

Association of Carbonated Drinks intake with Dental Erosion among Dental Students: A Comparison between Day Scholars and Hostel Residents

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ABSTRACT

Introduction Dental erosion is defined as a non-carious lesion having superficial tooth loss initiated by a chemical process either intrinsic or extrinsic, without involvement of bacteria. The incentive of this study was to assess and compare dental erosion associated with the intake of carbonated drinks among dental students; day scholars and hostel residents of the University College of dentistry, Lahore.

Materials and Methods: A cross-sectional descriptive study was carried out on 183 dental students. Dental erosion was estimated using the index of Basic Erosive Wear Examination (BEWE).

Results: 31.6% hostel residents and 11.2% day scholars consumed carbonated drinks multiple times daily. Higher erosion index values were seen in hostel residents than day scholars. 48.6% was the prevalence of dental erosion among the study participants.

Conclusion: Hostel residents consume more carbonated drinks than day scholars. Erosion of teeth by carbonated drinks is influenced by the frequency, quantity, type, carbonated drinks temperature and persons drinking habits.

Keywords: Tooth Erosion, Carbonated Beverages, Tooth Wear, Day Scholars, Hostel Residents.

INTRODUCTION

Dental erosion unlike caries process does not start as a remineralize subsurface enamel lesion.^{1,2} It causes softening of the tooth surface and is prone to wear. It occurs due to continuous contact of teeth with acidic substances. This loss of dental tissue leads to unesthetic appearance of teeth, dentinal hypersensitivity and consequently chewing difficulties.³ In early stage, dental erosion appears as smooth and flat facets on facial or palatal surfaces, sometimes shallow or localized dimpling on occlusal surfaces. If not managed, erosion will progress to deep cupping lesions with exposed dentin and subsequent loss of occlusal morphology. In extremely severe cases, pulp exposures may become inevitable.⁴

Dental erosion is multifactorial and is often found in conjunction with attrition, abrasion and abfraction. It causes softening of teeth which hastens wear of teeth during mastication (attrition) or by tissue loss while mechanical means like brushing (abrasion).⁵

It is assumed that the rate of erosion is relatively high due to a number of extrinsic and intrinsic causative factors. Intrinsic sources come into the oral cavity from stomach. Examples include GERD, bulimia, anorexia and frequent vomiting. Extrinsic sources are substances taken into the mouth. These

include carbonated beverages, non-carbonated drinks, juices and citrus fruits, vinegar, alcohol and factory chemicals.⁶ Consumption of carbonated drinks has become very trendy in young adolescents. These beverages mostly have low pH. Therefore, these solutions when come in contact with the hard tissues may destroy the hydroxyapatite crystals by erosion.⁷ Occlusal surfaces of posterior teeth, facial and palatal surfaces of anterior teeth are generally involved.⁸ Although dental erosion relevance to oral health is not comparable to caries and periodontitis, still its prevalence is increasing.⁹

The Operative Department at the University of Lahore has observed an increase in the number of erosion cases, presented with the frequent complaints of dentinal sensitivity in the recent past years in the young people. The most common factor among these cases was an increased consumption of carbonated drinks. A high percentage of these cases included students living in hostels. This study was carried out to assess the carbonated drink associated dental erosion in day scholars and hostel residents.

MATERIAL AND METHODS

The Ethics and Research Committee of the institution approved the study protocol. This cross-sectional study was completed over the period of four months (July 2019-October 2019) conducted in the University College of Dentistry, Lahore, Pakistan.

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Convenience non-probability sampling technique was used. Questionnaires were distributed to 200 undergraduate dental students from 1st, 2nd, 3rd and Final Year of The University College of Dentistry, Lahore. The questionnaire consisted of questions regarding quantity intake, favourite type, preferred temperature of consumption, pattern of drinking and reasons for taking carbonated drinks. A total of 183 dental students participated in the study. Students who responded to the questionnaire, present on the day of examination and met our inclusion criteria were counted in the study.

