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RESEARCH ARTICLE

Prevalence of Dental Caries Susceptibility Among Students of Different Age Groups

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Abstract
Dental caries is an infectious tooth decay caused by microbial activity in which bacteria present in mouth ferment sugars to acid which demineralize the enamel layer of teeth. Not only the sugar content but a number of other factors such as oral hygiene, oral health and diet, affects the development of dental caries. In the present study, prevalence of dental caries was studied in school and university students. Questionnaire based on oral health, hygienic practices, diet consumed and frequency of eating was filled by the students. Saliva samples of the students were qualitatively screened for the presence of dental caries by Synders agar test which showed that 78% students were susceptible for dental caries. Among the students with different dietary habits, the high number of caries susceptibility (83.33%) was observed in university students consuming vegetarian diet. It was found that 80% of students taking soft drinks regularly were positive for caries susceptibility. The habit of eating junk food was more prominent in school students and 90% of them showed positive results. The study concluded that an alarming rate of dental caries is present in both school and university students which is a matter of concern. However, many measures such as use of fluoridated toothpaste and generation of awareness about the oral health and hygienic practices can reduce the caries risk in students.

Keywords: Cariogenic, Dietary habits, Junk food, Oral health, Sweets, Tooth enamel

Introduction

Dental caries is one of the most common oral diseases that occurs in most of parts of the world. Dental caries can be defined as localized, progressive demineralization of hard tissue of the teeth caused by bacterial activity. Normally, many different types of bacteria are present in the human mouth. These bacteria have an affinity for salivary glycoproteins and continues build up on the teeth in the form of a biofilm called plaque. Human dental plaque harbours nearly 200-300 species of microorganisms (Hamilton and Bowden, 2000). This plaque represents a complex ecosystem mainly composed of diverse acid tolerating and acid producing microorganisms. Acidogenic oral microorganisms ferment carbohydrates to acids. This acid then brings about decalcification of enamel leading to dental caries (Rouabhia and Chmielewski, 2012). The main bacteria associated with it are *Streptococcus mutans, S. mitis, S. salivarious, S. sanguis, Lactobacillus acidophilus*, and Actinomycetes (Patil *et al.*, 2013). Of these *S. mutans* and other Streptococci are the most cariogenic pathogens as they produce short chain carboxylic acids which dissolve enamel and dentine. The frequency of individuals that suffer from caries is increasing due to increased sugar consumption and change in dietary habits of people (Saini *et al.*, 2003). In India, the dental carries is not only prevalent in children (51.9 %) but also in adults. About 85 % of adult population suffers from it (Dental Council of India, 2004). Apart from the high sugar intake, there are many other factors that affect the development of caries. The present study was focused on students of different age groups and explores the relationship between the oral hygiene, dietary habits and dental caries susceptibility among these students.

Materials and Methods

Study Group

The study was conducted on school and university students of an institution located in Jaipur city, India. Saliva samples were collected from 50 students grouped into 2 age groups viz., 13-17 years (school-going) and 18-28 years (university-going).

Questionnaire Format and Content

A questionnaire was designed that consisted of 20 questions based on oral hygiene, dental care and dietary habits of the students. Students were asked to fill up the questionnaire before sample collection.

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Sample Collection

Saliva samples were collected in sterile vials and were brought to the laboratory in ice packs for further study.

Dental Caries Susceptibility Test

In order to test the likelihood of students having dental caries, Synders test agar medium was used. The saliva sample was shaken vigorously for 30 seconds to dispense the organisms evenly and 0.2 ml of it was inoculated in each medium tube (melted at 45°C) aseptically. The contents of the tubes were mixed by gently tapping the tube with fingers. The tubes were then immediately cooled in an ice-water bath. Each set was prepared in triplicates. Uninoculated tube was taken as control. All the tubes were incubated at 37°C for 72 hours. These tubes were observed after every 24 hours for colour change from green to yellow and the observations were recorded (Aneja, 2003).

