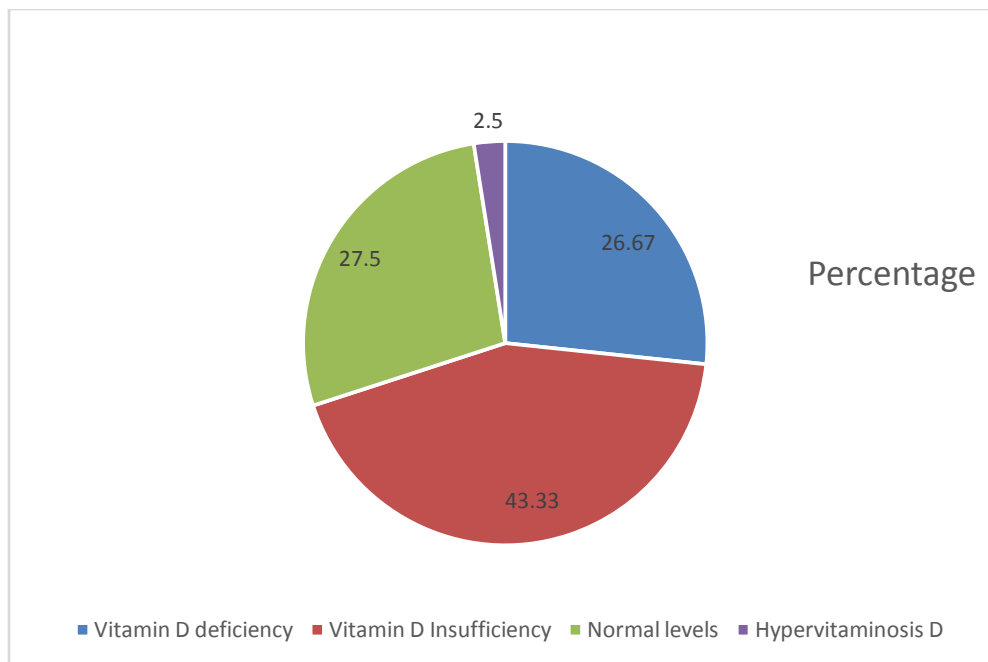


Figure 3:- Distribution of Vitamin D levels in study group. It was seen that 43.33% of patients had vitamin D insufficiency and 27.5% of patients had vitamin D deficiency.

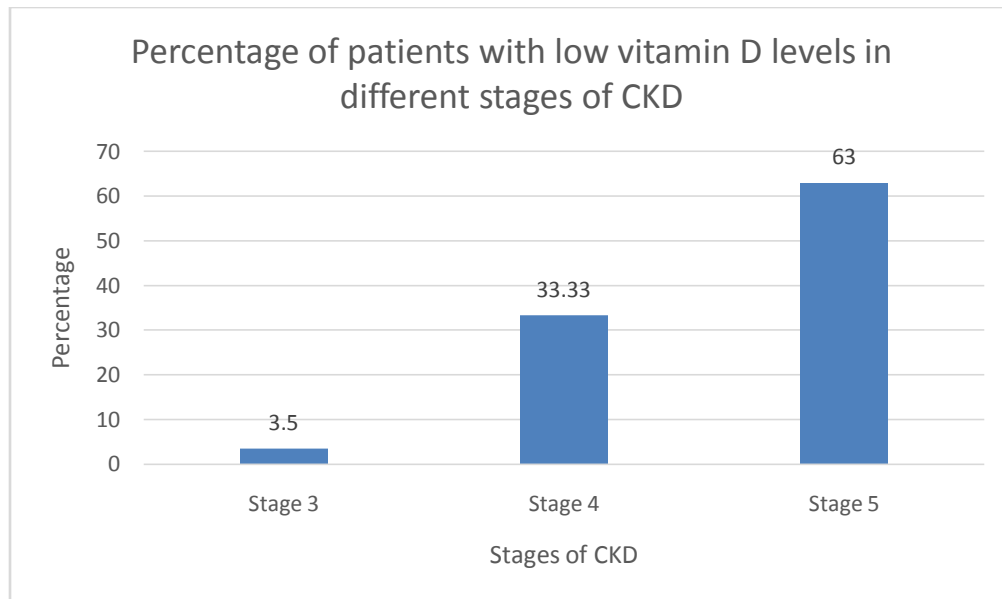


Figure 4:-Percentage of patients with low vitamin D levels in different stages of CKD. 63% of the patients with low vitamin D levels belonged to stage 5 CKD. 33.33% of the patients belonged to stage 4 and 3.5% to stage 3.

Discussion:-

The percentage of CKD patients with Vitamin D deficiency and insufficiency was 26.67% and 43.33% respectively. In the study done by Jabbar et al⁽⁶⁾, at PGIMER, Chandigarh, it was seen that 77% of the patients had lower vitamin D levels with mean vitamin D in stage 4 was 12ng/ml and, in stage 5 was 18.4 ng/mL. This was also similar to the study done by Valson et al⁽⁷⁾, done at CMC, Vellore. 75% of the patients in their study had lower vitamin D levels. The number of patients diagnosed as CKD stage 3 and 4 was also less most of the patients were asymptomatic and diagnosed on a routine check-up. The study was conducted over a period of one year and no seasonal effect leading to reduced sunlight. There are no studies done on vitamin D levels in the northeast Indian population that it could be compared with the CKD population though the study on general Indian population show a higher prevalence of vitamin D deficiency⁽²⁾.

Limitation of the study:

1. The number of cases was low, so the exact picture as depicted in other studies could not be found.
2. As this is a hospital-based study, most of the patients were from lower socioeconomic or middle-class family, the study population could not be generalised.
3. In the present study univariate analysis were done, further study is necessary to find out the multivariate analysis.
4. The study was done in a tertiary hospital so the majority of the patients belonged to symptomatic stage 5. Further study is required to assess the vitamin D levels in stages 3 and 4.

Conclusion:-

This study shows the high prevalence of vitamin D deficiency in the pre-dialytic CKD population. Considering the high prevalence of vitamin D deficiency, Kidney Disease Improving global outcomes (KDIGO) recommends regular vitamin D estimation along with other biochemical parameters of Chronic Kidney Disease- Mineral Bone Disorder, the time interval depending on the stage of Chronic Kidney Disease.

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