Prevalence of Dental Caries in Adult South Indian Population in Association with Dietary Pattern: A Comparative Study

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ABSTRACT

Background: Dental caries is considered to be one of the most prevalent dental diseases among humans. It involves cycles of demineralization and remineralization. The etiology and pathogenesis of dental caries are multifactorial. The role of diet plays an important aspect in occurrence and progression of dental caries. Indians have differing dietary habits due to various religious and personal reasons. A substantial number of Indians are vegetarian by choice. Aim: The aim of this study was to assess the effect of vegetarian and mixed diet over the prevalence of dental caries. Materials and Methods: This observational cross-sectional study was conducted among 104 individuals. Healthy subjects who were 20–40 years of age, with no systemic disease, and not on any medications were included in this study. A thorough dental examination was performed by a single investigator with the help of mouth mirror and probe. The examination of patients involved the sequential assessment of teeth starting from 1 to 32. All the exposed and accessible surfaces of the teeth were examined for dental caries, and the data were recorded. Statistical Analysis: The data obtained were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 11.0, and the results were tabulated. Univariate analysis was performed to find an association between caries and diet. Results: Distribution of the respondents according to dietary practices revealed 51% of the population consuming mixed diet and 49% consuming vegetarian diet. Oral hygiene was measured in terms of frequency of brushing tooth. Among the enrolled subjects, 57% brushed their teeth once a day and 42% brushed twice a day. No significant association was found between vegetarian and mixed dietary habits and dental caries. Two-sample independent \( t \) test was carried out to find the mean age. The mean age of caries group was 30.93 ± 12.27 and in without caries group, 27.83 ± 11.58, which is statistically not significant (\( P = 0.218 \)). Conclusion: The study did not show any significant association between dietary habits and prevalence of dental caries. Keywords: Dental caries, mixed diet, vegetarian diet

INTRODUCTION

Dental caries is a dynamic dietomicrobial disease of teeth, which results in localized dissolution and destruction of the mineralized tissues. It involves cycles of demineralization and remineralization. This results from complex interactions among the tooth structure, the dental biofilm, and dietary, salivary, and genetic influences.

To define, dental caries is an infectious microbiologic disease of the teeth that results in localized dissolution and destruction of the calcified tissues.

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Diet also plays an important role in the occurrence and progression of dental caries. Certain food types have greater propensity to increase the oral bacterial load, which in turn leads to plaque formation and bringing tooth decay.[3] Indians have differing dietary habits due to various religious and personal reasons. A substantial number of Indians are vegetarian by choice. Hence, this could be considered as an opportunity to study the effect of vegetarian and nonvegetarian diet or mixed diet over the prevalence of dental caries.[4]

**MATERIALS AND METHODS**

The study was an observational cross-sectional study conducted among 104 individuals. One group was enrolled from the Ashramites of Mata Amritanandamayi Math, Kollam, Kerala, India, and the second group included engineering students of Amrita Vidyapeetham, Amritapuri, Kollam, Kerala, India. Individuals were randomly enrolled in the study. Every individual screened had equal chance of enrollment in this study. Institutional ethics committee provided the ethical approval for the conduct of this study. Healthy subjects who were 20–40 years of age, with no systemic disease, and not on any medications were included in this study. An investigator-administered questionnaire was used to collect data. The questions were pertaining to subject’s demographic details, personal habits, oral hygiene, and diet. A thorough dental examination was done by single investigator, using a mouth mirror and probe. The examination of patients involved the sequential assessment of all teeth beginning from 1 to 32. All the exposed and accessible surfaces were checked for dental caries, and the data were recorded.

The data obtained were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 11.0, and the results were tabulated. Univariate analysis was performed to find an association between caries and diet. Two-sample independent \( t \) test was done to find the mean age.

