



Prevalence and severity of tooth wear in 12 to 15 year old school children in the Gurgaon district, Haryana, India: a cross-sectional study

Prevalência e severidade de desgaste dentário em escolares de 12 a 15 anos de idade no Distrito Gurgaon, Haryana, India: um estudo transversal

Savita Solanki^[a], Ishita Gupta^[b], Sumanth Prasad^[c], Chinmaya BR^[d]

^[a] PG student, Department of Public Health Dentistry, Faculty of Dental Sciences, SGT University, Budhera, Distt. Gurgaon (Haryana), India.

^[b] MDS, senior lecturer, Department of Oral Medicine and Radiology, Faculty of Dental Sciences, SGT University, Budhera, Distt. Gurgaon (Haryana), India.

^[c] MDS, professor, Department of Public Health Dentistry, Faculty of Dental Sciences, SGT University, Budhera, Distt. Gurgaon (Haryana), India.

^[d] MDS, reader, Department of Public Health Dentistry, Faculty of Dental Sciences, SGT University, Budhera, Distt. Gurgaon (Haryana), India.

Abstract

Introduction: Tooth wear is an ever increasing problem. However, literature on tooth wear prevalence is scarce. Therefore, the aim of the present study was to assess the prevalence and severity of tooth wear among 12 to 15 year old children of private schools of Farukhnagar block (Gurgaon) Haryana. **Material and Methods:** 973 school children in the age group of 12 to 15 year from the Gurgaon district were included in the study. All permanent teeth were examined by two trained calibrated examiners using CPITN probes in four surfaces, namely cervical (C), buccal (B), occlusal (O) or incisal (I) and palatal (P) or lingual (L) surface using Tooth Wear Index (TWI) . SPSS 19 was used for descriptive statistics and chi-square test. **Results:** A total of 26,230 teeth were examined. Overall prevalence of tooth wear was 29.7%. Most frequently affected teeth were the Incisors (15.4%), followed by the Molars (7.4%). Incisal/occlusal surface was the most commonly affected surface. All the tooth wear lesions observed were mostly confined to the enamel (76.4%). Boys had statistically significant higher tooth wear prevalence (16.2%) compared to girls (13.5%). Dental fluorosis determined higher tooth wear prevalence (61.5%). **Conclusion:** There is high prevalence of tooth wear among school children, and boys have more tooth wear compared to girls. Dental fluorosis

is associated with high risk for tooth wear. Thus tooth wear poses a significant public health problem, and steps should be taken for early diagnosis, prevention and management.

Keywords: Abrasion. Attrition. Erosion. Tooth wear. Prevalence. Dental fluorosis.

Resumo

Introdução: O desgaste dos dentes é um problema crescente. No entanto, a literatura sobre a prevalência de desgaste dentário é escassa. Portanto, o objetivo do presente estudo foi avaliar a prevalência e a severidade do desgaste dentário entre as crianças de 12 a 15 anos de idade de escolas particulares de Farukhnagar (Gurgaon) Haryana. **Material e métodos:** 973 crianças em idade escolar na faixa etária de 12 a 15 anos do bairro de Gurgaon foram incluídas no estudo. Todos os dentes permanentes foram examinados por dois avaliadores treinados calibrados utilizando sondas CPITN em quatro superfícies [cervical (C), vestibular (B), oclusal (O) ou incisal (I), e palatina (P) ou lingual (L)] da superfície do dente por meio do Índice de Desgaste Dental (IDD). O SPSS 19 foi utilizado para a estatística descritiva e teste do qui-quadrado. **Resultados:** Um total de 26.230 dentes foi examinado. A prevalência de desgaste dentário foi de 29,7%. Os dentes mais afetados foram os incisivos (15,4%), seguidos pelo molares (7,4%). A superfície incisal/oclusal foi a mais comumente afetada. Todas as lesões de desgaste dos dentes observados estavam confinadas principalmente ao esmalte (76,4%). Os meninos apresentaram maior prevalência de desgaste dos dentes (16,2%) em comparação às meninas (13,5%). A fluorose dental determinou maior prevalência de desgaste dentário (61,5%). **Conclusão:** Há uma alta prevalência de desgaste dentário em escolares, e os meninos apresentam mais desgaste em comparação com as meninas. A fluorose dental é associada ao alto risco de desgaste dentário. Assim, o desgaste do dente representa um importante problema de saúde pública, devendo ser tomadas medidas para o diagnóstico precoce, a prevenção e o tratamento.