Statistical Analysis

Comparision between susceptibility to dental carries among school and University students was made using students t test by IBM SPSS software (Version 22).

Results and Discussion

Questionnaire Analysis

The data collected through questionnaire showed that all the students brushed their teeth every day and only 28% of them were in a habit of brushing two times a day. About 40% of the students spent more than 3 minutes time for brushing. Maximum participants (94%) rinsed their mouth every time after eating food. The results revealed that nearly half of students (52%) dont eat chocolates/ candies/sweets every day whereas only 14% eat such sugary stuff only once a day. 34% of the students really liked the sweets and hence they used to eat sweets most of the times whereas about 48% (24 participants) ate sweets only after meals. Majority of the participants (90%) drank soft drinks occasionally. Maximum students (80%) consumed only vegetarian products and only a small fraction (20%) fed on non-vegetarian diet. About 39 participants (78%) never had a toothache and 20 (40%) never visited a dentist. Some of the students (42%) also reported that their parents had dental caries (Table 1).

Dental Caries Susceptibility Prevalence

A combination of different factors like age, sex, personal hygiene, diet, microflora, trace elements, saliva, genetic tendency and morphology of tooth affects the development of dental caries (Addy *et al.*, 1990; Dash *et al.*, 2002). In the present study, caries susceptibility was studied in 50 students of IIS School and The IIS University, Jaipur. Based on the results of Synders test agar, caries susceptibility was considered to be marked, moderate and slight, when medium colour changes from green to yellow in 24, 48 and 72 hours respectively. If no colour change was observed after 72 hours, then the student was considered to be negative for caries susceptibility. It was found that 39 students (78%) out of 50 were susceptible for dental caries (Table 2, Fig. 1 (a) and (b)). No significant difference was observed in school and university students with respect to caries susceptibility as observed by t test. Only a small number of students (22%) were negative for it.

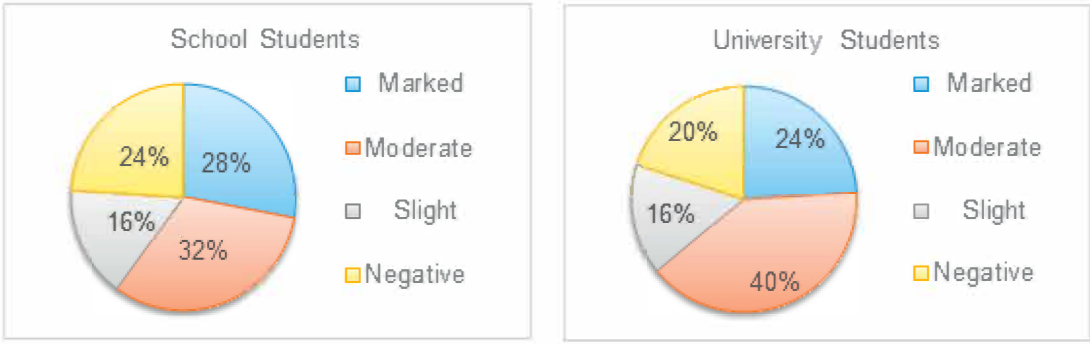
Oral care begins with good oral hygiene practices that includes proper brushing. In the present study, it was noticed that about 84.21% of those who brushed only once in a day were susceptible whereas only 66.66% of university students brushing twice a day were positive for same. On the contrary, school students who even brushed twice a day were found to be more susceptible (Fig. 2). Surprisingly it was noted that those who devote more than 3 minutes for brushing were also at high risk of caries. Proper brushing helps to remove cariogenic bacteria and fermentable materials from mouth thereby reducing the risk. The present data clearly indicates that the students are not aware of correct method of brushing and hence needs to be educated about the same.

