

Original Research Article

## Assessment of knowledge, attitude and practices of diet and nutrition on oral health among dental students

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### ABSTRACT

**Introduction:** Oral health is governed by a multitude of factors and of importance among these is diet and nutrition. Patients need to be made aware of the effect diet and nutrition has on their oral health. Patients should also be encouraged to reduce the frequency of intake of sugary foods. Dentists need to have adequate knowledge regarding diet and nutrition and its effects on oral health. Dental students can be targeted at an early stage as they will be the beacons of dentistry and carry on the knowledge into private practice.

**Aim:** The aim of the study was to assess the knowledge of the undergraduate dental students regarding diet and nutrition and its impact on oral health and to assess their attitude and practice towards the same.

**Methods:** A cross sectional questionnaire based study was carried out among 203 undergraduate students (122 third BDS, 22 Final BDS and 59 Residents) from dental colleges in Davangere, Karnataka. The responses were subjected to statistical analysis using SPSS (Statistical Package for the Social Sciences) version 22 and the tests used were Frequency distribution and Pearson Chi-Square test.

**Results:** Most of the participants (82.3%) were aware that sucrose is the most cariogenic sugar. 84.2% of the students knew the type of food that helps in preventing dental caries and strengthening the periodontium, yet only a few (19.2%) were able to correctly choose the most anticariogenic food among the options.

**Conclusion:** While most of the students were aware of the basic knowledge of diet and nutrition and its effect on the oral health, their attitude and eagerness towards the concept should be nurtured through extensive and in detail addition of diet in the curriculum to ultimately help patients maintain a better oral hygiene and prevent oral diseases.

**Keywords:** Diet and nutrition, Oral health, Dental, KAP study

### INTRODUCTION

Oral health is governed by a multitude of factors which influence its state in health and disease. Dental diseases impair quality of life and have a negative impact on self-esteem, eating ability and health, causing pain, anxiety, and impaired social functioning.<sup>[1,2]</sup> Tooth loss reduces the ability to eat a nutritious diet, the enjoyment of food and confidence to socialize.<sup>[3,4]</sup>

Dental caries was first described in Miller's chemo-parasitic theory in 1890.<sup>[5]</sup> Caries is caused by the dissolution of the teeth by acid produced by the metabolism of dietary carbohydrates by oral

bacteria. Diet and nutrition may interfere with the balance of tooth demineralization and remineralization in several ways.<sup>[6]</sup>

According to the American Dietetic Association, “nutrition is an integral component of oral health.”<sup>[7]</sup> Oral health and nutrition have a synergistic relation.<sup>[6]</sup> The assertion that diet plays a central role in the development of dental caries is unquestionable. Observations in humans, in animals, and *in vitro* have shown clearly that frequent and prolonged oral exposures to certain carbohydrates are fundamental to caries activity.<sup>[8]</sup>

Sugars enter the diet in two forms: Those found naturally in foods and those that are added to foods during processing.<sup>[9]</sup> Many factors, in addition to sugars, affect the caries process. Sucrose is generally considered the prime culprit in the causation of dental caries. Other disaccharides have a lower cariogenic risk than sucrose.<sup>[6]</sup> Periods of demineralization result in a fall in dental plaque pH caused by organic acids increasing the solubility of calcium hydroxyapatite in the dental hard tissues.<sup>[10]</sup> Duration may also be influenced by the frequency and amount of fermentable carbohydrate consumed.<sup>[11,12]</sup> The frequency of consumption seems to be a significant contributor to the cariogenicity of the diet, although Bowen *et al.* concluded that it is not the frequency of ingestion *per se* that is related to the development of caries but the time that sugars are available to microorganisms in the mouth.<sup>[13-17]</sup>

Patients need to be made aware of the effect diet and nutrition has on their oral health. Dietary advice to dental patients should be positive and personalized if possible. Patients should also be encouraged to reduce the frequency of intake of sugary foods.<sup>[18]</sup> A diet lower in added sugars and fermentable carbohydrates and high in calcium-rich cheese may also favor remineralization of the tooth.<sup>[6]</sup> Dentists need to have adequate knowledge regarding diet and nutrition and its effects on oral health. Dental students can be targeted at an early stage as they will be the beacons of dentistry and carry on the knowledge into private practice. Having asserted the influence of diet and nutrition on dental caries, the present study was conducted to assess the knowledge of the undergraduate students regarding the importance of diet and nutrition in oral health as well as their attitude toward diet counseling.

