

# Assessment of the Influence of Vegetarian and Nonvegetarian Diet on the Occurrence of Dental Caries in Sullia, India

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## ABSTRACT

**Introduction:** The outcomes of vegetarian diets on the oral health status could be various, but reports have so far mainly been studied for Western populations.

**Aim:** The purpose of this study was to evaluate the influence of vegetarian and nonvegetarian diets on the occurrence of dental caries in the Dakshina Kannada District population.

**Materials and methods:** In this study, 172 adult dentate and consenting individuals (79 females, 93 males) were included. Patients were subjected to clinical examination under natural light with the aid of mouth mirror, No. 23 explorer, and cotton rolls. The age of the study group ranged from 20 to 65 years. Demographic, diet, and other habit data were collected through personal interviews using a structured and validated questionnaire. The decayed, missing, and filled teeth (DMFT) index (WHO modification, 1987) was used to assess caries experience in the study group.

**Results:** The mean DMFT score of people with nonvegetarian/mixed diet was  $2.99 \pm 1.5$  and of people with vegetarian diet was  $5.4 \pm 1.9$ , which indicated a significant association between the type of diet and the involvement of dental caries in the Dakshina Kannada population ( $p = 0.001$ ).

**Conclusion:** This study throws light on the significant relationship of the vegetarian diet and dental caries experience in the population of Sullia Taluk. This information can be used to help counteract the potential increase in the cases of dental caries by designing preventive strategies for the persons at greatest risk.

**Keywords:** Dental caries, Diet, Humans, India, Vegetarian.

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## INTRODUCTION

Dental caries is a multifactorial infection resulting in demineralization of the tooth enamel with subsequent caries formation over a period of time where the triad – diet, host, and microbial flora – plays important roles.<sup>1</sup>

Dental caries is one of the most prevalent dental diseases and an important dental public health problem. This disease is greatly affected by many factors other than sugar consumption. The prevalence of dental caries varies with age, sex, socioeconomic status, food, race, and oral hygiene habits.<sup>2</sup>

India, the world's second most populous country, has 40% of its population, or about 399 million people, as vegetarians.

Exclusion of meat is the principle of a vegetarian diet. However, there are many variations of it, the most radical of which is veganism, which allows only plant foods. Lacto-vegetarianism allows plant foods with dairy products, and lacto-ovo vegetarianism adds eggs to the diet. So far, there have been only few publications dealing with the influence of vegetarian diet on the condition of the oral cavity, and most reports have so far mainly appeared from within Western populations.<sup>3</sup>

Indicating the status of dental caries in the Indian population, there exists a voluminous literature. In 1940, it was observed that the occurrence of dental caries in India was 55.5%, and in 1960, to be 68%. Urban and cosmopolitan residents have had an increase in the frequency and severity of dental caries since the last two decades. The disease prominence in rural and backward areas of the country in comparison, where 80% of the population lives, has not yet been determined.<sup>4</sup>

In a population, the components of improving oral health involves collecting information on oral diseases, valuating the data that aid to comprehend the needs of the community, documenting high-risk groups, and planning the management and preventive strategies for the community.<sup>4</sup>

There are conflicting evidences regarding the association between vegetarian diet and the incidence of dental caries, which reported controversial results with either lower or higher prevalence.<sup>5</sup>

A survey of every region is important to know the inequalities of oral health. Not many studies have been

done in Sullia Taluk to assess the dental caries and oral hygiene status. The current study was, hence, planned to provide the baseline data of prevalence of dental caries and the influence of vegan and nonvegan diets on the occurrence of dental caries that can help to plan preventive strategies for the population at greater risk for the development of dental caries in the Dakshina Kannada population.

**MATERIALS AND METHODS**

This is an original study, which was based on the data collected from the questionnaire. About 172 adult dentate and consenting individuals (79 females, 93 males) who had attended dental screening camps conducted by the KVG Dental College & Hospital Sullia, South Karnataka, India, were included in the study. With the aid of a mouth mirror, No. 23 explorer, and cotton rolls, patients were subjected to clinical examination under natural light. The age of the study group ranged from 20 to 65 years. Through personal interviews using a structured and validated questionnaire, the demographic, dietary habit, and health behavior data were collected. The subjects were examined by postgraduate students of the Department of Endodontic and Conservative Dentistry. The instruments used were sterilized after every single use. The site of dental caries was recorded. The decayed, missing, and filled teeth (DMFT) index (WHO modification, 1987) was used to assess caries experience of the study group.<sup>6</sup>

The data acquired were statistically analyzed using Statistical Package for the Social Sciences (SPSS) version 16.0, and the results were tabulated. Descriptive variables were reported as mean (standard deviation) for continuous variables and frequency (%) for categorical variables. Chi-square test was used to find an association between dental caries and dietary patterns. Two-sample independent t tests were used for comparison of caries status among study patterns according to diet history;  $p = 0.001$  was considered statistically significant.

**RESULTS**

Through this study, we tried to analyze the number of persons affected with dental caries in different genders, ages, and dietary habits among the patients studied. Among 172 subjects who were examined, 54.1% were males and the rest 45.9% were females. Mean age of study group was  $41.38 \pm 7.50$  years. In females, the occurrence of dental caries was found to be slightly higher (Table 1).

