Chemistry Research Journal, 2018, 3(2):87-92

Available online www.chemrj.org

Research Article

ISSN: 2455-8990
CODEN(USA): CRJHA5

Evaluation of Vitamin-D Deficiency in Selected Population Diagnosed with Various Clinical Conditions: Treatment and Outcome

Shazia Naureen[1], Rana Kauser[2], Humaira Ali[1], Junaid Mahmood Alam[1]

[1]Department of Chemical Pathology, Liaquat National Hospital & Medical College, Karachi, Pakistan
[2]Department of Biochemistry, Federal Urdu University of Arts, Science & Technology, Karachi-Pakistan

Abstract *Background:* Vitamin-D is a fat soluble steroid hormone that is mainly produced in the skin by exposure to sunlight. The two most important forms of vitamin-D are vitamin-D_3 (cholecalciferol) and Vitamin-D_2 (ergocalciferol). We have analyzed the total 25-hydroxy Vitamin D which is the metabolite to determine the overall Vitamin-D status as it is the major storage form of Vitamin-D in the human body. *Objective:* To study the role of Vitamin-D deficiency in patients with various diseases and their response to Vitamin-D supplementation. *Material & Method:* The present study was a population based randomized, retrospective study in the Department of Chemical Pathology, Liaquat National Hospital & Medical College Karachi between June 2015 to November 2015. 25-hydroxy Vitamin-D levels of 210 patients (Male 30% & Female 70%) in the age group of 10 to 84 years were analyzed before and after treatment by electrochemiluminescence technology using Cobas e 411 (Roche Diagnostics) auto analyzer. *Results:* A total of 210 patients were selected. We found Vitamin-D deficiency in 21% orthopedic patients, 19% Rheumatoid cases, 19% in General Medicine, 12% Diabetics, 12% Neuro Surgery or Neuro Medicine, 10% Gastric Patients, 5% Gynaecological cases & 2% Oncology cases. These patients were later treated with Vitamin-D supplementation and a significant increase in Vitamin-D was found in their serum. *Conclusion:* Vitamin-D deficiency is associated with significant morbidity for example Rickets, Osteomalacia, Osteoporosis and many others diseases. Vitamin-D supplementation and normalization of blood levels cause a significant reduction in morbidity

Keywords Vitamin-D Deficiency, Clinical Conditions, Treatment

Introduction

Vitamin-D is a fat soluble steroid hormone that is mainly produced in the skin by exposure to sunlight. Vitamin D is biologically inert and must undergo two successive hydroxylations in the liver and kidney to produce the biologically active 1,25dihydroxyvitamin D. The two most important forms of vitamin D are vitamin D_3 (cholecalciferol) and vitamin D_2 (ergocalciferol).

Vitamin-D deficiency affects all ages and both genders, commonly manifested as symmetric low back pain, proximal muscle weakness, muscle aches, throbbing bone pain. Furthermore, Vitamin-D deficiency is the main cause of the rickets in children [1,2].

Vitamin D deficiency has been shown to play a role in almost every major disease. This includes, Osteoporosis and Osteopenia, 17 varieties of Cancer (including breast, prostate and colon), Heart disease, High blood pressure, Obesity, Metabolic Syndrome and Diabetes, Autoimmune diseases, Multiple sclerosis, Rheumatoid arthritis,

Osteoarthritis, Bursitis, Gout, Infertility, Parkinson's Disease, Depression and Seasonal Affective Disorder, Alzheimer's Disease, Chronic fatigue syndrome, Fibromyalgia, Chronic Pain, Periodontal disease, Psoriasis [1-5].
In current study, we have analyzed the total 25-hydroxy Vitamin D which is the metabolite to determine the overall Vitamin-D status as it is the major storage form of Vitamin-D in the human body.

Definition of Vitamin D Deficiency
The Endocrine Society defines vitamin D deficiency as a 25-hydroxyvitamin D blood level below 20 ng/mL and vitamin D insufficiency as a level between 21–29 ng/mL.

Reference Values of **25-Hydroxy vitamin-D**
<20 ng/ml is defined as Deficiency; whereas 21 – 29 ng/ml as Insufficiency; 30 – 150 ng/ml as Desirable and > 150 ng/ml as Intoxication.

Objective
To study Vitamin-D deficiency in patients with various complications/diseases/ clinical conditions and favorable outcome and relief after Vitamin-D supplementation.

