

## RELATIONSHIP OF VITAMIN D LEVELS WITH SIMULTANEOUS OCCURRENCE OF PERIODONTAL AND CARDIAC DISEASES

Muhammad Amjid Bari<sup>1</sup>, Nagma Perveen<sup>2</sup>, Sohail Fareed<sup>3</sup>, Noorul Ain Arshad<sup>4</sup>, Saima Munir<sup>5</sup>, Khalil Ahmad Khan<sup>6</sup>

1. MBBS, FCPS  
Associate Professor  
Nishtar Institute Of  
Dentistry Multan
2. MBBS, FCPS  
Associate Professor  
Nishtar Institute Of  
Dentistry Multan
3. BDS, FCPS (OMFS)  
Demonstrator,  
Oral & Maxillofacial Surgery  
NID, Multan.
4. BDS, FCPS (OMFS)  
Assistant Professor  
Oral & Maxillofacial Surgery  
MM&DC Multan.
5. BDS, FCPS (OMFS)  
Assistant Professor  
of Oral & Maxillofacial Surgery  
NID, MULTAN.
6. Demonstrator  
Oral & Maxillofacial  
Surgery

**Correspondence Address:**  
Dr. SOHAIL FAREED  
dr\_sohail\_nmc@hotmail.com

**ABSTRACT... Objectives:** To observe relationship of vitamin D levels with the severity of periodontal disease and also with the occurrence of cardiac diseases. **Study Design :** A cross-sectional study. **Place and duration of study:** Nishtar institute of dentistry, Multan from March 5th, 2019 to December 1st, 2019. **Methodology:** Total 150 subjects were enrolled in the study, of which half were suffering from cardiac and periodontal diseases and one third were only affected by periodontitis. Twenty five subjects were normal. Vitamin D and calcium levels were recorded from the blood samples. Mean and standard deviation were calculated between the groups with 2 sample t- test using SPSS v.23.0. The significance of difference was taken at  $p \leq 0.05$ . **Results:** Vitamin D levels were  $24.98 \pm 4.53$  ng/ml and  $41.95 \pm 1.42$  ng/ml in patients with high and low intensity of periodontal disease, respectively ( $p=0.22$ ). Calcium levels were  $8.43 \pm 0.14$  nmol/L and  $8.69 \pm 0.28$  nmol/L in patients with high and low intensity of periodontal disease, respectively ( $p=0.437$ ). Among the male cardiac patients, vitamin D levels were  $20.96 \pm 2.39$  ng/ml and  $41.67 \pm 4.78$  ng/ml in high and low severity of periodontal disease cases ( $p=0.002$ ), whereas calcium levels were  $8.03 \pm 0.30$  nmol/L and  $8.95 \pm 0.77$  nmol/L in high and low severity of periodontal disease cases ( $p=0.075$ ). Among the female cardiac patients, vitamin D levels were  $17.5 \pm 4.93$  ng/ml and  $21.55 \pm 18.12$  ng/ml ( $p=0.83$ ), while calcium levels were  $8.4 \pm 0.33$  nmol/L and  $8.57 \pm 0.24$  nmol/L in high and low severity of periodontal disease cases, respectively ( $p=0.677$ ). **Conclusion:** Low level of vitamin D has the relationship with the severity of periodontal disease and also with the occurrence of cardiac diseases.

**Keywords:** Calcium, Cardiac disease, Periodontal disease, Severity, Vitamin D.

**Article Citation:** Bari MA, Parveen N, Fareed S, Arshad NA, Munir S, Khan KA. Relationship of Vitamin D Levels with Simultaneous Occurrence of Periodontal and Cardiac Diseases. Med J South Punjab. 2018;1(1);3-8.

### INTRODUCTION

The link of dental health and vitamin D had attained considerable attention in relation to periodontal disease. Vitamin D may affect the risk of developing periodontal disease via an effect on bone mineral density or via immunomodulatory effects<sup>1</sup>. This points out on the disorder of another system developing indirectly due to effect of a deficiency to its relevant system. The reports of studies on the relation of vitamin D deficiency and incidence of periodontitis are appearing. The deficiency of vitamin has been found to be the cause of several disorders apart from its primary function of bone calcification. The notable of these are cardiovascular disease, arthritis, multiple sclerosis, cancer etc. The association between periodontitis and cardiovascular is also well realized and various researches have highlighted the mechanisms of association between these. The interrelationship between periodontitis,