Among the students with different dietary habits, the high number of caries susceptibility (83.33%) was observed in university students consuming vegetarian diet (Fig. 3). Similar results were reported in patients visiting the dentistry department of local dental hospitals of Gwalior where patients on a vegetarian diet were more susceptible to caries as compared to those on mixed diet (Khana *et al.*, 2008). On the contrary in present study, school students that were on mixed diet had high susceptibility. It is known that bacteria present in oral cavity ferments sugar and forms acid which leads to decalcification of dental enamel and is the primary cause of dental caries (Tinanoff and Palmer, 2000). The students who consume mixed diet will have more of protein intake as compared to sugar, thus less amount of acid is developed and hence they are expected to have lesser susceptibility to caries. It was also observed that students taking carbohydrate rich diet were highly susceptible to caries. This is expected as more the amount of sugar more is the acid production and more is the susceptibility. In the present study, 80% of the students on mixed diet also showed susceptibility which can be attributed to other factors influencing caries such as oral health and consumption of sweets regularly. The frequency of eating can also contribute to an increase in cariogenicity of the diet (König and Navia, 1995), although Bowen *et al.* (1983) suggested that the caries development is related to the time that sugars are available to microflora

Table 1. Oral hygiene and eating habits of students

S. No.	Variable	Percentage of students (%)
1.	Brushing teeth daily	
	Yes	100
	No	0
2.	Brushing frequency in a day	
	Once a day	72
	Twice a day	28
	Thrice a day	0
3.	Time spend in brushing teeth	
	3 minutes	42
	more than 3 minutes	40
	don't know	18
4.	Type of diet consumed	
	Vegetarian	80
	Mixed (vegetarian and non-vegetarian)	20
5.	Number of times food is eaten in a day	
	3 times	48
	5 times	42
	more than 5 times	10
6.	Rinsing mouth after eating food / having meal	
	Yes	94
	No	06
7.	Number of times chocolates/ candies/ sweets are eaten in a day	
	Once a day	28
	Twice a day	10
	Thrice a day	10
	Don't eat chocolates/candies/sweets everyday	52
8.	Eating snacks between meals	
	Yes	50
	No	50
9.	Preferred time for eating sweets	
	At mealtimes	08
	Between mealtimes	10
	After meal	48
	At all times	34
10.	Drinking soft drinks	
	Frequently	10
	Occasionally	90
11	Eating junk foods	
	Frequently	34
	Occasionally	66
12	Enough amount of protein is taken in a day	
	Yes	80
	No	20
13	Enough amount of Carbohydrate is taken in a day	
	Yes	96
	No	04
14	Enough amount of Carbohydrate is taken in a day	
	Yes	96
	No	04
15	Enough amount of saliva is secreted in mouth	
	Yes	40
	Average amount	58
	Not at all	02
16	Feeling sensitivity during eating or drinking hot or cold food items	
	Yes	24
	No	76
17	Did you ever had a toothache? (Do not include teething pains)	
	Yes	22
	No	78
18	Ever visited a dentist	
	Yes	60
	No	40
19	Time of last visit to the dentist	
	One month ago	12
	Six months ago	22
	One year ago	28
	Never	38
20	Presence of dental caries in parents	
	Yes	42
	No	46
	Don't know	12

present in oral cavity and not to the frequency of ingestion. The frequency becomes important when caries are recognized as the outcome of the alternation of demineralization and remineralization (König and Navia, 1995). High frequency is associated with more demineralization and less remineralization. Similar results were obtained in the present study where it was found that all students who ate more than 5 times were susceptible to caries.