Material & Method
Research designs and study period: The present study was a population based randomized, retrospective study in the Department of Chemical Pathology, Liaquat National Hospital & Medical College Karachi from June 2015 to November 2015.
Vitamin D analysis: 25-hydroxy Vitamin-D levels of 210 patients (Male 30% & Female 70%) in the age group of 10 to 84 years were analyzed before and after treatment by electro-chemiluminescence technology (ECL) using Cobas e 411 (Roche Diagnostics) immunoassay auto analyzer.
Data presentations and analysis: Clinical data was retrieved or obtained by either contacting the Patients or HIMS, respectively. Results are primarily summarized according to prevailing clinical conditions or complications (Table 1) and then by Vitamin D supplementation status (Table 2). Subsequently, during or after treatment, patients were contacted for feedback regarding relief from co-morbids and complications. Data was then further elaborated and summarized according to Clinical conditions, its co-morbid and status of relief. (Tables 3-10)

Results

Fig 1: % Distribution of Clinical conditions in selected population

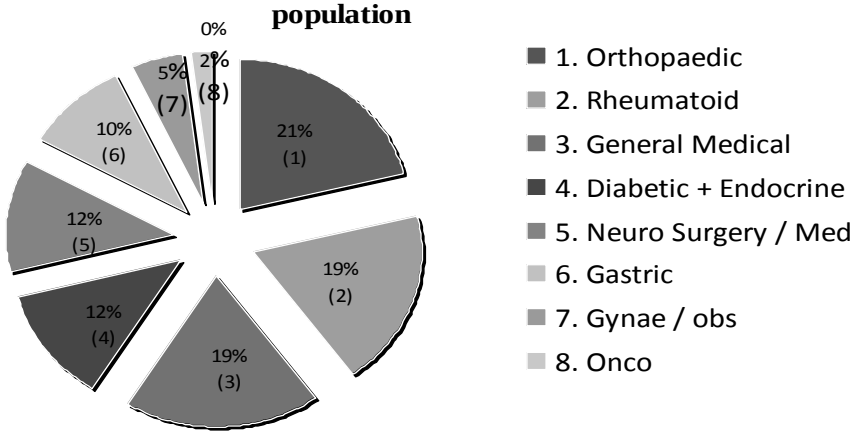

Table 1: Distribution of Patients (N = 210) According to Clinical Conditions

No	Complications /clinical conditions	Male/Female Patients (N)	Treated Cases in Percentage w.r.t Total Patients
1	Orthopedic	45	21%
2	Rheumatoid	40	19%
3	General medical	40	19%
4	Diabetic + Endocrine	25	12%
5	Neuro / Surgery Neuro / Medicine	25	12%
6	Gastric	20	10%
7	Gynae / obs	10	05%
8	Onco/malignancy	05	02%
	TOTAL	210	100

Table 2: Treated Cases of Vitamin-D Deficiency before and after Treatment

No	Clinical Conditions/Complications	Male/Female Patients (N)	Level of Vitamin D before Treatment (ng/ml)	Treatment IM Inj / Oral Inj / Tablets	Level of Vitamin D after Treatment (ng/ml)
1	Orthopedic	45 (21%)	(3 – 10)	Yes	45 to >70
2	Rheumatoid	40 (19%)	(3 – 12)	Yes	50 to >70
3	General medical	40 (19%)	(5 – 15)	Yes	55 to >70
4	Diabetic + Endocrine	25 (12%)	(9 – 10)	Yes	45 to >70
5	Neuro / Surgery Neuro / Medicine	25 (12%)	(7 – 12)	Yes	50 to >70
6	Gastric/GIT	20 (10%)	(6 – 10)	Yes	55 to >70
7	Gynae / obs	10 (5%)	(4 – 7)	Yes	52 to >70
8	Onco	05 (2%)	(3 – 6)	yes	48 to >70

A total of 210 patients were selected. We noted Vitamin-D deficiency in 21% of orthopedic patients, 19% patients suffering from Rheumatoid condition, 19% patients from General Medicine, 12% patients were Diabetics, 12% patients were either had ailments related to Neuro Surgery or Neuro Medicine, 10% patients were case of Gastric or GIT, 5% patients with a range of Gynaecological problems and 2% patients with malignant (oncology) background (Table 1 and Fig 1). These patients, as per advice from their treating physicians, were later treated with Vitamin-D supplementation and a significant increase in Vitamin-D was found in their serum (Table 2). Subsequently, favorable relief was noted in each and every Clinical condition or complications and presented in Table 3-10.

