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Original Article

Prevalence of tooth wear among Libyan dental students in Benghazi

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ABSTRACT

Background: The problem of tooth wear (TW) encountered increasingly by clinicians and researchers. An early recognition as well as an understanding of the etiologies and risk factors of tooth wear is important to prevent serious irreversible damage to the dentition and for the adequate provision of preventive and therapeutic measures.

Aims: To determine the prevalence of tooth wear and identify the associated factors among dental students in Faculty of Dentistry, University of Benghazi.

Methods: The study comprised of 300 participants aged 18-27 years, of which 250 (83%) were females and 50 (17%) were males. All participants completed a questionnaire before examination. The questionnaire consisting of 14 questions about dietary habits, hygiene habits, medications usage, tooth sensitivity and para-functional habits. Tooth wear was measured using Smith and Knight Tooth wear Index. Data were tabulated and analyzed using Chi Square test; P value was set at 0.05.

Results: The prevalence of tooth wear was 87%. Score 1 was the prevalent score. Lower anterior teeth were the most commonly affected teeth. TW is more frequent in males than females. Significant associations were found between TW and Drinking of coffee, Nescafe, and black tea ($p=0.048$), biting on hard objects ($p=0.039$), and subjective xerostomia ($p=0.010$).

Conclusion: Tooth wear is a prevalent condition in this population group. Data supports an association between TW and consumption of hot drinks, biting on hard objects, and xerostomia. Although of many factors investigated in this study, the majority of tooth wear remaining unexplained and further large-scale studies are recommended.

Keywords: tooth wear, prevalence, questionnaire, Libyan adults

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INTRODUCTION

Tooth wear is the loss of hard tooth structure as a result of interaction between three processes:

attrition, abrasion and erosion that rarely act in isolation ^(1, 2). There has been an increasing interest in tooth wear in dental literature. There is an evidence that its prevalence is growing steadily, especially amongst the young individuals ^(3, 4).

Attrition is a mechanical loss of tooth structure due to tooth-to-tooth contact with no foreign substance intervening and is usually due to mastication and para-functional activities. Abrasion is the mechanical loss of tooth substance caused by different foreign and repetitive factors introduced into the mouth and contact the tooth such as oral hygiene procedures (brushing) and nail biting or pen biting habits. Erosion is a progressive loss of hard dental tissue by a chemical process not involving bacterial action as a result of extrinsic or intrinsic acids ^(5, 6). It has recently been reported that erosion is playing an increasingly important role in tooth wear ⁽⁷⁾.

Abfraction is another form of TW— introduced by Grippo (1991) ⁽⁸⁾ to refer to the pathological loss of dental hard tissue caused by biomechanical forces possibly owing to flexure of the tooth caused by eccentric occlusal forces and the consequent

fatigue of enamel and dentin distant from the point of applied force⁽⁹⁾.

In recent years, many epidemiological studies have focused on the prevalence and etiology of tooth wear in adults. The prevalence of tooth wear was found to be high and varies widely in different parts of the world⁽¹⁰⁾. The results of such studies are difficult to compare, because of the use of different indices and methodology. Moreover, most studies have been performed on different age groups⁽¹¹⁾. Although there may be a lack of consensus regarding measurement, most studies reported higher prevalence of TW in males than females⁽¹²⁻¹⁴⁾, and likewise, there is a tendency for older people to show more TW than the younger age groups⁽¹⁵⁾.

Several indices used to describe the severity of tooth wear have been outlined in the literature. Most indices recorded the amount of tooth loss, some indices measured tooth wear by recording surfaces, teeth, or the whole mouth^(16,17). In most cases, changes to the anatomy of teeth from tooth wear is a combination of erosion, abrasion and attrition and it is difficult to assess which component is most important⁽⁴⁾. One of the most commonly used and widely accepted index was developed by Smith and Knight⁽¹⁷⁾ and has been adopted by many researchers^(12,18). This index is easy to use and not biased by the etiology of TW⁽¹⁹⁾.

