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COFFEE CONSUMPTION AND PERIODONTAL DISEASE IN SOUTH INDIAN MALE POPULATION

Dental Science

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ABSTRACT

Background: Coffee contains caffeine, caffeic acid and chlorogenic acid which are major dietary source of antioxidants as well as anti-inflammatory factors. Periodontal disease is considered as a disease of inflammatory origin and the role of these factors in the treatment of periodontal disease among South Indian males were explored.

Methods: Existing data collected by a prospective, closed panel cohort study. Participants included 100 dentate males who visited Rajarajeswari dental college and hospital, Bangalore. Mean age at baseline was 45 years. Periodontal status was assessed by, bleeding on probing (BOP), Probing depth (PD), Clinical attachment level (CAL). Coffee intake was obtained from participants self-report using food frequency questionnaires (FFQ).

Results: Participants who reported coffee intake of more than 3 cups per day differed significantly on various characteristics at baseline from those reporting lesser coffee consumption. It was found that higher coffee consumption was associated with reduction in both number of teeth and periodontal bone loss.

Conclusion: Found a "protective" association between coffee consumption and periodontal disease among South Indian males. There is extensive evidence for the anti-oxidant and anti- inflammatory effects of coffee as well as caffeine. There also exists much clinical and epidemiological evidence for their beneficial association with a number of systemic health outcomes. Although the beneficial association found in this study between higher level of coffee consumption and periodontal health was statistically significant the actual magnitude of the benefit was small and may not be consider to be of clinical significance. The high clinical significant finding was no evidence of harm to periodontal health from higher intake of coffee and caffeine.

KEYWORDS:

Introduction

Periodontitis is a chronic oral disease affecting the population all over the world 1, 2. Periodontitis is an inflammatory disease that occurs as a result of complex interactions between plaque microorganisms and host immune system 3. Studies have also indicated that nutritional modulation, which is influenced by lifestyle, environmental and genetic exposure, may also be involved in periodontitis 4, 5. An epidemiological study showed an inverse relationship between green tea intake and periodontitis 6. Also, recent research has shown an inverse association between high intake of fruits and vegetables and periodontitis progression 7. It is also shown that higher daily intakes of milk and fermented foods may be protective against periodontitis progression 8. However, the association between nutritional factors and periodontitis is still not completely understood.

Coffee is considered to be one of the most consumed beverage all over the world. It has been considered to be "the largest source of dietary antioxidants in industrialized nations." 9. Caffeine, Caffeic acid, and Chlorogenic acid are the components of coffee that have been found to have such effects 10, 11. Horrigan et al. reviewed the evidence for the immunomodulatory effects of caffeine, finding that it modulates both innate and adaptive immune responses. They reported that caffeine can suppress human "neutrophil and monocyte chemotaxis, and also suppress production of the pro-inflammatory cytokine tumor necrosis factor (TNF)-alpha." Caffeine was also found to "suppress human lymphocyte function as indicated by reduced T-cell proliferation and impaired production of Th1 (interleukin [IL]-2 and interferon [IFN]-gamma), Th2 (IL-4, IL-5) and Th3 (IL-10) cytokines." Horrigan et al. suggested that "at least some of the immunomodulatory actions of caffeine are mediated via inhibition of cyclic adenosine monophosphate (cAMP)-phosphodiesterase, and consequential increase in intracellular cAMP concentrations." They also noted that many of caffeine's immunomodulatory effects occur at concentrations that are relevant to normal human consumption 12.

Studies have shown that polyphenols of coffee including chlorogenic acid are potent chemo preventive agents 13, 14. Epidemiological studies shown that a higher coffee intake is associated with lower prevalence of oral, pharyngeal, and esophageal cancers 15. Furthermore, consumption of coffee was shown to be inversely associated with inflammatory markers and endothelial dysfunction 16. Therefore, it is suggested that consumption of coffee has an effect on periodontitis progression.

Findings from the Nurses' Health Study (NHS), a prospective cohort study of 89,433 females followed over 26 years, showed that intake of higher coffee, as well as intake of caffeine, were significantly associated with lesser risk of developing gout 17. The authors hypothesized that "caffeine, the predominant methyl xanthine of coffee, may decrease the risk of gout via inhibition of xanthine oxidase in humans." They also suggested that there may be other compounds in coffee which can contribute to this beneficial effect.