Many epidemiological studies have shown the relationship of vitamin deficiency with various diseases and amelioration of the disorder with the supplementations. In the subjects with values  $< 10$  ug/mL, which is clearly a deficient state, showed significant association with prevalence and extent of coronary artery disease. In these subjects the status of coronary artery disease when was assessed with angiography and also the vitamin D was estimated it was found that hypovitaminosis had evident and significant correlation with coronary artery disease. In cases where the supplementation of vitamin D had been done the incidence of coronary artery disease was observed to be considerably low<sup>2</sup>. Globally there are now apprehensions that hypovitaminosis D is contributing in several diseases like periodontitis, inflammatory bowel disease, obesity, cardiovascular diseases these all are considered as inflammatory bowel disease and

## INTRODUCTION

and vitamin D play an important role in these diseases 3. Management of these risk factors are key for contemporary care of periodontal patients though these risk factors are modifiable as well 4. Dietary supplements and regular intake may enhance periodontal health periodontal like vitamin C, vitamin D, calcium and multivitamins 5. Many studies have shown core relationship of periodontitis and vitamin D insufficiency and diabetes 6. It is verified that 25-hydroxy vitamin D play important role in human gingival fibroblasts and periodontal ligaments. It has been revealed that there is strong correlation between generalized or aggressive periodontitis and with plasma vitamin D binding protein 7, 8. It is evident that 25 OH vitamin D play important role in periodontal health and its deficiency causes periodontal and gingival inflammation. The investigations in relation to vitamin D and cardiovascular function had been for some time. It is mainly understood in relationships of cardiovascular diseases and vitamin D deficiency. Ischemic stroke has been documented to be associated with deficiency of serum 25-hydroxy vitamin D and it was found that ischemic stroke has an independent association with 25-hydroxy vitamin D deficiency. The overall physiological adaptation leads to increase risk of cardiovascular disease like hypertension and all other diseases like dyslipidemia, peripheral vascular disease, diabetes, cancer etc., in fact all had association with low level of vitamin D. The pathogenesis and risk of diabetes mellitus and cardiovascular disease had especially in focus in the studies with respect to vitamin D deficiency and its critical role and prevalence 9. Vitamin D deficiency is reported an independent risk factor of mortality causing disease cardiovascular disease and diabetes. Many metabolic changes actively started with in body like cardiac inflammation, fibrosis, oxidative stress, cardiac hypertrophy, apoptosis, left chamber alteration, systolic dysfunction and these all changes are associated with deficiency of vitamin D. Studies proved that vitamin D has potential protective effect on cardiovascular system 10. Vitamin D deficiency adverse effect in expression of several diseases including periodontitis and cardiovascular diseases is widely now accepted. There is need of

considerable attention to prevent several diseases such as multiple sclerosis, autoimmune disease, diabetes, autism, cancer and cardiovascular diseases. Thus present study was undertaken to investigate relationship between vitamin D in periodontitis and cardiovascular diseases in the population of Lahore and Rawalpindi.

## MATERIAL AND METHODOLOGY:

This cross sectional study was conducted at Nishtar institute of dentistry, Multan over a time period from March 5th, 2019 to December 1st, 2019. Ethical approval for the commencement of the study was taken from the hospital review committee. Total 150 subjects were selected by randomized sampling technique and informed consent form was signed by each of the included subject before the start of study. The patients of the hospitals ranging between 30 to 70 years were categorized in different groups in relation to the disorders for screening of vitamin D and calcium. The subjects of both the genders were assessed that a group is affected only by periodontitis with further realization of low and high degree of the disorder; this group had no clinical indications of heart diseases. In another group the subjects were not only affected by varying degree of periodontitis but also were inflicted with cardiac diseases. A third group was of control nature and none of the subject had periodontitis in any degree and did not have clinical history of cardiac diseases. The admitted subjects in the hospitals were provided at 6:00 AM and the sampling was done at 8:00 AM. Total 150 subjects were enrolled in the study, of which 110 were males and remaining 40 were females. Out of 150 almost half were suffering from the cardiac and periodontal diseases. About one third was only affected by periodontitis and did not have any history of cardiac ailment. Twenty five subjects were with no periodontitis and also were without any indications of cardiac disease.