There is a lack of data on the prevalence of tooth wear in the Middle East region and little is known about the tooth wear or the etiology of the problem among Libyan adults population. The aim of the present study was to assess the prevalence of tooth wear (TW) in a sample of students studying at a Faculty of Dentistry, University of Benghazi to investigate the association of TW to the most commonly known factors such as gender, dietary habits, oral hygiene habits, medication usage, and para-functional habits.

MATERIALS AND METHODS

Ethical approval:

Study approval was obtained from the head of the faculty of Dentistry, Benghazi University.

Participants:

This study was conducted on a sample of dental students aged 18–27 years. The purpose of this study was explained to all participants and their agreement to take part in this study was obtained. The study comprised of 300 students; 250 were females and 50 were males, and conducted in the faculty of Dentistry during the period from January until May 2018. The exclusion criteria was subject's unwillingness to

participate, or being out of the targeted age, or students with hereditary dentition problems.

The questionnaire:

Before clinical examinations, the participants completed a previously validated questionnaire⁽²⁰⁾. The questionnaire included 14 questions related to the following topics: the frequency of acidic foods and drinks consumption, vomiting, medication usage (vitamin C, aspirin), oral hygiene practices, biting on hard objects, tooth sensitivity, bruxism and xerostomia. Whenever a participant expressed any doubts or needs clarifications, the questions were clarified by the interviewer. The study questionnaire was specially constructed according to the forms employed in previous studies (Table 1).

Clinical Examination:

Clinical oral examination of the study subjects was done in dental clinic using mouth mirror and dental probe. The area was dried by compressed air when necessary under good artificial light on the dental chair unit. All the students were examined by the two previously trained and well calibrated examiners. Inter-examiner reproducibility yielded Kappa score of 0.7 while intra-examiner reproducibility was 0.8 and 0.76. All the teeth present at the time of examination were examined while wisdom teeth were excluded. All examinations were carried out by the operator standing in front of the subjects. Tooth wear scores were recorded utilizing Tooth Wear Index (TWI) of Smith and Knight (1984). This index graded wear on the cervical, buccal, incisal/ occlusal and palatal/ lingual surfaces of each tooth; each tooth was given a score from 0–4 according to the severity of wear (Table 2). This index was chosen due to its simplicity, easily comparable and widely used⁽¹⁹⁾.

Statistical analysis:

SPSS version 20 statistical software was used (SPSS Incorporation Chicago, IL, USA) for data entry and analysis, and the results were expressed as frequencies and percentages. The relationship between tooth wear and the questionnaire items was evaluated using the chi-square test. Significance level was set at the p value < 0.05.

RESULTS

Out of 300 students examined. There were 250 (83%) females and 50 (17%) males. Their mean age was 22 years and 263 (87%) showed signs of tooth wear. The majority of teeth showed loss of enamel surfaces characteristics (score 1) in both upper and

lower teeth at the occlusal and incisal surfaces. The most commonly affected teeth were upper and lower anterior followed by lower first molar (Figures 1 & 2).

When the proportions of female and male subjects with tooth wear were compared it was found that there is no statistically significant difference between two genders ($P = 0.307$). Tooth surface loss affected 86% of females and 92% of males (Table 3).

The tooth wear percentage was 87% in the students who are frequently drinking acidic beverage (25%) and 89% in the students who are frequently taking acidic food (30%). There were no statistical association between tooth wear and consumption of acidic drinks ($p = 0.384$) or acidic food ($p = 0.774$). Whereas the association was statistically significant between tooth wear and drinking coffee, Nescafe and black tea ($p = 0.0480$) where more than half of the students (54%) reported drinking of such hot drinks continuously and had 91% TW.

The results showed that the tooth wear percentage was 83% in the students who are taking vitamin C medication (6%) and 83% in the students who are taking aspirin medication (2%). The difference was not statistically significant ($p = 0.067$, $p = 0.900$).

Eighth students (3%) were reported vomiting in many occasions with a percentage of tooth wear 87% which is not statistically significant ($p = 0.743$). About 24% of students practicing the habit of bruxism frequently at which the tooth wear percentage was 91%. There were no significant association between tooth wear and bruxism ($p = 0.236$).