Importantly, in regard to identifying similar associations between coffee and caffeine consumption and periodontal disease, there is a paucity of data from human studies among South Indian male population. Thus, this study aimed to explore the relationship between coffee consumption and periodontal disease if any among south Indian males.

Materials and method:

Study population

Existing data collected by a prospective, closed panel cohort study. Participants included 100 dentate males who visited Rajarajeswari dental college and hospital, Bangalore. Mean age at baseline was 45 years. Periodontal status was assessed by probing depth (PD), bleeding on probing (BOP), and Clinical attachment level (CAL). Coffee intake was obtained from participant self-reports using food frequency questionnaires (FFQ).

Study design

Inclusion criteria:

1. Coffee consumers
2. Localized or generalized chronic periodontitis
3. Age range of 30-60 years.
4. No systemic problems.
5. Patients willing to participate in the study

Exclusion criteria

1. Patients with systemic diseases.
2. Patients who refuse to participate in the study.

Measurements

Oral examinations: Comprehensive oral examinations along with periodontal status was assessed on the day of examination with radiographical assessment. Alveolar bone loss (ABL) was measured on the mesial and distal root surfaces of each tooth, using intraoral periapical radiographs. Periodontal probing depth (PD) was recorded in millimeters at six sites (four proximal line angles and mid-buccal and mid-lingual surfaces) on each tooth. While measuring PD, bleeding on probing (BOP) at each site was recorded as either yes or no. The number of teeth remaining was counted (excluding third molars). After rinsing with a disclosing solution, extent of supragingival plaque was determined on each tooth. Supragingival calculus was determined separately on four sites of each tooth, and the worst site of each tooth was recorded. Whole-mouth mean scores for calculus and plaque were calculated for each participant.

Questionnaire:

Coffee intake assessments: Information on coffee and caffeine consumption in participants was obtained by participant's self-report method via, FFQ. Information on coffee Consumption was obtained by using using questions – Do you drink coffee (YES/NO), "Do you drink more than three cups of coffee a day?" (yes/no), When do you have coffee (morning/evening/any time).

Covariate assessments:

Done by using questions like Do you smoke (yes/no), alcohol consumption (yes/no), medical history (yes/no), past dental history (yes/no), oral hygiene measures like how do you brush your teeth, frequency of brushing, direction of brushing, frequency of change of tooth brush, use of floss, mouth washes.

Data analysis

Following tests are employed for the analysis of data,

1. Independent student t test
2. Chi square test
3. Mann Whitney U test

Results

Independent student t test showed that the mean age of the participants consuming ≤ 3 cups of coffee / day was significantly lesser [36.6 ± 6.1] when compared to those having more number of cups [42.9 ± 7.4] as shown in table 1 and graph 1. This suggests that increased coffee consumption was seen in middle age participants as compared to the younger adults [< 40 yrs].

However, the chi square test results did not show any statistically significant difference in the habits related to smoking & alcohol in both with ≤ 3 cups & > 3 cups of coffee consumption / day as seen in table 1 and graph [2].

Independent student t test was conducted to compare the mean scores of various study parameters between the participants having different frequency of coffee intake.

The test results showed that the people having ≤ 3 cups of coffee / day have fewer teeth [27.8 ± 2.6] compared to those having coffee > 3 cups / day. OHI-S scores doesnot differ significantly between the two groups. The participants having coffee > 3 cups / day had lesser GI scores [1.40 ± 0.53] compared to those having less than 3 cups per day, this was found to be statistically significant (Table 2 and Graph 3). Thus the present study findings suggest that increased intake of coffee had no deteriorating effect on the oral hygiene, but gingival health was found to be better among people who have coffee intake of more than 3cups per day.

Mann Whitney U test was conducted to compare the mean scores of periodontal parameters between the participants having different frequency of coffee intake.

