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Frequency of Non-Bacterial Tooth Loss in the Millennial Generation of Rawalpindi and Islamabad, Pakistan

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ABSTRACT

Objective: This study aimed to assess the prevalence of non-bacterial tooth loss mainly attrition, abrasion, abfraction, erosion and acute trauma in the Millennial generation.

Materials and Methods: The study comprised of 500 subjects divided into two groups, namely Group I (23-31 years) and Group II (32-39 years) who were examined in the region of Islamabad and Rawalpindi from September 2019 till January 2020. All subjects were examined with dental mirrors and torchlight to observe tooth wear patterns that included attrition, abrasion, abfraction, erosion and acute trauma. The extent of tooth wear was assessed according to Smith and Knight Tooth Wear Index (1984) and acute trauma with the help of Classification by McDonald (2004).

Results: The prevalence of non-bacterial tooth loss observed was higher in Group I (45 individuals) than in Group II (15 individuals). It was also found to be more significant in females than in males. The percentage of tooth wear patterns observed was as following: Attrition (9.6%), Abrasion (2%), Abfraction (0.2%), Erosion (0.6%) and acute dental trauma (4.2%).

Conclusion: Out of all the tooth wear patterns examined attrition was the most commonly found, mainly in subjects belonging to the underprivileged class. Other tooth wear patterns were not as significant.

Keywords: Millennial Generation, Smith and Knight Index, Tooth Wear

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INTRODUCTION

Tooth loss can manifest as either bacterial or non-bacterial. Bacterial tooth loss refers to dental caries, non-bacterial tooth loss generally pertains to the loss of dental hard tissue due to acute trauma, and tooth wear—an umbrella term encompassing the mechanical processes causing chronic trauma to tooth substance as well as the chemical process of erosion.[1] Hence, tooth wear includes the four processes of attrition, abrasion, abfraction, and erosion.

Attrition is the wearing of teeth caused by tooth-to-tooth contact.[2] While a certain level of attrition normally occurs as a person age (attributed to occlusion and mastication), the process becomes pathologic when tooth loss becomes great enough to affect aesthetics and function.[3] Clinically attrition can appear as large, flat and smooth wear facets on the incisal and occlusal surfaces of teeth.[2] In some instances, loss of cusps and even tooth fracture can occur.[4]

Abrasion is defined as the loss of tooth structure due to the action of an external agent.[2] Clinically, abrasion appears as round ditches around the cervical margins of teeth, commonly described as 'shallow' wedge shaped concavities.[5] Common causes of abrasion include improper tooth brushing especially using a hard-bristled toothbrush, the use of abrasive dentifrices, excessive use of dental floss and/or toothpicks, chewing upon and holding foreign, inedible objects between the teeth, and wearing ill-fitting dental appliances. Other less common causes include nail biting and the presence of intra-oral jewelry such as lip or tongue piercings.[6]

Abfraction is the flexure and failure of dental hard tissues at a location (mostly cervical), away from that of the loading.[7] Its clinical appearance varies from an angular, notch-like depression to a broad dished-out lesion on the facial surfaces of particularly molars and premolars.[8] Abfraction can occur as a result of bruxism, mineral loss occurring cervically due to abrasive agents and also in combination with other dental wear processes like abrasion and erosion.[9]

Erosion is defined as the loss of tooth structure by acids (phosphoric and citric acids). Clinically, an eroded tooth appears pale which later on becomes translucent with large surface concavities. In severe cases, the whole occlusal morphology is affected. Factors that cause erosion can either be intrinsic (ulcers, anorexia, bulimia, GERD) or extrinsic (citrus fruits, pickled food and carbonated drinks). Erosion due to extrinsic factors mostly affects the facial side of the anterior teeth while that due to intrinsic factors commonly affects the palatal surface of the maxillary teeth.[10,11]

Acute dental trauma is the second major cause of non-bacterial tooth loss along with tooth wear. It is defined as the injury sustained by a tooth when a direct force is applied to it. Broadly classified, acute dental trauma would include fractures (breaking away of part of tooth structure), luxation (dislodgement of tooth while still in the socket) and avulsion (displacement of tooth out of the socket).[12] Experiencing a fall, having a traffic accident, playing contact sports or being a victim of violence or abuse are the major causes of acute dental trauma.[13] According to the Dental Trauma Guide, an estimated 50-60% of the world's population has suffered dental trauma at some point in time.[14] This research is limited to dental trauma involving either partial or complete fractures of the crown, only. The current study is focused on the demographic cohort named Generation Y—the Millennial. It generally refers to the people born between 1981 and 1996.[15]

The Millennial generation has a greater propensity towards fast food due to it being readily available.[16] A cross sectional study carried out in Trinidad in 2006, found tooth wear to be common in the Trinidadian population and showed the association between tooth wear and certain dietary habits.[17] However, the study was not specific for any age group. Similarly, research carried out in Malaysia in 2012, showed a high prevalence of tooth loss (erosion) in undergraduate students who frequently consumed acidic food and carbonated drinks.[18] Neither of these studies included all clinical aspects of non-bacterial tooth loss. Our aim is to record the prevalence of all kinds of non-bacterial tooth loss, particularly in the Millennial and determine their relationship to extrinsic causes such as the environment, lifestyle and eating habits.