**RESULTS**

A number of subjects affected with dental caries in different gender, age, and dietary habits were studied. Distribution of the respondents according to dietary practices revealed 51% of the population consuming mixed diet and 49% consuming vegetarian diet [Table 1]. Oral hygiene was measured in terms of frequency of brushing tooth. Among the enrolled subjects, 57% brushed their teeth once in a day and 42% brushed twice in a day. Association of various factors such as sex, diet, frequency of brushing, and consumption of snacks with dental caries is given in Table 2. No significant association was found between vegetarian and mixed dietary habits and dental caries.

Two-sample independent \( t \) test was carried out to find the mean age [Table 3]. The mean age in caries group and in without caries group was 30.93 ± 12.27 and 27.83 ± 11.58 years, respectively, which is statistically not significant (\( P = 0.218 \)).

**DISCUSSION**

When diet and oral health is considered, Moynihan[5] states that, “Good diet is essential for the development and maintenance of healthy teeth, but healthy teeth

### Table 1: Distribution of study subjects by dietary habits

| Vegetarian | Mixed |
|------------|-------|
| 49%        | 51%   |

The number of subjects (\( n = 104 \)) in the study, consuming vegetarian and mixed diet, are represented in terms of percentage.

### Table 2: Association of factors with dental caries

| Factors                  | Category | Caries | No  | \( P \) value |
|--------------------------|----------|--------|-----|---------------|
|                          |          | \( n \) | %   | \( n \) | %   |         |
| Sex                      | Female   | 40     | 71.4| 16   | 28.6| 0.236   |
|                          | Male     | 29     | 60.4| 19   | 39.6|         |
| Diet                     | Vegetarian| 36     | 70.6| 15   | 29.4| 0.369   |
|                          | Mixed    | 33     | 62.3| 20   | 37.7|         |
| Frequency of brushing    | Once     | 39     | 65.0| 21   | 35.0| 0.734   |
|                          | Twice    | 30     | 68.2| 14   | 31.8|         |
| Consumption of snacks    | Seldom/never| 13    | 81.3| 3    | 18.8| 0.083   |
|                          | Several times in a month| 24    | 75.0| 8    | 25.0|         |
|                          | Once a week| 9     | 50.0| 9    | 50.0|         |
|                          | Several times a week| 17    | 68.0| 8    | 32.0|         |
|                          | Everyday | 4      | 50.0| 4    | 50.0|         |
|                          | Several times a day| 0     | 0.0 | 2    | 100.0|         |
are important in enabling the consumption of a varied and health diet throughout life cycle;” thus emphasizing the two-way relationship between the diet and the oral health. Dental caries is considered to be a multifactorial disease, in which diet being one of the major contributing factors, is well-documented in many studies. India being a land of cultural diversity, Indian diet is different from a Western diet, and with not many studies addressing this issue, there arises the need to explore this concept of dietary influence on dental caries.[6]

This study attempted to compare the prevalence of dental caries among the people who consumed vegetarian and mixed diet. The study was undertaken among the ashramites who follow a strict vegetarian diet and the engineering students of Amritapuri campus who commonly have a mixed diet. The study included 104 subjects, of which 49% were vegetarians and 51% had mixed dietary habits. Chi-square and two-sample independent t tests did not show any statistically significant differences among the two groups.

Of note is the observation that higher prevalence of dental caries was recorded in individuals who reported higher consumption of mid-meal snacks. This did not show any statistical significance, very likely due to small sample size, and should be evaluated in a larger study. Though etiology of dental caries is multifactorial and is mainly caused by microbes, it is also influenced by diet, hygiene habits, tooth shape and strength, saliva-buffering capacity, and host immune system, among other factors.[7]

The drop in pH levels in the mouth leads to demineralization of the teeth where the mineral part of the teeth dissolves due to desaturation, which is moderated by acids, which ultimately results in cavities.[8] This could be possible when there is an accumulation of bacteria present in the dental plaque and they ferment the dietary carbohydrates over a sufficient amount of time; hence, the acid, which is produced locally, cannot be neutralized by the buffering capacity of saliva.[9]

