Academic Sciences

International Journal of Current Pharmaceutical Research

ISSN- 0975-7066 Vol 4, Issue 4, 2012

Research Article

EVALUATION OF EFFICACY OF COENZYME Q_{10} IN MANAGEMENT OF GINGIVITIS & SLIGHT PERIODONTITIS -A CLINICAL STUDY

UNNATI PITALE[1], SHALEEN KHETARPAL[2], KALPAK PETER[1], VISHNU PAL[1]*, ESHA VERMA[3], PUNEET GUPTA[4]

[1]Department of Periodontics, RKDF Dental College, Bhopal (M.P), [2]Department of Periodontics, Govt College of Dentistry & Hospital, Indore(M.P), [3]Department of Periodontics, College of Dentistry, Rau, Indore(M.P), [4]Dept of Preventive& Community Dentistry, Govt College of Dentistry & Hospital, Indore (M.P) Email: dr.unnati10@gmail.com

Received: 21 July 2012, Revised and Accepted: 06 August 2012

ABSTRACT

Periodontal disease is an inflammatory disease process, resulting from the interaction of a bacterial attack and host inflammatory response. Arrays of molecules are considered to mediate the inflammatory response including free radicals and reactive oxygen species (ROS). Periodontal pathogens can induce ROS overproduction and thus may cause collagen and periodontal cell breakdown. When ROS are scavenged by antioxidants, there can be a reduction of collagen degradation. Ubiquinone (reduced form coenzyme Q_{10}) serves as an endogenous antioxidant which increases the concentration of CoQ_{10} in the diseased gingiva and effectively suppresses advanced periodontal inflammation.

The aim of the study was to evaluate the efficacy of Coenzyme Q_{10} (Perio Q ™) as adjunct to scaling and root planning, in management of gingivitis and slight periodontitis. 30 systemically healthy patients in a split mouth study design, where one half of the arches were test sites (treated with scaling and root planing + Perio Q ™ gel) and the other half of the arches were the control site were treated with scaling and root planing only .Results were compared statistically using Students's paired T test, at baseline and at 1st and 2nd week intervals. Various clinical parameters like periodontal probing depth and bleeding on probing were evaluated .Also Plaque and Gingival Index were evaluated .There was a statistically significant improvement in gingival index and reduction in probing depth in test sites seen at the end of 2 weeks period. Sites with bleeding on probing were reduced more in the test group than in control. Hence, coenzyme Q_{10} can be said to have a beneficial effect clinically on gingivitis and slight periodontitis when used as adjunct to scaling and root planning.

Keyword: Periodontal disease, Slight periodontitis, Antioxidants, Coenzyme Q_{10}, Ubiquinone, Bioenergizer,

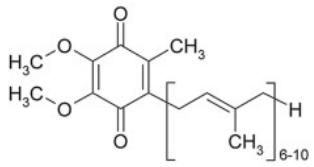
INTRODUCTION

Periodontal disease is an infectious disease causing inflammation of supporting tissues of teeth such as gingiva, periodontal ligament, cementum and alveolar bone leading to tissue destruction and tooth loss. Various experiments and studies have proved that dental plaque is the primary etiologic factor in causing periodontal disease. Other factors like host immune response and environmental factors like stress are involved in causing this disease[1].

Dental plaque is a soft deposit formed on the tooth surface, which when mineralized, forms a hard deposit called calculus. Dental plaque contains microorganisms which exist in a state of biofilm. Oral microbial flora in health is loaded with gram positive organisms and in diseased conditions changes to anaerobic flora[2,3]. Host immune cells like neutrophils (polymorphonuclear leukocytes) and monocytes are released to act against these microorganisms. During phagocytosis, there is a non-mitochondrial O_2 consumption, which may be 10 or 20 times that of resting consumption ultimately ends in generation of free radicals (FRs) and reactive oxygen species (ROS), such as superoxide anion radicals, hydrogen peroxide, hydroxyl radicals, and hypochlorous acid, all capable of damaging either cell membranes or associated biomolecules[4].

Antioxidants are substances that scavenge these free radicals, the damaging compounds in the body that alter cell membranes, tamper with DNA, and even cause cell death. They are normally present in our body to counteract these free radicals. But when there is over production of free radicals like in diseased condition, anti-oxidants are unable to counteract the free radicals leading to tissue destruction[5,6]. When this tissue destruction happens in periodontal connective tissues, the attachment apparatus is weakened leading to mobility of teeth and finally tooth loss. Hence anti-oxidants are used as supplements to counteract the over production of free radicals in periodontal disease[7].

