

## CONSUMPTION BEHAVIOR AND AWARENESS OF MEDICAL STUDENTS ABOUT DENTAL EROSION AND ITS ASSOCIATION WITH CONSUMPTION OF CARBONATED/ACIDIC BEVERAGES

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### ABSTRACT

**Objective:** Irreversible loss of dental hard-tissue due to a chemical process is termed as dental erosion. The aim of this study was to evaluate the awareness of under-graduate medical students about dental erosion and its association with intake of acidic/carbonated beverages and to assess their consumption behavior.

**Methods:** This was a cross-sectional questionnaire-based study conducted on 220 undergraduate medical students. Data were collected as mean and percentages and analyzed using IBM SPSS Statistics 27.0.

**Results:** More than half of the participants n=118 (53.64%) reported that they consumed some form of acidic/carbonated beverages on a weekly basis in varying frequencies. The pattern of consumption of 1-2 servings (approx. 300 ml/serving)/day was most commonly seen in 25% participants. About 82.73% had the knowledge of dental erosion and 81.82% were aware that carbonated/acidic beverages are the reason of dental erosion.

**Conclusion:** Medical students had accurate knowledge and positive attitudes toward dental erosion and its association with intake of carbonated/acidic beverages. Despite being well aware about adverse effects of carbonated/acidic beverages consumption, many of them presented with harmful consumption behaviors.

**Keywords:** Dental erosion, Acidic beverages, Carbonated beverages, Medical students, Awareness, Attitude.

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### INTRODUCTION

Dental erosion is characterized by chemical dissolution of dental hard-tissue with no involvement of acids derived from oral bacteria[1,2]. Due to acid content and some chemicals, the surface of teeth gets eroded and structural loss of teeth occurs [1,3,4]. Erosive tooth wear means loss of tooth substance due to dental erosion and these lesions are seen as smooth melted form [5]. Occlusal surfaces of posterior teeth, facial, and palatal surfaces of anterior teeth are frequently involved in tooth erosion.

Erosive tooth wear is resultant of high in-take of acidic drinks which are common in adolescents nowadays [6-11]. In studies conducted by Hasselkvist *et al.* and Mulic *et al.*, association was found between unhealthy lifestyle, brushing teeth once a day or less, vomiting, daily/weekly episodes of gastro-oesophageal reflux, high frequency of consumption of fruit juices, and sugary soft drinks with an increased incidence of both erosive lesions and caries among adolescents [10,12].

Lack of knowledge among adolescents is basic cause of increased erosive tooth wear [13-14]. Subjective knowledge differs from objective knowledge with reference to psychology of consumer. Subjective knowledge comprises perception of individual toward their own knowledge [15]. Objective knowledge comprises knowledge due to individual's self-memory. It is knowledge based on facts, which, however, is often described as actual [16]. It is mostly assumed that those being unaware of consequences of tooth erosion are less worried about the effects of consumption of acidic beverages, while those who are worried and concerned about it will be well alert to find the ways to limit use of acidic drinks.

As we consider Medical professionals as primary health-care providers, their knowledge about oral health and its determinants can influence

the oral health of their patients. They have a good opportunity to contribute to good oral health of their patients by imparting oral health education and prompt referral to a dentist if required. The aim of the present study was to assess the awareness of undergraduate medical students about dental erosion on consumption of carbonated/acidic beverages in medical college of Rewa district (M.P).

### METHODS

This was cross-sectional questionnaire-based study conducted during November 2021-February 2022 among the undergraduate medical students of Shyam Shah Medical College, Rewa (MP). Sample size was calculated by taking 95% confidence limits for the awareness rate of dental erosion with satisfactory precision, the minimum sample size required was 220 [17-22] and an acceptable margin of error at 5%. Informed consent regarding participation in the study was obtained from the participants.

All students from different professional years aged more than 18 years who gave consent for participation were included in this study. Questionnaire was distributed to the study participants. Duplicate responses were prevented. The questionnaire comprised various questions which were taken from the previous studies [23,24]. Data collected included age, MBBS professional year, awareness, and knowledge of dental erosion and acidic beverages with consumption behaviors.

The acidic beverages were soft-drinks, fruit-juice, sugar-free soft drinks, energy/sports drink, ice tea, etc. Beverage consumption data included the number of preferred beverage types (different acidic beverages consumed multiple times), quantity of beverage consumption, and beverage consumption patterns.

