

EFFECT OF VITAMIN D3 AND K2 AS ADJUNCT TO PERIODONTAL THERAPY

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ABSTRACT

Background and Objectives: chronic periodontitis is a prevalent disease among the adult population that can cause serious damage to the periodontal tissue. Vitamin D3 deficiency/insufficiency is a global public health issue that has been linked to various inflammatory disorders, including periodontitis. Vitamin K2 has recently gained importance as a potential therapeutic agent because it regulates body calcium metabolism. The use of Vitamin D3 and K2 supplementation as adjunctive during non-surgical periodontal treatment (NSPT) can help improve the treatment outcome and the severity of chronic periodontitis. Further research is needed to determine the optimal dosage and duration of supplementation required for maximum benefit.

Material and methods: involved 45 systemically healthy patients between the ages of range 20-45 years viewing moderate to severe chronic periodontitis were selected and randomly divided into 3 groups, the control group (n= 15) received conventional periodontal treatment, Drug and SRP group (n=15) received conventional periodontal treatment with pharmaceutical intervention (Vit D3 5000 iu + K2 100mg) for the treatment of vitamin D deficiency and Drug group (n=15) received the pharmaceutical intervention (Vit D3 5000 iu +K2 100mg) for the treatment of vitamin D deficiency.

Result: Significant reductions in PI, GI, and CAL were detected after 2 months of non-surgical periodontal treatment (NSPT) with Vitamin D3 and K2 supplementation compared to baseline in both groups (Drug+ SRP and Drug group). Superior decrease than the control group.

Conclusion: Taking vitamin D3 and K2 supplements along with non-surgical periodontal treatment could be a good option for treatment in the future.

KEYWORDS: Vit D3, Chronic periodontitis, Vit K2

1. INTRODUCTION

Periodontitis (PD) is indeed a complex polymicrobial disease induced by both oral microbial and the individual inflammatory response (Caton J.G, et al, 2018). Periodontitis is usually initiated by the accumulation of dental plaque on the teeth, which contains a diverse community of microorganisms. (Kassebaum N.J, et al, 2014), Some of these microorganisms can trigger an inflammatory response in the host, which can lead to the destruction of the periodontal tissues. Gingivitis is the earliest stage of periodontitis and is characterized by inflammation of the gingiva, if left untreated, gingivitis can progress to periodontitis, which involves the destruction of the alveolar bone that supports the teeth. This destruction can ultimately lead to tooth loss if the disease is not managed appropriately. (Helal O, et al., 2019)

Periodontitis is considered a non-communicable disease because it is not

contagious and is usually caused by factors such as poor oral hygiene, smoking, genetics, and certain medical conditions that affect the immune system. The disease is classified as a pandemic because it affects a significant proportion of the global population and can have a significant impact on oral health and overall well-being. (Kassebaum NJ, et al., 2014).

The recent study on the global prevalence of periodontal disease is alarming. It revealed that the percentage of adults affected by various stages of periodontal disease is 100% in China, India, and Belarus. Moreover, over half of the adult population in several countries, including Germany, Nepal, Poland, Malaysia, Libya, Iran, and Taiwan, have periodontitis. These findings highlight the urgent need for effective prevention and treatment strategies for periodontal disease, especially in high-prevalence countries. (Nazir M, et al., 2020).

Vitamin D intake was inversely related to periodontitis incidence in epidemiological

studies. Luo *et al.*, Discover that the second-highest vitamin D supplement had a lower incidence of periodontitis than the highest-level vitamin D supplement. (Luo PP, *et al.*, 2018)

According to studies, 25 (OH) D status can raise the risk of periodontitis by regulating the host's immune response to infection or by preventing alveolar bone loss. vitamin d deficiency is related to the severity and progression of periodontal disease. (Pihlstrom BL, *et al.*, 2005), (Dragonas P, *et al.*, 2020)

