

## Prevalence and risk factors of dental erosion among 8 to 19 - year old adolescents in Jeddah, Saudi Arabia

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**Abstract:** Dental erosion is defined as the progressive loss of hard dental tissues by a chemical process not involving bacterial action (Shafer, et al., 1983; Watson and Tulloch, 1985). In order to prevent its advancement, early detection is important. This study aimed to determine the prevalence of dental erosion among 8 to 19 – year old students from two different private schools in Jeddah, Saudi Arabia and to determine the risk factors leading for them to acquire dental erosion. The results implicated that there is a large consumption of acidic beverages as well as fruits and candies among the adolescent samples. However, significant relationship with dental erosion has only been established with the consumption of fruits, which is higher among the girls. Being a multifactorial disease, further investigations should be established in order to determine the importance of relevant factors as to the occurrence of dental erosion.

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### 1. Introduction

Our teeth are sheltered by enamel, a thin layer of hard tissue, but this protection can be damaged or becomes softer due to medical conditions or acidic foods and drinks. Loss of enamel makes the teeth to decay, chip or shorten over time.

Dental erosion can be defined as the progressive loss of hard dental tissues by a chemical process not involving bacterial action (Shafer, et al., 1983; Watson and Tulloch, 1985). Such tissue loss is insidious in nature and may not be apparent until the patient reports symptoms of sensitivity or the fracture of thinned incisal edges (Nunn, 1996). Millward and co-workers (Millward, et al., 1994a) considered tooth wear in young children to be dental erosion except when it occurred on the incisal edges of anterior teeth and occlusal surfaces of posterior teeth. Although tooth surface abrasion in children is uncommon, attrition of incisal edges in the primary dentition is very common at the time of exfoliation, and it is extremely difficult to separate erosion from attrition in the late stages of the primary dentition (Millward, et al., 1994a, Millward et al., 1994b)

Dental erosion for so many years has been a condition that is often neglected by most clinicians and researchers. This has been changed during past years, and there is some evidence that the presence of dental erosion is growing steadily (Lussi, et al., 2008). In order to prevent advancement, it is important to detect it early. Dental erosion is a multifactorial condition: the relationship of chemical, biological and behavioral factors is critical and helps explain why some

individuals demonstrates more erosion than others (Lussi, et al., 2008).

The UK National Diet and Nutrition Survey (Smith and Knight, 1984) of children aged 11/2 to 41/2 years was piloted using the same diagnostic criteria for dental erosion as the 1993 National Survey of Child Dental Health. The results revealed 19% of children had erosion affecting the palatal surfaces and 10% of children had erosion of the buccal surfaces of their maxillary incisors. Erosion involved dentine or the pulp palatally in 8% and buccally in 2%. The survey showed a feeble association between the numerous ingestion of sweetened drinks and carbonated soft drinks and dental erosion, with the timing of intake (bedtime) of these drinks more closely linked with the occurrence of dental erosion.

Sales of soft drinks in the temperate climate of the UK have increased dramatically over the past 40 years to 178 liters per capita in 1996 with adolescents accounting for up to 65% of these purchases (Rugg-Gunn and Nunn, 1999). Since the consumption of soft drinks has been widely implicated as a major factor in the aetiology of dental erosion (Zero, 1996), in the hotter climates of developing countries there is growing distress for the dental health of consumers since day-to-day fluid intake is high and soft drinks, mainly carbonated soft drinks, are progressively accessible at evenhanded cost.

Saudi Arabia is a fast developing country with a population of approximately 19 million (MOI, 1995). The nation's economy increased almost 40 fold from 1960 to the late 1980s (Sebai, 1988). Changes to the diet have included substantial increases in the

consumption of carbonated beverages and acidic drinks (Johansson, et al., 1996).

The purpose of this study is to determine the prevalence of dental erosion among 8 to 19 – year old students from two different private schools in Jeddah, Saudi Arabia and to determine the risk factors leading for them to acquire dental erosion.

## 2. Materials and Methods:

In this study we used a questionnaire designed to gather information regarding the eating behavior, presence and non presence of chronic diseases, intakes of medications and vitamins and dental visits among a number of boys and girls with age ranging from 8 to 18 years of age, studying at two different private schools at Jeddah, Saudi Arabia. Additionally, the questionnaire gathered information to determine the presence of symptoms leading to dental erosion and if they are already suffering from dental erosion.

This study used descriptive statistics for range, mean and variations and frequency distribution for counts and percentages.

To show the relationship between two categorical variables, Chi-square test is used in this study with 95% confidence interval. For comparing group mean measures of two groups with normal distribution, this study used Independent *t*-test and for two groups with non normal distribution we use Welch's *t*-test. All results are tested out at  $p$ -value < 0.05.