Regarding brushing, 27% of the group use the "vertical" technique, which normally should not be harmful to the tooth, 62% use combination technique, and 11% use "horizontal" techniques. Two hundred and eleven subjects (70%) used medium to hard toothbrush and most subjects (86%) brushed their teeth at least twice daily. These results showed that there was no association with the technique, frequency of tooth brushing or hardness of toothbrush and TW ($p = 0.562$, $p = 0.383$, $p = 0.993$) respectively. tooth wear percentage was 90% in the students complaining of dentin hypersensitivity (48%). The difference was not statistically significant ($p = 0.186$).

The percentage of tooth wear was 92.8% among students who reported a habit of nail or pen biting

(37%), which indicates significant statistical association with tooth wear ($p = 0.039$). In addition, the association was statistically significant between tooth wear and xerostomia ($p = 0.010$) where tooth wear percentage was 97% in the students who had xerostomia (14%).

DISCUSSION

Tooth wear is a common problem and considered as a risk factor for the aesthetics, function and longevity of the human dentition behind acute trauma, caries and periodontal disease ⁽²¹⁾. Occlusal tooth wear in particular leads to loss of vertical dimension, poor masticatory efficiency and in most cases requires full mouth rehabilitation by extensive restorations ⁽⁴⁾. The irreversible and multifactorial aspects of tooth wear process make it one of the most difficult problems to manage and to diagnose its etiology clinically from the appearance of a lesion without a comprehensive dietary and dental history ⁽²²⁾.

Many studies found that acidic foods and beverages to be linked to the problem. In addition, patients with gastro-oesophageal reflux disease or other diseases that provoke reflux may be prone ⁽²³⁾. Salivary factors and bruxism also investigated to see if they contribute to tooth surface loss. Known factors can explain only 41% of tooth wear, with the majority of tooth wear remaining obscure ⁽²⁴⁾. Although of different epidemiological studies with different examination standards and groups, the prevalence of tooth wear has not been well documented ⁽¹⁷⁾. There are a few prevalence studies of adults tooth wear reported in the literature and none from Libya.

In this study, the prevalence of tooth wear was 87%. It is important to note that this prevalence rate of tooth wear was higher than that reported in China ⁽²⁰⁾, Turkey ⁽²⁵⁾, Sweden ⁽²⁶⁾, and the UK ⁽²⁷⁾. Such variations in prevalence between studies were partly explained by the differences in diagnostic criteria, indexes used, age groups, as well as the varying socio-economic, cultural and geographical factors that could influence the outcome of prevalence data.

At the same time during examination of the severity of tooth wear in our young adults (18-27 years), the results showed that score 1 was the prevalent score. There is a reasonably strong evidence to suggest that

Table 1: Questionnaire.

Number:	Name:	Age:	Gender: (Male/Female)	Telephone number:
Drinking acidic beverages like Cola, Pepsi, Sprite, 7 up, Fanta, lemon juice, apple juice, orange juice, grapefruit juice, sport drinks			Never / Rarely / Sometimes / always	
Drinking coffee, Nescafe, Black Tea			Never / Rarely / Sometimes / always	
Eating fruits (like strawberry, lemons, peaches, orange, apple, grapes, pears, apricots)			Never / Rarely / Sometimes / always	
Eating foodstuff (like fruit jam, jelly, mayonnaise, ketchup, yogurt, pickles)			Never / Rarely / Sometimes / always	
Vomiting / Regurgitation			Never / Rarely / Sometimes / always	
Taking vitamin C			Never / Rarely / Sometimes / always	
Taking aspirin			Never / Rarely / Sometimes / always	
Clenching or Bruxism			Yes / No	
Brushing technique			Horizontal / Vertical / Combination	
Frequency of tooth brushing			1 / 2 / 3 times daily	
Hardness of brush bristle			Soft bristle / Medium bristle / Hard bristle	
Tooth sensitivity			Yes / No	
Nail biting / Pen biting			Yes / No	
Xerostomia			Yes / No	

Table 2: Smith and Knight Tooth Wear Index (TWI) (1984).