Vitamin D has been proven to play a significant role in immune processes, having anti-inflammatory and antimicrobial effects, inhibiting cell proliferation, and promoting differentiation. This term encompasses both Vitamin D₂, synthesized from the ultraviolet radiation of yeast ergosterol, and Vitamin D₃, created by the ultraviolet radiation of 7-dehydrocholesterol in lanolin. Furthermore, Vitamin D₃ has been proven to influence the regulation of calcium in the gallbladder. (Botelho J, *et al.*, 2020)

Vitamin K moreover called “Koagulation Vitamin” in Danish, was found by Henrik Dam and colleagues amid examining dietary cholesterol's part. It could be a crucial fat-soluble vitamin. Vitamin K is a vital nutrient that plays an essential role in blood coagulation, bone health, cardiovascular health, and insulin sensitization. The Vitamin K series, particularly vitamin K₂, has significant therapeutic potential and has been used clinically worldwide to treat various conditions. Therefore, it is essential to maintain adequate levels of vitamin K through diet or supplementation to ensure optimal health. (Sunita A, *et al.*, 2022)

The combination of vitamins D and K can have advantageous effects on calcium balance that will lead to stronger bones. Vitamin D enhances calcium absorption, while Vitamin K controls calcium to create optimal calcification of bone and activate osteocalcin, which builds calcium in bones and teeth. Furthermore, Vitamin K₂ helps transport calcium to where it is needed in the muscles to build and maintain strong bones. (Walaa Fikry Elbossaty, 2018)

2. MATERIALS AND METHODS

2.1 Setting and time of the study

The current research was conducted in Duhok City, Periodontics Branch /College of Dentistry/ University of Duhok. The patients were joining the Branch of Periodontics. The research was

conducted by only one dentist and information was collected by the same dentist with data collected from December 2021 until January 2023.

2.2 Study population and design

The College of Dentistry at Duhok University's research ethics committee approved the current study. All patients received full information about the study's nature, the surgical procedure, and its objectives. Each patient received information on the treatment advantages, potential negative effects, and required follow-up visits. Each participant in the research then signed a formal consent form after receiving all necessary information. The study design is a randomized controlled clinical trial to evaluate the role of Vitamin D₃ and K₂ supplementation as adjunctive during non-surgical periodontal treatment (NSPT).

The participants were selected for the study based on the following inclusion and exclusion criteria.

Clinical examination

Clinical examinations were performed using a Michigan "O" probe with William Markings/ Williams Probe: It has circumferential markings at 1, 2, 3, 5, 7, 8, 9 & 10 mm respectively, and a dental mirror, including Plaque index (PI), Gingival index (GI), Probing pocket depth (PPD), Clinical attachment level (CAL).

Inclusion criteria:

Patient with a diagnosis of periodontitis was referred to the new classification of periodontal disease (Tonetti M.S, *et al.*, 2018), and had a minimum of two teeth with probing pocket depth (PPD) ≥ 4 mm, CAL ≥ 3 mm (moderate to severe), and positive bleeding in the affected areas.

1. No systemic diseases.
2. Age between 20 to 45 years.
3. No previous Vit D₃ and K₂ supplementation.
4. No scaling and root surface debridement for at least six months.

Exclusion criteria:

1. Diabetes Mellitus patient.
2. Smoker.
3. Alcoholic patient.
4. Pregnant and lactating females.
5. Hypothyroidism.

Laboratory investigation:

Venous blood samples were taken for measurement of serum 25(OH)D₃ concentrations before and after periodontal

treatment through 3 months. Vit D levels of the patients were categorized into three groups

The Institute of Medicine (IOM) and the Nordic Nutrition Council base their recommendations on the following blood levels:

Sufficient: 25(OH)D greater than 20 ng/ml (50 nmol/l)

Insufficient: 25(OH)D less than 20 ng/ml (50 nmol/l)

Deficient: 25(OH)D less than 12 ng/ml (25 nmol/l) (Ross AC, *et al.*, 2011).