Table 3: Orthopedic

Complains	Outcome of Treatment by Vitamin D Supplements
Fracture Healing	Swift
Chronic Pain in Bones	Relief
In Surgery	Early Healing
Post Operative Recovery	Fast
Sports Health	Strong
Athletic Performance	Excellent

Table 4: Rheumatoid

Complains	Outcome of Treatment by Vitamin D Supplements
Joints deformation	Slows Down
Joints Damage	Relief
Joints pain	Reduced
Joints Inflammation	Relief
Stiffness	Reduced

Table 5: General Medical

Complains	Outcome of Treatment by Vitamin D Supplements
Growth of Strong Muscles	Promoted
Blood Pressure	Regulated
Fibromyalgia Pain	Relief
Muscles Weakness	Improved

Table 6: Endocrine + Diabetes

Complains	Outcome of Treatment by Vitamin D Supplements
Production of insulin	Improved
Risk of developing Type-I Diabetes	Reduced
Glycemic Control & insulin sensitivity	Improved

Table 7: Neuro-Surgery or Neuro-Medicine

Complains	Outcome of Treatment by Vitamin D Supplements
Intervertebral Disc Degeneration	Reduced
Spinal Canal Stenosis	Relief
Spinal Disc Herniation	Reduced
Spinal Injury & Back Pain	Relief

Table 8: Gastric/GIT

Complains	Outcome of Treatment by Vitamin D Supplements
Irritable bowel-syndrome (IBS)	Relief
Abdominal Pain	Reduced
Constipation	Relief
Diarrhea	Relief
Calcium Absorption	Normalized
Stomach Ache	Relief

Table 9: GYNAE/OBS

Complains	Outcome of Treatment by Vitamin D Supplements
Regulation of Bone Metabolism	Improved
Hormonal Imbalance	Improved
Hormonal fluctuation	Relief
Pregnancy Complications (Gestational Diabetic, Preeclampsia, Preterm Birth, & Low Birth Weight)	Declined

Table 10: Onco/Malignancy

Complains	Outcome of Treatment by Vitamin D Supplements
Growth of certain tumors In prostate Cancer	Reduced Vitamin D has been administered as a part of cancer treatment

Discussion

It is documented that vitamin D deficiency is endemic. A high number of healthy children and adolescents are also vitamin D deficient. One study was found that vitamin D levels were inversely to the cardio vascular risk factors, blood pressure greater than 140/90 mm Hg, Blood glucose level above 125 mg/dl, and body mass of 30 kg/m^2 or greater [1]. A nested case control study from the nurses's health study reported that the risk of colon cancer is inversely related to serum level of vitamin D [2]. Vitamin D deficiency has a link to depression and decreased cognitive function [3,4]. Vitamin D has found to several activities that might slow or prevent the development of cancer, including promoting cell differentiation, decrease cancer cell growth, stimulate the cell death (apoptosis) and reduce the tumor blood vessel formation (angiogenesis) [5,6]. The vitamin D and omega 3 trial (vital) will discuss that vitamin D supplements can prevent the development of a variety of cancer types in healthy older men and women [7]. Vitamin D level is basic need for autoimmune disease, in this body's immune system attacks its own organs and tissues. In this way vitamin D supplements help to boost our body defense power to fight against infectious disease, such as tuberculosis and seasonal flu. In other European case control studies also suggest that vitamin D may helpful to protect the type I diabetes [8]. In past history a British doctor is hypothesized that sunlight related "*seasonal stimulus*" triggered influenza out breaks [9]. A recent Randomized controlled trial in Japanese school children shows that taking daily vitamin D supplements would prevent seasonal flu [10]. Several case control studies has done and they suggest that people diagnosed with tuberculosis have lower level of vitamin D then those healthy people who have same age and other characteristics [11]. Researchers suspect that the sunshine vitamin D may help to clear the plaques in the brain that is link to dementia.

According to Table-II patients with different complication were treated with Vitamin-D supplements. All patients had Vitamin-D supplements by their body weight and height. A qualified physician had to decide to recommend dose for patient that how many Vitamin-D supplements patients had to take. Vitamin D supplements depend on patient's height, weight and Vitamin-D level. The Institute of Medicine (IOM) of national academies has developed recommended daily "Intake of Vitamin-D" [12-14]. Those people who have 1-70 years of age including women who are pregnant or lactating the recommended dietary allowance (RDA) is 15 micro grams per day.