Code Scores	Surface	Criteria
0	B/L/O/I C	No loss of enamel surface characteristics No change in contour
1	B/L/O/I C	Loss of enamel surface characteristics Minimal loss of contour
2	B/L/O I C	Loss of enamel, visible dentine for less than 1/3 of the surface. Loss of enamel just exposing dentine. Defect less than 1mm deep
3	B/L/O I C	Loss of enamel, visible dentine for > 1/3 of the surface. Loss of enamel and substantial loss of dentine but not exposure of pulp or secondary dentine. Defect 1 - 2mm deep
4	B/L/O I C	Complete loss of enamel, pulp exposure, or secondary dentine. Pulp exposure or exposure of secondary dentine. Defect more than 2mm deep or pulp exposure or exposure of secondary dentine

*B,Buccal or Labial; L, Lingual or Palatal; O, Occlusal; I,Incisal; C, Cervical.

Table 3: The relationship between TW and different factors among the study population.

Factor		Number (N)	Tooth wear (N)	Tooth wear% (%)	Chi-Square (χ^2) P- value
Gender	Male	50	46	92%	1.042 ^a
	Female	250	217	86%	P=0.307
Drinking acidic beverage	Rarely	46	42	91%	1.914 ^a
	Sometimes	179	153	85%	P=0.384
	Always	75	68	87%	
Eating acidic fruits	Rarely	20	17	85%	0.513 ^a
	Sometimes	188	164	87%	P=0.774
	Always	92	82	89%	
Drinking coffee, Nescafe, and black tea	Rarely	50	45	88%	6.087 ^a
	Sometimes	87	70	80%	P=0.048*
	Always	163	149	91%	
Taking vitamin C	Rarely	195	182	93%	0.211 ^a
	Sometimes	87	75	86%	P=0.900
	Always	18	15	83%	
Taking aspirin	Rarely	249	215	86%	5.397 ^a
	Sometimes	45	43	95%	P=0.067
	Always	6	5	83%	
Vomiting	Rarely	253	221	87%	0.595 ^a
	Sometimes	39	35	89%	P=0.743
	Always	8	7	87%	
Bruxism	Yes	72	66	91%	1.402 ^a
	No	228	197	86%	P=0.236
Brushing technique	Horizontal	35	29	82%	1.153 ^a
	Vertical	80	72	90%	P=0.562
	Combination	185	162	87%	
Frequency of tooth brushing	One	41	38	92%	0.762 ^a
	More than one	259	225	86%	P=0.383
Hardness of brush bristle	Soft bristle	89	78	87%	0.000 ^a
	Medium to hard bristle	211	185	87%	P=0.993
Tooth sensitivity	Yes	144	130	90%	1.746 ^a
	No	156	133	85%	P=0.186
Nail& pen biting	Yes	111	103	92%	4.282 ^a
	No	189	160	84%	P=0.039*
Xerostomia	Yes	44	43	97%	6.591 ^a
	No	256	220	85%	P=0.010*