## METHODOLOGY

### Study participants and study location

The present study was a cross-sectional survey conducted among the dental undergraduates of colleges in Davangere city, Karnataka. Out of a total of 250 students, the total number of participants included in the study were 203 (3<sup>rd</sup> year, final year, and residents) and the study was conducted in the month of March 2018.

### Procedure

A questionnaire containing 15 close-ended questions regarding diet and nutrition and its effect on dental caries formation was prepared. A pilot test was conducted among 15 students from among 3<sup>rd</sup> year, final year, and residents before the administration of the questionnaire and the results were not included in the study (Cronbach's Alpha = 0.81). The students were informed about the importance of the study and were included on a voluntary basis. The questionnaire was converted into an online survey using Google forms, and the links were forwarded to the participants. The response rate of the study was 81.2%.

### Statistical analysis

The data were collected and tabulated using the Microsoft Excel sheet. The recorded data were subjected to frequency distribution and Chi-square statistical tests using the IBM SPSS software version 22 ( $P \leq 0.05$ ).

## RESULTS

Out of a total of 203 participants included in the study, 122 (60.1%) of the participants were from the 3<sup>rd</sup> year BDS, followed by 59 (29.1%) residents and the least being the final year BDS students who were 22 (10.8%) [Table 1].

The frequency distribution of the responses that were recorded along with the Pearson Chi-square result is tabulated in Table 2. Most of the questions tested the knowledge of the students regarding diet and nutrition and its effect on oral health. Only two of the questions involved attitude and practice-based assessment.

A total majority of 167 (82.3%) students said that sucrose was the most cariogenic among lactose and maltose. Among the different years of study, 54.2% of the 3<sup>rd</sup> year students, 22.7% of the residents, and 5.4% of the final year students agreed that sucrose was the most cariogenic. A highly significant statistical difference was observed with  $P = 0.001$ . When asked about the sugar substitute that reduces the chances of dental caries the most, 29.1% of the 3<sup>rd</sup> years said the answer was saccharine, while 16.3% of the residents thought the answer was xylitol. The difference was statistically significant with  $P = 0.026$  [Graph 1].

With regard to the most anticariogenic food, 122 (60.1%) of the participants felt nuts were the most anticariogenic. About

**Table 1:** Frequency distribution based on year of study.

Year of study	Frequency ( <i>n</i> )	Percentage
Third-year BDS	122	60.1
Final year BDS	22	10.8
Residents	59	29.1