Palavras-chave: Abrasão. Atrito. Erosão. Desgaste dentário. Prevalência. Fluorose dental.

Introduction

Tooth wear is considered an increasing problem worldwide (1, 2). The presence of tooth wear has become evident, due to the significant decline in dental caries (3). It is viewed as an oral disease and is included in the WHO classification of diseases and related health problems (4). Tooth is the non-carious loss of tooth tissue as a result of the interaction of three processes that may occur isolated or associated – attrition, erosion and abrasion. Attrition is the loss of tooth substance or a restoration caused by mastication, or contact between occluding surfaces. On the other hand, erosion is the progressive loss of hard dental tissues by chemical processes not involving bacterial action (5). Abrasion is the pathological loss of tooth substance caused by abnormal and repetitive mechanical wear other than tooth to tooth contact (6).

Tooth wear leads to sensitivity, loss of dental shape and function and even abscess. Thus to diagnose

tooth wear at an early stage is necessary to increase tooth longevity. The prevalence of tooth wear varies greatly with age group, geographic location and lifestyle. To the best of our knowledge, data on tooth wear in Indian subpopulation in the age group of 12 to 15 year is scarce. Also even though fluorosis is an established risk factor for tooth wear (7) but studies signifying the association are limited in India.

Therefore, the present study was undertaken to assess the prevalence and severity of tooth wear in permanent dentition among 12 to 15 year old children in private schools of Farukhnagar block, Gurgaon district, Haryana.

Materials and Method

The study was approved by the ethical research committee of the institute. This cross-sectional study was carried among 12 to 15 year old school children in private schools of Farukhnagar block,

Gurgaon district, Haryana. The sample size was determined based on the point prevalence of the pilot study conducted in a private school.

$$n = 4pq/l^2$$

Where: p = point prevalence

$$q = 1-p$$

$$l = 95\% \text{ confidence interval}$$

This determined a sample size of 973 school children. Sixteen schools were selected by simple random sampling. Since the schools had different strength of students – i.e., all the schools had different number of children in the age group of 12 to 15 year – an equal probability selection method proportional to size was used to ensure that all the children would have equal chance of selection, which means equal number of children were taken from all the schools. Children undergoing orthodontic treatment were excluded from the study. A total of 973 school children (558 boys and 415 girls) were included in this cross-sectional study. A written informed consent was obtained from the parents/guardians of the children.

Inclusion Criteria: 12 to 15 year old school children present on the day of examination. Children

who returned the signed consent to participate in the study.

Exclusion criteria: Teeth with class V restorations; partially erupted teeth; teeth with prosthesis or serving as abutments; children undergoing orthodontic treatment.

The clinical examination was carried out by two examiners who had been trained during calibrations sessions. Theoretical discussions were held, and practical activities performed regarding the diagnostic criteria of tooth wear. All the permanent teeth present in the oral cavity of the school children were examined for four surfaces, namely cervical (C), buccal (B), occlusal (O) or incisal (I) and palatal (P) or lingual (L) surfaces. Clinical oral examination of study subjects was done in the respective school premise. The school children sit on a stool and the examiner stood in front of them during examination. The teeth were wiped using a cotton pellet to remove saliva and food debris, and the CPITN probe was used to measure the depth of eroded surface. Table 1 shows the scores and criteria for tooth wear assessment according to the tooth wear index by Smith and Knight, 1984 (8).

Table 1 - Scores and criteria for tooth wear index (Smith and Knight, 1984)

Score	Surface	Criteria
0	B/L/O/I	No loss of enamel surface characteristics
	C	No loss of contour
1	B/L/O/I	Loss of enamel surface characteristics
	C	Minimal loss of contour
2	B/L/O	Loss of enamel exposing dentine for less than one third of surface
	I	Loss of enamel just exposing dentine
3	C	Defect less than 1 mm deep
	B/L/O	Loss of enamel exposing dentine for more than one third of surface
	I	Loss of enamel and substantial loss of dentine
4	C	Defect less than 1–2 mm deep
	B/L/O	Complete enamel loss–pulp exposure–secondary dentine exposure
	I	Pulp exposure or exposure of secondary dentine
	C	Defect more than 2 mm deep–pulp exposure–secondary dentine exposure

If there was doubt over a particular score – whether the condition was present or its severity –, then it was either scored 0 or the lower score was applied. Kappa value was used to assess the reproducibility of the diagnostic criteria.