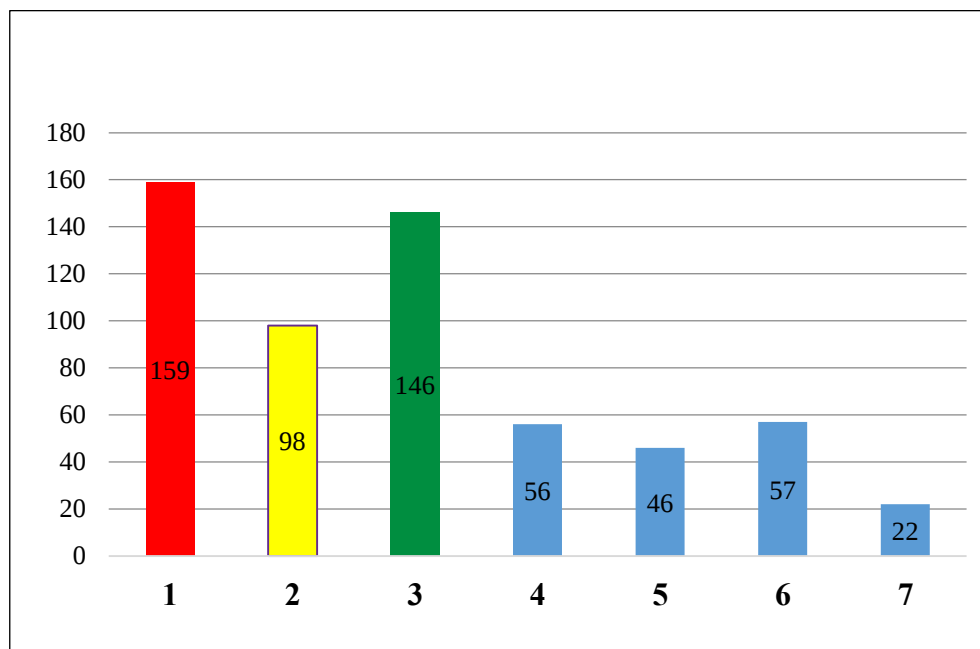


Figure.1: Frequency of tooth wear in upper teeth

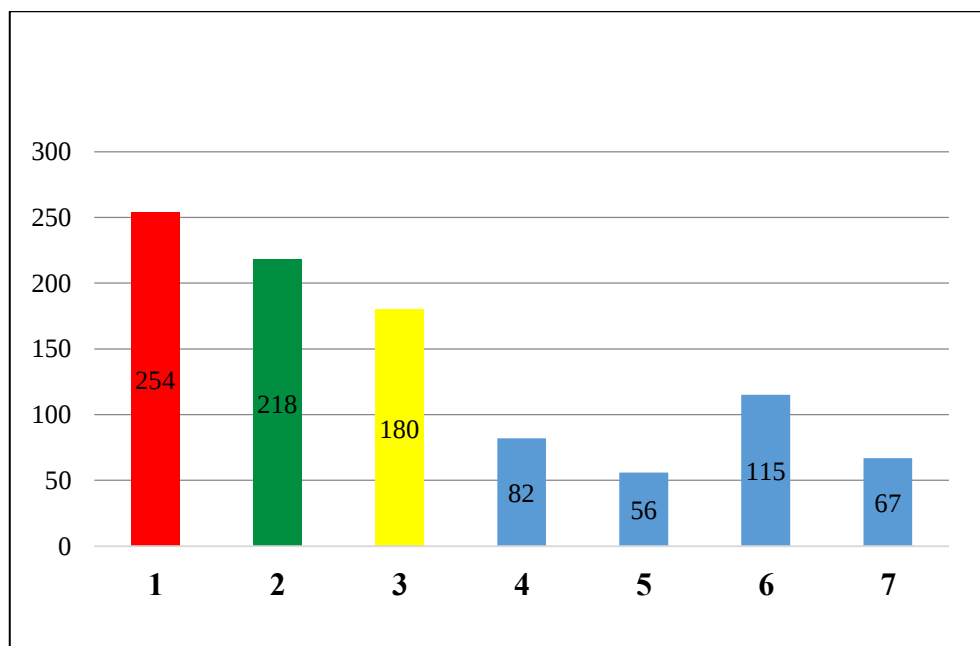


Figure.2: Frequency of tooth wear in lower teeth

tooth wear is an age related phenomenon. A recent review concluded that there was an increasing trend towards increasing wear with age ⁽²⁸⁾. The finding of this study agreed with an Indian study ⁽⁴⁾ that found that in the age group 18-29 grades 1 and 2 were the most prevalent scores, likewise these results are in accordance with the Turkish study of TW in adult patients where score 1 could be found as early as in the 18-30 years-old ⁽²⁵⁾.

Concerning to its prevalence relative to tooth position, the central incisors showed the greatest degree of wear while the premolars showed the least (Figures 1 & 2). These findings are in an agreement with a previous study that showed that incisors had the most severe wear ⁽²⁹⁾. However, another study has shown that tooth wear was seen most frequently on first molar ⁽²⁴⁾. These results may be explained by the fact that the central incisors and first molar are the first permanent teeth to erupt into the oral cavity. Therefore, they can be exposed more to various factors leading to tooth wear.