Estimation of 25(OH) Vitamin D3

Participants were urged to visit the Lab Department of Clinical Biochemistry at General Central Laboratory, Duhok, Kurdistan region,

Iraq. After overnight fasting for 12-14 hours and avoiding heavy physical activity for more than two hours before the examinations, all patients were urged to stay at the same place in the morning. Blood samples were collected between 9:00 and 11:00 a.m., and about 10 ml of blood was extracted by venipuncture using a vacutainer from the antecubital vein and the Cobas 6000 Roche device for clinical chemistry analysis.

Drug used

Vit D3 5000 International Units, And Vit K2 100 microgram.



Fig. (1): Vit D3 (5000 IU) and Vit K2 (100 mcg)

The study population was divided randomly into the following three groups:

The control group (n= 15) received conventional periodontal treatment.

The drug and SRP group (n=15) received conventional periodontal treatment with pharmaceutical intervention (Vit D3 5000 iu +K2 100mg) for the treatment of vitamin D deficiency.

The drug group (n=15) received Vit D pharmaceutical intervention (Vit D3 5000 iu +K2 100mg) for the treatment of vitamin D deficiency.

Reevaluation follows up after 1 and 2 months.

Control group

Patients are examined by a dental mirror and periodontal probe to determine whether the case has chronic periodontitis or not. We chose the case with chronic periodontitis and sent them to Vit D3 Test after that we Classified the patients into 3 groups according to chronic periodontitis disease and Vit D3 level.

For the control group, we select patients with normal Vit D3 levels (sufficient: 25(OH)D greater than 20 ng/ml (50 nmol/l). Firstly, we took all the clinical measurements and wrote

them on a case sheet which consisted of (The gingival index, Plaque index, Probing Depth, and Clinical attachment loss) by using a dental mirror and Michigan "O" probe with William Markings/ Williams Probe which considered as a baseline. Secondly, after finishing all the clinical parameters, we start scaling and polishing with an ultrasonic scaler and pumas, and Root surface debridement was done for the teeth with clinical attachment loss by Gracey curettes. Then, oral hygiene instructions were given to the patient about brushing technique, Mouthwash, and Dental floss.

After 1 month the patient was re-visited at the dental clinic of the Department of Periodontics, College of Dentistry, University of Duhok for the 2nd schedule of treatment which included measurements of all the clinical parameters, scaling + root surface debridement (SRP) for inflamed teeth which not respond to previous treatment. Also, all instructions were given to the patient about oral health hygiene (brushing technique, Mouthwash, and Dental floss).

The patients followed up after 2 months of treatment with examinations of all the clinical indexes to get knowledge and to see the amount of improvement followed by the SRP therapy.



Fig. (2 (A)): Clinical measurement by periodontal probe (B) Chronic periodontitis patient

Drug and SRP group

The same thing was done for the second group but we select patients with Vit D3 deficiency/ insufficient (insufficient: 25(OH)D less than 20 ng/ml (50 nmol/l), deficient: 25(OH)D less than 12 ng/ml (25 nmol/l) and we describe Vitamin D3 (5000 iu) and Vitamin K2 (100mg) drug one Tab per Day of Vit D3+K2.

It is recommended that all patients undergo the necessary examination (Vit D3 test) before the appointment to know if they patient continues with drugs or not. According to the test, if the Vit d3 level is within the normal level, the patients should stop taking drugs., but if it is still deficient/ insufficient the patients continue taking the drugs.

The patients followed up after 2 months of treatment with examinations of all the clinical indexes to get knowledge and to see the amount of improvement followed by the SRP therapy.

Drug group

For this group, we select patients with Vit D3 deficiency/ insufficient (insufficient: 25(OH)D less than 20 ng/ml (50 nmol/l), deficient: 25(OH)D less than 12 ng/ml (25 nmol/l).