In quest for the search of an antioxidant therapy to be used as an adjunct scaling root planning in periodontally involved patients, focus has shifted to products like Coenzyme Q_{10} (CoQ_{10}), which is a compound found naturally in the energy-producing center of the cell known as the mitochondria. CoQ_{10} is involved in the making of an important molecule known as ATP. ATP serves as the cell's major energy source and drives a number of biological processes including muscle contraction and the production of protein. CoQ_{10} also works as an effective antioxidant.



Coenzyme Q $_{10}$ Molecule

Also, a deficiency of coenzyme Q_{10} at its enzyme sites in gingival tissue may exist independently of and/or because of periodontal disease. If a deficiency of coenzyme Q_{10} existed in gingival tissue for nutritional causes and independently of periodontal disease, then the advent of periodontal disease could enhance the gingival deficiency of coenzyme Q_{10}[8]. In such patients, oral dental treatment and oral hygiene could correct the plaque and calculus, but not that part of the deficiency of CoQ_{10} due to systemic cause. Thus periodontal therapy with CoQ_{10} can be included for an overall improvement of this type of periodontal disease[8].

Although coenzyme Q_{10} may have been viewed as an alternative medication, it is used routinely, both topically and systemically, by many believing dentists and periodontists. However, there is a dearth of new information for coenzyme Q_{10} in the treatment of periodontal conditions.

The aim of the study was to clinically evaluate the efficacy of Coenzyme Q_{10} (Perio Q™ gel) applied topically and intrasulcularly at site with gingivitis and slight periodontitis[9] (1-2 mm of clinical attachment loss) as an adjunct to scaling root planning as compared to sites treated with scaling root planning alone .

MATERIAL & METHODS

Sample Size

The study was an in vivo study design. 30 systemically healthy, including 18 male and 12 female patients with a mean age of 33.7 ±

3.1 years, presenting with generalized gingivitis or slight periodontitis(1-2 mm of clinical attachment loss) were included in the study. Subject with present or past history of smoking, were specially excluded from the study. The study design was a split mouth study design where each patient acted as a test and a controlled site. One half of the arches i.e right side (1st and 4th quadrant) or left side (2nd and 3rd quadrant) as per FDI notation acted as a test site and the other half acted as control. The sites were randomly distributed to either of the test or control site by a toss of coin.

Clinical parameters and periodontal indices

After recording the plaque index (Sillnes & Loe)[10] and gingival Index (Loe & Sillness)[11] , clinical parameters of periodontal probing depth (in millimeters) and bleeding on probing, were recorded using DB 764 R probe second generation pressure sensitive probe (Aesculap, Tuttlingen, Germany) (Fig 1a & 1b). Bleeding on probing was recorded for all the teeth of the test as well as controlled sites. Periodontal probing depth was evaluated for all the teeth and then the means were calculated for both the test sites and controlled sites.

Treatment Rendered

Periodontal scaling and root planning was done using ultrasonic scaler (EMS piezoelectric scaler, Fig 2) and intrasulcular application of Coenzyme Q_{10} (Perio Q™ gel, Hamilton, U.S.A) was done at the same visit (Fig 3). Also patient was given Perio Q™ gel for self application topically on attached and marginal gingiva, twice daily strictly at the test site only. Patients were evaluated after an interval of 1 week and 2 weeks. The other side of the arches which acted as control sites were managed by scaling and root planning as a monotherapy, with no additional application of CoQ_{10} gel. They were also evaluated at the same intervals (Fig 4&5) .Different set of examiners were involved in evaluation of the indices at baseline scores. The examiners who evaluated at the end of 1st and 2nd week, were blinded for the test and the control sites in each patient.

Statistical Analysis

The Student's paired t-test was used to compare the data of test and control sites at baseline and 1 week and 2 weeks intervals . If the probability value (p) was more than 0.05, the difference observed was considered non-significant and if less than or equal to 0.05, it was considered significant.