This study analyzed an adult sample of 300 subjects, among them males show more tooth wear than females. This was a common finding in previous, several studies ^(4, 30); no explanation for this has yet been given in the literature. There is no evidence that there is differences in tooth structure or composition of saliva. Concerning the diet, there is evidence that adults males consume more acidic drinks than females resulting in more chemical tooth wear ⁽³¹⁾. In addition, it has been hypothesized that men's masticatory muscles exert higher forces leading to more mechanical tooth wear ⁽²⁴⁾.

The consumption of coffee, Nescafe, and black tea in this study was found to be significantly associated with TW, and this is similar to a finding of the Jordanian study where daily consumption of sweetened coffee was associated with tooth wear ⁽¹⁴⁾. Whereas consumption of acidic beverages and foods in our study were not significantly associated with the presence of wear. On the other hand, in another study there were only a significant association found in relation to consumption of acidic beverages, but not acidic foods ⁽²⁵⁾.

Similarly, we found that gastric reflux was not associated with presence of tooth wear. Our finding agrees with that of Central China study ⁽³²⁾ and disagrees with that of Karabekiroğlu ⁽²⁵⁾, Bartlett ⁽³³⁾ and their co-associates where they found that gastric reflux is associated with tooth wear.

Intake of vitamin C and aspirin has been reported as an associating factor in a number of studies ^(20, 34), whereas in our study there were no

significant association with the development of wear. A finding reported by Zhang et al. supports the result of our study where intake of vitamin C was not associated with TW ⁽³²⁾.

In the recent study, 24% of students stated that they had a bruxism habit, but they did not have any significant higher prevalence of tooth wear as compared to subjects who did not have bruxism. While some subjects may know about their para-functional habit, many more probably do not. Some authors have reported outcomes similar to ours ^(35, 36), whereas Grippo and Simring ⁽⁹⁾ as well as Khan et al ⁽³⁷⁾ had reported different findings.

Although 70% of our subjects use hard to medium toothbrush and most subjects (86%) brushed their teeth at least twice a day, no significant association was found between TW and tooth brushing technique, frequency or hardness. This is in agreement with other study where there was no association with the frequency of tooth brushing ⁽²⁵⁾. In contrast to other study where there was an increased tooth wear in those who brushed their teeth at least twice a day compared to those who brushed less often ⁽³⁸⁾.

Tooth wear often brings discomfort and sensitivity especially during eating, drinking or tooth brushing. Dentine hypersensitivity is a painful clinical condition that affects 8-57 % of the adult population ⁽³⁹⁾. In the present study, the prevalence of tooth wear in the students who are complaining of dentin hypersensitivity was 90% but there were no significant association between hypersensitivity and tooth wear and this disagrees with the Indian study that found that there were a significant association between tooth wear and hypersensitivity ⁽⁴⁾.

It has been suggested that patients who use chronic medicaments with an acidic composition or that causes xerostomia are mostly at risk to tooth wear ⁽⁵⁾. In our study, there was a significant association between TW and xerostomia and this is in agreement with clinical experience and observation made in other studies where dry mouth were associated with tooth wear ^(25, 40).

A Malaysian study reported that biting on the hard shell was suspected to have a significant relationship to tooth wear; especially the incisors teeth because the regular eaters like to pry open the clamshells with their anterior teeth. Likewise, biting on hard objects habit in this study has a significant relationship to tooth wear ⁽⁴¹⁾.

Tooth wear is a slow process occurring over many years; in addition, it is a preventable and treatable condition. In order to prevent this problem

from becoming worse and become a burden in future, it is important in clinical practice to identify tooth wear at an early stage, diagnose its causes if possible, apply preventive measures and to be monitored carefully over a long period as well as to increase the awareness amongst practitioners and public.