The blood sample of an amount of 5-6 ml was obtained with disposable sterile syringes and the blood was kept in syringe to clot. It was left at the laboratory temperature until the serum was separated. The serum from blood was placed in vaccinator serum separator tube and centrifuged at 3000rpm for 5-7 minutes. The clear serum was then pipetted out and poured into two separate 1.5 ml vials.

The sera stored at -20 degree centigrade until used for hormonal and biochemical assays. Vitamin-D levels were expressed in ng/mol. It was noted in the kit manual that values that are less than 8.3 ng/mol must be reported as <8.3 ng/ml and values that are greater than 143.6 ng/ml is reported as > 143ng/ml. serum calcium levels were expressed as nmol/L.

In the comparisons of various groups mean and standard deviation were calculated and the significance of the difference between the groups was determined with 2 sample t- test. The data was analyzed by SPSS v.23.0. The significance of difference was taken at  $p \leq 0.05$ .

**RESULTS:**

All the patients included in the study were from 30 to 70 years of age. Mean calcium levels were  $8.7 \pm 0.319$  nmol/L in normal males and  $9.23 \pm 0.24$  nmol/L in normal females ( $p=0.231$ ). Mean levels of vitamin D were  $20.25 \pm 3.61$  ng/ml and  $7.47 \pm 4.35$  ng/ml in normal males and females, respectively ( $p=0.109$ ). Table-I

Vitamin D levels were  $24.98 \pm 4.53$  ng/ml and  $41.95 \pm 1.42$  ng/ml in patients with high and low intensity of periodontal disease, respectively ( $p=0.22$ ). Calcium levels were  $8.43 \pm 0.14$  nmol/L and  $8.69 \pm 0.28$  nmol/L in patients with high and low intensity of periodontal disease, respectively ( $p=0.437$ ). Table-II

Among the males who were cardiac patients, vitamin D levels were  $20.96 \pm 2.39$  ng/ml and  $41.67 \pm 4.78$  ng/ml in high and low severity of periodontal disease cases ( $p=0.002$ ). Among the males who were cardiac patients, calcium levels were  $8.03 \pm 0.30$  nmol/L and  $8.95 \pm 0.77$  nmol/L in high and low severity of periodontal disease cases ( $p=0.075$ ). Table-III

Among the females who were cardiac patients, vitamin D levels were  $17.5 \pm 4.93$  ng/ml and  $21.55 \pm 18.12$  ng/ml in high and low severity of periodontal disease cases ( $p=0.83$ ). Among the females who were cardiac patients, calcium levels were  $8.4 \pm 0.33$  nmol/L and  $8.57 \pm 0.24$  nmol/L in high and low severity of periodontal disease cases ( $p=0.677$ ). Table-IV

**Table-I**

Calcium and vitamin D levels in normal individuals

Gender	Calcium, nmol/L	Vitamin D, ng/ml
Normal males	$8.7 \pm 0.319$	$20.25 \pm 3.61$
Normal females	$9.23 \pm 0.24$	$7.47 \pm 4.35$
p-value	0.231	0.109

DATA IS ENTERED AS MEAN ± STANDARD DEVIATION.

**Table-II**

Comparison of vitamin D and calcium levels in two groups of patients according to severity of disease

Intensity of Periodontal Disease	Vitamin D, ng/ml	Calcium, nmol/L
High	$24.98 \pm 4.53$	$8.43 \pm 0.142$
Low	$41.95 \pm 1.42$	$8.69 \pm 0.28$
P-Value	0.22	0.437

DATA IS ENTERED AS MEAN ± STANDARD DEVIATION.

**Table-III**

Vitamin D and calcium concentration in low and high periodontal disease males with cardiac disease also.

Intensity of Periodontal Disease	Vitamin D	Calcium
High	$20.96 \pm 2.39$	$8.03 \pm 0.30$
Low	$41.67 \pm 4.78$	$8.95 \pm 0.77$
P-Value	0.002	0.075

DATA IS ENTERED AS MEAN ± STANDARD DEVIATION.

**Table-IV**

Vitamin D and calcium concentration in low and high periodontal disease females with cardiac disease also.

Intensity of Periodontal Disease	Vitamin D	Calcium
High	$17.5 \pm 4.93$	$8.4 \pm 0.33$
Low	$21.55 \pm 18.12$	$8.57 \pm 0.24$
P-Value	0.83	0.677

DATA IS ENTERED AS MEAN ± STANDARD DEVIATION.