After that, we describe Vitamin D3 (5000 iu) and Vitamin K2 (100mg) drugs to all of them. One Tab per Day of Vit D3+K2, but this group differs from the second group by drug therapy (Vitamins) without SRP for chronic periodontitis patients.

It is recommended that all patients undergo the necessary examination (Vit D3 test) before the appointment to know if patients continue with drugs or not. According to the test, if the Vit D3 level is within the normal level, the patients should stop taking drugs., but if it is still deficient/ insufficient the patients continue taking the drugs. After finishing all the clinical parameters, Vitamin D3 (5000 iu) and Vitamin K2 (100mg) drug described to all of them. One Tab per Day of Vit D3+K2.

The patients followed up after 2 months of treatment with examinations of all the clinical indexes to get knowledge and to see the amount of improvement followed the drug therapy. After that scaling and polishing with an ultrasonic scaler and pumas and Root surface debridement was done for the teeth with clinical attachment loss by Gracey curettes.

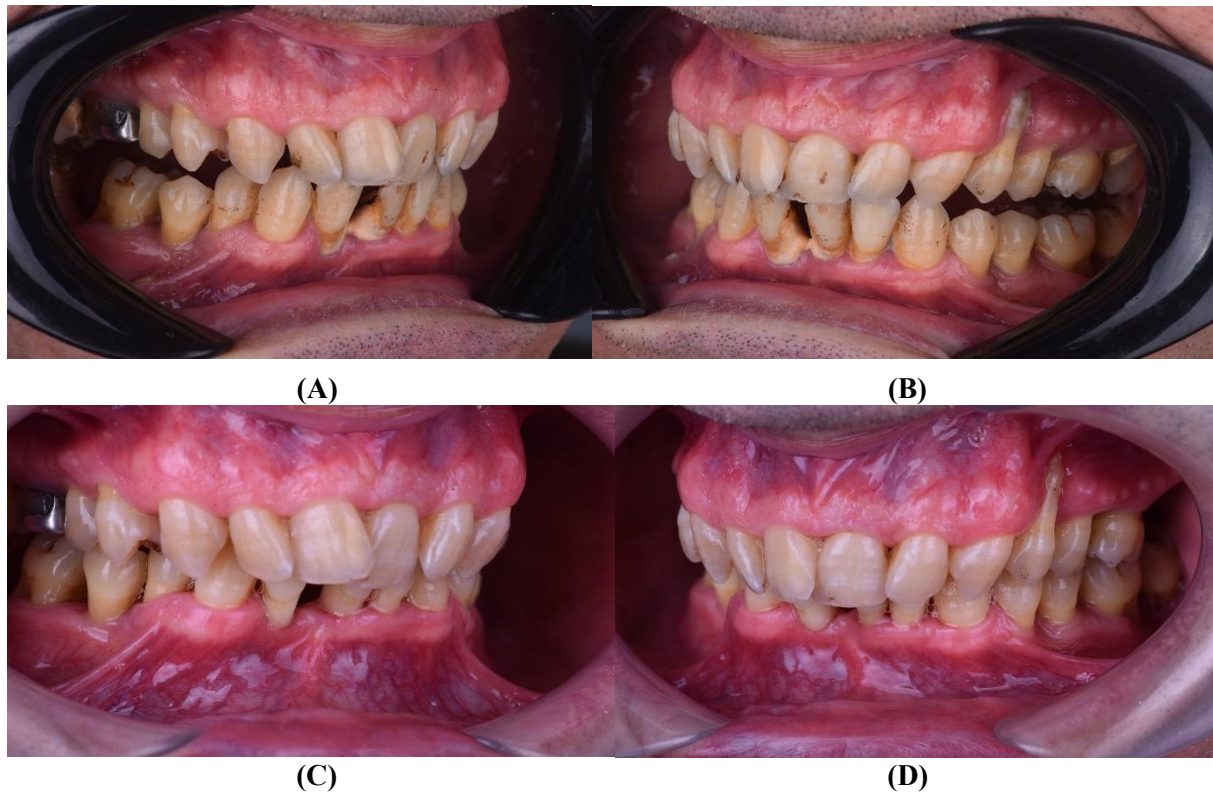


Fig. (3): Chronic periodontitis patient at baseline (A) Right side (B) Left side (c) At 2nd-month treatment Right side (d) Left side