The formation of reactive dentin is considered to be one of the pulp tissue’s responses against bacterial invasion. The dentinal channels are irregularly arranged in this altered tissue and blocked by the formation of crystals, preventing the advancement of bacteria toward the dental pulp.[10] In addition, this tissue is devoid of water and proteins, which also includes the collagen.[11] If low pH levels were the only reason for the caries progression, then the reactive dentin should be degraded by the sugar-fermenting organisms, but then this modified tissue in fact reduces the progression of the lesion effectively. In the light of the microbial hypothesis presented here, dietary sugar-fermenting organisms are a minority in dentin caries and do not have access to fermentable complex carbohydrates, whereas dentin dwellers are also specialized in the proteolytic digestion of dentinal tissue and would therefore not be able to create the acidogenic environment that presumably would be necessary to break reactive dentin.[12]

If dental caries was a tissue-dependent process, then standard preventive measures such as dietary reduction of fermentable sugars,[13] pH regulation strategies,[14] and targeting of acidogenic species for immunization[15] would still represent valid approaches as they would be focused in reducing the initiation of cavities. However, caries progression would definitely involve a different set of bacterial players and tissue-degrading processes and would likely be relatively independent on the diet of an individual. Thus, factors such as buffering of acidic pH and diet control may have a reduced effect once the lesion has demineralized the enamel and entered the dentin.

**Conclusion**

This study did not show any significant association between dietary habits and prevalence of the dental caries. The limitation of this study was its small sample size, which was due to logistic concerns. We believe that a study with a larger sample size would definitely help to understand the actual role of the dietary factor in dental caries etiology.

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**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Zero DT, Fontana M, Martinez-Mier EA, Ferreira-Zandoná A, Ando M, González-Cabezas C, et al. The biology, prevention, diagnosis and treatment of dental caries: scientific advances in the United States. JADA 2009;140:25S-34S.
2. Theodore R, Harold H, Edward S. Sturdevant’s art and science of operative dentistry, St. Louis, MO: Mosby; 2002. p. 66.
3. Leake JL. Clinical decision making for caries management in root caries. J Dent Educ 2001;65:1147-53.
4. Khan AA, Jain SK, Shrivastav A. Prevalence of dental caries among the population of Gwalior (India) in relation of different associated factors. Eur J Dent 2008;2:81-5.
5. Moynihan P. The interrelationship between diet and oral health. Proc Nutr Soc 2005;64:571-80.
6. Punitha VC, Amudhan A, Sivaprakasam P, Rathanaprabu V. Role of dietary habits and diet in caries occurrence and severity among urban adolescent school children. J Pharm Bioallied Sci 2015;7:S296-300.
7. Ten Cate JM. The need for antibacterial approaches to improve caries control. Adv Dent Res 2009;21:8-12.
8. Fejerskov O, Manji F. Risk assessment in dental caries. In: Bader J, editor. Risk assessment in dentistry. Chapel Hill, NC: University of North Carolina Dental Ecology; 1990. p. 215-7.
9. Marsh PD. Microbial ecology of dental plaque and its significance in health and disease. Adv Dent Res 1994;8:263-71.
10. Love RM, Jenkinson HF. Invasion of dentinal tubules by oral bacteria. Crit Rev Oral Biol Med 2002;13:171-83.
11. Nanci A. Ten Cate’s oral histology; development, structure and function. St Louis, MO: Elsevier; 2012. p. 163-205.
12. Simon-Soro A, Belda-Ferre P, Cabrera-Rubio R, Alcaraz LD, Mira A. Tissue-dependent hypothesis of dental caries. Caries Res 2013;47:591-600.
13. Marsh PD. Are dental diseases examples of ecological catastrophes? Microbiology 2003;149:279-94.
14. Stookey GK. The effect of saliva on dental caries. J Am Dent Assoc 2008;139:11-7S.
15. Abiko Y. Passive immunization against dental caries and periodontal disease: development of recombinant and human monoclonal antibodies. Crit Rev Oral Biol Med 2000;11:140-58.