Journal of Medicine, Physiology and Biophysics
ISSN 2422-8427 An International Peer-reviewed Journal
Vol.37, 2017

Frequency of Vitamin D Deficiency in Patients in Chronic Hemodialysis Patients

DR. MUHAMMAD AWAIS NAQVI, MBBS
FATIMA MEMORIAL HOSPITAL LAHORE

DR. HASSAN MAJID BHATTI, MBBS
FATIMA MEMORIAL HOSPITAL LAHORE

DR. MUNEEB UR REHMAN CHISHTI, MBBS
PAKISTANI INSTITUTE OF MEDICAL SCIENCES, ISLAMABAD

Abstract
Objective: To determine the frequency of Vitamin D deficiency in chronic hemodialysis patients and its association with duration on dialysis. **Material and Methods:** One hundred fifty two patients on hemodialysis were taken in this descriptive study, conducted at department of Nephrology, Fatima Memorial Hospital, Lahore from June 2014 to June 2016. After brief history, examination and record review, blood sample was collected for 25(OH) Vitamin D and SPSS was employed for data entry and analysis purpose. **Results:** Of these 152 study cases, 93 (61.2%) were male patients while 59 (38.8%) were female patients. Mean age of our study cases Was 48.84 ± 7.34 years, for male patients mean was 47.38 ± 7.72 years while of female patients was 51.15 ± 6.07 years (p=0.002) and 92 (60.5%) belonged to age group of 46 – 60 years of age. Of these 152 study cases, 83 (54.6 %) were diabetic, 40 (26.3 %) were hypertensive patients. Majority of our study cases i.e. 98 (64.5%) were poor, 31 (20.4%) had middle income and 23 (15.1%) were rich. Ninety two (60.5 %) were from rural area while 60 (39.5%) were from urban areas. Sixty four (42.1%) had history of exposure to the sunlight while majority 88 (57.9%) did not had history of exposure to sunlight. Mean duration on hemodialysis was noted to be 18.04 ± 8.57 months (with minimum duration on hemodialysis was 4 months while maximum duration on hemodialysis was 39 months). Mean vitamin D level was noted to be 13.78 ± 8.78 ng/ml; ranging from 7 ng/ml to 29 ng/ml. Vitamin D deficiency was noted in the 129 (84.9%) of our study cases. **Conclusion:**In our study, frequency of vitamin D deficiency was very high among patients on hemodialysis. Vitamin D level should be routinely monitored and corrected among patients on Hemodialysis which will improve their quality of life. These patients need supplementation of high dosage of cholecalciferol. Vitamin D deficiency was significantly associated with female gender, hypertension, poor socioeconomic status, disease duration and exposure to the sunlight. Proper supplementation can help save these patients from cardiovascular diseases and immunological disorder.
Keywords: Vitamin D deficiency, hemodialysis, chronic kidney disease.

Introduction

Chronic kidney disease (CKD) often leads to the impairments in the vitamin D metabolism in the patients. Among healthy human population, synthesis of vitamin D primarily occurs through sunlight in skin or it is obtained via diets[1-4]. This newly synthesized pro vitamin D is hydrolyzed in liver to 25-hydroxy Vit D [25(OH) D] and its levels are used to assess status of vitamin D in the body as it constitutes major storage form. Over 95 % of the 25-hydroxy Vit D [25(OH)D] which is analyzed in blood is Vit D_3 (25-OH) while vitamin D_2 (25-OH) can only achieve detectable levels in persons taking Vit D_2 supplementation.[5-8] Impairment in the conversion of 25(OH)D to $1,25(OH)_2D$ is linked with renal dysfunction. Hence CKD patients as well as end stage renal disease (ESRD) particularly those on hemodialysis are usually given supplementations with active 25(OH) Vit D [1, $25(OH)_2D$] while it has recently been reported conversion of 25(OH)D to $1,25(OH)_2D$ in other organs such as prostate, breast, colon, and macrophages other than kidneys [9, 10]

This production of $1,25(OH)_2D$ in these organs is important for different biological features in these tissues. Therefore circulating levels of 25(OH)D may be significant even when supplemented with active dosses of Vitamin D, similar to the patients having CKD showing lower renal synthesis of $1,25(OH)_2D$.[11,12] Concentrations of 25(OH)D less than 30 ng/ml are related with increased levels of parathyroid hormone (PTH), high risk of hip fractures and poor bone mineral density. Recent Endocrine society guidelines have categorized serum 25(OH)D levels ranging from 20-30 ng/ml pointing 25(OH) Vitamin D insufficient levels while serum concentation less than 20 ng/ml indicates Vitamin D deficiency and levels less than 10 ng/ml as severe deficiency [6]. KDIGO have reported 25(OH)D levels must be optimized more than 30 ng/ml in chronic kidney disease patients as different researches have reported its deficiency in CKD patients. [13] But there is limited data relating to the patients having CKD stage 5 who are on dialysis which has led to the impacts of vitamin D supplementation [2, 3, 14, 15].