## 3. Results:

Our sample is composed of 210 students with a minimum age of 8 and maximum age of 19 mean  $11.82 \pm 3.7$ . We gathered a total of 93 males (44.3%) and 117 females (55.7%). Of these samples 124 (59%) are from elementary, 42 (20%) from intermediate and 44 (21%) from secondary schools. Among the 210 samples 73 (34.8%) of them have chronic diseases of which 21 (28.8%) are taking medications and 52 (71.2%) are not taking medications. Only 19 (9%) of these samples are taking vitamins.

From the 210 respondents 72 (34.3%) of them have dental visits once every 6 months, 26 (12.4%) visits once every 3 months, 75 (35.7%) visits once a year and 37 (17.6%) did not visit the dentist at all. 119 (56.7%) of the samples are having tooth decay and 81 (38.6%) do not have tooth decay. For fluoride use, 130 (61.9%) said yes, 48 (22.9) said no and 32 (15.2%) said they sometimes use.

Of the 210 samples, 72 (34.3%) mentioned that they are having sensitivity of teeth, 100 (47.6%) said they are not experiencing sensitivity and 38 (18.1%) said they sometimes experience sensitivity. 103 (49%) of the samples have yellower teeth and 72 (34.3%) don't have yellower teeth. As to teeth cracks, 92 (43.8%) have cracked teeth, 81 (38.6%) do not have cracked teeth and 37 (17.6%) are undetermined. 66

(31.4%) of the samples have dental erosion and 144 (68.6%) do not have dental erosion.

Using chi-square test, this study determined the diet risk factors to dental erosion. Based on the results, the less intake of fruits, 1-2 times a day, is more prevalent in having dental erosion (34.5%) compared to the groups that consumes more the 2 times a day (17.5%),  $p$ -value = 0.040. While the rest, juice, team beverages, energy drink and candy, does not give a significant risk to dental erosion.

**Table 1. Demographics vis-à-vis dental erosion**

Demographics*Erosion		N	Mean $\pm$ SD	p-value
Age	Yes	66	14.29 $\pm$ 3.0	<0.001*
	No	144	10.69 $\pm$ 3.5	
		<b>Yes N=66</b>	<b>No N=144</b>	
GENDER	Male	8 (8.6%)	85 (91.4%)	<0.001*
	Female	58 (49.6%)	59 (50.4%)	
Q3Level	Elementary	20 (16.1%)	104 (83.9%)	<0.001*
	Average	19 (45.2%)	23 (54.8%)	
	Secondary	27 (61.4%)	17 (38.6%)	

\*significant using Independent *t*-test and Chi-square test @ 0.05 level

As to the relationship of demographics versus dental erosion (Table 1), we found out that 66 of those with mean age of  $14.29 \pm 3.0$  are having dental erosions and 144 samples with a mean age of  $10.69 \pm 3.5$  do not have dental erosion,  $p$ -value = <0.001. Of the 66 samples with dental erosion, 58 (49.6%) are female and 8 (8.6%) are male,  $p$ -value = <0.001. As to the level of education, 20 (16.1%) of the 66 samples who have dental erosion are from elementary, 19 (45.2%) from intermediate and 27 (61.4%) from secondary school,  $p$ -value = <0.001. 20 (30.3%) of the 66 samples with dental erosion are having chronic diseases and 46 (69.7%) do not have chronic diseases. 13 (19.7%) of these 66 are taking medications and 53 (80.3%) are not taking medications,  $p$ -value = 0.002 (Table 2).

**Table 2. Patients with dental erosion with chronic diseases**

Variable		Erosion		p-value
		Yes N=66	No N=144	
Chronic	With Chronic	20 (27.4%)	53 (72.6%)	0.358
	Without Chronic	46 (33.6%)	91 (66.4%)	
Taking	Yes	13 (61.9%)	8 (38.1%)	0.002*
	No	53 (28.0%)	136 (72.0%)	
Medication	With Medication	9 (47.4%)	10 (52.6%)	0.117
	Without Medication	57 (29.8%)	134 (70.2%)	

\*significant using Chi-square test @ 0.05 level

Among the 66 samples who have dental erosion, 30 (45.5%) are having dental visits once every 6 months, 9 (13.6%) visits once every 3 months, 18 (27.3%) visits once a year and 9 (13.6%) do not visit at all. As to the presence of tooth decay, 38 (57.6%) have tooth decay and 25 (37.9%) do not have tooth decay. As to the use of fluoride, 46 (69.7%) uses fluoride, 8 (12.1%) do not use fluoride and 12 (18.2%) sometime use fluoride. (Table 3)

**Table 3. Dental visits, fluoride usage and presence of decay**

Variable		Erosion		p-value
		Yes N=66	No N=144	
Visit	Did not visit	9 (24.3%)	28 (75.7%)	0.093
	once a year	18 (24.0%)	57 (76.0%)	
	once every 3 months	9 (34.6%)	17 (65.4%)	
	once every 6 months	30 (41.7%)	42 (58.3%)	
Decay	Yes	38 (31.9%)	81 (68.1%)	0.928
	No	25 (30.9%)	56 (69.1%)	
	I do not know	3 (30.0%)	7 (70.0%)	
Fluoride	Yes	46 (35.4%)	84 (64.6%)	0.042*
	No	8 (16.7%)	40 (83.3%)	
	sometimes	12 (37.3%)	20 (62.5%)	