(a) **(b)**

Fig. 1. Prevalence of dental caries (a) School students (b) University students

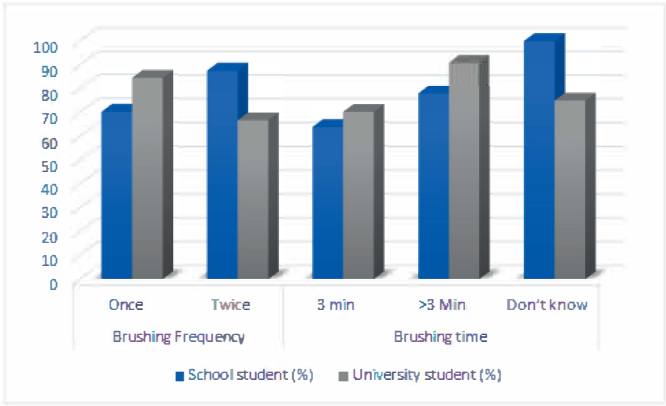


Fig. 2. Relation between oral hygiene habits and susceptibility to dental caries

Table 2. Distribution of Dental Caries Susceptibility among Students

Participants	Dental caries susceptibility			
	Number of students showing Positive results			Number of students showing Negative results
	Marked	Moderate	Slight	
School Students	7	8	4	6
University Students	6	10	4	5
Total	13	18	8	11
	39			

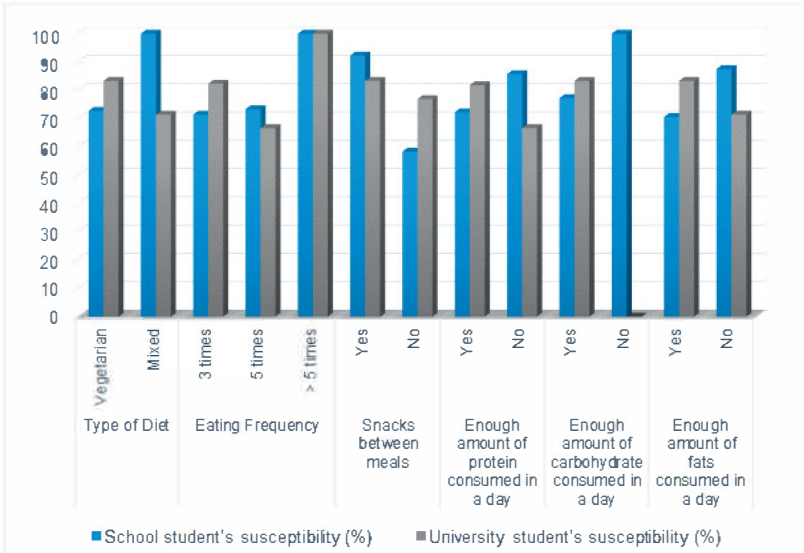


Fig. 3. Relation between Dietary habits and susceptibility to dental caries

It was observed that the students who preferred to eat sweets between meal times were lesser susceptible (50% of school students and 66% of university students) as compared to those who ate after meals and at all times (Fig. 4). This data clearly indicates that eating sweets after or along with meals increases the risk for caries and hence should be discouraged. It was also observed that university students were fonder of eating candies, chocolates and hence were at higher risk of having dental caries. Consumption of the products like candies which are retained in mouth for a longer time or are sticky in nature leads to higher risk of caries (König and Navia, 1995).

It is a well-known fact that soft drinks contain acid and high amount of sugar thus regular intake of such drinks will increase caries susceptibility (Sohn *et al.*, 2006). The results observed in the study were in accordance with the same and showed that 80% of students consuming soft drinks regularly were positive for caries susceptibility.

The habit of eating junk food was more prominent in school students and 90% of them showed positive results (Fig. 4). Similar results were obtained in a study conducted on school students of Solapur city where children having the habit of consuming soft drink were more susceptible to caries (Deshpande *et al.*, 2012).

Saliva act as a buffering agent and neutralizes the acid production in mouth thereby lowering the risk of caries. In the present study, it was observed that the 66.66 % of school students and 72.72% of university students who produced enough amount of saliva were less susceptible to caries whereas more than 80% of students who produced only an average amount of saliva were more susceptible to caries due to lesser buffering action of saliva. A substantial proportion of students had sensitivity while eating or drinking hot or cold food items and more than 70% of them were susceptible to caries. 60% of the students who suffered from toothache had positive results for caries. Near about 20 students never visited a dentist and