Favorable outcome of supplementation may include immune system improvement, diabetes, malignancies

and cardiovascular diseases. In Pakistan, vitamin D deficiency is commonly reported in different population groups in all age groups and a study reported 88% vitamin D deficiency in hemodialysis population.[4] This may be explained in terms of clothing practices of Pakistani people, skin pigmentations and changes in their lifestyles with restricted outdoor activities [1,16].

Materials and methods

Informed consent was taken from 152 patients on hemodialysis aged up to 60 years from department of Nephrology, Fatima Memorial Hospital, Lahore from June 2014 to June 2016. Patients with acute renal failure and Known cases of malignancies, bleeding disorders like hemophilia were excluded from our study. Patients were included after explaining to them the purpose and procedure of the study in detail and ensuring the confidentiality. After brief history, examination and record review, blood sample was collected for 25(OH) Vitamin D levels estimation, calcium and phosphorus levels which was analyzed frm using (COBAS) for 25(OH) Vitamin D. Patients having levels were less than 20 ng/ml were labeled as deficient. Specific information regarding socioeconomic status, residential status and sunlight exposure (at least 30 min a day) was taken. Data were analyzed by using SPSS version 20. For qualitative variables like gender, age groups, Socioeconomic status and residential area frequencies and percentages have been calculated.

Results

Of these 152 patients, 93 (61.2%) were male while 59 (38.8%) were female patients. Mean age was 48.84 ± 7.34 years, for male patients mean age was 47.38 ± 7.72 years while of female patients was 51.15 ± 6.07 years (p=0.002) and 92 (60.5%) belonged to age group of 46 – 60 years of age. Of these 152 study cases, 83 (54.6 %) were diabetic, 40 (26.3 %) were hypertensive patients. Majority of our study cases i.e. 98 (64.5%) were poor, 31 (20.4%) had middle income and 23 (15.1%) were rich. Ninety two (60.5 %) were from rural area while 60 (39.5%) were from urban areas. Sixty four (42.1%) had history of exposure to the sunlight while majority 88 (57.9%) did not had history of exposure to sunlight. Mean duration on hemodialysis was noted to be 18.04 ± 8.57 months (with minimum duration on hemodialysis was 4 months while maximum duration on hemodialysis was 39 months). Mean vitamin D level was noted to be 13.78 ± 8.78 ng/ml ; ranging from 7 ng/ml to 29 ng/ml. Vitamin D deficiency was noted in the 129 (84.9%) of our study cases.

Table No. 1 Stratification of Vitamin D deficiency with regards to duration on Hemodialysis.

Duration	Vitamin D deficiency		P- value
	Yes (n=129)	No (n=23)	
Less than 2.5 Years (n=128)	105	23	**0.026**
More than 2.5 - Years (n=24)	24	00	
Total	**152**		

Table No. 2 Stratification of Vitamin D deficiency with regards to gender.

Gender	Vitamin D deficiency		P- value
	Yes (n=129)	No (n=23)	
Male (n=93)	70	23	**0.000**
Female (n=59)	59	00	
Total	**152**		

Table No. 3 Stratification of Vitamin D deficiency with regards to age.

Age groups	Vitamin D deficiency		P-value
	Yes (n=129)	No (n=23)	
30 – 45 years (n=60)	52	08	**0.652**
46 – 60 years (n=92)	77	15	
Total	**152**		

Table No. 4 Stratification of Vitamin D deficiency with regards to Diabetes.

Diabetes	Vitamin D deficiency		P- value
	Yes (n=129)	No (n=23)	
Yes (n=83)	68	15	**0.364**
No (n=69)	61	08	
Total	**152**		

Table No. 5 Stratification of Vitamin D deficiency with regards to Hypertension.