**Table 2:** Frequency distribution of responses of Chi-square distribution.

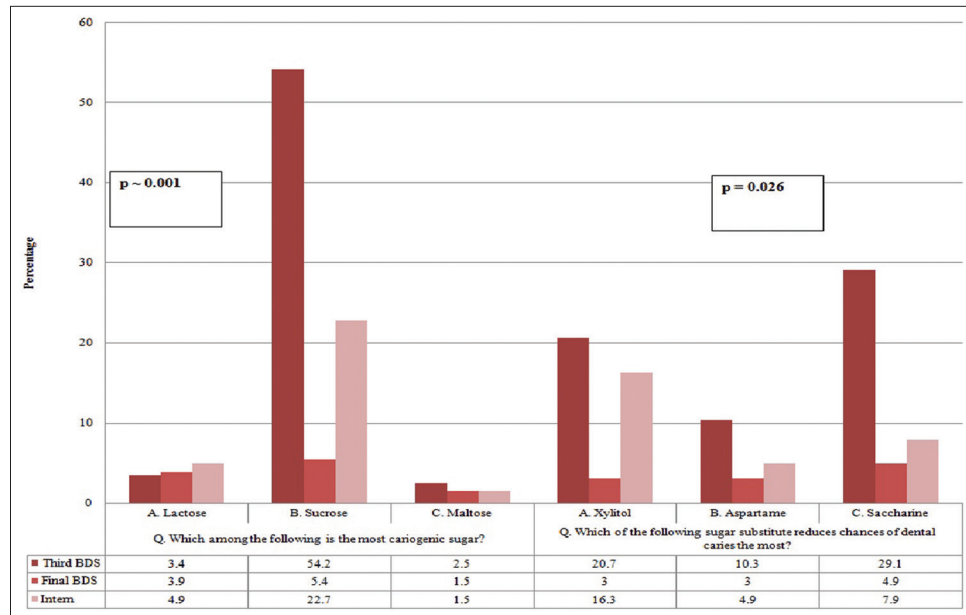
Questionnaire	Response	Frequency (%)			P value
		III BDS	IV BDS	residents	
Q. Which among the following is the most cariogenic sugar?	A. Lactose	7 (3.4)	8 (3.9)	10 (4.9)	-0.001
	B. Sucrose	110 (54.2)	11 (5.4)	46 (22.7)	
	C. Maltose	5 (2.5)	3 (1.5)	3 (1.5)	
Q. Which of the following sugar substitute reduces chances of dental caries the most?	A. Xylitol	42 (20.7)	6 (3)	33 (16.3)	0.026
	B. Aspartame	21 (10.3)	6 (3)	10 (4.9)	
	C. Saccharine	59 (29.1)	10 (4.9)	16 (7.9)	
Q. Which of the following food is anticariogenic?	A. Milk	20 (9.9)	10 (4.9)	12 (5.9)	0.011
	B. Cheese	21 (10.3)	2 (1)	16 (7.9)	
	C. Nuts	81 (39.9)	10 (4.9)	31 (15.3)	
Q. Which of the following form of food helps in preventing dental caries and strengthens periodontium?	A. Firm and fibrous food	101 (49.8)	16 (7.9)	54 (26.6)	0.027
	B. Liquid food	12 (5.9)	6 (3)	3 (1.5)	
	C. Hard and sticky food	9 (4.4)	0 (0)	2 (1)	
Q. Which among the following deficiencies manifest as oral symptoms?	A. Vitamins C and B12 deficiency	29 (14.3)	6 (3)	20 (9.9)	0.564
	B. Iron deficiency	3 (1.5)	0 (0)	2 (1)	
	C. Both	90 (44.3)	16 (7.9)	37 (18.2)	
Q. With which of the following genetic error would an individual have practically no decay?	A. Hereditary glucose intolerance	45 (22.2)	8 (3.9)	26 (12.8)	0.554
	B. Hereditary lactose intolerance	46 (22.7)	11 (5.4)	19 (9.4)	
	C. Hereditary fructose intolerance	31 (15.3)	3 (1.5)	14 (6.9)	
Q. Which of the following psychological disorders affect nutritional status and oral health of an individual?	A. Bulimia and anorexia	72 (35.5)	15 (7.4)	24 (11.8)	0.103
	B. Schizophrenia	25 (12.3)	4 (2)	20 (9.9)	
	C. Bipolar and anxiety disorders	25 (12.3)	3 (1.5)	15 (7.4)	
Q. Which of the following elements present in trace amounts in food is strongly cariostatic?	A. Fluoride	91 (44.8)	16 (7.9)	43 (21.2)	0.758
	B. Calcium	17 (8.4)	5 (2.5)	10 (4.9)	
	C. Iodine	14 (6.9)	1 (0.5)	6 (3)	
Q. Do you counsel patients with high caries risk?	A. Always	77 (37.9)	13 (6.4)	47 (23.2)	0.11
	B. Sometimes	39 (19.2)	9 (4.4)	11 (5.4)	
	C. Never	6 (3)	0 (0)	1 (0.5)	
Q. Do you think diet counseling can help prevent dental caries?	A. Yes	98 (48.3)	19 (9.4)	52 (25.6)	0.277
	B. Maybe	17 (8.4)	3 (1.5)	7 (3.4)	
	C. No	7 (3.4)	0 (0)	0 (0)	