**Table 1:** Distribution of study participants according to gender

Gender (n=172)	Frequency n(%)
Males	93 (54.1)
Female	79 (54.1)

The mean DMFT score of people with nonvegetarian diet was  $2.99 \pm 1.5$  and of people with vegetarian diet was  $5.4 \pm 1.9$ , which showed significant association between the type of diet and dental caries experienced in the Sullia Taluk population ( $p = 0.001$ ) (Table 2).

**DISCUSSION**

Good oral health has significant health gains, as it is a part of general health. It can greatly improve quality of life and contribute to self-image and social interaction. Assessing the prevalence of diseases, disclosing trends in disease development, and analyzing possible factors influencing the disease pattern can be done by conducting epidemiologic studies.<sup>7</sup>

The customary allowance of food and drink taken by a person on a day-to-day basis is referred to as diet. The diet affects dental caries, as it reacts with the enamel surface and also serves as a substrate for cariogenic microorganisms.

On a worldwide basis, there is polarization of caries, where the incidence of caries is increasing in less-developed nations, diminishing in developed nations, and epidemic in developing nations. The drop in caries prevalence in developed countries has been allied with a more sensible approach of sugar consumption, enhanced oral hygiene practices, and numerous preventive programs.<sup>8</sup>

The influence of vegetarian diet on the progress of dental caries and erosion has been barely explored earlier.

There is much documented proof about the general well-being benefits from a vegetarian diet. But a Finnish study advocated that 76.9% of lactovegetarians had dental erosion as compared with no erosion in aged-matched controls, and that the salivary pH and the stimulated flow rate was lower in lactovegetarians.<sup>9</sup>

A study done by Rahmatulla and Guile<sup>9</sup> proposed that, theoretically, there may be some advantage in a reduced caries level from a vegetarian diet. Such a benefit possibly will be indirect and associated with vegetarian lifestyle, characterized by a monitored and cautious intake of foodstuffs.

Staufenbiel et al<sup>5</sup> suggested that vegetarians had a significantly better oral hygiene, but at the same time contradicting, also significantly more carious lesions than nonvegetarians. As intake of fruits was considerably more dominant in vegetarians than in nonvegetarians, it might be established that carbohydrates within the fruits are accountable for the higher number of carious lesions.

**Table 2:** Decayed, missing, and filled teeth scores of vegetarian and non-vegetarian diet

Groups	Mean DMFT score
Vegetarian Diet	$5.4 \pm 1.9$
Non-Vegetarian Diet	$2.99 \pm 1.5$



Low-molecular-weight carbohydrates contain monosaccharides, such as glucose, galactose, and fructose and disaccharides, such as sucrose, maltose, and lactose. The major sugars in fruits are glucose, sucrose, and fructose. Animal models have proven that each of these sugars can be fermented to acids by oral bacteria, and thus, each may cause caries.

Thanikasalam et al,<sup>10</sup> in their study population, concluded that the person who follows a vegetarian diet had the highest number of caries risk due to constant carbohydrate fermentation.

Bhardwaj et al,<sup>11</sup> likewise in their study, concluded that children consuming a vegetarian diet had higher occurrence of dental caries than those following a mixed diet; this difference was highly statistically significant. Similar outcomes were reported by Khan et al.<sup>12</sup>

The current study was conducted in Sullia Taluk of Dakshina Kannada District, and the results directed to a mean DMFT score of people with nonvegetarian diet as  $2.99 \pm 1.5$  and of people with vegetarian diet as  $5.4 \pm 1.9$ , which exhibited significant association between the type of diet and the dental caries experience in the Dakshina Kannada population ( $p = 0.001$ ).

It has been proven that dental caries is a process that occurs due to formation of acid by fermentation of sugar through acidogenic bacteria, which leads to enamel decalcification. However, with the buffering action of saliva, this acid is usually neutralized, and the dental caries is not permitted to ensue. Once fermentable carbohydrate was not added to the saliva, fermentation was replaced by putrefaction, acidity was replaced by alkalinity, and no decalcification was observed. Putrefaction is the result of protein consumption, so it is suggested that the persons who consume plenty of protein-rich foods will develop less quantities of acid in their mouth and rather be secured from dental caries. This might be the reason for fewer number of cases among the nonvegetarian (mixed diet) population.<sup>12</sup>

When the diet is deficient in nutrients, such as vitamins D, B2, B12, and calcium, which are plentiful in meat and dairy products, vitamin deficiencies can occur easily. Deficiency of vitamins C and D and calcium can cause teeth to become softer over time, which makes them more susceptible to tooth decay and periodontal disease.

A study done by Lukacs and Largaespada<sup>13</sup> indicated that higher caries rates were found more often among females than males. The reasons put forward by them for this reason were (1) longer exposure of girls' teeth to the cariogenic oral environment due to earlier eruption of teeth in girls, (2) better access to food supplies and frequent snacking during food preparation by women, and (3) pregnancy.

The current study also showed higher caries incidence among females. Further investigations have to be done to obtain a strong reason for the same.

The study population receiving care at a university dental camp may be reflected as biased to the subject pool. Patients may have chosen this location for numerous reasons. It is likely that patients may have selected the camp for financial reasons, and studies have shown that oral health and dietary habits are influenced by socioeconomic status.

## CONCLUSION

This study speaks in favor that vegetarians have an increased risk of dental caries compared with nonvegetarians and DMFT score ( $p = 0.001$ ). To be specific, vegetarians regularly consuming more quantities of fruits should be guided about the cariogenic and erosive potential of fruits. The results of this study suggest that the vegetarian diet in Sullia Taluk population may produce deleterious effects on the oral health, and its associations have to be studied further.

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