CONCLUSION

Within the limitation of this study, it can be concluded that, there is a high prevalence of tooth wear among this population group. The occlusal surface had more TW than other surfaces and the central incisors had the most. The study also analyzed the possible etiological factors of tooth wear. A high consumption of coffee, Nescafe, and black tea, biting on hard objects and xerostomia appeared to associate with an increased risk of tooth wear

Conflict of Interests

Authors have no conflict of interest.

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REFERENCES

1. Shellis RP, Addy M. The interactions between attrition, abrasion and erosion in tooth wear. *Monogr Oral Sci* 2014; 25: 32–45.
2. Young A, Amaechi BT, Dugmore C, et al. Current erosion indices– flawed or valid? Summary. *Clin Oral Investig*. 2008;12: 59–63.
3. Jaeggi T, Lussi A. Prevalence, incidence and distribution of erosion. *Monogr Oral Sci* 2014; 25: 55–73.
4. Deshpande S. Investigation of Tooth Wear and its Associated Etiologies in Adult Patients Visiting Dental Institute in India. *Dentistry* 2015; 5: 271.
5. Lussi A, Carvalho TS. Erosive tooth wear: a multifactorial condition of growing concern and increasing knowledge. *Monogr Oral Sci*. 2014; 25:115.
6. Wetselaar P, Lobbzoo F. The Tooth Wear Evaluation System: a modular clinical guideline for the diagnosis and management planning of worn dentitions. *J Oral Rehab*. 2016; 43: 69–80.
7. Johansson AK, Omar R, Carlsson GE, Johansson A. Dental erosion and its growing importance in clinical practice: from past to present. *Int J Dent* 2012; 2012: 632907.1:17.
8. Grippo JO. Abfractions. A new classification of hard tissue lesions of teeth. *J Esthet Dent* 1991; 3:14-9.
9. Grippo JO, Simring M. Dental ‘erosion’ revisited. *J. Am. Dent. Asso.* 1995; 126:619-30.
10. Muts EJ, van Pelt H, Edelhoff D, Krejci I, Cune M. Tooth wear: a systematic review of treatment options. *J Prosthet Dent*. 2014; 112:752–9.
11. Milosevic A. The problem with an epidemiological index for dental erosion. *Brit Dent J*. 2011;211:201–3.
12. Al-Dlaigan YH, Shaw L, Smith A. Dental erosion in a group of British 14-year-old, school children. Part I: prevalence and influence of differing socioeconomic backgrounds. *Br Dent J*. 2001;190:145–9.
13. 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. *Br Dent J*. 2004;197:413–6.
14. Abu-Ghazaleh S B, Burnside G, Milosevic A. The prevalence and associated risk factors for tooth wear and dental erosion in 15- to 16-year-old schoolchildren in Amman, Jordan. *Eur Arch Paediatr Dent* 2013; 14: 21–7.
15. Wetselaar P, Vermaire JH, Visscher CM, Lobbzoo F, Schuller AA. The Prevalence of Tooth Wear in the Dutch Adult Population. *Caries Res* 2016; 50: 543–50.
16. Lussi A, Schaffner M, Hotz P, Suter P. Dental erosion in a population of Swiss adults. *Community Dent Oral Epidemiol* 1991;19: 286–90.
17. Smith BG, Knight JK. An index for measuring the wear of teeth. *Br Dent J* 1984; 156:435-8.
18. Dugmore CR, Rock WP. The prevalence of tooth erosion in 12-year-old children. *Br Dent J* 2004; 196:279–82.
19. Van’t Spijker A, Rodriguez JM, Kreulenc CM, Bronkhorst EM, Bartlette DW and Creugers HJ. Prevalence of Tooth Wear in Adults. *The Inter. J. prosthodont*. 2009; 22: 151-8.
20. Wei Z, Du Y, Zhang J, Tai B, Du M, Jiang H. Prevalence and Indicators of Tooth Wear among Chinese Adults. *PLOS ONE* 2016;11(9): e0162181.doi:10.1301621871/journal.pone.1.
21. Nunn JH. Prevalence and distribution of tooth wear In: Addy M, Embery G, Edger WM, and Orchardson R. *Tooth wear and sensitivity*. Martin Dunitz, London 2000; 93-104.
22. Johansson A, Omar R. Identification and management of tooth wear. *Int J Prosthodont*. 1994; 7: 506-16.
23. Gregory-Head B.L, Curtis D.A, Kim L. & Cello, J. Evaluation of dental erosion in patients with gastroesophageal reflux disease. *Journal of Prosthetic Dentistry* 2000; 83: 675.
24. Chuajedong P, Kedjarune-Leggat U, Kertpon D, Chongsuvivatwong V & Benjakul P. Associated factors of tooth wear in southern Thailand. Blackwell Science Ltd, *Journal of Oral Rehabilitation* 2002;29: 997–1002.
25. Karabekiroğlu S, Şener S, Mağat G, Akdemir I, Ünlü N. Occlusal and incisal tooth wear in Turkish adult patients. *Inter. J. Med. and Health Res*. 2017; 3: 54-60.

