

Dental Erosion Frequency Among Its Different Etiological Factors

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ABSTRACT

Dental Erosion one of the uprising threat to the community and a challenge to a dentist represents with specific signs and pattern depending upon its etiological factors though having common symptoms. **Aims and objective:** To determine the frequency of dental erosion among its different etiological factors and the patterns formed by each. **Methods:** Study was done at four tertiary health care centers, three educational institutes and one chemical industry in which a total of 463 individuals aged 5-75 years (mean=35 years) were examined and assessed for dental erosion. A structured questionnaire was designed and administered on these 463 individuals, dental erosion grading was done according to Eccles and Jenkins erosion scale. The data collected was then entered into the SPSS-11 for analysis and tabulated into percentages. **Results:** Highest frequency with a strong correlation is seen among GERD and dental erosion *i.e.*, 82.4% with ($p < 0.000$) followed by occupational exposure to acidic environment 67%, asthma 56%, cerebral palsy 50% and juices and beverages 16%. **Conclusion:** General dental practitioners should know and identify these patterns in order to determine the causative factor and hence prevent further tooth loss through proper management and treatment.

INTRODUCTION

Dental erosion, a multifactorial, non-bacterial, irreversible tooth structure loss, is becoming more common due to the lack of awareness of the disease among the patient and is being ignored at the same time in the dental community.¹⁻⁶ Increase in its incidence points towards the presence of a continuously increasing threat within the community due to the continuous use and exposure to the abusive factors causing dental erosion with no definite preventive measures taken.³ As it occurs in conjunction with the other types of tooth wear diseases and further more due to lack of awareness to the subject, its identification becomes even more challenging for general dental practitioners.^{4,6}

Awareness of the different etiologies and high risk factor of dental erosion is very important for the correct knowledge of the subject.⁷ Also the knowledge of the different clinical appearances or

erosive pattern in conjunction with the etiological factor is very important for the accurate and earliest recognition of both dental erosion and its causative factor.⁸

The etiology of dental erosion can be grouped as extrinsic and intrinsic factors.⁹ Extrinsic factors include acidic foodstuff and airborne acid that comes in contact with tooth in some particular chemical industries.^{4,10,11} The intrinsic factors include a range of diseases, which lead to an influx of acidic stomach content into the oral cavity and affecting the teeth like gastroesophageal reflux disease (GERD).¹²⁻¹⁴ Some syndromes and disease like cerebral palsy,^{15,16} asthma,¹³ congenital dysfunction of major salivary glands and Sjogren's syndrome¹⁷ are also associated with dental erosion. They may have extrinsic or intrinsic factors playing the role like reduction in salivary secretion, mouth breathing or certain medications.¹⁸

Tooth wear especially dental erosion can be

assessed through various scales like Eccles index, Lussi index, Smith and Knight index and Eccles and Jenkins index. In case of Eccles and Jenkins index it categorizes the dental erosion severity into four levels: 0; Normal surface, without enamel wear. Level 1; Surface with enamel wear but without dentin wear. Level 2; Surface with dentin wear less than 1/3 of the surface. Level 3; surface with dentin wear more than 1/3 of the surface.¹⁹

Attempt is been made to see through majority of the etiologies, their mode of causing erosion and the specific pattern been made by each. So that this problem could be made to recognize as a major threat among the population and awareness could be created both among the patients and the primary oral health care doctors.

A preventive protocol is intended to be initiated in order to fight the challenge of preventing the widely spreading unstoppable disease and its further progression.

MATERIAL AND METHOD

This cross sectional descriptive study was conducted in 463 individuals aged 5-75 years (mean=35 years). The study was done at four tertiary health care centers, three educational institutes and one chemical industry. A convenience sample of, 261 subjects was taken from Punjab Dental Hospital, Lahore Learning Campus (LLC) and Government Degree College for Women, Chuna Mandi; 114 patients with GERD was taken from Gastroenterology Departments of Mayo Hospital and Shaikh Zayed Hospital; 34 asthma patients from asthma ward of Mayo Hospital; 24 patients suffering from cerebral palsy from Children Hospital (Developmental disorder department) and Special Children Complex (Johar Town) and 30 subjects were taken from Ittehad Chemicals Limited (ICL), to see the frequency of dental erosion with its different etiological factors and the different erosive patterns formed by each like GERD, asthma, cerebral palsy, juices, beverages and acidic environment.

Questionnaires were specially designed according to each etiological factor. Patients irrespective of the age and gender with clinical features susceptible to dental erosion like smoothing

and softening of the enamel surface, flattening of the incisal edges or cupping of the incisal edges, flattening of the occlusal aspects of molars, decrease in the molars cusp height, visibility of dentine from beneath the enamel, loss of fissures, appearance of wear facets and v shaped deformities. After receiving permission from the concerned authorities, the questionnaires were distributed to the study subjects to be filled under the supervision of the examiner. The filled proforma were returned to the examiner after 15-20 min. The proforma were checked and any incomplete forms were asked to be completed.

