Original Article

Analysis of food frequency and acquired dietary allowance (ADA) in relation to dental caries and dental erosion affecting dental postgraduate students of Sawangi: A cross-sectional survey

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ABSTRACT

Background: The development and integrity of the oral cavity and the progression of oral diseases may be affected by the nutritional status and diet of the person. The most ubiquitous oral diseases are found to be dental caries and periodontal diseases in the world. Therefore, the aim of the present study was to assess the correlation between food frequency with nutrient adequacy ratio (NAR), NAR with dental caries, and dental erosion. **Materials and Methods:** This study was conducted among dental postgraduate (PG) students. A self-administered questionnaire was developed with consisted food frequency, acquired dietary allowance, Decayed, Missing Filled teeth (DMFT) index, and tooth wear index. Correlation was assessed between food frequency and NAR, NAR with dental caries and dental erosion. **Results:** Out of 123 PGs 100 PGs participated in the study making response rate 81%. Consumption of chapatti, pulses vegetables white rice, sugar, milk and milk products, and acidic food is on the daily basis mostly and it was statistically significant ($P < 0.05$). A statistically significant difference ($P < 0.05$) was also seen between frequency of consuming food items in decreasing order is fats, legumes, roots and tubers, fruits, meat and meat products, fried foods, vitamin and mineral supplements those who eat daily and never. **Conclusion:** The significant association between food frequency and nutrient adequacy ratio might be helpful assessing nutritional values. The high use of acidic beverages is a serious threat to the health of the oral cavity.

Keywords: Acquired dietary allowance, dental caries, dental erosion, food frequency

Introduction

Nutrition may be defined as the science interpreting the interaction of nutrients and other substances in food with the maintenance, growth, reproduction, health and disease of an organism which includes food intake, absorption, assimilation, biosynthesis, catabolism, and excretion.[1] Nutritional status

affects the teeth posteruptive as caries formation majorly but it can also show impact during the preeruptive stage also.[2] Nowadays, students pursuing higher education does not pay heed toward it. Dietary studies[1,3] are pertinent for enlightening our understanding of the role of nutrition in deterrence and identification of certain oral diseases.

"As the nutrition is an indispensible constituent of oral health and oral health is reflected as an essential measure of general

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health".[4] Thus, nutrition and oral health have a collegial relation among them.

The development and integrity of the oral cavity and the progression of oral diseases may be affected by the nutritional status and diet of the person. The most ubiquitous oral diseases are found to be dental caries and periodontal diseases in the world. These diseases blemishes and impairs the integrity of the tooth. A vigorous relation exists among diet and oral health. The veracity of the teeth; number; pH, and composition of the saliva; and plaque may be distressed by diet. Dental caries is a chronic disease which can affect residents at any age.[5] Till 5 years prevalence of dental caries gradually increases by 68.8% as it is multifactorial in nature.[4] The levels of dental caries remained prevailing and increasing in some developing countries experiencing nutrition transition in spite of improved bandwagon.[2]

Dental erosion may be defined as the progressive loss of dental hard tissue because of acids.[6] The source of extrinsic acids can be diet [e.g. acidic beverages and citrus products like citrus fruit or juices, soft drinks, etc.] occupational environment (e.g. galvanizing factories).[7] Dental erosion due to faulty dietary practices like frequent intake of acidic beverages, bulimia nervosa, and can weaken tooth integrity. Dietary acids from soft drinks are associated with increased incidence of dental erosion.[2] The prevalence of dental erosion changes with age.[8] Fruits, fruit juices, and candies with high concentrations of citric acid, carbonated beverages, and vinegar (acetic acid) found in pickled foods are the usual extrinsic dietary instigators of dental erosion.[9]

There is severe dearth of information regarding diet and its effects on dental tissues among Indian scenario; hence, the aim of the present study was to evaluate the correlation between food frequency with NAR, NAR with dental caries and dental erosion, and food frequency with dental caries and dental erosion.

Materials and Method

The present study was conducted in Sharad Pawar Dental College, Sawangi, Maharashtra, India. Permission to conduct the study was obtained from the college authorities, and ethical clearance was obtained from the institution's ethical committee. All the 123 dental postgraduates (PGs) students were invited for the study, only 100 gave consent to be the part of the study making response rate of 81%.

All the PGs were gathered in the class and the instructions were given regarding the purpose of the survey and filling of the survey questionnaire. All the PGs were given a format consisting of informed consent, instructions, and questionnaire and were given 30 minutes to fill the questionnaire. All the participants were clinically examined in the Department of Public Health Dentistry successive days.

Training and intraexaminer calibration was done for clinical examination. The examiner practiced the examination on 20 subjects twice on successive days. The results of the two examinations observed by the examiner were compared and agreements for most assessments were in the range of 89%. On the same pilot study was done. The reliability of the questionnaire (Cronbach's α value) after modifying questions was 0.83. A self-administered, investigator developed questionnaire, consisting information on food frequency, dietary pattern, frequency of different types of food consumption, dietary habits, lifestyle, DMFT index, and tooth wear index which was obtained. The average daily intake of foods and their nutrients for acquired dietary allowance was calculated[10] and compared with ICMR recommended RDA.[11]

$$NAR = Nutrient\ intake/RDA \times 100$$

Data obtained were entered into the computer (MS Excel, MS Word) and Statistical Package for Social Sciences (SPSS), version 16.0 (SPSS Inc, Chicago IL) was employed for data analysis. Level of significance was kept at 5%. Chi-square test and correlation analysis were performed.