26. Hugoson A, Bergendal T, Ekfeldt A, Helkimo M. Prevalence and severity of incisal and occlusal wear in an adult Swedish population. *Acta Odontol Scand*. 1988; 46:255-65.
27. Kelly M, Steele J, Nuttall N et al. Adult Dental Health Survey- Oral Health in the United Kingdom. London: The Stationery Office, 2000, 1998.
28. Jaeggi T, Lussi A. Prevalence, incidence and distribution of erosion. *Monogr Oral Sci* 2006; 20: 44-65.
29. Smith B.G. & Robb N.D. The prevalence of toothwear in 1007 dental patients. *J. O. Rehab*. 1996; 23: 232.
30. Van Rijkom HM, Truin GJ, Frencken JE, König KG, van't Hof MA, et al. Prevalence, distribution and background variables of smooth-bordered toothwear in teenagers in the Hague, the Netherlands. *Caries Res* 2002; 36: 147-54.
31. Heuer T, Krems C, Moon K, Brombach C, Hoffmann I. Food consumption of adults in Germany: results of the German National Nutrition Survey II based on diet history interviews. *Br J Nutr* 2015; 113.
32. Zhang J, Du Y, Wei Z, Tai B, Jiang H, Du M. The prevalence and risk indicators of tooth wear in 12- and 15-year-old adolescents in Central China. *BMC Oral Health*. 2015; 15:120.
33. Bartlett DW, Evans DF, Anggiansah A et al. A study of the association between gastro-oesophageal reflux and palatal dental erosion. *Br Dent J*. 1996; 181:125-31.
34. Grace EG, Sarlani E, Kaplan S. Tooth erosion caused by chewing aspirin. *J Am Dent Assoc*. 2004; 135: 911-4.
35. Milosevic A, Soo Fong Lo M. Tooth wear in three ethnic groups in Sabah (Northern Borneo). *Int. Dent. J*. 1996; 46: 572-8.
36. Pegoraro LF, Scolaro JM, Pegoraro TA. Noncarious cervical lesions in adults: Prevalence and occlusal aspects. *J Am Dent Assoc*. 2005; 136: 1-7.
37. Khan F, Young WG, Shahabi S, Daley TJ. Dental cervical lesions associated with occlusal erosion and attrition. *Aust Dent J* 1999; 44:176-86.
38. Bergstrom J, Lavstedt S. An epidemiologic approach to toothbrushing and dental abrasion. *Community Dent Oral Epidemiol*. 1979; 7:57-64.
39. Markowitz K, Pashley DH. Personal reflections on a sensitive subject. *J Dent Res* 2007; 86: 292-5.
40. Ramsay DS, Rothen M, Scott JA, Cunha-Cruz J. Tooth wear and the role of salivary measures in general practice patients. *Clin Oral Investig*. 2015; 19: 85-95.
41. Wirdatul RD, Wan Bakar WZ, Husein A, Ismail NM, Amaechi BT. The study of tooth wear patterns and their associated etiologies in adults in Kelantan, Malaysia. *Arch. Orofac. Sci*. 2010; 5: 47-52.