39.9% of these were 3<sup>rd</sup> year undergraduates and 15.3% were residents. About 4.9% each answered milk and nuts among the final year participants ( $P = 0.011$ ). A significant difference was seen when the students were quizzed with regard to the form of food which helps in preventing dental caries and strengthening the periodontium ( $P = 0.027$ ). With a large number of participants (84.2%) suggesting firm and fibrous food be the best option, 49.8% of these were 3<sup>rd</sup> year followed by 26.6% were residents [Graph 2].

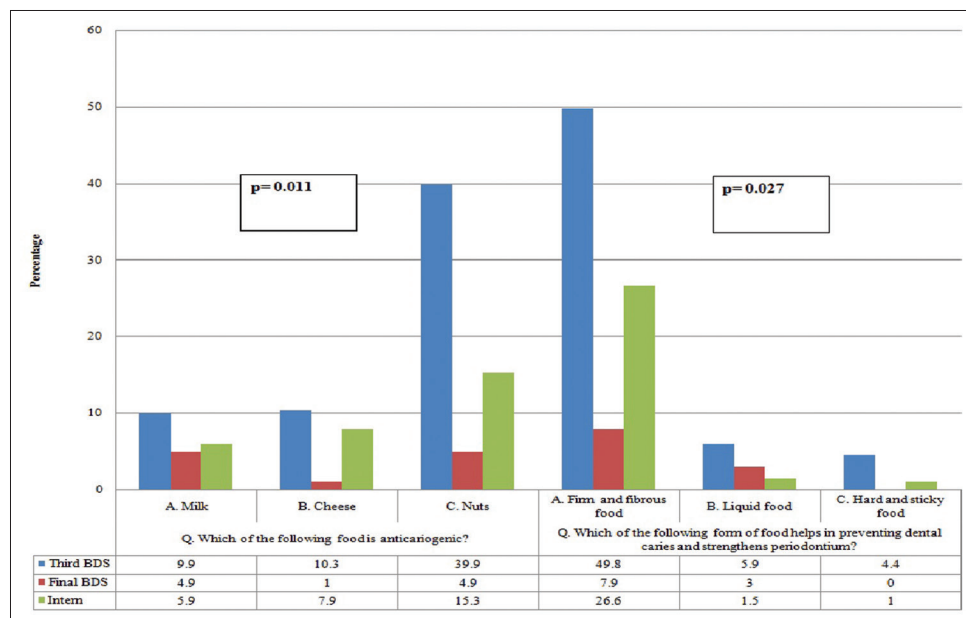
When asked which plays a greater role in caries formation, 130 (64%) said the frequency of sugar consumption was the main determinant while 155 (76.4%) of them said that both sugar content and sugar concentration in food was a

major consideration in determining the cariogenic potential of sugar. Among all the participants, a significant number of participants; 152 (74.9%) thought that therapeutic and supportive were the two types of Vitamin C supplements.

About 143 (70.4%) of the total students were aware that both Vitamins C and B12 as well as Iron deficiency manifest as oral symptoms. Out of these, 44.3% were 3<sup>rd</sup> year students, 18.2% were residents, and 7.9% were final year students. Participants were asked to choose the genetic disease in which caries was practically absent, to which, 46 (22.7%) of the 3<sup>rd</sup> year and 11 (5.4%) of final years chose Hereditary lactose intolerance while 26 (12.8%) of the residents felt the answer was Hereditary glucose intolerance [Graph 3].