The Eccles and Jenkins erosive scale was used for recording dental erosion. The factors leading to dental erosion like carbonated drinks, history of exposure to occupational environment, medical conditions like asthma, GERD and Cerebral palsy were noted. The examination was carried out by trained and calibrated examiners. Diagnostic sets were used for clinical examination. The clinical examination was done under natural light. The occlusal, buccal, palatal/lingual surfaces of all teeth were checked for presence of dental erosion.

RESULTS

A total of 463 patients were seen irrespective of the gender with the mean age of 35 ranging from 5 to 75 years. 126 patients from Punjab Dental Hospital (PDH) and 135 students from Lahore Learning Campus (LLC) and Degree College for Women (DCW), Chuna Mandi were clinically examined for dental erosion (Table 1). A specially designed questionnaire was administered to determine dental erosion only related to juices and beverages. It was seen that out of 261 subjects only 42 had dental erosion due to excessive acidic drinks intake as shown in the table below. Degree of erosion and pattern of erosion was also noted and was seen to be Peephole effect, or "cupping," on the cusps of tooth of the posteriors.

A total of 114 GERD patients were selected from Shaikh Zayed Hospita and Mayo Hospital Lahore and were clinically examined for dental erosion and its pattern (Table 1). It was noted that 94 out of 114 patients were suffering from dental erosion and is shown in the Table below. Occlusal

Table 1: Dental erosion in Punjab Dental Hospital, Lahore, Learning Campus and Degree College for Women, Chuna Mandi, Shaikh Zayed Hospital and Mayo Hospital, Asthmatic patients from Mayo Hospital Asthmatic Ward, Children Complex patients and Ittehad Chemical Factory workers.

Study center	Total number	Dental erosion (+ve)	Dental erosion (-ve)	Degree of erosion		
				1	2	3
Punjab Dental Hospital	126	16	110	10	6	0
Lahore Learning Campus and Degree College for Women Chuna Mandi	135	26	109	22	4	0
Shaikh Zayed Hospital and Mayo Hospital Lahore	114	94	20	57	36	1
Mayo Hospital Asthma ward	34	19	15	8	11	0
Children Hospital & Special Children complex.	24	12	12	9	2	1
Ittehad Chemical factory	30	20	10	16	3	1

aspects of molars and palatal aspects upper anteriors was the erosive pattern observed.

It was seen that 82.4% of the patients had dental erosion among the GERD patients which on statistical analysis was calculated to be $p < 0.000$ which is less than 0.001 showing a very strong correlation of dental erosion with GERD.

Thirty four (34) known asthmatic patients were taken from Mayo Hospital Asthma ward and were clinically examined for dental erosion (Table 1). It was seen that 19 patients had dental erosion and their pattern was noted to be occlusal aspects of posterior molars of both jaws.

Twenty four patients of cerebral palsy were examined at Children hospital and Special children complex to see for any incidence of dental erosion (Table 1). It was seen that 50% of the patients had the signs of dental erosion. The pattern of erosion was not of marked significance and was seen to vary among the patients, however upper and lower molars and upper incisors were seen to be affected.

Thirty workers at Ittehad chemicals limited were seen for dental erosion as a result of acidic environment (Table 1). It was seen that out of 30 workers 20 were having signs of dental erosion and

were under the regular contact with acidic fumes. They had the most different type of erosive pattern which was the Erosion of the labial surfaces of both upper and lower anteriors. Furthermore few workers also had Dish faces concavities at the incisal edges and occlusal surfaces of the molars.

DISCUSSION

Dental erosion is a multi-etiological in nature and is caused by both behavioral and physiological factors.²⁰ Behavioral factors include citrus abuse, bulimia, use of vitamin C tablets and over consumption of carbonated beverages.²¹ Physiological factors include gastric reflux and GERD.²² Dental erosion is clinically diagnosed as a non-carious tooth wear which is as a result of interaction of acid with the tooth surface and superadded by the mechanical action of mastication.⁴

The prevalence of dental erosion in Pakistan has been reported to be 1 out of every 5²³ which is quite less than study reported in New Zealand i.e., 2.15-2.3 out of every 5 individuals,⁶ this has been attributed to the fact that Pakistani population is

predominantly non alcoholic whereas New Zealand population is alcoholic and its consumption has been increased to 58.2% in female and 60% in males in recent years.

The frequency of dental erosion has been calculated in multiple studies and is seen to be varying in most of the literature review. In our current study, dental erosion is calculated to be 40% which is in cohesion with the studies done in UK 37% and US 41%²⁴ and 45.9% by Mcguire et al.²⁵ However another study done in Pakistan reports a very high frequency of dental erosion i.e. 73.48%,²⁶ it may be due to the fact that in our study we have a large sample size which is covering a broader spectrum of patients with asthma and cerebral palsy which was not the part of the study mentioned above.