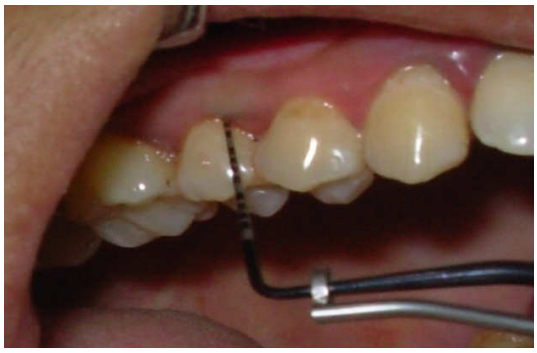


Fig. 1a: Test site

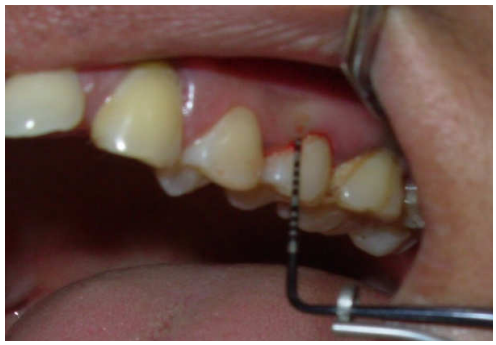
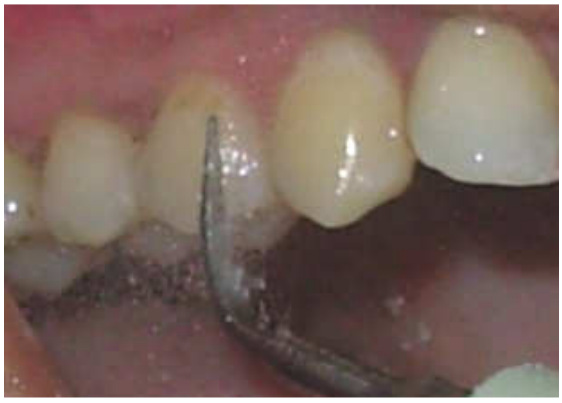


Fig. 1b: Control site



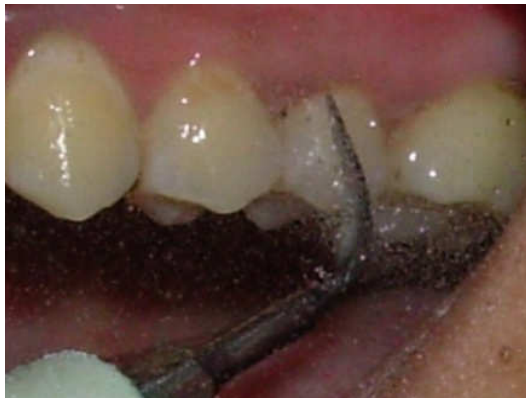


Fig. 2: Ultrasonic scaler at test site and control sites

Fig. 3: Perio Q™ Gel

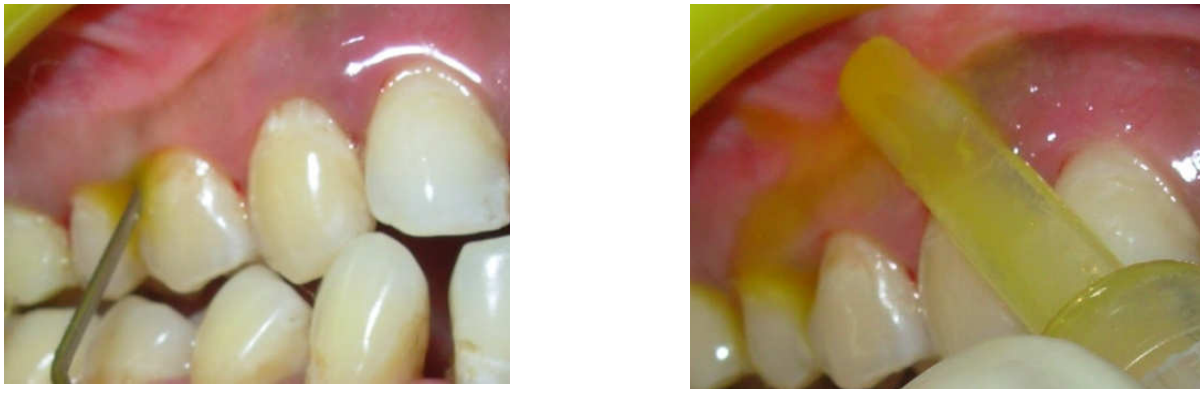
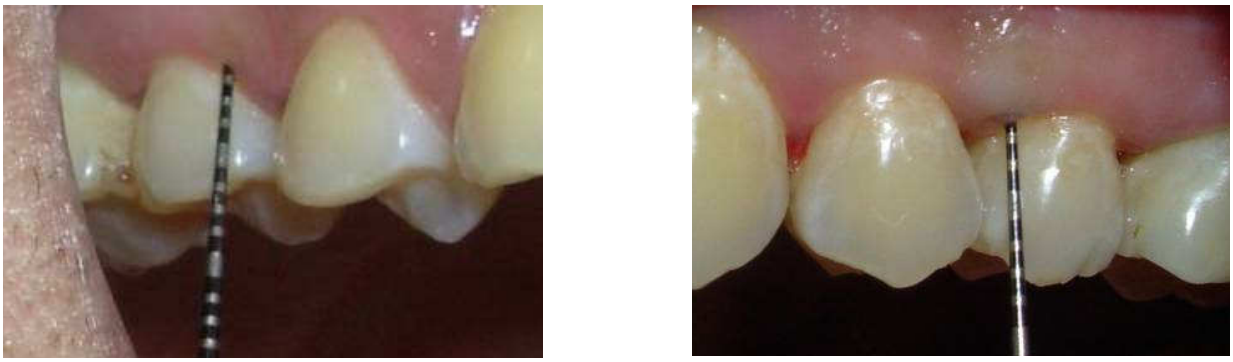