**Graph 1:** Percentage of association between the year study and the responses.

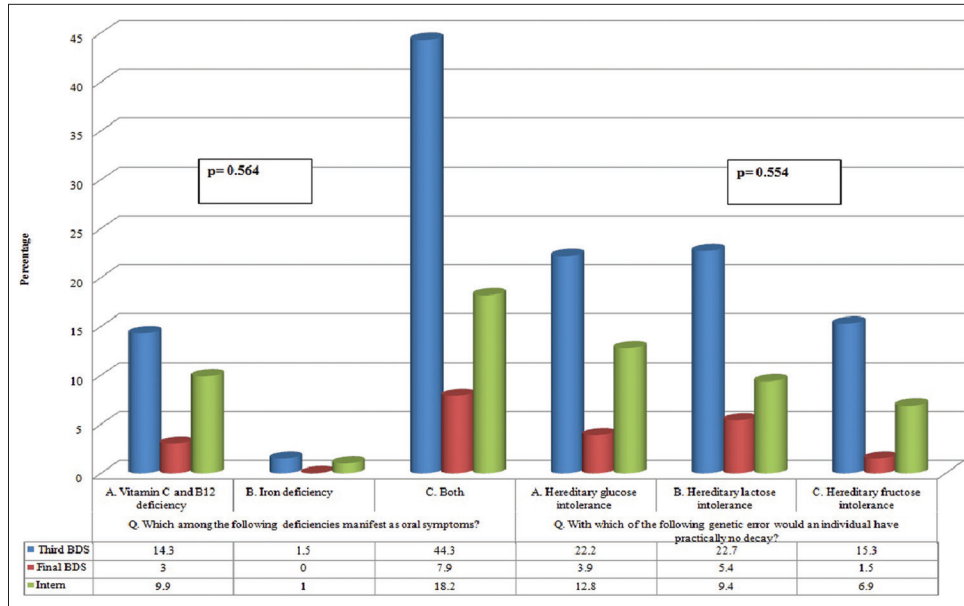


**Graph 2:** Percentage of association between the year study and responses.

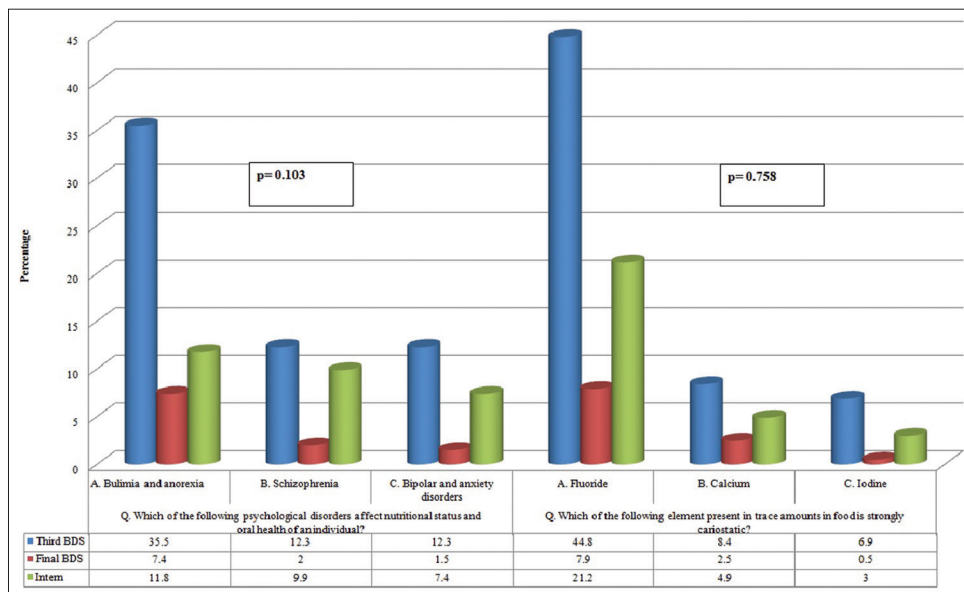
From among rinse, chewing gum and tablets, participants were asked to pick the one which is not a fluoride supplement. About 92 (45.3%) felt the answer was chewing gums, while 78 (38.4%) and 33 (16.3%) felt the answer were tablets and rinse, respectively. When asked regarding the term “perimolysis,” 54.7% of the participants chose the correct option while a close percentage (41.9%) said they were not sure what the term meant.