2.3 Statistical analysis

The study was checked for the homogeneity of the general (age and gender) and main outcome (dental indicators) among study groups (control, drug and SRP, and drug group). In this regard, the number of cases decreased from 15 in each group to 12 (control), 11 (drug and SRP), and 13 (drug group). The homogeneity of the general and baseline clinical indicators of study groups was examined in Wilcoxon / Kruskal-Wallis Tests (Rank Sums) and Perscon chi-squared tests. Non-parametric statistical tests were used in this study because the sample size was smaller than 15. The comparisons of dental clinical indicators among study groups at 1 and 2 months were examined by Wilcoxon / Kruskal-Wallis Tests (Rank Sums). The pairwise comparisons were performed using the Dunn test. These comparisons were presented in box plots. The comparisons of dental clinical indicators of study groups between pre and post-test were examined by the Wilcoxon Signed Rank test. The comparison of indicators between male and female patients of study groups at two months was examined in a Mann-Whitney U test. The correlations of dental indicators with age in study groups at two months were examined in the Spearman rho test. The

significant level of difference was determined by a p-value of less than 0.05. The statistical calculations were performed using the JMP pro-14.30.

3. RESULTS

Thirty-six patients (17 females -19 males) with ages ranging from 20 to 45 years old were included in the present study and continued the 2 months follow-up evaluation.

* ^a Wilcoxon / Kruskal-Wallis Tests (Rank Sums) and ^b Perscon chi-squared test

IQR: Interquartile Range (Median), PI: Plaque index, GI: Gingival index, CAL: Clinical attachment loss, VitD3+K2: Vitamin D3 + Vitamin K2, SRP: Scaling and root planning, SD: Mean

The median value of the study group for the baseline measurement was similar in **Age** [IQR = 38.5 (14.5), IQR= 40 (13); IQR= 39(10.5)], **PI** [IQR= 2.15(0.55), IQR= 2.4(0.8), IQR= 2.3(0.6)], **GI** [IQR=2.65(0.28), IQR= 2.8(0.4), IQR= 2.7(0.6)], **CAL** [IQR= 3.25(0.38), IQR= 3.5(1.2), IQR= 3.6(0.92)] for Control group; Drug and SRP and Drug group respectively

In addition, the study group was comparable in gender [Male 50.00, 36.36, 69.23%], [Female 50.00, 63.64, 30.77].

There were statically significant differences ($P < 0.0001^a$) among the study group (Control

group; Drug and SRP and Drug group) in pre-treatment serum 25(OH)D and Vit K2 levels were [IQR= 33.35(5.93) nmol/L, IQR= 9.01(6.04) nmol/L, IQR= 10.8(6.75) nmol/L]. As it is shown in (Table 1).

Table (1): Comparisons of general and baseline clinical indicators among study groups