Conclusion

Vitamin-D deficiency is associated with significant morbidity for example Rickets, Osteomalacia, Osteoporosis and many others diseases. Vitamin-D supplementation and normalization of blood levels cause a significant reduction in morbidity. Current population based study shows that vitamin D supplements suggestively played a role in relieving the severity of various clinical conditions and complications as mentioned above and thus prevented cardiovascular intricacy, malignancy, depression, improvement in immune system, and reducing the risk of premature death or Obstetric complications.

References

1. Martins, D., Wolf, M., Pan, D., Tareen, N., Thadhani, R., Felsenfeld, A., Levine, B., Mehrotra, R., Norris, K. (2007). Prevalence of cardiovascular risk factors and the serum levels of 25-hydroxyvitamin D in the United States: data from the Third National Health and Nutrition Examination Survey. *Arch Intern Med.* 167 (11):1159-1165.
2. Feskanich, D., Ma, J., Fuchs, C.S., Kirkner, G.J., Hankinson, S.E., Hollis, B.W., Giovannucci, E.L. (2004). plasma Vitamin D metabolites and risk of colorectal cancer in women Cancer Epidemiol Biomarkers prev, 13(9):1502-1508.
3. Wilkins, C.H., Sheline, Y.l., Roe, C.M., Birge, S.J., Morris, J.C. (2006) Vitamin D deficiency is associated with low mood and worse cognitive performance in older adults. *Am J Geriatr Psychiatry*. 14(12):1032-1040.
4. Gloth, F.M. III, Alam, W., Hollis, B. (1999) Vitamin D vs broad spectrum phototherapy in the treatment of seasonal affective disorder. *J Nutr Health Aging*. 3(1):5-7.

5. Thorne, J., Campbell, M.J. (2008) The vitamin D receptor in cancer. Proceedings of the Nutrition Society. 67(2); 115-127.
6. Deb, K.K., Trump, D.L., Johnson, C.S. (2007) Vitamin D signalling pathways in cancer: potential for anticancer therapeutics. Nature Reviews Cancer. 7(9):684-700.
7. Manson, J.E., Bassuk, S.S., Lee, I.M., Cook, N.R., Albert, M.A., Gordon, D., Zaharris, E., Macfadyen, J.G., Danielson, E., Lin, J., Zhang, S.M., Buring, J.E. (2012). The VITamin D and OmegA-3 Trial (VITAL): rationale and design of a large randomized controlled trial of vitamin D and marine omega-3 fatty acid supplements for the primary prevention of cancer and cardiovascular disease. Contemporary Clinical Trials. 33(1):159-171.
8. Zipitis, C.S., Akobeng, A.K. (2008) Vitamin D supplementation in early childhood and risk of type 1 diabetes: a systematic review and meta-analysis. *Arch Dis Child*. 93:512-7.
9. Hope-Simpson, R.E. (1981) The role of season in the epidemiology of influenza. J *Hyg (Lond).* 86:35-47.
10. Urashima, M., Segawa, T., Okazaki, M., Kurihara, M., Wada, Y., Ida, H. (2010). Randomized trial of Vitamin D supplementation to prevent seasonal influenza A in school children. Am J clinNutr. 19:1255-60, Epub 2010 Mar 10.
11. Nnoaham, K.E., Clarke, A. (2008) Low serum Vitamin D levels and tuberculsosis: a systematic review and meta-analysis. *Int J Epidemiol*. 37:113-9.
12. Otten, J.J., Hellwig, J.P., Meyers, L.D. Vitamin D. (2006) In: Dietary Reference Intakes: The Essential Guide to Nutrient Requirements. Washington, DC: National Academies Press, 2006.
13. Institute of Medicine Committee to Review Dietary Reference Intakes for Vitamin D and Calcium. (2011). *Dietary Reference Intakes for Calcium and vitamin D*. Washington, DC: National Academies Press; 2011.
14. Lipman, F., (2009) https://www.bewell.com/blog/symptoms-diseases-associated-with-vitamin-d-deficiency/ Sep. 15, 2009; Symptoms & Diseases Associated with Vitamin D Deficiency.