About 111 (54.7%) of the participants suggested that bulimia and anorexia were the psychological disorders

which affect the nutritional status and oral health of an individual. About 35.5% were from 3<sup>rd</sup> year, 7.4% were from final year, and 11.8% were from among the residents. A close number of residents (9.9%) also felt the answer could be schizophrenia. Participants were questioned about the strongly cariostatic element present in trace amount in food, to which 150 (73.9%), thought the answer to be fluoride. Out of the total, 91 (44.8%), 16 (7.9%), and 43 (21.2%) were from 3<sup>rd</sup> year, final year, and residentship, respectively [Graph 4].



Graph 3: Percentage of association between year of study and responses.

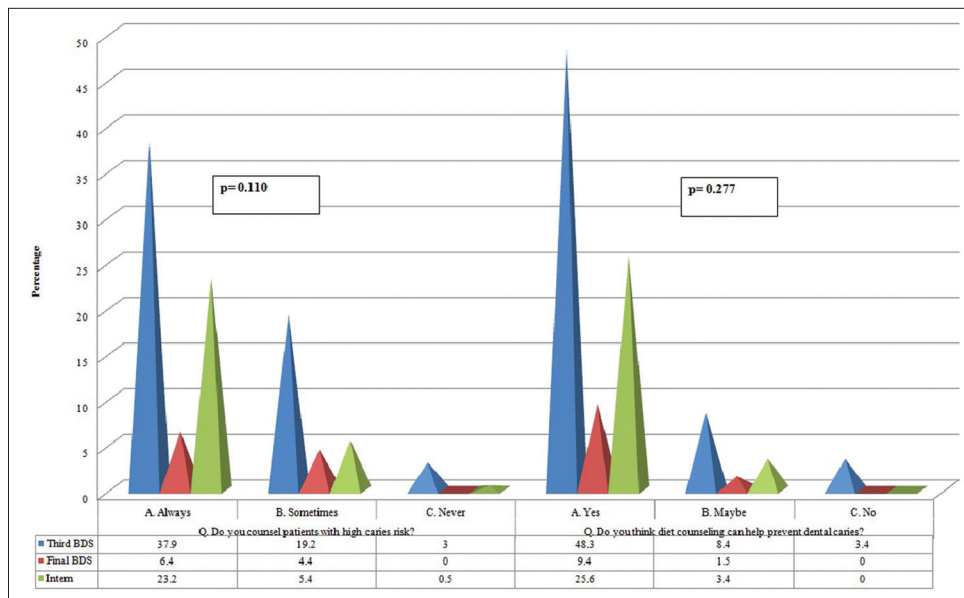


Graph 4: Percentage of association between year of study and responses.

The participants were asked if they counsel patients with high caries risk to which, 67.5% said they always counsel the patients and a minority of 3% accepted they never counsel the patients. Finally, the students were questioned if they thought diet counseling could help in the prevention of dental caries. Most of the participants, 83.3% agreed that diet counseling can help in caries prevention. Yet, a meager 3.4% of the participants thought diet counseling could play no role in the prevention of caries ( $P = 0.277$ ) [Graph 5].

## DISCUSSION

Professionals from various fields have stressed the importance of diet and nutrition on general health. Yet, not many studies were found to have been conducted among dental students and the assessment of their knowledge regarding diet and nutrition. Moreover, the comparison between the years of study has not been done. The present study was conducted to assess the knowledge of dental students toward the importance of diet and nutrition on oral health. The study concluded that 169 (83.3%) participants from 203 believed



**Graph 5:** Percentage of association between year of study and responses.

that diet counseling could help in the prevention of dental caries.