Dental indicators (n=36)		Study groups			P(two-sided)
		Control (n=12)	Drug and SRP group (n=11)	Drug group (n=13)	
Age	Mean (SD)	36 (7.70)	38.27 (8.27)	36.85 (7.73)	0.5494 ^a
	Median (IQR)	38.5 (14.5)	40 (13)	39 (10.5)	
PI	Mean (SD)	2.13 (0.35)	2.36 (0.47)	2.25 (0.44)	0.3031 ^a
	Median (IQR)	2.15 (0.55)	2.4 (0.8)	2.3 (0.6)	
GI	Mean (SD)	2.66 (0.21)	2.82 (0.19)	2.63 (0.31)	0.1632 ^a
	Median (IQR)	2.65 (0.28)	2.8 (0.4)	2.7 (0.6)	
CAL	Mean (SD)	3.33 (0.21)	3.78 (0.70)	3.80 (0.58)	0.0776 ^a
	Median (IQR)	3.25 (0.38)	3.5 (1.2)	3.6 (0.92)	
VitD3+K2	Mean (SD)	34.61 (4.28)	11.04 (5.37)	11.12 (4.35)	<0.0001 ^a
	Median (IQR)	33.35 (5.93)	9.01 (6.04)	10.8 (6.75)	
Gender	no (%)	6 (50.00)	4 (36.36)	9 (69.23)	0.2674 ^b
	Male	6 (50.00)	7 (63.64)	4 (30.77)	
	Female				

^a Wilcoxon / Kruskal-Wallis Tests (Rank Sums) and ^b Perscon chi-squared test were performed for statistical analyses.

There were significant differences in **PI** among the groups ($P < 0.0001$) As it showed in (Table 2), The Drug group had a higher Median value compared to Drug and SRP group (IQR= 1.7 (0.43) V.S 1.1(0.12); $p < 0.0001$), Also it is higher in comparison to the Control group (IQR= 1.7 (0.43) V.S 1.75 (0.28); $P= 1.0000$), But Control group Median value higher than the Drug and SRP group about (IQR= 1.75(0.28) V.S 1.1(0.12); $P= 0.0002$).

In **GI** index showed a significant difference between study groups ($P < 0.0001$) with a higher

Median value of the Control group than the Drug group and Drug and SRP group (IQR= 2.15(0.35) V.S 1.6(0.32); $p= 0.0016$), (IQR= 2.15(0.35) V.S 1.4(0.3); $p < 0.0001$).

The drug and SRP group had lower Median values in **GI** in comparison to the Drug group [IQR= 1.4(0.3) V.S 1.6(0.32)].

There was no significant difference among all groups in CAL measurement ($P= 0.6399$), also for Vit D3+ K2 ($P= 0.2586$).

Table (2): Comparisons of dental clinical indicators among study groups at 1 month

Dental indicators		Study groups			P	Pairwise comparisons
		Control (n=12)	Drug and SRP group (n=11)	Drug group (n=13)		
		GA	GB	GC		
PI	Mean (SD)	1.72 (0.24)	1.13 (0.07)	1.74 (0.27)	<0.0001	GC vs. GB (P<0.0001)
	Median (IQR)	1.75 (0.28)	1.1 (0.12)	1.7 (0.43)		GC vs. GA (P=1.0000)
						GB vs. GA (P=0.0002)
GI	Mean (SD)	2.16 (0.23)	1.39 (0.18)	1.59 (0.20)	<0.0001	GC vs. GB (P=0.3573)
	Median (IQR)	2.15 (0.35)	1.4 (0.3)	1.6 (0.32)		GC vs. GA (P=0.0016)
						GB vs. GA (P<0.0001)
CAL	Mean (SD)	3.07 (0.23)	2.93 (0.34)	2.99 (0.55)	0.6399	NA
	Median (IQR)	2.95 (0.45)	3 (0.5)	2.8 (0.95)		
VitD3+K2	Mean (SD)		19.88 (7.04)	21.83 (4.29)	0.2586	NA
	Median (IQR)		18.17 (11.02)	21.7 (8.1)		

Wilcoxon / Kruskal-Wallis Tests (Rank Sums) were performed for statistical analyses. The pairwise comparisons were performed using the Dunn test.

The periodontal parameters (PI, GI, and CAL) presented a significant difference among all groups.

Regarding PI & GI, there was a statistically significant reduction in all groups, however, this reduction was more significant in the group's Drug and SRP group and Drug group compared to group Control group. CAL readings showed statistically significant post-treatment changes in all three groups in the 2-month follow-up period.