Inclusion criteria: Dental students of the UCD habitual of consuming carbonated drinks.

Exclusion criteria: History of chronic GERD, vomiting, bulimia, anorexia, excessive use of lemon, non-carbonated soft drinks, acidic medicaments, vinegar and alcohol.

Assessment Tool: Data was attained by direct clinical examination of the permanent teeth of all the individuals according to the basic erosive wear examination index (BEWE).¹⁰ This risk score tends to provide the level of erosive wear risk for each individual and thus, help in clinical management.¹¹

The BEWE criteria is shown below:

Score	Criteria
0	No erosive tooth wear
1	Initial loss of surface texture
2	Distinct defect hard tissue loss <50% of surface area
3	Hard tissue loss ≥50% of surface area

Table-1: Basic Erosive Wear Examination Index

Based on the characteristics observed on enamel and dentin, index score of the most eroded tooth was recorded for each participant. The clinical examination of all the individuals was done by a single calibrated investigator.

STATISTICAL ANALYSIS

Using Statistical Package for Social Science software Version 22, collected data was tabulated and analysed. P value less than 0.05 was considered statistically significant. As descriptive statistics, percentages were calculated and Point Bi-serial correlation was used as inferential statistics to explore the relation between the level of dental erosion among two groups (day scholars and hostel residents) taking carbonated drinks.

RESULTS

The study subjects (183) consisted of 107 day scholars and 76 hostel residents comprising of 53 (29.0%) males and 130 (70.0%) females. The prevalence of dental erosion among

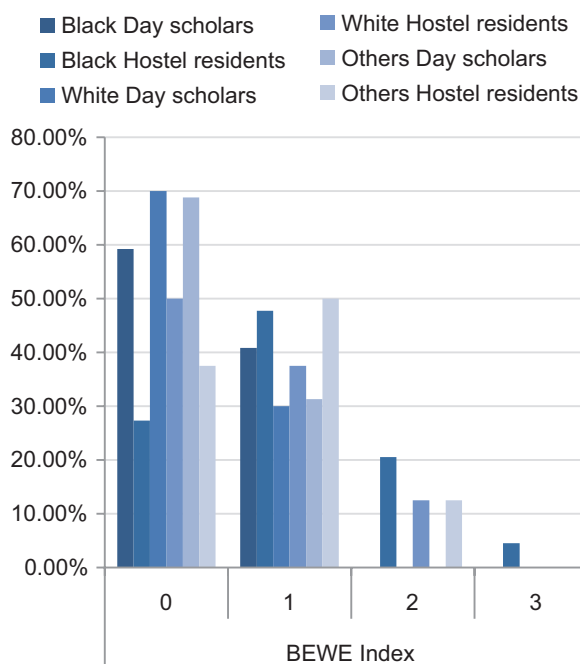
the participants was 48.6%

Frequency of carbonated drinks consumption

The results of Pearson correlation revealed that there was a significant, positive relationship between intake Frequency of carbonate drinks and Dental Erosion among day scholars as well as among the hostel residents i-e., $r=0.298$, $p<0.01$ and $r=0.552$, $p<0.01$ respectively. The results also explained the effect size of intake Frequency of carbonate drinks and Dental Erosion which was small effect size for day scholars as compared to the hostel residents, with medium effect size (Table 2). This showed that hostel residents' intake of carbonate drinks was found to be more as compared to the day scholars. Similarly, Dental Erosion was found to be more in hostel residents as compared to day scholars.