In the present study, the majority (82.3%) of the participants reported sucrose to be the arch-criminal of caries. This was similar to the results obtained by Sivakumar *et al.*, in a study conducted among dental students in India, regarding their perception of diet counseling. Most of the students (64%) reported sucrose as the most cariogenic sugar in the study by Sivakumar *et al.*<sup>[19]</sup>

There are some human studies which demonstrate that the frequency of sugar intake is an important etiological factor for caries development.<sup>[20,21]</sup> There is also evidence to show that both the frequency and the amount of sugars consumed are associated with dental caries.<sup>[22-24]</sup>

The primary evidence for the belief that the prevalence of dental caries is directly related to the frequency with which sugar is eaten comes from the Vipeholm study.<sup>[14]</sup> These results were in synchrony with the results of our study, with 64% of the participants relating frequency of sugar consumption with dental caries occurrence.

Cheese stimulates the salivary secretion and increases plaque calcium concentration. The calcium concentration of dental plaque strongly influences the balance between demineralization and remineralization of enamel.<sup>[10,25]</sup> In an epidemiological study, cheese intake was higher in children who remained caries-free over a 2-year period than in those who developed caries.<sup>[23]</sup> Yet, in the present study, least number (19.2%) of students thought of cheese as the most anticariogenic and 60.1% believed nuts were the most anticariogenic food.

The total sugar content per serving of a food is not a major consideration in determining its cariogenic potential; rather, it is the concentration of sugar of food which is more important.<sup>[26]</sup> Only 18.7% of the participants in the present study felt sugar concentration was considered in determining the cariogenic potential, with 76.4% considering both sugar content and concentration as a major consideration in determining cariogenic potential.

It can be inferred from the present study that a majority (83.3%) of the students did have a positive attitude toward diet counseling as a tool in the prevention of dental caries. Similar findings have been reported by Carole *et al.* in whose study dental students expressed a generally favorable attitude toward nutrition and nutritional counseling of their patients. Of the subjects, 42% reported that dietary advice was sometimes rendered to the patients, while a few rarely did the same.<sup>[27]</sup> Two studies conducted with caries-active individuals also showed that dietary counseling and reinforcement reduced caries increment by 85% and 60%.<sup>[28,29]</sup>

Overall, the present results suggest that the undergraduates have fairly sufficient knowledge and attitude toward diet and nutrition and its role on the maintenance of oral health.

## CONCLUSION

The focus of diet counseling has mostly been on the management of diseases. However, the focus should be on health promotion, disease prevention, and comprehensive care. Dentists can be considered “gatekeepers” for recognizing dietary risk and referring patients to dieticians and physicians for further care when indicated. These visits can also provide

an opportunity to improve lifestyle, as well as oral hygiene and can be a form of motivation to the patients to bring about positive changes in their general and dental health through diet modifications.

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### Conflicts of interest

There are no conflicts of interest.