Elevation of the mean serum 25(OH)D3 concentration when the 2 months of Drug and SRP (IQR= 29(7.0) and Drug group (IQR= 29.6(4.95)) measurements were compared to the starting (baseline IQR=9.01(6.04) and (IQR=10.8(6.75)).

By day two months of observation, the IQR values of PI, GI, and CAL, which represent the presence and severity of periodontal inflammation, decreased dramatically, indicating the therapy's success. Throughout the entire observation period, a gradual and significant decrease in this parameter was observed. It was a sign of the pronounced positive effect seen mainly in the Drug and SRP + Drug groups. As shown in (Table 3).

There were significant differences in PI among the groups (P <0.0001) As it showed in

(Table 3), The Drug group had a higher Median value compared to Drug and SRP group (IQR= 1.08 (0.15) V.S 1.04 (0.04); p =0.0146) But had lower value in comparison to the Control group (IQR= 1.08 (0.15) V.S 1.2 (0.18); P= 0.1188), Also Control group Median value higher than the Drug and SRP group about (IQR= 1.2(0.18) V.S 1.04(0.04); P<0.0001).

In GI index showed a significant difference between study groups (P <0.0001) with a higher Median value of the Control group than the Drug group and Drug and SRP group (IQR= 1.6(0.3) V.S 1.1(0.18); p= 0.0043), (IQR= 1.6(0.3) V.S 1.04(0.12); p <0.0001).

The drug and SRP groups had lower Median values in GI in comparison to the Drug group [IQR= 1.04(0.12) VS. 1.1(0.18); P= 0.3396].

Finally, the IQR of CAL index showed a significant reduction of about P= 0.0398 among all groups, Control group had higher values than the Drug group, and Drug+ SRP [IQR= 2.7(0.68) VS. 2.1(0.6); P=0.0499], [IQR= IQR= 2.7(0.68) VS. 2.16(1.04); P=0.1274] Also the Drug and SRP appear lower values in compared to the Drug group values [IQR= 2.1(0.6) VS. 2.16(1.04); P=0.9706]. As it showed in (Table 3)

Table (3): Comparisons of dental clinical indicators among study groups at 2 months

Dental dictators		Study groups				P(two-sided)	Pairwise comparisons
		Control (n=12)	Drug and SRP group (n=11)	Drug group (n=13)			
		GA	GB	GC			
PI	Mean (SD)	1.25 (0.11)	1.03 (0.03)	1.13 (0.09)	<0.0001	GC vs. GB (P=0.0146)	
	Median (IQR)	1.2 (0.18)	1.04 (0.04)	1.08 (0.15)		GC vs. GA (p=0.1188)	
						GB vs. GA (P<.0001)	
GI	Mean (SD)	1.65 (0.26)	1.05 (0.06)	1.16 (0.11)	<0.0001	GC vs. GB (P=0.3396)	
	Median (IQR)	1.6 (0.3)	1.04 (0.12)	1.1 (0.18)		GC vs. GA (p=0.0043)	
						GB vs. GA (P<.0001)	
CAL	Mean (SD)	2.73 (0.51)	2.25 (0.52)	2.29 (0.46)	0.0398	GC vs. GB (P=0.9706)	
	Median (IQR)	2.7 (0.68)	2.16 (1.04)	2.1 (0.6)		GB vs. GA (P=0.1274)	
						GC vs. GA (P=0.0499)	
VitD3+K2	Mean (SD)		29.25 (4.58)	30.05 (3.62)	0.4687	NA	
	Median (IQR)		29 (7.0)	29.6 (4.95)			

Wilcoxon / Kruskal-Wallis Tests (Rank Sums) were performed for statistical analyses. The pairwise comparisons were performed using the Dunn test.