**DISCUSSION:**

The roles of vitamin D is massive in human health and that is well projected from a report on a meeting

"Vitamin D and Human Health: from the Gamete to the Grave" 11. Thus the normal requirement of vitamin D is crucial from the normal development of fetus through out the different phases of an individual life up to the old age. The estimated level of the vitamin in each individual reflects the status in relation to its normal requirement for the functions. Vitamin D < 10 ug/mL is considered to be deficient, between 10 -29 ug/mL is insufficient and > 30 ug/mL is sufficient and > 100 ug/mL is vitamin toxicity. Therefore it is now considered that around 40 ug/mL is the ideal level for the normal functioning and least risk of various degenerative diseases from vitamin D requirements

In the present study it has been very concerning to observe that except a minor proportion of the screened population the remaining has been found 'to be vitamin D deficient. Very few subjects were found to be in the range of sufficient level. In this situation the strategy was undertaken to put aside the results of vitamin D in relation to the normal requirements and analyze the data according to the objectives of the present study. It has been striking to observe that the population that was assessed as control without periodontitis and cardiovascular disease showed very concerning low level of vitamin D. In the control group when the subjects were assessed gender wise it was striking to find that females had almost one third of the vitamin level in the males when in the males the vitamin level was 'almost half of the adequately required normal level. Thus females have extremely low level of vitamin D. The female belong to the category which mostly remained indoor and may also have the lower opportunity on the availability of the vitamin in foods. The males had better level probably of their outdoor opportunity and synthesis of the vitamin. Various observations were found to suggest that the major role of 1, 25(OH) 2D3 in bone is to provide the proper microenvironment for bone mineralization through stimulation of the intestinal absorption of calcium and phosphate 12. The calcium is utilized thus the probability of higher calcium in the blood demonstrates the possibility of low utilization of calcium. In females the comparative higher calcium level probably reflects low utilization of calcium due to low vitamin D. The calcium level in all these comparisons did not show obvious difference and

statistically highly non-significant.

The link of dental health and vitamin D had attained considerable attention in relation to periodontal disease. Vitamin D may affect the risk of developing periodontal disease via an effect on bone mineral density or via immunomodulatory effects 1. Therefore the many investigations have shown on the relation of vitamin deficiency and incidence of periodontitis. Globally there are now apprehensions that hypovitaminosis D is contributing in several diseases like periodontitis, inflammatory bowel disease, obesity, cardiovascular diseases these all are considered as inflammatory bowel disease and vitamin D play an important role in these diseases 3.

The comparison on the vitamin D level in the males with low and high level of periodontitis and also suffering from cardiac diseases, the vitamin level was in satisfactory range in low incidence of periodontitis than very significantly reduced level of the vitamin in high incidence of periodontitis. The difference was also highly significant statistically. In females however there was no clear difference in the vitamin as well as calcium levels between high and low status of periodontitis although in both cases vitamin level were distinctly deficient.

The pathogenesis and risk of diabetes mellitus and cardiovascular disease had especially in focus in the studies with respect to vitamin D deficiency and its critical role and prevalence 9. The relationship between vitamin D deficiency and cardiovascular disease has been supported by growing body of evidences however underlying mechanism is yet to be understood. The present study from the specific population has also observed and contributed in the understanding that vitamin D deficiency adverse effect in expression of several diseases including periodontitis and cardiovascular diseases is proving. It has clearly indicated that certain comparisons that low level of vitamin D looked to be contributory in cardiac disease. If people get continuous supplementation of vitamin D and calcium on daily basis <1,000 IU/day, periodontal health may be preserved and most important is good dental care which is best solution of every periodontal problem 13.

There is no doubt that the importance of vitamin D had been overlooked and recently it is being



revealed several degenerative diseases incidences are on rise due to vitamin D deficiency. Vitamin D association is also reflected as supplementation reduces this problem resulting in less tooth loss 14-17. Effect of supplementation was seen just within 24 weeks as periodontal attachment was well maintained and tooth loss also reduced 18. In population of Germany oral disease like caries, tooth loss, periodontitis are highly prevalent side by side they are also high prevalence in vitamin D deficiency, so vitamin D deficiency might be as risk factor for periodontitis as well as act as protective factor against periodontitis, caries and tooth loss 19.

**CONCLUSION:**

Low level of vitamin D has the relationship with the severity of periodontal disease and also with the occurrence of cardiac diseases.