\*significant using Chi-square test @ 0.05 level

As to the sensitivity of teeth, 42 (63.6%) of the 66 samples with dental erosion said that they have sensitive teeth, 15 (22.7%) do not have sensitive teeth and 9 (13.6%) said that they sometimes experience teeth sensitivity, p-value = >0.001. As to the yellower teeth, 46 (69.7%) of the 66 samples have yellower teeth and 17 (25.8%) do not have yellower teeth, p-value = >0.001. As to the presence of cracked teeth, 50 (75.8%) among the 66 samples have cracked teeth and 14 (21.2%) do not have cracked teeth, p-value = <0.001 (Table 4).

**Table 4. Teeth status**

Variable		Erosion		p-value
		Yes N=66	No N=144	
Sensitivity	Yes	42 (58.3%)	30 (41.7%)	<0.001*
	No	15 (15.0%)	85 (85.0%)	
	sometimes	9 (23.7%)	29 (76.3%)	
Yellower	Yes	46 (44.7%)	57 (55.3%)	<0.001*
	No	17 (23.6%)	55 (76.4%)	
	I do not know	3 (8.6%)	32 (91.4%)	
Cracked	Yes	50 (54.3%)	42 (45.7%)	<0.001*
	No	14 (17.3%)	67 (82.7%)	
	I do not know	2 (5.4%)	35 (94.6%)	

\*significant using Chi-square test @ 0.05 level

#### 4. Discussion

In accordance to different studies, the prevalence of dental erosion was determined on children and adolescent samples in different countries (Litonjua, et al., 2003; Arnadottir, et al., 2003; Mungia, et al., 2009; Auad, et al., 2007; El Aidi, et al., 2010; Al-Dlaigan, et al., 2001). This is mainly due to their high consumption of acid drinks as stated by the National Child Dental Health Survey in 1993 (O'Brien, 1994). However in this study, though dominantly consumed, juice, team beverages, energy drink as well as candy, does not give a significant risk to dental erosion. This is in agreement with Arnadottir, et al (2003) and Deery, et al (2000). However, numerous studies such that of Dugmore and Rock (2004) confirmed that acidic or carbonated drinks increases the odds of erosion being present at 12 years by 252% and was a strong predictor of the amount of erosion found at age 14.

There is convincing evidence that fluoride has the ability to strengthen teeth against damages caused by corroding acids, and high-concentration fluoride agents and/or frequent applications are considered potentially effective approaches in preventing dental

erosion (Magalhaes, et al., 2011). It is to be noted that there is a prevailing usage of fluoride among the samples and this could be the reason why association of the consumption of acidic drinks and dental erosion is non-significant in this study.

The symptoms of dental erosion include teeth sensitivity, discoloration or yellowing of teeth and cracking of teeth. These have been notably present among the 66 respondents who are having dental erosion. Apparently, it is a positive thing that these samples are having regular dental visits for the prevention of further damage of their eroded teeth and as mentioned earlier, fluoride has also been used considerably among these samples and this is a good since this could help in the remineralisation of teeth (O'Sullivan and Milosevic).

Researches pertaining to dental erosion have been sprouting. Much of the epidemiology has been investigated in children and adolescents rather than adults and so the validity of any association between severity and age is based on clinical observations seen primarily in these young people and their main concentration (Bartlett and Dugmore, 2008). Based on the current data, though there is significance as to the relationship of dental erosion and the age of the respondents, it is too challenging to say that that dental erosion is age-related. It must be remembered that the study is only limited to 210 samples which is extremely small considering the population concerned. However, this assumption needs to be investigated further and that a fair number of populations be involved as well as its scope as to age should be widened.

In this study, girls were found to be more susceptible in having dental erosion compared to the boys, which is in agreement with the study of Wang et al (2010). However, several studies had found a significantly higher incidence in boys than in girls (Dugmore and Rock, 2004; Truin, et al., 2005), while Correr et al (2009) and Peres et al. (2005) found no difference in gender. Girls ate more sweets and fruits, and were more likely to sip drinks than boys, however, these had no significant difference between children with and without dental erosion (Wang, et al., 2010). These results show that the cause of gender dissimilarity in the occurrence of dental erosion was not apparent and more studies are essential on this issue.

#### 5. Conclusion

The results in this study implicated that there is a large consumption of acidic beverages as well as fruits and candies among the adolescent samples. However, significant relationship with dental erosion has only been established with the consumption of fruits, which is higher among the girls. Being a multifactorial disease, further investigations should be established in



order to determine the importance of relevant factors as to the occurrence of dental erosion.

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