Results

In this study, 100 PG students of the institution were examined. The mean age of examined population was 23.78 years with a standard deviation of 3.11 years, among them 64% were females and 36% were males who participated in this study. Among the study subjects the mean height was (1.63±0.09 m), weight (62.11±10.46 kg), body mass index (23.38±2.91 m^2/kg), and food frequency was found (3.15±0.91 times/day). Among the examined students, 48% were found to be vegetarian and 52% were found to be of mixed diet; 24% were on dieting and 76% were not on dieting.

Prevalence of frequency of consumption of different types of food items consumed in a week has been tabulated and shown in Table 1.

The calculated mean value of protein, fat, carbohydrate, energy intake, and NAR has been tabulated and shown in Table 2.

Prevalence of different types of dietary habits attained in a month has been tabulated and shown in Table 3.

Prevalence of frequency of strenuous activities performed by students in a week has been tabulated and shown in Table 4.

An established significant correlation was found between food frequency and NAR when analyzed the collected data by correlation, while correlation between food frequency and DMFT, food frequency and dental erosion, nutrient adequacy ratio and DMFT, nutrient adequacy ratio, and dental erosion were found to be not significantly correlated, Table 5.

Table 1: Frequency of consumption of different types of food items in a week						
Question	*P*	Daily (*n*)(%)	4-5 times per week (*n*) (%)	2-3 times per week (*n*) (%)	Once in a week (*n*) (%)	Never (*n*) (%)
Chapatti	0.000*	90 (90)	7 (7)	1 (1)	2 (2)	0 (0)
Rice	0.000*	69 (69)	9 (9)	9 (9)	9 (9)	4 (4)
Milk products	0.000*	56 (56)	11 (11)	19 (19)	9 (9)	5 (5)
Meat	0.000*	29 (29)	12 (12)	23 (23)	40 (40)	49 (49)
Pulses	0.000*	46 (46)	19 (19)	15 (15)	17 (17)	3 (3)
Green leafy vegetables	0.028*	32 (32)	22 (22)	32 (32)	14 (14)	0 (0)
Fruits	0.003*	22 (22)	17 (17)	28 (28)	27 (27)	6 (6)
Roots and tubers	0.039*	11 (11)	21 (21)	30 (30)	22 (22)	16 (16)
Fats and fatty acids	0.000*	32 (32)	28 (28)	25 (25)	9 (9)	6 (6)
Legumes	0.039*	9 (9)	24 (24)	28 (28)	19 (19)	20 (20)
Sugar	0.000*	72 (72)	10 (10)	12 (12)	6 (6)	0 (0)
Acidic food	0.006*	28 (28)	19 (19)	24 (24)	23 (23)	6 (6)

Note: *P<0.05 is significant

Table 2: Mean value of protein, fat, carbohydrate and energy intake, nutrient adequacy ratio along with the value of recommended dietary allowance by Indian Council of Medical Research (ICMR)					
Gender	Mean±SD				
	Protein (g/day)	Fat (g/day)	Carbohydrate (g/day)	Energy (kCal/day)	NAR
Female	101±27	109±68	495±130.09	3752.73±958.77	194.23±47.60
Male	113.06±42.82	98.20±52.60	535.91±206.34	4002.04±1500.58	153.43±55.89

Table 3: Frequency of different personal habits by postgraduate students in a month					
Question	*P*	Daily (*n*) (%)	Weekly (*n*) (%)	Monthly (*n*) (%)	Never (*n*) (%)
Alcohol	0.000*	0 (0)	6 (6)	11 (11)	83 (83)
Smoking	0.000*	7 (7)	3 (3)	0 (0)	90 (90)
Tea/coffee	0.000*	59 (59)	23 (23)	13 (13)	5 (5)
Fried foods	0.000*	29 (29)	52 (52)	14 (14)	5 (5)
Vitamins and mineral supplements	0.000*	43 (43)	22 (2)	10 (10)	25 (25)

*P<0.05 is significant

Table 4: Frequency of strenuous activities performed by students in a week					
Questions	*P*	Daily (*n*) (%)	2-3 times a week (*n*) (%)	Once a week (*n*) (%)	Never (*n*) (%)
Exercise	0.003*	30 (30)	25 (25)	10 (10)	35 (35)
Work more than 16 h	0.000*	23 (23)	12 (12)	14 (14)	51 (51)

*P<0.05 is significant

Discussion

The mean age of participants was 23.78 ± 3.11 years, among which 64% were females and 36% males. The mean body mass index among the students participated in this study was found to be 23.38 ± 2.91 (m²/kg). The frequency of food intake in the examined population was found to be 3.15 ± 0.91 times/day. Among the examined students, 48% students were vegetarian and 52% were consuming mixed diet.