MATERIALS AND METHODS

This is a descriptive, cross-sectional study carried out on individuals in Islamabad and Rawalpindi. Informed consent was taken from each subject. Sterilized dental mirrors were used along with torch lights to examine the dentition. A 30-item questionnaire was formulated to collect information about the patients. Smith and Knight Index (1984)[19] was used to measure the clinical

variables of tooth wear. Classification by McDonald (2004)[20] was employed to measure the extent of acute trauma.

500 subjects were examined in the study belonging to the millennial generation. Convenience sampling technique was employed to collect the sample. Following are the variables taken as part of the study: Age, Gender, Socio economic status, Presence/absence of a GI disorder, Attrition, Abrasion, Erosion, Abfraction, Acute trauma to the crown, Oral hygiene habits, Para functional habits, Dietary habits.

Inclusion criteria comprises of subjects belonging to the age range of 23 to 39 years with completely erupted permanent dentition, tooth wear including attrition, abrasion, erosion and abfraction was noted as well as acute trauma involving fractures of the crown.

Exclusion criteria comprises of third molars as well as developmental enamel and dentine disorders (Turner hypoplasia, Fluorosis, Amelogenesis imperfecta, Dentinogenesis imperfecta, Dentine dysplasia, and Regional odontodysplasia). Avulsion, luxation and subluxation injuries to the teeth due to acute trauma were also not evaluated in the study.

SPSS version 22.0 was used for analysing the data. Pearson Chi-Squared Tests were carried out to compute the results.

RESULTS

The Millennial generation examined in the study was categorized into two subgroups, Group I (23-31 years) and Group II (32-39 years) as per their ages. Prevalence of tooth wear was found to be higher in Group I (45 individuals) than Group II (15 individuals), in a total of 60 subjects experiencing tooth wear. Frequencies of different tooth wear patterns are shown in Table 1.

Table 1: Frequencies/Percentages of different tooth wear patterns

Tooth wear pattern	Absent	Present	Percentage %
Attrition	452	48	9.6
Abrasion	490	10	2.0
Abfraction	499	1	0.2
Erosion	497	3	0.6

The sample was divided into two groups according to their age groups. 322 were females while 178 were males. The subjects were also classified on the basis of their socio-economic status with 66 being underprivileged, 244 belonging to the middle class and 190 to upper middle class.

With respect to toothbrush bristles, the sample was divided among those who did not brush and those who used hard, medium, soft or extra soft bristles' brushes, respectively. Out of the total, 17 subjects did not brush, 56 subjects used hard toothbrush, 280 used medium, 144 used soft while 3 used extra soft bristle toothbrushes. 154 individuals used dental floss and 70 used Miswaak.

Out of the total, 21 were bruxists, 70 had the habit of clenching, 74 claimed to do nail biting, 91 were toothpick users while 19 used to bite on foreign objects. 60 were smokers, 6 were Naswar (snuff) users, 14 were Paan (betel quid) consumers and 9 used Chalia (betel nut)/Ghutka. 393 were soft drink consumers, 407 consumed citrus fruits/juices and 434 consumed junk food as shown in Table 2.

Table 2: Comparison of tooth wear among the different socio-economic classes and other variables

Variables		Present	Absent	*p*-values
Age	Group I	45	383	≤ 0.01
	Group II	15	57	
Gender	Male	16	162	≥ 0.01
	Female	44	278	
Socio-economic status	Underprivileged	19	47	≤ 0.01
	Middle Class	21	223	
	Upper Middle Class	22	168	
Bruxism		21	479	≤ 0.01
Clenching		70	430	≤ 0.01
Nail Biting		74	426	≤ 0.01

Toothpick Usage	91	409	≥ 0.01
Thumb Sucking	3	497	≥ 0.01
Smoking	60	440	≥ 0.01
Pan Usage	14	486	≥ 0.01
Chalia/Gutka Usage	9	491	≥ 0.01
Soft Drinks	393	107	≤ 0.01
Junk Food	434	66	≥ 0.01
Citrus Fruits/Juices	407	93	≤ 0.01