**Conflict of interest: NIL**

**Funding source: NIL**

**RESOURCES:**

1. Martelli FS, Martelli M, Rosati C, Fanti E. Vitamin D: relevance in dental practice. Clin Cases Miner Bone Metab. 2014;11(1):15.
2. Verdoia M, Schaffer A, Sartori C, Barbieri L, Cassetti E, Marino P, et al.. Vitamin D deficiency is independently associated with the extent of coronary artery disease. Eur J Clin Invest. 2014;44(7):634-42.
3. Jahani R, Fielding KA, Chen J, Villa CR, Castelli LM, Ward We, et al. Low vitamin D status throughout life results in an inflammatory prone status but does not alter bone mineral or strength in healthy 3-month-old CD-1 male mice. Mol Nutr Food Res. 2014;58(7):1491-501.
4. Genco RJ, Borgnakke WS. Risk factors for periodontal disease. Periodontol. 2013;62(1):59-94.
5. Johnston B, Fritz P, Ward W. Use of dietary supplements in patients seeking treatment at a periodontal clinic. Nutrients. 2013;5(4):1110-21.
6. Wang Q, Li H, Xie H, Fu M, Guo B, Ding Y, et al. 25-Hydroxyvitamin D3 attenuates experimental periodontitis through downregulation of TLR4 and JAK1/STAT3 signaling in diabetic mice. J Steroid Biochem Mol Biol. 2013;135:43-50.
7. Zhang X, Meng H, Sun X, Xu L, Zhang L, Shi D, et al. Elevation of vitamin D binding protein levels in the plasma of patients with generalized aggressive periodontitis. J Periodont Res. 2013;48(1):74-9.
8. Bashutski JD, Eber RM, Kinney JS, Benavides E, Maitra S, Braun TM, et al. The impact of vitamin D status on periodontal surgery outcomes. J Dent Res. 2011;90(8):1007-12.
9. Griz LH, Bandeira F, Gabbay MA, Dib SA, Carvalho EF. (2014) Vitamin D and diabetes mellitus, 1:1-8.
10. Beveridge LA, Witham MD. Vitamin D and the cardiovascular system. Osteoporosis Int. 2013;24(8):2167-80.
11. Beveridge LA, Witham MD. Vitamin D and the cardiovascular system. Osteoporosis Int. 2013;24(8):2167-80.
12. Martineau A, Jolliffe D. "Vitamin D and Human Health: from the Gamete to the Grave": Report on a meeting held at Queen Mary University of London, 2014.
13. Kronenberg HM, Melmed S, Polonsky K, Larsen P. Hormones and disorders of mineral metabolism. Williams Textbook of Endocrinology, 11th ed. Philadelphia Editorial Saunders Elsevier. 2008:1224-69.
14. Garcia MN, Hildebolt CF, Miley DD, Dixon DA, Couture RA, Spearie CL, Langenwaller EM, Shannon WD, Deych E, Mueller C, Civitelli R. One year effects of vitamin D and calcium supplementation on chronic periodontitis. J Periodontol. 2011;82(1):25-32.
15. Grant WB, Boucher BJ. Are Hill's criteria for

- causality satisfied for vitamin D and periodontal disease?. *Dermato Endocrinol.* 2010;2(1):30-36.
16. Grant WB, Giovannucci E. The possible roles of solar ultraviolet-B radiation and vitamin D in reducing case-fatality rates from the 1918–1919 influenza pandemic in the United States. *Dermato-Endocrinol.* 2009;1(4):215-19
17. Bashutski JD, Eber RM, Kinney JS, Benavides E, Maitra S, Braun TM, et al. The impact of vitamin D status on periodontal surgery outcomes. *J Dent Res.* 2011;90(8):1007-12.
18. Miley DD, Garcia MN, Hildebolt CF, Shannon WD, Couture RA, Anderson Spearie CL, et al. Cross sectional study of vitamin D and calcium supplementation effects on chronic periodontitis. *J Periodontol.* 2009;80(9):1433-39.
19. Intini G, Katsuragi Y, Kirkwood KL, Yang S. Alveolar bone loss: mechanisms, potential therapeutic targets, and interventions. *Advance Dent Res.* 2014;26(1):38-46.
19. Zhan Y, Samietz S, Holtfreter B, Hannemann A, Meisel P, Nauck M, et al. Prospective study of serum 25-hydroxy vitamin D and tooth loss. *J Dental Res.* 2014;93(7):639-44.