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JOURNAL OF WOMEN MEDICAL & DENTAL COLLEGE

The Severity of Tooth Surface Loss in Adult Patients Presenting to a Private Dental Hospital

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Abstract

This study aimed to assess the severity of tooth surface loss (TSL) in adult patients at a private dental hospital for 6 months. This research explored the severity of TSL using the Smith and Knight Tooth wear index (TWI). Study participants underwent intraoral examination in dental chairs with adequate lighting using a mouth mirror. Prior to examination, sterile cotton swab was used to clean and dry the teeth and to eliminate any plaque residue. Each tooth surface (buccal, lingual, cervical and occlusal/incisal) were evaluated using the TWI and documented on the research proforma. Only the most affected teeth and teeth surfaces were noted in a patient. A total of 320 patients were observed between ages (18-40 years), out of which 140 had tooth wear according to TWI. The male patient had a ratio of 40.91% while female were 50.08%. The mandibular anterior teeth had score 2 in 97.1% of the patients and maxillary premolars had score 1 and 2 which were 96.4% and 92.9% respectively. The occlusal surface was involved in 58% of maxillary teeth and 100% in mandibular teeth. Our study indicates that the mandibular anterior occlusal surfaces are particularly susceptible to the impacts of tooth wear. This may lead to aesthetic concerns, exposure of pulp with advanced wear and occlusal imbalance, which will require extensive treatment. Hence, it is imperative to raise awareness among individuals regarding the early indicators and symptoms of tooth wear.

1. Introduction

Tooth surface loss (TSL), commonly known as tooth wear (TW), refers to the permanent reduction of dental hard tissue due to non-carious factors that combine to result in the deterioration of the tooth structure (1). It can be physiological, occurring as a result of normal mastication, or pathological, characterized by abnormal destruction that may require treatment (2). Excessive Tooth surface loss (TSL) results in hypersensitive teeth and exposure of dentin and pulp, leading to esthetic issues due to the loss of vertical dimension of occlusion and reduction in tooth size (3).

It is a global dental issue, with high prevalence in various populations worldwide. The World Health Organization has also included it as an important oral health indicator (4). In the initial phases of tooth wear, patients may not experience symptoms, later, it can lead to discomfort during eating, drinking, or tooth brushing. Over time, this discomfort can worsen, resulting in spontaneous pain or pulp necrosis. Patients usually seek help due to pain, changes in function, and dissatisfaction with their appearance (5).

Accurate evaluation of the degree of tooth wear is critical for developing effective interventions, in a study it was noted that TSL typically is symmetrical in both the upper and lower teeth (6). A research study involving Dutch adults examined how age, gender, and socioeconomic status influence the severity of tooth surface loss (TSL). They divided the participants into five age groups: (25-34, 35-44, 45-54, 55-64, and 65-74 years). The findings showed that 13% had mild TSL, 80% had moderate TSL, and 6% had severe TSL. Individuals from low socioeconomic and men showed greater severity in tooth surface loss compared to their counter parts. Mild to

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moderate tooth wear was found to be common and increased with age (7). In a Pakistani study, it was reported that tooth wear impacts the occlusal surface of molar teeth more as compared to the cervical surfaces followed by the incisors (8). Another study indicated that non carious cervical lesions mainly affects molars and premolars (9). The causes mainly include age, diet, medications, chemical insults, pathologies, poor oral hygiene, consumption of carbonated drinks, and cultural practices like beetle nut chewing and dental habits including attrition, abrasion, erosion and abfraction (8, 9). The study referenced employed the TWI by smith and Knight to assess and quantify tooth patterns and leisions. For detection of TSL different indices are used which include Basic Erosive Wear Examination, Visual Analog Scale, Index of Tooth Erosion and Wear,10 Tooth Wear Index by Smith and Knight. The Smith and Knight index holds a significant importance in the examination of tooth wear as it is more practical and clinically relevant (3,11). Minor cases of tooth wear may not require restorative treatments, severe or rapid wear may require intervention using composites or crowns. However, these restorative interventions may not be affordable for all patients, leading to burden on economy and on health care system (12).

Assessing the severity of TSL and associated risk factors through studies can aid in improved treatment planning (13). Compared to the west, there have been fewer studies conducted in Asian populations examining the occurrence and intensity of tooth wear (14).

This study aims to investigate severity of tooth surface loss in adult patients presenting to a private dental hospital of Islamabad, Pakistan. By addressing the current gap in knowledge on tooth surface loss in Pakistan, the findings of this research will enable improved patient education and help in the development of appropriate protocols for early interventions which will aid in enhancing oral health and life quality of patients and help reduce burden of disease on health care system.