Hypertension	Vitamin D deficiency		P- value
	Yes (n=129)	No (n=23)	
Yes (n=40)	38	02	**0.041**
No (n=112)	91	21	
Total	**152**		

Table No. 6 Stratification of Vitamin D deficiency with regards to family income.

Family income	Vitamin D deficiency		P- value
	Yes (n=129)	No (n=23)	
Poor (n=98)	91	07	**0.000**
Middle Income (n=31)	31	00	
Rich (n=23)	07	16	
Total	**152**		

Discussion;

Patients having CKD with prolonged duration of illness usually exhibit Vitamin D deficiency and insufficiency as reported in different studies, moreover beneficial impacts of its supplementation have been shown to improve immune functions, cardiovascular diseases and bones [17]. However there is little known regarding vitamin D deficiency in our population of Southern Punjab.

Our study included a total of 152 study cases on chronic hemodialysis who fulfilled inclusion and exclusion criteria of our study. Among these patients, 93 (61.2%) were male patients while 59 (38.8%) were female patients. Bansal et al [4] reported 71 % male and 29 % female patients on Hemodialysis which is similar to our study results. Jean et al [10] reported 58 % male patients while 42 % female patients, these findings are close to our study results. Another recent study published in 2015 reported 67 % male gender predominance over female patients [18] and Korkor et al [19] also has reported 56 % male gender predominance. Mean age of our study cases was 48.84 ± 7.34 years. Jean et al [10] reported 66 ± 7 years mean age which is quite high than that of our study results. This difference is due to the inclusion criteria of our study i.e. we included only 30 – 60 years aged patients. Bansal et al [4] reported 55 ± 13 years mean age of these patients, close to our study results. Del-valle et al [20] reported mean age of these patients to be 58.9 ± 16.6 years which is close to our findings. Of these 152 study cases, 83 (54.6 %) were diabetic, 40 (26.3 %) were hypertensive patients. Bansal et al [4] reported 51 % patients had history of diabetes. Jean et al [10] reported diabetes in 34 % patients which is quite lower than our findings. Poor socio-economic status leads to negative impact on the health of these patients of CKD having poor quality of life. Majority of our population in south Punjab lives below line of poverty without essential facilities available to them in terms of proper healthcare system and educational system. Majority of our study cases i.e. 98 (64.5%) were poor, 31 (20.4%) had middle income and 23 (15.1%) were rich. Ninety two (60.5 %) were from rural area while 60 (39.5%) were from urban areas. Sixty four (42.1%) had history of exposure to the sunlight while majority 88 (57.9%) did not had history of exposure to sunlight. Similar results have been reported by Jean et al [10] and Del-valle et al [20] Mean vitamin D level was noted to be 13.78 ± 8.78 ng/ml ; ranging from 7 ng/ml to 29 ng/ml. Bansal et al [4] reported mean vitamin D level to be10.14 ± 8.7 ng/ml. Our study results are close to that of reported by Bansal et al [4].

Vitamin D deficiency was noted in the 129 (84.9%) of our study cases which is really high. Bansal et al [4] also reported 88.9 % patients on chronic Hemodialysis had vitamin D deficiency. Our study results are close to that of Bansal et al. Del-valle et al [20] also reported 76.1% vitamin D deficiency/insufficiency in their study. Korkor et al [19] reported 85 % vitamin D level deficiency which is similar to that of our study results. Vitamin D deficiency was significantly more common in female patients and similar findings have been reported by Korkor et al [19] and Bansal et al .[4]

Conclusion

In our study, frequency of vitamin D deficiency was very high among patients on hemodialysis. Vitamin D level should be routinely monitored and corrected among patients on Hemodialysis which will improve their quality of life. These patients need supplementation of high dosage of cholecalciferol. Vitamin D deficiency was significantly associated with female gender, hypertension, poor socioeconomic status, disease duration and exposure to the sunlight. Proper supplementation can help save these patients from cardiovascular diseases and immunological disorder.