Type of carbonated drink preferred:

59.2% day scholars and 27.3% hostel residents who preferred black carbonated drinks showed BEWE score 0 whereas no day scholar and 20.5% hostel residents revealed score 2 of BEWE index. 70% day scholars and 50% hostel residents who used to take white carbonated drinks showed 0 BEWE score whereas no day scholar and 12.5% hostel residents had score 2 of BEWE index. 68.8% day scholars and 37.5% hostel residents who preferred other colored carbonated drinks showed BEWE score 0 whereas no day scholar and 12.5% hostel residents revealed BEWE score 2. BEWE

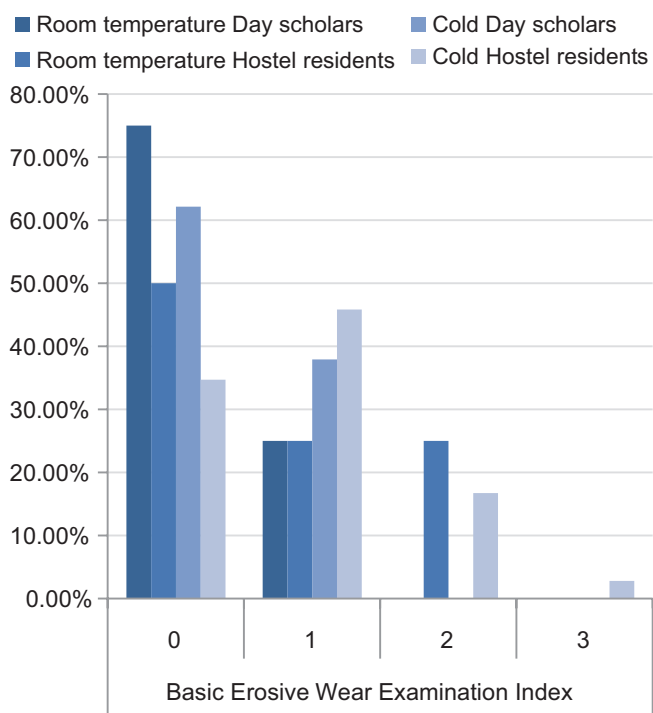


Graph-1: Types of carbonated drinks preferred by day scholars and hostel residents and their corresponding index value

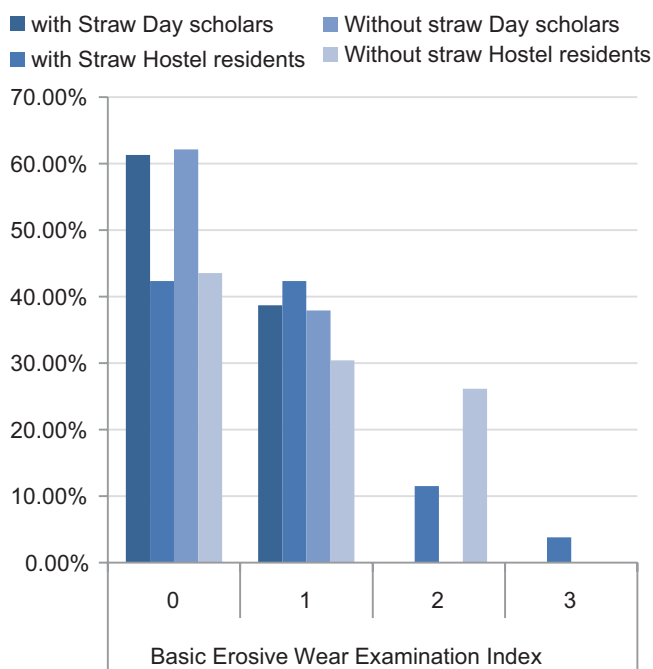
		Intake Frequency of carbonated drinks	Dental Erosion (BEWE index)
Day Scholar	Intake Frequency of carbonated drinks	1	.298**
	Dental Erosion (BEWE index)		1
Hostel Resident	Intake Frequency of carbonated drinks	1	
	Dental Erosion (BEWE index)	.552**	1

** . Correlation is significant at the 0.01 level (2-tailed).

Table-2: Relationship of Intake Frequency of carbonate drinks and Dental Erosion (BEWE index)



Graph-2: Preferred temperature of carbonated drinks by day scholars and hostel residents and their corresponding index value.



Graph-3: Pattern of drinking while taking carbonated drinks by day scholars and hostel residents and their corresponding index value.

index scores obtained were higher for black colored drinks than white or other colored drinks (Graph 1).