### REFERENCES

1. Kelly M, Steele J, Nuttall N. Adult Dental Health Survey. Oral Health in the United Kingdom 1998. London: The Stationery Office; 2000.
2. Chen M, Andersen RM, Barmes DE, Leclercq MH, Lyttle SC. Comparing Oral Health Systems. A Second International Collaborative Study. Geneva: World Health Organization; 1997.
3. Joshipura KJ, Willett WE, Douglass CW. The impact of edentulousness on food and nutrient intake. *J Am Dent Assoc* 1966;129:1261-9.
4. Steele JG, Sheiham A, Marcenes W, Walls AW. National Diet and Nutrition Survey: People Aged 65 Years and Over. Volume 2: Report of the Oral Health Survey. London: The Stationery Office; 1998.
5. Miller WD. In: König KG, editor. Basel, The Microorganisms of the Human Mouth. Switzerland: S Karger; 1973.
6. Touger-Decker R, van Loveren C. Sugars and dental caries. *Am J Clin Nutr* 2003;78:881S-892S.
7. American Dietetic Association. Position Paper: Nutrition and Oral Health. *J Am Diet Assoc* 2003;5:615-25.
8. Tinanoff N, Palmer CA. Dietary determinants of dental caries and dietary recommendations for preschool children. *J Public Health Dent* 2000;60:197-206.
9. Johnson RK, Frary C. Choose beverages and foods to moderate your intake of sugars: The 2000 dietary guidelines for Americans what's all the fuss about? *J Nutr* 2001;131:2766S-2771S.
10. Moynihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. *Public Health Nutr* 2004;7:201-26.
11. Lingström P, van Houte J, Kashket S. Food starches and dental caries. *Crit Rev Oral Biol Med* 2000;11:366-80.
12. Kashket S, Van Houte J, Lopez LR, Stocks S. Lack of correlation between food retention on the human dentition and consumer perception of food stickiness. *J Dent Res* 1991;70:1314-9.
13. König KG, Navia JM. Nutritional role of sugars in oral health. *Am J Clin Nutr* 1995;62:275S-82S.
14. Gustafsson BE, Quensel CE, Lanke LS, Lundqvist C, Grahnen H, Bonow BE, *et al.* The vipeholm dental caries study; the effect of different levels of carbohydrate intake on caries activity in 436 individuals observed for five years. *Acta Odontol Scand* 1954;11:232-64.
15. König KG, Schmid P, Schmid R. An apparatus for frequency-controlled feeding of small rodents and its use in dental caries experiments. *Arch Oral Biol* 1968;13:13-26.
16. Firestone AR, Schmid R, Mühlemann HR. Cariogenic effects of cooked wheat starch alone or with sucrose and frequency-controlled feedings in rats. *Arch Oral Biol* 1982;27:759-63.
17. Bowen WH, Amsbaugh SM, Monell-Torrens S, Brunelle J. Effects of varying intervals between meals on dental caries in rats. *Caries Res* 1983;17:466-71.
18. Moynihan PJ. Dietary advice in dental practice. *Br Dent J* 2002;193:563-8.
19. Sivakumar V, Jain J, Tikare S, Palliyal S, Kulangara SK, Patil P. Perception of diet counseling among dental students in India. *Saudi J Oral Sci* 2016;3:36-41.
20. Sreebny LM. Sugar availability, sugar consumption and dental caries. *Community Dent Oral Epidemiol* 1982;10:1-7.
21. Kalsbeek H, Verrips GH. Consumption of sweet snacks and caries experience of primary school children. *Caries Res* 1994;28:477-83.
22. Rodrigues CS, Sheiham A. The relationships between dietary guidelines, sugar intake and caries in primary teeth in low income Brazilian 3-year-olds: A longitudinal study. *Int J Paediatr Dent* 2000;10:47-55.
23. Rugg-Gunn AJ, Hackett AF, Appleton DR, Jenkins GN, Eastoe JE. Relationship between dietary habits and caries increment assessed over two years in 405 English adolescent school children. *Arch Oral Biol* 1984;29:983-92.
24. Szpunar SM, Eklund SA, Burt BA. Sugar consumption and caries risk in schoolchildren with low caries experience. *Community Dent Oral Epidemiol* 1995;23:142-6.
25. Rugg-Gunn AJ, Edgar WM, Geddes DA, Jenkins GN. The effect of different meal patterns upon plaque pH in human subjects. *Br Dent J* 1975;139:351-6.
26. Nizel AE, Papas AS. The Role of Carbohydrates in the Production of Dental Caries. In: *Nutrition in Clinical Dentistry*. 3<sup>rd</sup> ed. Philadelphia, PA: WB Saunders; 1989. p. 34.
27. Pietz CL, Fryer BA, Fryer HC. Nutritional knowledge and attitudes of dental students. *J Am Dent Assoc* 1980;100:366-9.
28. Becks H. Rampant dental caries: Prevention and prognosis. A five-year clinical study. *J Am Dent Assoc* 1944;31:1189-200.
29. Krasse B. Approaches to prevention. In: Stiles HM, Loesche VV, O'Brien TC, editors. *Proceedings Microbial Aspects of Dental Caries*. Special Supplement of Microbiology Abstracts. Vol. 3. Arlington: Published by Information Retrieval, Inc.; 1976. p. 867-76.

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