Out of 500 subjects examined, 48 exhibited attritions with 35 from Group I and 13 from Group II, respectively. 34 females were affected with attrition while 14 males were affected. Fourteen individuals among the underprivileged class and 17 each in the middle class and upper middle class manifested attrition. Out of the total 21 bruxists, 7 exhibited attritions. Five subjects who clenched their teeth once a day, and 4 who clenched twice a day, showed signs of attrition as shown in figure 1

Figure 1: Images showing attrition in the mandibular incisors (both central and lateral)

In Group I, 10 subjects displayed abrasion while no subjects in Group II had the condition. There were 9 females and 1 male. Two of them belonged to the underprivileged class, 3 to the middle class and 5 belonged to the upper middle class. Single cases each were observed in both hard and soft bristles users respectively. However, 8 cases of abrasion were seen in those using medium bristles' toothbrush. There were no cases of abrasion reported in those who brushed every other day or those who did not brush at all, while 3 were reported in those who brushed once daily and 7 in those who brushed twice daily. Subjects who did not floss at all constituted 7 cases of abrasion, while 2 cases and a single case were reported in those who flossed every other day and once daily respectively. Among whom did not use Miswaak, 8 cases of abrasion were seen and single cases each were reported in those who used it every other day or once daily. A total of 3 cases of nail biting were seen out of which 2 did nail biting once a day and a single subject did it twice daily. Similarly, 3 cases of abrasion were seen in those who used tooth pick once a day. With respect to tobacco usage, only 1 case of abrasion was found in a pan consumer and none among those who used Naswar, Chalia/Ghutka or smoked cigarettes. A single case each of abrasion was reported in those who consumed junk food twice daily or did not consume any at all, while 4 were reported in those who consumed it as frequently as 2-3 times a week. Only one subject exhibited abfraction from Group I. No association with para-functional habits is noted.

All three cases of erosion were found in the underprivileged class. A total of 3 cases of erosion were reported out of which 1 subject each claimed to consume citrus fruits/juices and soft drinks 2 to 3 times a month respectively. The remaining 2 subjects, who showed signs of erosion, consumed soft drinks once daily as shown in Figure 2. Scoring of Maxillary and Mandibular teeth for tooth wear according to Smith and Knight Index (1984) is shown in Table 3.

Figure 2: A 32-year-old male exhibiting yellow surface concavities characteristic of erosion

Table 3: Scoring Maxillary and Mandibular teeth for tooth wear according to Smith and Knight Index (1984)

Tooth	Code 0	Code 1	Code 2	Code 3	Code 4	Mean (SD)
Right Maxillary Central Incisor	478	16	6	0	0	0.06
Right Maxillary Lateral Incisor	488	7	5	0	0	0.03
Right Maxillary Canine	496	2	2	0	0	0.01
Right Maxillary First Premolar	499	1	0	0	0	0.00
Right Maxillary Second Premolar	498	2	0	0	0	0.00
Right Maxillary First Molar	497	2	1	0	0	0.01
Right Maxillary Second Molar	499	1	0	0	0	0.00
Left Maxillary Central Incisor	477	16	7	0	0	0.06
Left Maxillary Lateral Incisor	490	6	4	0	0	0.03
Left Maxillary Canine	497	1	2	0	0	0.01
Left Maxillary First Premolar	499	1	0	0	0	0.00
Left Maxillary Second Premolar	499	1	0	0	0	0.00
Left Maxillary First Molar	499	1	0	0	0	0.00
Left Maxillary Second Molar	499	1	0	0	0	0.00

Left Mandibular Central Incisor	450	31	16	3	0	0.14
Left Mandibular Lateral Incisor	462	22	16	0	0	0.11
Left Mandibular Canine	486	6	8	0	0	0.04
Left Mandibular first Premolar	494	3	3	0	0	0.02
Left Mandibular Second Premolar	495	3	2	0	0	0.01
Left Mandibular First Molar	495	4	1	0	0	0.02
Left Mandibular Second Molar	497	1	2	0	0	0.01
Right Mandibular Central Incisor	453	29	14	4	0	0.14
Right Mandibular Lateral Incisor	457	27	14	2	0	0.12
Right Mandibular Canine	483	9	7	1	0	0.05
Right Mandibular First Premolar	495	3	2	0	0	0.01
Right Mandibular Second Premolar	495	4	1	0	0	0.01
Right Mandibular First Molar	495	4	1	0	0	0.02
Right Mandibular Second Molar	497	1	1	1	0	0.01

Out of the total teeth examined, a mere 21 teeth were found to be affected with acute trauma as shown in figure 3 whereas scoring for acute trauma according to Classification by McDonalds is shown in Table 4.