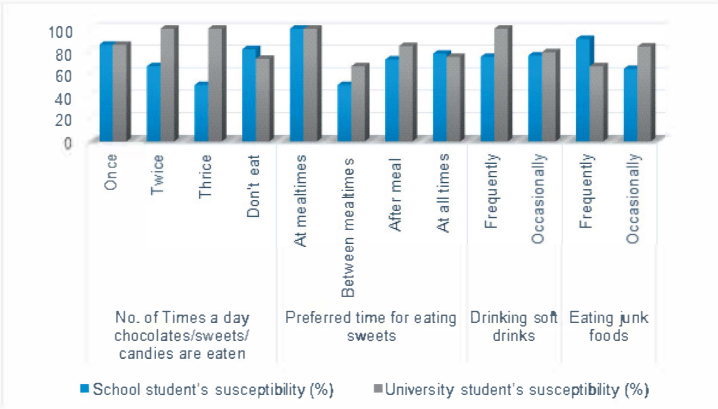


Fig. 4. Relation between consumption of sweets, soft drinks, junk food and susceptibility to dental caries

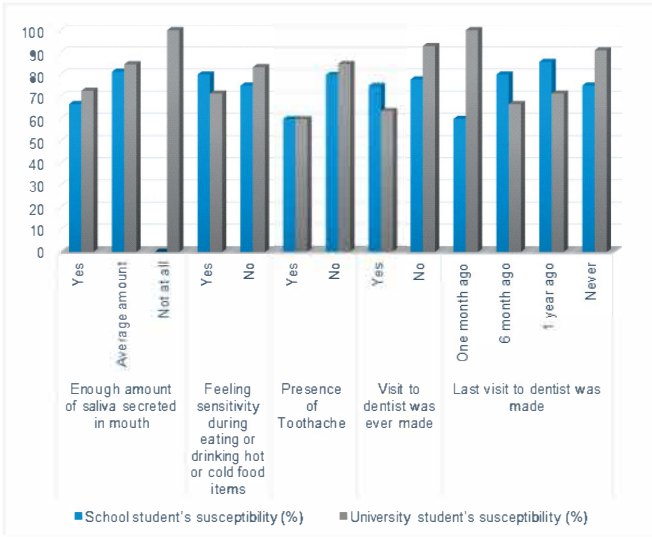


Fig. 5. Relation between oral health and susceptibility to dental caries

those who visited, about 70 % were susceptible to caries (Fig. 5).

Conclusion

The relation between cariogenic sugars and oral health is dynamic. Both naturally occurring and added sugars as well as many fermentable carbohydrates stimulate bacteria to produce acid resulting into demineralization of enamel which leads to dental caries. Apart from sugars there are number of other factors that are responsible for risk of developing caries such as eating habits, nutrient composition, time of exposure, saliva, use of fluoride in potable water, toothpastes and other agents. In the present study, determination of susceptibility to dental caries was studied by Snyder test agar method which is very simple, economic and rapid test as compared to other tests such as *Lactobacillus* count. The present study highlighted that dental caries susceptibility is present in both school and university students at an alarming rate. About 78% of both category of students was found to be susceptible to dental caries and this is a matter of concern. No significant difference was found between school and University students with respect to parameters studied and susceptibility to dental caries, indicates that similar type of oral and eating habits exist between students. Based on the present results it can be concluded that many of the students do not follow proper oral hygiene and have faulty food habits. Few measures can be recommended to reduce the risk of dental caries in students such as education about practicing good oral hygiene habits and proper brushing mechanism. Generating awareness in students about the use of fluoridated toothpastes as they reduce the risk of caries (Decker and Loveren, 2003). In addition having a balanced diet that includes dairy products having fermentable carbohydrates and other saccharides also reduced the risk. Higher intake of protein in diet will minimize acid production. Consuming raw fruits and vegetables to increase the salivary flow. The regular use of junk food and carbonated drinks should be discouraged. If a soft drink or sweetened drink needs to be taken then do not sip it but drink directly. Regular visits should be organized to meet dentist so as to maintain good oral health. In a nutshell, maintaining a proper oral hygiene, having a balanced diet and generating awareness about oral health education will help to reduce the risk of detnal caries.

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