Data analysis was performed using SPSS version 19. Descriptive analyses were conducted and the results were expressed as frequencies and percentages. Chi-square test was used to evaluate the association of tooth wear with gender and dental fluorosis. Dental fluorosis was assessed in this study as a risk factor for tooth wear.

Results

The study group was composed by 973 children, 415 girls (42.7%) and 558 boys (57.4%). The response rate was 98% of all study subjects invited.

Reasons for non participation were mainly the fear to the dentist.

Tooth wear was assessed in 289 children. The most commonly wear was found in only enamel surface (76.4%), while enamel and dentin was seen in (23.6%). The prevalence of tooth wear was found to be statistically greater for boys than girls ($p < 0.05$) (Table 2). The most frequently affected teeth were incisors (15.4%), followed by molars (7.4%) and premolars (5.3%) (Table 3). When the individual surfaces were evaluated for tooth wear, it was found that incisal/occlusal surface were the most affected (23.4%), followed by buccal, lingual and cervical surfaces (Table 4).

The most affected surface for incisors and canine was the incisal surface, and for premolars and molars it was buccal surface (Table 5). Out of 973 school children, 360 (37%) had dental fluorosis. Among these children, 61.5% had tooth wear which was

Table 2 - Distribution of the severity of tooth wear by gender

Degree of tooth wear	Number of subjects (%)	95% Confidence Interval	Boys	Girls
0	70.3	67.9 – 72.7	83.8	86.5
1	22.7	20.1 – 25.3	12.0	10.7
2	7.0	4.4 – 9.6	4.2	2.8
3	0.0	-	0.0	0.0
4	0.0	-	0.0	0.0
Prevalence	29.7	-	16.2	13.5

Table 3 - Distribution of the severity or prevalence of tooth wear according to different types of teeth

Severity degree	Incisors (%) n=7784	Canine (%) n= 3892	Premolars (%) n= 7581	Molars (%) n=6973
0	84.6	98.4	94.7	92.6
1	12.4	1.3	3.9	5.1
2	3.0	0.3	1.4	2.3
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
Prevalence	15.4	1.6	5.3	7.4

Table 4 - Distribution of the severity or prevalence of tooth wear according to surfaces of teeth examined

Degree of tooth wear	Incisal/occlusal (%) n=25836	Buccal (%) n=24560	Lingual/palatal (%) n=25239	Cervical (%) n =25978
0	76.6	77.3	88.3	85.7
1	19.4	17.6	9.7	9.5
2	4.0	5.1	2	4.8
3	0.0	-	0.0	0.0
4	0.0	-	0.0	0.0

statistically significant ($p < 0.01$). A Kappa value of 0.81 was obtained for inter-examiner reproducibility, which indicated very good agreement for reproducibility tooth wear diagnosis.

Wang et al. (14) reported a prevalence of 27.3% in Southern China among 12-13 year old school children with incisors being the most affected teeth by tooth wear and the incisal surface the most

Table 5 - Distribution of tooth wear according to type of teeth and surface involved

Surfaces	Incisors	Canine	Premolars	Molars
Incisal / Occlusal	14.1	1.0	0.3	2.5
Lingua / Palatal	1.3	-	-	-
Cervical	-	0.6	-	-
Buccal	-	-	5.0	4.9
Prevalence rate (%)	15.4	1.6	5.3	7.4

Discussion

This study assessed the tooth wear status in 12 to 15 year old school children as all permanent teeth are erupted by this age, except the third molars. Moreover, age 12 and age 15 are considered to be the index ages (9). The study evaluated non-specific tooth wear. It is almost impossible to distinguish among the influence of tooth attrition, erosion or abrasion during clinical examination without introducing bias into assessment procedure. So, total tooth wear was calculated using the tooth wear index by Knight and Smith (8). The index is widely employed for assessing tooth wear in some studies due to its easy comparability and coverage of whole dentition (10-12).

The overall prevalence of tooth wear in this study was 29.7%. This was similar to the prevalence of dental erosion reported by Caglar et al. (13), with a prevalence of 28% in school children of Istanbul.

involved, results was similar to our study. However, a wide range of prevalence (11.6% - 100%) has been reported in the literature (15-18). This variation can be attributed to differences in the indices used, study criteria and diagnostic criteria, which makes the comparison of results almost impossible. Also, different dietary and lifestyle habits in different countries have an impact on tooth wear data.