The test results showed that, people having > 3 cups of coffee / day have relatively less no. of teeth affected by periodontal pocket [4.00 ± 2.29] compared to those having coffee ≤ 3 cups / day [4.23 ± 2.11]. Similarly, the mean CAL in participants consuming more coffee was reduced [2.94 ± 1.64] compared to those who consumed less number of coffee per day [4.05 ± 3.23] not statistically significant as shown in Table 3 and graph 4. The study findings illustrates that the amount of coffee consumption has neither harmful nor beneficial effect on the periodontal status of the study samples

Table-1

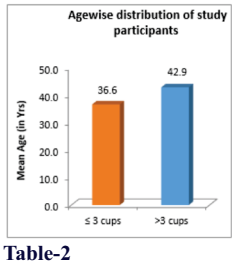
Demographic and habit characteristics of study participants based on frequency of coffee intake

Variables	Categories	≤ 3 cups [n=43]		> 3 cups [n=57]		P-value
		Mean	SD	Mean	SD	
Age	Mean & SD	36.6	6.1	42.9	7.4	<0.001*[a]
	Range	29 - 57		29 - 60		
		N	%	n	%	P-Value
SMOKER	Yes	19	44.2%	32	56.1%	0.24[b]
	No	24	55.8%	25	43.9%	
ALCOHOL	Yes	19	44.2%	34	59.6%	0.13[b]
	No	24	55.8%	23	40.4%	

* - Statistically Significant

Note: a: Independent student t test; b: Chi Square test

Graph-1



Graph-2

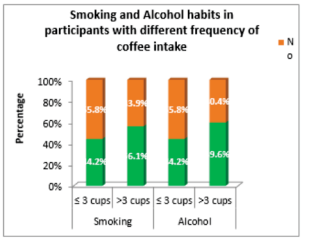


Table-2

Comparison of mean clinical parameters between the 02 groups based on the frequency of coffee intake using Independent student t test

Parameters	Coffee	N	Mean	SD	S.E.M	Mean Diff	t	P-Value
TEETH PRESENT	≤ 3 cups	43	27.8	2.6	0.3	-0.33	-0.723	0.47
	>3 cups	57	28.1	1.7	0.3			
OHI-S	≤ 3 cups	43	1.72	0.89	0.12	0.28	1.631	0.11
	>3 cups	57	1.44	0.77	0.12			
GI SCORE	≤ 3 cups	43	1.65	0.67	0.09	0.25	2.014	0.04*
	>3 cups	57	1.40	0.53	0.08			

* - statistically significant

Graph-3

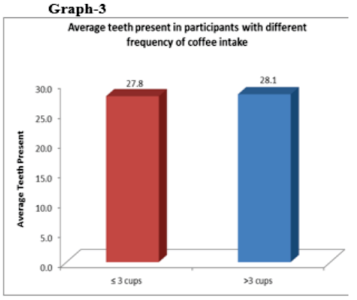
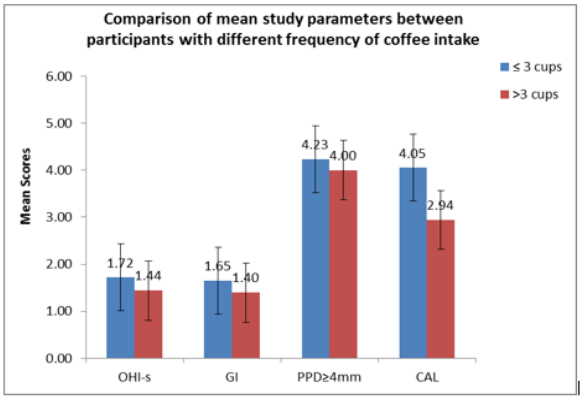


Table-3

Comparison of mean Periodontal parameters between the 02 groups based on the frequency of coffee intake using Mann Whitney U test

Parameters	Coffee	N	Mean	SD	Mean Rank	Mean Diff	Z	P-Value
PPD≥4mm	≤ 3 cups	39	4.23	2.11	48.40	0.23	0.803	0.42
	>3 cups	53	4.00	2.29	43.92			
CAL	≤ 3 cups	17	4.05	3.23	29.26	1.11	1.228	0.21
	>3 cups	37	2.94	1.64	23.68			

Graph-4



Discussion

In this cohort study we tried to explore the relationship between coffee intake and periodontal disease status among south Indian males while controlling some important covariates. We found that Participants who reported coffee intake of ≥ 3 cups per day differed significantly on various characteristics at baseline from those reporting lesser coffee consumption. This study showed that the people having ≤ 3 cups of coffee / day have less teeth [28.1 ± 1.7] compared to those having coffee ≥ 3 cups / day. This can indicate that consumption of coffee has an effect on periodontal status.