4. DISCUSSION

Periodontitis treatment involves a broad range of therapies to prevent and minimize inflammation. The most important part of the therapy is the monitoring of the oral biofilm, both by periodontist intervention and patient-friendly activities. It is exacerbated by dental plaque, subgingival biofilm overgrowth, and calculus formation. Other known risk factors must also be monitored and controlled. As such, a balanced and nutritionally equilibrated diet is also vital. Periodontal inflammation can be reduced by nonsurgical therapies such as vitamins, prebiotics, probiotics, and symbiotic agents. (Butera, *et al.*, 2022), (Santonocito, *et al.*, 2022)

The relationship between periodontitis and vitamin D levels among adults was investigated in our study. 45 systemically healthy individuals with moderate to severe chronic periodontitis aged 20-45 years were selected and divided into three groups; the control group (n=15) received conventional periodontal care with normal Vit D3, the Drug + SRP group received conventional periodontal care with pharmaceutical intervention (Vit D3 5000 iu + K2 100mg) for the treatment of vitamin D deficiency, while the Drug group received the pharmaceutical intervention (Vit D3 5000 iu + K2 100mg) The results showed a significant decrease in the clinical periodontal quality among the SRP + Drug group and the Drug group than in the

control group. This finding was in agreement with the Alzahrani a, *et al.*,2021 study, which found a significant correlation between periodontitis and Vitamin 25(OH)D serum levels. (Alzahrani A, *et al.*, 2021)

Both groups of our study who have chronic periodontitis with Vit D3 deficiency showed improvement in CAL index that reduce the index level from severe to moderate and mild and this result came close to the study which reported that the vitamin D3 serum level in periodontitis patients decreased in comparison to healthy individuals in the Iwona and Elena, 2022 study, and it seems that the decrease in vitamin D3 levels increased with the disease severity, distribution, and risk. (Iwona and Elena, 2022).

Results of the CAL index showed the amount of achievement through the period of treatment in both groups receiving Vit D3 + K2 supplementation Drug + SRP at baseline IQR 3.5(1.2) And Drug group 3.6(0.92), Drug + SRP at 2nd month IQR 2.16(1.04) And Drug group 2.1(0.6). Gao *et al.*'s research revealed that their findings were not coincident. Vitamin D supplementation significantly increased serum levels, reduced attachment loss and probing depth, and reduced systemic inflammation (Gao, *et al.*, 2020), (Meghil, *et al.*, 2019). These results point to the possibility of a positive effect of vitamin D on periodontal health, which contrasts with our study, which showed a decrease in periodontal parameters in both groups taking vit d3+k2.

The significant decrease in GI in all groups especially the two-group taking Vit D3 + K2 supplementation (IQR for control, drug + SRP and Drug group sequentially 2.65(0.28), 2.8(0.4) and 2.7(0.6) at baseline) that reduced to (IQR 1.6(0.3), 1.04(0.12) and 1.1(0.18) at 2nd months) showed agreement with Ebersole, et al., 2018 study which reported that Vit C and Vit D decrease bleeding within the gingiva, which can be used in other treatments for periodontal disease. This can improve patient life quality, improve symptoms, and promote good oral hygiene in patients affected by the disease. Low concentrations of both vitamins in the blood correlate with disease development and raise the risk of tooth loss. (Ebersole, et al., 2018). And Vit C and Vit D seem to be essential components in preventing periodontitis (Taskan, et al., 2020).

A corrodng to our study and the Significant reduction in clinical parameters (PI, GI, and CAL) from the baseline to the 2nd month of treatment that showed in (Table 1,2,3) for both groups (drug group + drug with SRP), this was following the study done by Marina Perić, Who found that the in future, vitamin D supplementation in conjunction with non-surgical periodontal therapy may be considered as a treatment option for patients with a baseline serum Vit D of below 30 ng/ml. (Marina Perić, et al., 2020).

5. CONCLUSION

In conclusion, the new study found that chronic periodontitis is related to a Vit D3 + K2 supplement. As a result, these individuals may be screened for serum vitamin D levels. To reduce periodontal disease, vitamin D3 and K2 supplements can be taken in conjunction with SRP.

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