Preferred temperature of carbonated drinks

At room temperature, 75% day scholars and 50% hostel residents showed BEWE score 0 whereas no day scholar and 25% hostel residents revealed score 2 of BEWE index. 62.1% day scholars and 34.7% hostel residents who used to take cold carbonated drinks showed 0 BEWE score whereas no day scholar and 16.7% hostel residents had BEWE score

2. BEWE index scores obtained were higher for drinks taken at room temperature than at cold (Graph 2).

Pattern of drinking:

61.3% day scholars and 42.3% hostel residents who consumed carbonated drinks with straw showed BEWE score 0 whereas no day scholar and 11.5% hostel residents revealed score 2 of BEWE index. 62.1% day scholars and 43.5% hostel residents who consumed carbonated drinks without straw showed 0 BEWE score whereas no day scholar and 26.1% hostel residents had score 2 of BEWE index. BEWE index scores obtained were higher for drinks taken without straw than with straw (Graph 3).

DISCUSSION

The present study aimed to assess and compare dental erosion due to intake of carbonated drinks between day scholars and hostel residents. Our results demonstrated that the dental erosion was considerably linked to the frequency of intake of carbonated drinks. Daily consumption resulted in greater erosion than weekly or monthly (Table 2). These results are similar to that reported by Lussi and colleagues.¹² Moazzez and colleagues also found similar findings in a group of adolescents.¹³

The type of carbonated drink consumed and the extent of erosion has significant relevance. Subjects who consumed black coloured carbonated drinks had higher erosion of dental hard tissues in comparison to those who preferred white or other coloured carbonated drinks (Graph 1). Results were almost similar to the study done in India.⁷

The present study shows that the dental erosion is also influenced by temperature of the carbonated drinks. Consumption of chilled drinks showed less erosion than at room temperature (Graph 2). Similar results have been reported previously that drinks consumed at high or room temperature are more damaging than chilled drinks.^{14,15} At elevated temperature, increase in erosion is likely to be due to low pH and higher dissolution rate that ultimately results in an increased rate of diffusion in the fluid.^{16,17}

The difference in the pattern of drinking also has a major impact on the effects of dental erosion. Some individuals like to use straw, while others prefer to gulp. Holding the drink in the mouth for a significant time, moving the liquid in the mouth before swallowing or nipping from a bottle leads to significant drop in pH and strengthens the effect of erosion.^{18,19} If the straw is pointed palatally, it can avoid bathing the teeth.²⁰ When carbonated drinks are taken from a straw directed labially to teeth or are swished between the teeth, evidently increase erosion.²¹ The current study showed that higher erosion index values were found in the participants who used straw (Graph 3). No significant difference was found between day scholars and hostel residents in their pattern of drinking. This could probably be due to the difference in the positioning of straw and the variations in the duration of time period, the subjects keep the drink in the mouth before swallowing.

The presence of erosion was found to be more obvious in hostel residents than in day scholars as their frequency

is greater (Table 2). This outcome supports the previous studies that there is an increased risk of erosion associated with the carbonated drinks.²²⁻²⁴ As hostel residents seek more independence, are out of parental influence, tend to socialise more and are prone to stress, hence their excessive consumption happens.²⁵ This predicts some sort of relationship between life style factors and dental erosion.²⁶ This cross-sectional study design had multiple limitations because of recall bias and the small sample size. Data was collected at one definite point of time. Moreover, the long term effects of carbonated beverages could not be assessed. Many students might not have correctly filled the questionnaire. There is a need to conduct more studies on this topic.

In order to lessen dental erosion among hostel residents, educational and behavioural interventions can be helpful along with regular dental care services should be provided for diagnosing early erosive lesions and planning preventive approaches.

CONCLUSION

Hostel residents consume more carbonated drinks than day scholars. Frequent intake, black type, drinking pattern without straw and increased temperature of carbonated drinks can cause deleterious effects on enamel and dentin.

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