This study showed that the mean age of the participants consuming ≤ 3 cups of coffee / day was significantly lesser [36.6 ± 6.1] when compared to those having more number of cups [42.9 ± 7.4] as shown in table 1 and graph 1. This suggests that increased coffee consumption was seen in middle age participants as compared to the younger adults [< 40 yrs.]. However, results did not show any statistically significant difference in the habits related to smoking & alcohol in both with ≤ 3 cups & > 3 cups of coffee consumption / day as seen in table 1 and graph 2.

Study also showed that the people having ≤ 3 cups of coffee / day have fewer teeth [27.8 ± 2.6] compared to those having coffee > 3 cups / day. OHI-S scores doesnot differ significantly between the two groups. The participants having coffee > 3 cups / day had lesser GI scores [1.40 ± 0.53] compared to those having less than 3 cups per day, this was found to be statistically significant (Table 2 and Graph 3). Thus the present study findings suggest that increased intake of coffee had no deteriorating effect on the oral hygiene, but gingival health was found to be better among people who have coffee intake of more than 3cups per day.

Study results showed that, people having > 3 cups of coffee / day have relatively less no. of teeth affected by periodontal pocket [4.00 ± 2.29] compared to those having coffee ≤ 3 cups / day [4.23 ± 2.11]. Similarly, the mean CAL in participants consuming more coffee was reduced [2.94 ± 1.64] compared to those who consumed less number of coffee per day [4.05 ± 3.23] not statistically significant as shown in Table 3 and graph 4. The study findings illustrates that the amount of coffee consumption has neither harmful nor beneficial effect on the periodontal status of the study samples

The phenolic compounds of coffee such as chlorogenic acid, ferulic acid, and p-coumaric acid are known to have a strong protective antioxidant property 16. A study done by Nathan Ng et al., Coffee consumption may be protective against periodontal bone loss in adult males18. A previous study done by Huang J et al., reported that dihydrocaffeic acid, which is detected in human plasma following coffee ingestion, scavenges intracellular reactive oxygen species (ROS) 19. These findings suggest that the systemic increase in anti-oxidative property following coffee consumption contributes to a decrease in ROS-induced damage at the local level. It has shown that there is involvement of ROS in pathology of periodontitis 20. Therefore, the anti-oxidative property of coffee may correlate with severe periodontitis in our findings. However, further studies are needed to clarify this point.

A previous study done by Kokubo Y et al., shown that consumption of coffee (≥1 cup/day) decreased the risk of cardiovascular disease due to its antioxidant activities 21. In a study done by Naganuma T et al., Coffee consumption (≥1 cup/day) was associated with reduced risk of upper gastrointestinal cancer among Japanese population 15.

A cross-sectional study done by Yamashita K et al., found that consumption of coffee showed significant positive relationships with adiponectin and total and low-density lipoprotein cholesterol, and inverse associations with leptin, high sensitivity CRP, triglycerides and liver enzymes 22. Moreover, a 30-year longitudinal study done by Ng N., Kaye E.K., Garcia R.I. Between 1968 and 1998 reported that consumption of coffee might be protective against periodontal bone loss among adult men 23. These findings are consistent with the present concept that coffee consumption was related to severe periodontitis in the maintenance phase of periodontal treatment.

In contrast one of the limitation of the study is all male cohort there by limiting the ability to generalize the findings to females and more diverse populations. Other limitations include participants were self-selected volunteers and the use of self-report dietary data to measure the primary exposure of interest via coffee consumption.

Conclusion

Found a "protective" association between coffee consumption and periodontal disease among south indian males. There is extensive evidence for the anti-oxidant and anti-inflammatory effects of coffee as well as caffeine. There also exists much clinical and epidemiological evidence for their beneficial association with a number of systemic health outcomes. Although the beneficial association found in this study between higher level of coffee consumption and periodontal health was not found to be statistically significant the actual magnitude of the benefit was small and may not be consider to be of clinical significance. The high clinical significant finding was no evidence of harm to periodontal health from higher intake of coffee and caffeine.

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