When the severity of tooth wear was assessed, first degree tooth wear involving only the enamel was the most commonly observed in our study (Table 2). This is in accordance with other studies for similar age group (13, 18-20). The possible reason for this observation is that children of this age group have been exposed to risk factors at low level, or for a relatively short period of time (20).

Tooth wear was found to be significantly more common in boys (Table 2) which is in accordance to the findings of other studies (18, 21). The higher rate of tooth wear in boys can be explained due to

difference in the strength of musculature and biting forces, and also a higher consumption of acidic carbonated drinks and sport drinks among boys (7). However, contrasting results have also been reported in the literature showing that there was no difference in the prevalence of tooth wear among boys and girls (19, 20, 22).

The higher wear rate seen in incisors and molars (Table 3) is due to their presence in oral cavity for a longer time as these teeth are the first to erupt and thus are exposed to possible extrinsic etiological factors for a longer period of time. Even though molars bear maximum masticatory forces, the increase of wear seen in incisors could be due to their position in oral cavity, more exposition to extrinsic factors (14) and also habits like holding pencil between anterior teeth. The comparatively higher prevalence of tooth wear seen in premolars and molars in this study can be ascribed to inadequate brushing. Premolars and molars together formed a total prevalence rate of 12.7% and out of which the buccal surface involved a prevalence of 9.9% (Table 5). Regarding the severity of tooth wear, the buccal surface was the most affected surface with tooth wear involving dentin 5.1% (Table 4).

Haryana is located in the endemic belt of dental fluorosis in India (24). In this study, 360 (37%) school children had dental fluorosis and, among them, 61.5% had tooth wear. This demonstrates the higher risk of tooth wear associated with dental fluorosis since the reduced mineralization seen in fluorosis makes teeth more susceptible to wear (20).

It was observed that incisal/occlusal surface had maximum tooth wear (23.4%) followed by the buccal (22.7%), cervical surfaces (14.3%) and lingual (11.7%) (Table 4). These rates are in accordance to those reported by other authors (14, 25). The high biting and masticatory forces are thought to be responsible for the increased wear seen in incisal/occlusal surfaces, while buccal surface wear might be due to faulty brushing technique or excessive pressure due to habits. Studies on tooth erosion found that the buccal surfaces are the most commonly affected because of the high consumption of acidic beverages (18, 20). Some authors have also reported high prevalence of tooth wear on palatal surfaces due to increased intake of citrus fruits and fresh juices (19, 21).

The present study had limitations because of its cross-sectional design and based on clinical

examination. However, this study attempts to draw attention to the growing problem of tooth wear. A representative sample was used by simple random sampling to avoid bias. This study also confirms dental fluorosis as an important risk factor for tooth wear among subjects. Dental professionals need to be advised about this particular clinical situation, since it can become worse with time as the tooth wear in adolescents can continue into adulthood and furthermore into elderly stage. Identification of etiologic factors and early diagnosis and treatment are required for the successful management of tooth wear and to prevent further progression.

Conclusion

Tooth wear is a public health problem which can lead to loss of tooth shape and function. This study reported a high prevalence of 29.7% among the children of 12 to 15 year old. Dental fluorosis was found to be a determinant etiological factor for this condition in this study. Early diagnosis, management and preventive measures should be carried out to reduce tooth wear prevalence in India. Longitudinal studies are recommended to measure the cumulative effect of tooth wear on teeth and also to find the association with other risk factors.

References

1. Francisco JL, Lizett CC, Jenifer MG, Jose ML, Juan JS. Clinical measurement of tooth wear: Tooth wear indices. *J Clin Exp Dent*. 2012;4:48-53.
2. Bishop K, Kelleher M, Briggs P, Joshi R. Wear now? An update on the etiology of tooth wear. *Quintessence Int*. 1997;28(5):305-13.
3. Daly R, Bakar WZ, Husein A, Ismail NM, Amaechi BT. The study of tooth wear patterns and their associated aetiologies in adults in Kelantan, Malaysia. *Archives of orofacial sciences*. 2010;5:47-52.
4. WHO International Statistical Classification of Diseases and Related Health Problems. 10th Revision, version for 2007. Available at <http://apps.who.int/classifications/apps/icd/icd10online>
5. Ganss C, Young A, Lussi A. Tooth wear and erosion: Methodological issues in epidemiological and public health research and future research agenda. *Community Dent Health*. 2011;28:191-195.