Fig. 4: Intrasulcular and topical application of Perio Q™ gel at test sites



Test Site **Control Site**

Fig. 5: Reevaluation done at the end OF 2nd week

RESULT AND DISCUSSION

Plaque index.

Table 1 shows the values of the hygiene indicators like the plaque index For both the test and control sites, at baseline after scaling root planning and at intervals 1st and 2nd week. When comparisons were made between the groups, there was a reduction in the scores at test sites(mean 2.25 to 1.22) and control sites (mean 2.24 to 1.27) from base line to the end of 2nd week, indicating that the patients maintained their oral hygiene over the period of time of the study. Also there was a statistically non significant difference (p value 0.715) at the end of 2nd week for both the test and control sites. (Table 1, Fig 6), Hence corroborating the fact, that subjects were unbiased while maintaining their oral hygiene, between the test and the control sites, even though they were given the Perio Q™ gel to be self applied only at one side, for home use ,which could have indirectly motivated them to maintain their oral hygiene more towards the test sites .This is in conjunction with another study where in the plaque scores remained unchanged between the groups.[12]

Gingival Index

When the gingival index score values were compared between the test and control sites at baseline, 1st and 2nd week interval (Table 2. Fig 7), there was a statistically significant improvement (p value 0.015) seen in terms of decrease in gingival index score values for the test sites (mean 1.99 to 0.85) as compared to control sites (mean 1.95 to 1.11) at the end of 2nd week.

Though both sites showed improvement over the course of time of study, improvement were better for the test sites, thereby corroborating the added advantage of coenzyme Q_{10} gel. The results are in conjunction with other studies which also showed similar results [5, 13].

Bleeding on Probing

The sites were also evaluated for bleeding on probing (BOP), by walking the probing circumferentially, around each tooth at test and control site at base line and at the end of 1st and 2nd week. Though there were fewer number of test sites (6.67%) with bleeding on probing, than control sites (16.67%) at the end of 2nd week, yet the difference was statistically insignificant (p value 0.228) (Tab 3, Fig 8).This reduction in bleeding from gingiva specially for the test sites could be attributes to the additional use of coenzyme Q_{10} gel. Ubiquinone (reduced form of coenzyme Q_{10}) serves as an endogenous antioxidant which increases the concentration of CoQ_{10} in the diseased gingiva and effectively suppresses advanced periodontal inflammation. [14.15] . Also when reactive oxygen species (ROS) are scavenged by antioxidants like CoQ_{10}, there can be a reduction of periodontal collagen degradation.

Periodontalprobing Depth

Periodontal probing depth was evaluated with a pressure sensitive probe. There was a improvement seen in terms of reduction in probing depth in millimeters from 3.28mm to 1.98mm for the test sites as compared to control sites where in the reduction was from 3.21 to 2.35 mm. The p value 0.002 was statistically significant at 2nd week for the test site (Tab 4, Fig 9).The results are in conjunction with other studies where in significant improvement was seen in groups were coenzyme Q_{10} was used with scaling root planning[5,12,16].