Acidic drinks are now considered as strong extrinsic etiological factor of dental erosion.²⁷ The frequency of dental erosion due to juices and beverages in our study was seen to be 16% which is in cohesion to another study done in Pakistan i.e., 19.7%.²⁶ This frequency is seen to be less in comparison to the studies done in Iceland 21.6%,²⁸ Australia 25.4%,²⁹ Switzerland 28%³⁰ and Saudia Arabia 43%³¹. The higher frequency may be postulated to the fact that these studies are done in countries where there has been marked increase in carbonated drinks consumption since last 5 decades.³² Also studies were based on inaccurate self reporting of the patients and with no intraoral examination. It has been reported that there is an increase of three-fold higher risk of developing dental erosion for subjects drinking soft drinks three times a week or more often ($p < 0.05$).³² The erosion involved the occlusal aspects of the molars;³² palatal erosion has also been reported.³³ Whereas in our study it has been reported to be "cupping," on the cusps of tooth of the posteriors.

Among the intrinsic factor GERD is considered as an established factor for dental erosion and may manifest as one of the early sign of this disease.²³ Results of the present study indicate that 82.4% of individuals with GERD also had the dental erosion, showing strong correlation $p < 0.000$, which is way ahead than other studies like 22.6% in Iran,³⁴ 65.5% Bohmer et al³⁵. A systematic review based on 17 studies was done by Pace et al in 2008³⁶

and showed a strong correlation between dental erosion and GERD and was reported to be 24% which is also in cohesion with another systematic review done by Firouzie et al.³⁷ However there are also other systematic reviews, cross sectional studies and review of literature which describes no association between GERD and dental erosion.^{2,38} Higher prevalence of dental erosion with GERD can be postulated to be related to the increase intake of fatty foods, spicy foods, caffeine, smoking, beverages etc.^{9, 10} If the dentist is suspicious of any gastric reflux in the patient, he should refer the patient to the gastroenterologist for further medical evaluation.

Asthmatic patients may suffer from dental erosion and has higher chances due to decrease in the salivary flow which acts as an important barrier for both the intrinsic and extrinsic acids.³⁹ Excessive coughing episodes bring about chest pressure alterations, triggers reflux. Also asthmatic drugs which dilate the airway may relax LES, contributing to GERD.⁴⁰ In this current study Dental erosion due to Asthma was seen to be 56% which is closer to a study reporting 59%⁴¹ but is much lesser than reported in another study i.e., 76.5%⁴². Furthermore they have also compared between the asthmatic and non-asthmatic patient and has reported to have an obvious difference between the two groups. In our study the pattern of erosion was seen to be occlusal aspects of posterior molars of both jaws which is in cohesion with the study done in South East Queensland.³⁹ However it is different than reported by other studies mentioning the palatal aspects of the incisors and some mentioning the labial aspects of the incisors.⁴²

Cerebral palsy patients has been reported to have high incidences of feeding difficulty, including problem with swallowing, vomiting, recurrent chest infections, poor oral hygiene, irritability.¹⁶ In the current study it was observed that 50% of the patients had dental erosion which is in cohesion with another study done in America in 2003 reporting to be 52%.¹⁶ Pattern of erosion was seen to be upper and lower molars and upper incisors which are once again in cohesion to the study mentioned above.^{15,16} This tooth wears in Cerebral palsy patients are associated to both oral para-functional activity and enamel softening from the acidic

reflux.²⁷

Occupational exposure to acidic chemicals has been reported to cause severe erosion.^{11,43,44} In the current study dental erosion was seen among 67% of the chemical factory worker and the main chemical in which they were in contact was hydrochloric acid. In comparison to our study, another study done in Pakistan²⁶ mentions a very low frequency which is 7.6% the difference can be attributed to the fact that our study is done in the factory population whereas the study conducted by Khan et al was done in hospital based environment which may not be the true representation of the actual suffering subjects. Other studies related to both the factory worker and hydrochloric acid exposure has shown varying percentages of dental erosion. 31% in study done in Japan,⁴⁵ 17% in Korea,⁴⁶ 34% in Netherland,⁴⁷ 47% in Great Britain⁴⁸. However, higher frequency in our study can be attributed to the poor facilitation provided to the workers and lack of awareness among both the factory workers and the management. Awareness among the different factory workers especially in direct exposure to chemicals is needed to be instigated and mask or mouth guard usage should be made mandatory among them.

In GERD patients, behavioral changes like raising the bed head height, avoiding particular foods most commonly beverages, chocolates, alcohol and caffeine. Precaution should be taken not to take heavy meals especially near to bed time, bending after heavy meals or wearing tight cloths. Dental erosion due to beverages is highly effected through the specific method of drinking; straw usage reduces the exposure time of the fluid to the dentition. Therefore, straw usage is recommended instead of a cup.¹⁰

CONCLUSION

GERD has a strong correlation with dental erosion and dentists observing signs and symptoms of both erosion and GERD should refer such patients to gastroenterologists for further evaluations. Reflux causes erosion on the occlusal aspects of the posteriors of both the jaws and in chronic condition also involves the palatal aspects

of the upper anteriors. In Juices and beverages, Peephole effect, or "cupping," on the cusps tips of the posteriors. In acidic environment, erosion of the labial surface of both upper and lower anteriors, dish faces concavities at the incisal edges and occlusal surfaces of the molars are seen.

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