Data collection was done by a pilot survey done on ten respondents to verify the questionnaire. After this was deemed successful, the data of the pilot study were destroyed before the distribution of the survey to the 220 medical students. Data analysis was done by IBM SPSS Statistics 27.0 (IBM, Chicago, IL, USA) which included descriptive statistics (frequency distribution and cross-tabulation). The significance level was set at 5%. Appropriate statistical tests were applied where ever necessary.

## RESULTS

Two hundred and twenty undergraduate medical students participated in the survey by filling the questionnaire. The participants' age ranged from 18 to 30 years, with a mean age of 23.5 years. The students mostly resided in boys and girls hostel situated in the campus of our medical college. Most of the study participants (60%) were male, while 40% were female. About 64% were on vegetarian diet and 36% were on both vegetarian and non-vegetarian diet. About 46.4% (n=102) reported no consumption of acidic beverages/per weeks, 6.36% (n=14) reported an intake of 1-2 times per week (Table 1).

Among the 118 (53.60%) participants who consumed acidic soft drinks, 97 (44.09%) preferred carbonated soft drinks, 21 (9.54%) did not like to drink soft drinks much, but they had to drink soft drinks due to the fruit juices being expensive and/or fruit juices being inaccessible.

Majority of the participants (64.5%) were aware of high calories content in acidic soft drinks. About 26.36% students had faced ill effects due to soft drink consumption. Among ill effects, they had experienced cavities, sensitivity to hot and/or cold, and irritation in the mouth (Table 2). Among 118 students 75.5% consumed all types of acidic beverages, while 8.4% consumed only healthy acidic beverages (Table 3).

**Table 1: Distribution according to gender, diet, and frequency of consumption of acidic beverages (n=220)**

Gender	Number (n)	Percentage
Male	132	60
Female	88	40
Diet	Number	Percentage
Vegetarian	141	64
Mixed	79	36
Frequency of consumption	Number	Percentage
No Consumption	102	46.40
1-2 times/week (approx 300 ml/serving)	14	6.36
2-6 times per week (approx. 300 ml/serving)	22	10
1-2 servings (approx. 300 ml/serving)/day	55	25
3-5 servings (300 ml/serving)/day	19	8.63
More than 5 servings of 300 ml/day	8	3.64

**Table 2: Distribution of the study population according to the choices of intake of acidic beverages and awareness regarding calorie content and associated ill effects**

Choice and awareness about acidic beverages intake	Number (n)	Percentage
Liked to drink carbonated soft drinks	97	44.09
Aware of calories of soft drinks	142	64.5
Facing ill effects in teeth	58	26.36

About 82.73% had awareness regarding tooth erosion/wear. About 75% had awareness about the mechanism involved in erosive tooth wear. About 81.82% were aware that tooth erosion is associated with intake of acidic beverages. About 30.45% were aware that tooth erosion requires dental treatment (Table 4). One hundred and sixty students had positive attitude regarding the benefits of keeping the teeth clean for good general health. Ninety-seven students had negative attitude regarding scaling being harmful for gums. All 220 cases had positive opinion regarding acidic beverages leading to early tooth decay (Table 5).

## DISCUSSION

Awareness of oral health leads to positive attitude and adequate behavior among people. Among 220 students, majority had awareness about oral health and general facts about dental erosion.

We identified a risk group for developing erosive tooth wear as 37.27% (n=82) of the participants reported that they drink some sort

**Table 3: Distribution according to type of beverages consumed**

Type of beverage consumed	Number (n)	Percentage
All acidic (healthy and unhealthy) beverages	89	75.50
Healthy acidic beverages	10	8.40
Unhealthy acidic beverages	19	16.10
Total	118	100

**Table 4: Distribution according to awareness regarding tooth erosion associated with acidic beverage consumption (n=220)**

Awareness regarding acidic beverages use	Yes (n)	Percentage of agreement
Are you aware about erosive tooth wear?	182	82.73
Are you aware of mechanism of erosive tooth wear?	165	75.00
Do you know acidic beverages exert erosive effects on teeth?	180	81.82
Do you know addiction of beverages occurs on frequent consumption?	103	46.81
Do you know that as temperature of the beverage increases the erosion potential decreases?	67	30.45
Do you know dental erosion requires dental treatment	67	30.45