Here most of students consumed chapatti daily. This is in accordance with the study done by Caulfield *et al.*[12] Chapatti is the most staple diet hence the same was found.

Milk and milk products daily consumption among participants was 56, fats 32, and sugars 72, respectively. This is in accordance

with Sati and Dahiya[13] in their study they observed increased consumption of sugar, milk, and milk products. Increased consumption of fatty products in the present study was found due to increased intake of junk food.

Students who never consumed meat were 49 in number. Whereas, students who consumed pulses daily were 46 and legumes 2–3 times/week was 28 in number, respectively. This study was found to be in accordance with Sridhar *et al.*,[14] in his study he observed increased consumption of pulses and legumes, but not meat. In Indian culture, legumes and pulses are culturally accepted.

In present study, it was seen that daily 32 students consumed vegetables, 30 and 28 students consumed roots and tubers and fruits 2–3 times/week, respectively. This study was found to be

P	Pearson correlation	Mean±SD			
		Food frequency	NAR	DMFT	Dental erosion
0.046*	0.200	3.15±0.91	179.54±54.16	-	-
0.907	0.907	3.15±0.91	-	1.40±1.87	-
0.185	0.133	3.15±0.91	-	-	0.02±0.14
0.910	-0.011	-	179.54±54.16	1.40±1.87	-
0.701	-0.039	-	179.54±54.16	-	0.02±0.14

Table 5: Correlation values of food frequency, NAR, DMFT, and dental erosion

*P<0.05 is significant

in accordance with Frary *et al.*[15] In collegial life work load in terms of finishing quota, seminars, and preparing for exams, makes it little difficult to think about consuming proper fruits and vegetables.

High consumption of acidic food on daily basis was found among 28 students, it was opposite with the results shown by Bartlett DW;[16] they found low frequencies of acidic food consumption. Increased consumption was found in the present study due to habit of consuming lemon after food in this vidharba region of Maharashtra.

It was observed in the present study that intake of protein was 101.79 ± 27.68 g/day, fat 109.36 ± 68.64 g/day, carbohydrate 495.52 ± 130.09 g/day and energy were 3752.73 ± 958.77 kCal/day among females, whereas males consumed protein 113.06 ± 42.82 g/day, fat 98.20 ± 52.60 g/day, carbohydrate 535.91 ± 206.34 g/day and energy 400204 ± 1500.58 kCal/day. This study was found to be in accordance with Thukral *et al.*,[1] Increased work load and stress might have contributed to the same.

From the present study, it was seen that nutrient adequacy ratios among females were 194.23 ± 47.60 and males 15343 ± 55.89. This study was found to be in accordance with Thukral *et al.*,[1] in his study he observed increased nutrient adequacy ratio among females.

According to the collected data students never smoked and drank alcohol was 90 and 83 in number, respectively. The present study was incongruity with Torheim LE *et al.*[17] These days smoking and alcohol usage is very much accepted among school- and college-going students.

Overall tea/coffee was consumed by 59 students and vitamin and mineral supplements (43 students) on daily basis and fried foods (52 students) on weekly basis. The present study was found to be in accordance with Bartlett DW *et al.*;[16] they also found increased consumption of tea or coffee. Drinking tea and coffee is very much culturally accepted in the Indian scenario.

In this study, maximum number of students did not perform extra physical activity (35) and working more than 16 hours (51) students. As this study was conducted among dental PG students and they work for more than 16 hours to finish their prescribed quota, academic work, managing paper work for thesis, and

studying for exams makes the situation not conducive to do exercise daily.

In this study, a definite correlation between food frequency and nutrient adequacy ratio was found. The present study was found to be in accordance with Torheim *et al.*;[17] they also found an association between food frequency and nutrient adequacy. In the present study, definite correlation between food frequency and DMFT, food frequency and dental erosion, nutrient adequacy ratio and DMFT, nutrient adequacy ratio and dental erosion were not found. The present study was found to be in accordance with Arnadóttir IB *et al.*,[7] they also found no association between dental erosion and diet, dental caries and daily sugar intake. The present study was found to be incongruity with Torheim LE *et al.*[17] they found an association between tooth wear and acids from diet, dental caries, and intake of carbohydrate. ne of the recent study by Shay B *et al* have shown that poor oral conditions due to disorder of nutrition can impact the oral health related quality of life of the students in terms of functional and physical limitations, social and psychological disability.[18]

Limitation

The data presented here are from one dental institute only; hence, the results cannot be generalized. Questionnaire studies have inherent limitations of social desirability of faking good or faking bad bias. Further longitudinal and nationwide studies are warranted to explore more about the true nature of diet and dental diseases.

Conclusion

Considering the findings of the above study, an association between food frequency and nutrient adequacy ratio exists which can be used for assessing nutritional values. The staple diet of this region is chapatti, pulses, and vegetables, while rice is also consumed in a great amount. The intake of sugar, milk, and milk products is on the daily basis mostly which can be a causative factor for dental caries but significant association between these was not observed, as the acidic foods are consumed in high amount which can be a causative agent for dental erosion.

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Conflicts of interest

There are no conflicts of interest.

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