6. Saerah NB, Ismail NM, Naing L, Ismail AR. Prevalence of tooth wear among 16 year old secondary school children in kota bharu Kelantan. *Archives of Orofacial Sciences*. 2006;1:21-28.
7. Bardsley PF, Taylor S, Milosevic A. Epidemiological studies of tooth wear and dental erosion in 14-year-old children in North West England. Part 1: The relationship with water fluoridation and social deprivation. *British Dental Journal*. 2004; 197: 413-416.
8. Smith BGN, Knight JK. An index for measuring the wear of teeth. *Br Dent J*. 1984;156:435-438.
9. World Health Organization. *Oral health Surveys: Basic Methods*. IV edition. Geneva; 1997.
10. Shivakumar KM, Jayashree SH, Chandu GN, Pushpanjali K. Prevalence, etiology and severity of tooth wear among \leq 26-66 year old population of Davangere city, Karnataka, using tooth wear index. *Journal of the Indian association of public health dentistry*. 2006;7:48-52.
11. Saerah NB, Ismail NM, Naing L, Ismail AR. Tooth wear prevalence and sample size determination: a pilot study. *Malaysian Journal of Medical Sciences*. 2008;15:35-40.
12. Shivakumar S, Saha S, Jagannath GV, Choudhary A. Prevalence of deciduous tooth wear in 5-10 year old school children in Lucknow and its relationship with potential explanatory factors - a Cross Sectional Study. *Journal of the Indian association of public health dentistry*. 2011;18:32-35.
13. Caglar E, Kargul B, Tanboga I, Lussi A. Dental erosion among children in an 12. Istanbul public school. *J Dent Child*. 2005;72(1):5-9.
14. Wang P, Lin HC, Chen JH, Liang HY. The prevalence of dental erosion and associated risk factors in 12-13-year-old school children in Southern China. *BMC Public Health*. 2010;10:478- 487.
15. Ganss C, Klimek J, Giese K: Dental erosion in children and adolescents – a cross-sectional and longitudinal investigation using study models. *Community Dent Oral Epidemiol*. 2001, 29(4):264-271.
16. Waterhouse PJ, Auad SM, Nunn JH, Steen IN, Moynihan PJ: Diet and dental erosion in young people in south-east Brazil. *Int J Paediatr Dent*. 2008, 18(5):353-360.
17. Harding MA, Whelton HP, Shirodaria SC, Mullane DM, Cronin MS. Is tooth wear in the primary dentition predictive of tooth wear in the permanent dentition? Report from a longitudinal study. *Community Dent Health*. 2010;27:41-45.
18. Al-Dlaigan YH, Shaw L, Smith A. Dental erosion in a group of British 14 year old, school children. Part 1: prevalence and influence of differing socioeconomic backgrounds. *Br Dent J*. 2001;190:145-149.
19. Auad SM, Waterhouse PJ, Nunn JH, Steen N, Moynihan PJ: dental erosion amongst 13- and 14-year-old Brazilian schoolchildren. *Int Dent J*. 2007;57(3):161-167.
20. Ferreira VF, Praetzel RJ, Ardenghi TM: prevalence of tooth erosion and associated factors in 11-14 year old brazilian school children. *Journal of Public Health Dentistry*. 2011;71:6-12.
21. Dugmore CR, Rock WP: the prevalence of tooth erosion in 12-year-old children. *Br Dent J*. 2004;196(5):279-282.
22. Peres SHC, Peres AC, Marsicano JA, Carvalho CAP, Carvalho FS, Lauris JRP et al: The relationship between tooth wear in the primary and permanent dentitions. *Community Dent Health*. 2011;28:196-200.
23. El Aidi H, Bronkhors EM, Truin GJ. A longitudinal study of tooth erosion in adolescents. *J Dent Res*. 2008;87:731-735
24. World Health Organization (WHO). *Fluoride in Drinking-water* (2006). Fawell J, Bailey K, Chilton J, Dahi E, Fewtrell L and Magara Y. Fluoride in Drinking water. IWA Publishing, London, UK.
25. Al-Majed I, Maguire A, Murray JJ: risk factors for dental erosion in 5-6 year old and 12-14 year old boys in Saudi Arabia. *Community Dent Oral Epidemiol*. 2002;30(1):38-46

Recebido: 13/12/2013

Received: 12/13/2013

Aceito: 16/01/2014

Accepted: 01/16/2014