**Table 5: Distribution according to attitude adopted for prevention of tooth decay (n=220)**

Attitude of medical students toward oral health	Positive	Negative
Keeping your teeth clean and healthy is beneficial to prevent tooth decay from beverages	160	60
Scaling is harmful for gums	123	97
Dentist care only about treatment and not prevention	147	73
Acidic beverages lead to early tooth decay	220	0
Brushing with fluoridated toothpaste prevent tooth decay	201	19
Brushing teeth twice a day improves oral hygiene	209	11
Gum bleeding denotes gum infection	195	25
Improper brushing leads to gum disease	203	17

of acidic beverage every day. A frequent consumption of "unhealthy acidic beverages" such as soft drinks is considered particularly risky regarding the development of erosive wear, because these products are often taken over a prolonged period of time and in greater volumes than "healthy acidic beverages" like fruit-juices.

Studies, in by Dugmore *et al.* and Truin *et al.*, presented a finding that boys have a higher prevalence of erosive tooth wear than girls, and that this can be related to more frequent consumption of acidic beverages [25,26]. In contrast, Al-Majed *et al.* and by Kunzel *et al.* found a significantly higher prevalence of dental erosion in girls than in boys [27,28], whereas studies by Kannan *et al.*, Peres *et al.*, and Wang *et al.* found no difference between genders and occurrence of dental erosion [29-31].

Jensdottir *et al.*, in his study, reported the pattern of beverage consumption and found that milk-based beverages were significantly more consumed than carbonated drinks followed by pure fruit juice followed by fruit juice from concentrate followed by sport drinks [32]. In our study, the use of carbonated soft drinks was preferred by 44.09% (n=97) participants in comparison to non-carbonated soft drinks which were similar to study by Kannan *et al.* who reported similar findings with 238 respondents (59.5%) in a study done on 400 adults [29].

All beverages cause a fall in salivary pH but to differing degrees. The erosive potential of drinks is determined by their pH and the buffering capacity. Studies have reported the buffering capacities to be in the following order: fruit juices >fruit-based carbonated drinks >non-fruit-based carbonated drinks [33]. Acidic drinks can influence surface hardness of enamel and dentine, along with restorative materials including microfilled composites, and resin-modified glass ionomer. Sports drink and juices in decreasing order of softening effect merely affect the enamel [34]. Certain drinks containing supplements such as calcium, phosphate, and fluoride decrease the progress of enamel demineralization by saturating the solution/altering the enamel solubility [35].

Consumption patterns are an important determinant since intake of soft drinks with meals is less harmful than when consumed alone, and continuous sipping is more harmful to teeth than taking a drink at once. Some soft drinks, especially cola beverages, have their properties retained on the tooth surface, which is very hard to be removed by saliva, and hence, erosive potential is increased. It is also seen in literature that drinks taken at high temperature or room temperature are more damaging than chilled drinks because low pH and higher dissolution rate results in an increased rate of diffusion in the fluid [29,36].

Schmidt and Huang, in their study on a sample of university students, found that academic fields, geographic location, awareness about dental erosion, and knowledge score did not have any relationships with the beverage consumption pattern [37]. Our study had similar findings with respondents having high level of awareness and positive attitude but presenting with a practice of consumption of acidic beverages.

The consumption of sugar-sweetened acidic beverages has shown a decline in recent years with an increase in consumption of artificially sweetened acidic beverages [38]. Various study focusing on artificially sweetened acidic beverages influence on dental-erosion required to be conducted.

The preventive aspect for dental erosion includes decreasing the intake of acidic beverages, consuming low erosive beverages, reducing the time of holding the acidic drink in the oral cavity, tooth brushing at least twice daily, avoiding brushing tooth within 1 h after an erosive attack, and using remineralizing or fluoride toothpaste [34].

## CONCLUSION

The awareness among medical students regarding dental erosion and its association with consumption of acidic beverages with low pH

values was found to be good. Despite being well aware, many of them consumed the acidic beverages indicating a knowledge-practice gap which can be attributed to opportunity to leverage, easy accessibility peer pressure, lack of parental influence, and stressful lifestyle.

## AUTHORS' CONTRIBUTIONS

Shireen Sharma and Ambrish Mishra were involved in conceptualization, methodology, data collection, statistical analysis, data interpretation, manuscript drafting, and editing. Medha Singh Tiwari and Divashree Sharma were involved in conceptualization, methodology, data collection, data interpretation, manuscript drafting, editing, and review.

## CONFLICTS OF INTEREST

All authors declare no conflicts of interest in publishing this article.

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