References

1. Bhan I, Burnett-Bowie SA, Ye J, Tonelli M, Thadhani R. Clinical measures identify 25(OH) Vit D deficiency in dialysis. Clin J Am Soc Nephrol. 2010;5:460–7.
2. De Boer IH. 25(OH) Vit D and glucose metabolism in chronic kidney disease. Curr Opin Nephrol Hypertens. 2008;17:566–72.
3. Drechsler C, Pilz S, Obermayer-Pietsch B, Verduijn M, Tomaschitz A, Krane V, et al. 25(OH) Vit D deficiency is associated with sudden cardiac death, combined cardiovascular events, and mortality in haemodialysis patients. Eur Heart J. 2010;31:2253–61.
4. Bansal B, Bansal S, Mithal A, Kher V, Marwaha R. Vitamin D deficiency in hemodialysis patients. Indian J Endocrinol Metab. 2012;16(2):270
5. Hart GR, Furniss JL, Laurie D, Durham SK, Measurement of vitamin D status: background, clinical use and methodologies. Clin Lab. 2005;52(7-8):335-43.
6. Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, et al. Evaluation, Treatment, and Prevention of 25(OH) Vit D Deficiency: an endocrine society clinical practice guideline. J Clin Endocrinol Metab. 2011;96:1911–30.
7. Holick M.F. Vitamin D deficiency. N Engl J Med. 2007;357:266-281.
8. Houghton LA., Veith R.The case against egrocalciferol (Vitamin D2) as Vitamin supplement. Am J Clin Nutr.2006 84;694-697.
9. Jabbar Z, Aggarwal PK, Chandel N, Kohli HS, Gupta KL, Sakhuja V, et al. High prevalence of 25(OH) Vit D deficiency in north Indian adults is exacerbated in those with chronic kidney Disease. Nephrology.2009;14:345–9.
10. Jean G, Terrat J, Vanel T, Hurot J, Lorriaux C, Mayor B, et al. Daily oral 25-hydroxycholecalciferol supplementation for 25(OH) Vit D deficiency in haemodialysis patients : E0 ffects on mineral metabolism and bone markers. Nephrol Dial Transplant. 2008;23:3670–6.
11. Kalantar-Zadeh K, Kovesdy CP. Clinical outcomes with active versus nutritional 25(OH) Vit D compounds in chronic kidney disease. Clin J Am Soc Nephrol. 2009;4:1529–39.
12. Kandula P, Dobre M, Schold JD, Schreiber MJ, Jr, Mehrotra R, Navaneethan SD. 25(OH) Vit D supplementation in chronic kidney disease: A systematic review and meta-analysis of observational studies and randomized controlled trials. Clin J Am Soc Nephrol. 2011;6:50–62.
13. KDIGO Clinical practice guidelines for the diagnosis, evaluation, prevention and treatment of chronic kidney disease- mineral and bone disorder. Kidney Int Suppl. 2009;113:S1–130.
14. Liu PT, Stenger S, Li H, Wenzel L, Tan BH, Krutzik SR, et al. Toll-like receptor triggering of a 25(OH) Vit D mediated human antimicrobial response. Science. 2006;311:1770–3.
15. Matias P, Jorge C, Ferreira C, Borges M, Aires I, Amaral Y, et al. Cholecalciferol supplementation in hemodialysis patients : E0 ffects on mineral metabolism, inflammation, and cardiac dimension parameters.Clin J Am Soc Nephrol. 2010;5:905–11.
16. Mithal A, Wahl DA, Bonjour JP, Burckhardt P, Dawson-Hughes B, Eisman JA, et al. Global 25(OH) Vit D status and determinants of hypovitaminosis D. Osteoporos Int. 2009;20:1807–20.
17. Ross AC, Manson JE, Abrams SA, Aloia JF, Brannon PM, Clinton SK, et al. The 2011 report on dietary reference intakes for calcium and vitamin D from the Institute of Medicine: what clinicians need to know. J ClinEndocrinolMetab 2011;96:53-8.
18. Jean G, Souberbielle JC, Lechevallier S, Chazot C. Kinetics of serum 25-hydroxyvitamin D in haemodialysis patients treated with monthly oral cholecalciferol. Clin Kidney J. 2015 Aug;8(4):388-92.
19. Korkor AB, Bretzmann CM, Eastwood DC. Vitamin D deficiency in dialysis patients and its effects on

various disease markers. Dialysis Tansplant. 2009;38(11):1-5.
20. Del Valle E, Negri AL, Aguirre C, Fradinger E, Zanchetta JR. Prevalence of 25(OH) vitamin D insufficiency and deficiency in chronic kidney disease stage 5 patients on hemodialysis. Hemodial Int. 2007 Jul;11(3):315-21.