Figure 3: Acute trauma of the right central incisor in 23 years old female

Table 4: Scoring Maxillary/Mandibular commonly affected teeth for acute trauma according to Classification by McDonalds

Tooth	Class 1	Class 2	Class 3	Class 4
Right Maxillary Central Incisor	5	0	0	0
Right Maxillary Second Premolar	1	0	0	0
Left Maxillary Central Incisor	4	1	1	0
Left Maxillary Second Premolar	1	0	0	0
Right Mandibular Central Incisor	1	1	0	0
Left Mandibular Central Incisor	3	0	0	0
Left Mandibular First Molar	3	0	0	0

DISCUSSION

Tooth wear is a general term, describing the loss of dental hard tissues from the surfaces of teeth.[21] Previously, it had been proved that non-bacterial tooth loss is more prevalent in adults with mean age ranging from 30 to 80 years.[22] Majority of the studies carried out in the past focused only on a single process of tooth wear.[8,18] Therefore, the purpose of our research is to determine all kinds of non-bacterial tooth loss in a specific age group, the Millennial. It was observed that females exhibited a higher frequency of tooth wear comprising 45 females (13.97%) as opposed to 17 males (9.55%). This is in contrast to a study carried out in Northern Saudi Arabia where tooth wear was predominantly found in males.[23]

Attrition occurred significantly higher than other tooth wear processes with a frequency of 48 individuals (9.6%) out of which Group I comprised of 35 subjects and Group II of 13 subjects. Socio-economic status had a significant effect on the results with 21.2% of the underprivileged class being affected, 6.9% of the middle and 8.9% of the upper-middle class displaying attrition. A statistically insignificant relation was seen with respect to the para-functional habits of bruxism and clenching. 33.3% of the bruxists and 12.8% of those who clenched their teeth with an equal frequency of either once or twice daily exhibited attrition.[23]

With regards to the oral hygiene habits, 3 subjects (1.92%) who brushed their teeth once a day while 7 (2.4%) of those who brushed twice daily showed abrasion. However, conflicting evidence was found in a study carried out amongst adolescents in China.[24] The difference may be due to the fact that their study was carried out on subjects who were of the ages 12 and 15 and ours specifically focuses on the millennial generation. All the cases of abrasion were found in toothpaste users as opposed to tooth powder users. This concurs with the results of a previous study carried out in London.[25] When questioned about the toothbrush bristles, 1.7% of the subjects use hard bristles toothbrush, 2.8% used a medium one while 0.69% used the soft bristles brush which is an insignificant finding. This result is similar to another research carried out by Luis A. Litonjua, where the most common cause of abrasion was faulty tooth brushing technique probably related to the frequency, bristle design and abrasive dentifrices.[26] Similarly, the usage of dental floss

equalled to 3.4%. Subjects who were found to be smokers had no apparent abrasion and/or erosion. smokeless tobacco (Naswar, Chalia/Ghutka) use had no correlation with abrasion was found.

Abfraction was the least observed out of all the tooth wear patterns examined. The only case which exhibited abfraction was on a central incisor, similar to a study carried out on US veterans in 2001, in which Non-Carious Cervical Lesions (NCCLs) predominated in the anterior and premolar teeth due to them being smaller in size.[27,28]

In previous studies, erosion has been linked to the presence of gastro-intestinal disorders and the consumption of citrus fruits and carbonated drinks, especially when taken in excess.[17,23] However, in the current study only 3 subjects showed erosion with no relation to the aforementioned factors.

Acute trauma was more prevalent in maxillary central incisors as compared to mandibular central incisors in the millennial generation. Other teeth showed no significant trauma. No major difference between the two genders was found with 4.3% cases in females and 3.9% in males, similar to a study carried out in Damascus.[29]

CONCLUSION

Out of all the tooth wear patterns examined attrition was the most prevalent. It was mainly found in subjects belonging to the underprivileged class. Other tooth wear patterns were not as significant. Factors such as para-functional habits, diet and oral hygiene habits may be associated with the tooth wear patterns but no conclusive evidence was found.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

FUNDING DISCLOSURE

AUTHORS CONTRIBUTION

Conception and design of the study: R. Masood

Acquisition of data: H. Ahmed, F. Aftab, A. Noor, M. Khanzada, S. Amjad

Analysis and interpretation of data: R. Masood, H. Ahmed, F. Aftab, A. Noor, M. Khanzada, S. Amjad

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