All the parameters as well as clinical indices indicate that coenzyme Q_{10} (Perio Q ™) when used with scaling root planning gave added advantage as compared to sites where scaling root planning alone. Other than antioxidant action, it has also been shown in literature that it acts as an immune enhancer [17]and also accelerates tissue healing [18]. The results of the study could probably be due to the cumulative effects of Perio Q ™ gel as an antioxidant , immune enhancer and tissue healer.

Current research was centered around the use of coenzyme Q_{10} as adjunct to scaling and root planning in patient of gingivitis and slight periodontitis, which could be managed non surgically.

The time period for the study was kept at 2 weeks in accordance with classic study of Loe et al, where in patients with gingivitis required at least week for inflammation to resolve post scaling. [19] Since the study also included patients with slight periodontitis, with clinical attachment loss of 1-2mm, 2 week time duration was considered optimum, for revaluation of the indices and the various clinical parameter. Smoker, either current or former were strictly excluded from the study, as nicotine a major constituent of cigarette causes a local vasoconstrictive action on the blood vessels, there by showing altered gingival index and bleeding on probing, even in presence of inflammation[20].

Further detailed observation in a bigger group or in comparative groups, for a longer duration of time seems to be justified, so that the supporting action of coenzyme Q_{10} could further be substantiated.

Table 1:

Plaque Index				
		Baseline	**1 Week**	**2 Week**
Test Group	Mean	2.25	1.68	1.22
	SD	0.37	0.49	0.59
Control Group	Mean	2.24	1.65	1.27
	SD	0.41	0.48	0.61
Student t test	p value	0.922	0.769	0.715
	Sig	Not Sig	Not Sig	Not Sig

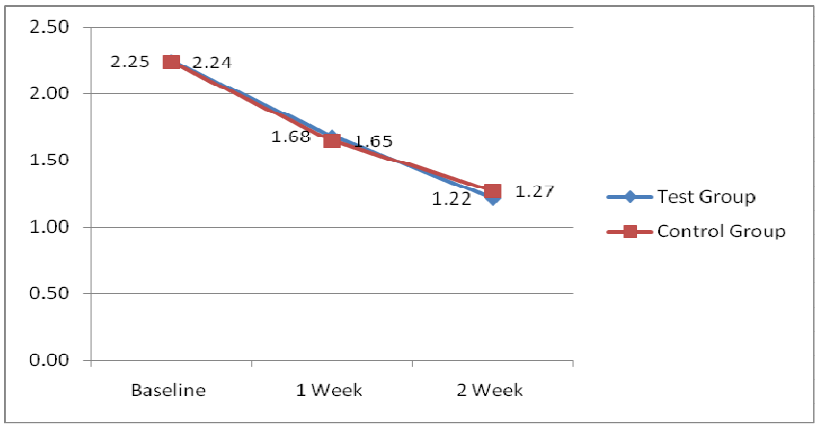


Fig 6:

Table 2:

Gingival Index				
		Baseline	**1 Week**	**2 Week**
Test Sites	Mean	1.99	1.20	0.85
	SD	0.62	0.45	0.34
Control Sites	Mean	1.95	1.34	1.11
	SD	0.65	0.51	0.46
Student t test	p value	0.792	0.264	0.015
	Sig	Not Sig	Not Sig	Sig

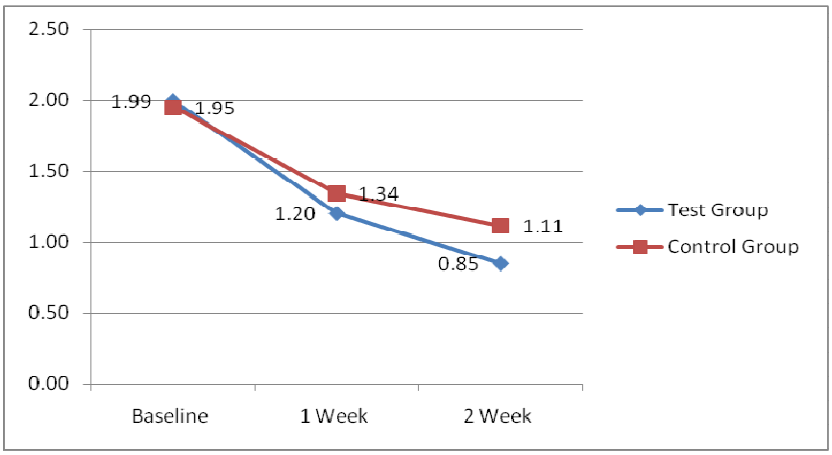


Fig. 7:

Table 3:

		Bleeding On Probing		
		Baseline	**1 Week**	**2 Week**
Test Sites	n	30	4	2
	%	100.00%	13.33%	6.67%
Control Sites	n	30	6	5
	%	100.00%	20.00%	16.67%
p value			0.488	0.228
Sig			Not Sig	Not Sig

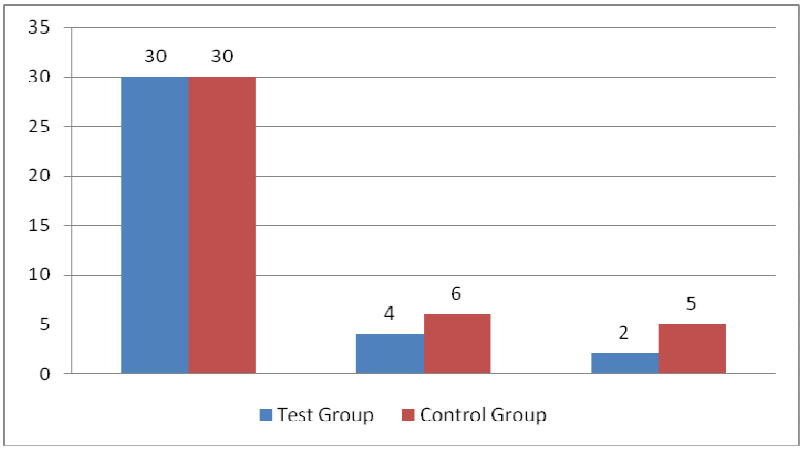


Fig. 8:

Table 4:

		Probing Depth		
		Baseline	**1 Week**	**2 Week**
Test Group	Mean	3.28	2.49	1.98
	SD	0.62	0.41	0.33
Control Group	Mean	3.21	2.63	2.35
	SD	0.61	0.53	0.52
Student t test	p value	0.661	0.236	0.002
	Sig	Not Sig	Not Sig	Sig

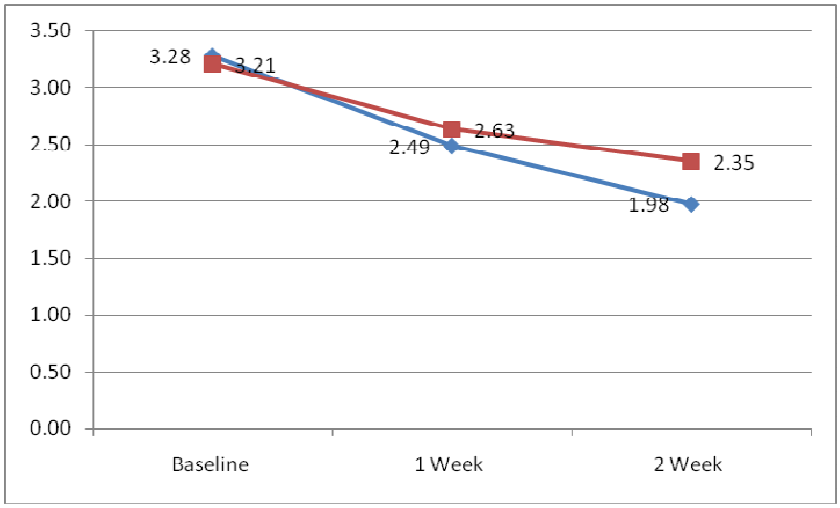


Fig. 9:

CONCLUSION

The concept of ROS-induced destruction has led to search for an appropriate complimentary antioxidant therapy in the treatment of numerous diseases including inflammatory periodontal diseases. As it is an antioxidant, there is a dearth of new information for coenzyme Q_{10} in the treatment of periodontal conditions. The pharmacology of coenzyme Q_{10} indicates that it may be an agent for treatment of periodontitis. On the basis of on new concepts of synergism with nutritional supplements and host response, coenzyme Q_{10} may possibly be effective as a topical agent as an adjunct to scaling root planning in treatment for gingivitis and slight periodontitis. The results of the present study, confirmed the added and adjunctive advantage coenzyme Q_{10} in such situations.

ACKNOWLEDGEMENT

The authors are thankful to the Chairman, Modern Dental College and Research Center for providing the test gel and other facilities at their institute for carrying out the study.

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