2. Methodology

This cross-sectional study was conducted at the dental section of Islamabad Medical and Dental College. Ethical approval (Ref: # IMDC/DS/IRB/225 Dated 19th May, 2023) was obtained from the Institutional Review Board of Islamabad Dental Hospital. The data was collected from the outpatient Department of Islamabad Dental Hospital. Participants were recruited via non probability convenient sampling technique which included adults (18-40 years), who were willing to participate and gave consent for the study. The adults with fixed orthodontic appliances, Carious teeth, greater than 50% of restored tooth surfaces, Missing teeth >2 in one quadrant, patients with a fixed partial denture or removable partial dentures and those with developmental defects of teeth were excluded from the study. Participants were briefed about the study's purpose, its methods, the risks and benefits involved and written informed consent was then obtained. Socio-demographic details like age, gender and education level were recorded. Visual dental examination was conducted in dental chair, aided by a mouth mirror and proper lighting. Teeth were cleaned and dried before the examination using a sterile cotton swab to eliminate plaque and debris. The presence or absence of tooth surface loss in the form of dentine exposure, change in tooth color, size and shape was noted by the researcher. If the study participant had TSL, they were examined further to find out the most affected tooth and the most affected tooth surface. The four main surfaces of all teeth (buccal, lingual, cervical and occlusal/incisal) were scored, according to the TWI by Smith and Knight and recorded on proforma and the highest score for each tooth was recorded. Data was encoded, entered and analyzed using SPSS 23. Descriptive statistics were calculated for age, gender and education level. Frequencies and percentages were calculated for the teeth and the tooth surfaces most affected. The score of Smith and Knight index for each tooth and tooth surface was presented in the form of frequency and percentage.

3. Results

The study was carried out in 320 dentate patients between age 18-40 years over a six-month period. Out of these 140 (43.75%) were identified as having tooth wear.

Figure 1 illustrates the age distribution, categorized into younger age (20-30 years) which were 40% of the population and older age (31-40 years) which were 60% of the population. The distribution of gender groups in the population is presented in Figure 2. Tables 1 and 2 provide detailed information about the frequency and percentages of tooth scoring of individual teeth according to smith and knight tooth wear index, in the upper and lower arches, respectively. These results depict that majority of tooth wear is found to be in mandibular anterior and

maxillary posterior teeth predominantly premolars. Additionally, Table 3 and 4 present data regarding the surfaces that were affected by tooth surface loss in both the upper and lower dentition. It shows that occlusal surface was involved in maxillary teeth having score 1 and 2 (70 &60%) respectively. Furthermore in mandibular teeth occlusal surfaces had score 1 and 2 (64% and 75%) respectively.

Table 1: Tooth surface loss on maxillary teeth on basis of Smith and Knight TWI

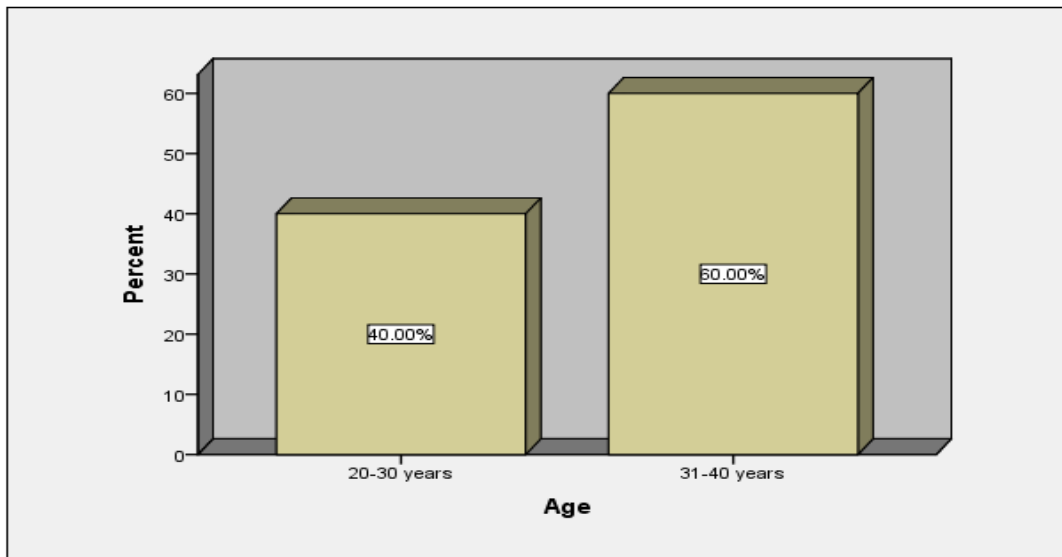| Teeth number (FDI)	Total Teeth	Score 0	Score 1	Score 2	Score 3	Score 4
#16	140	126(90%)	11(7.9%)	2(1.4%)	1(0.7%)	0
#15	140	2(1.4%)	135(96.4%)	2(1.4%)	1(0.7%)	0
#14	140	4(2.9%)	133(95%)	3(2.1%)	0	0
#13	140	1(0.7%)	132(94.3%)	7(5%)	0	0
#12	140	124(88.6%)	8(5.7%)	7(5%)	1(0.7%)	0
#11	140	130(92.9%)	8(5.7%)	1(0.7%)	1(0.7%)	0
#21	140	121(86.4%)	8(5.7%)	10(7.1%)	1(0.7%)	0
#22	140	0	133(95%)	7(5%)	0	0
#23	140	1(0.7%)	133(95%)	5(3.6%)	1(0.7%)	0
#24	140	3(2.1%)	7(5%)	130(92.9%)	0	0
#25	140	3(2.1%)	9(6.4%)	128(91.4%)	0	0
#26	140	3(2.1%)	133(95%)	3(2.1%)	1(0.7%)	0

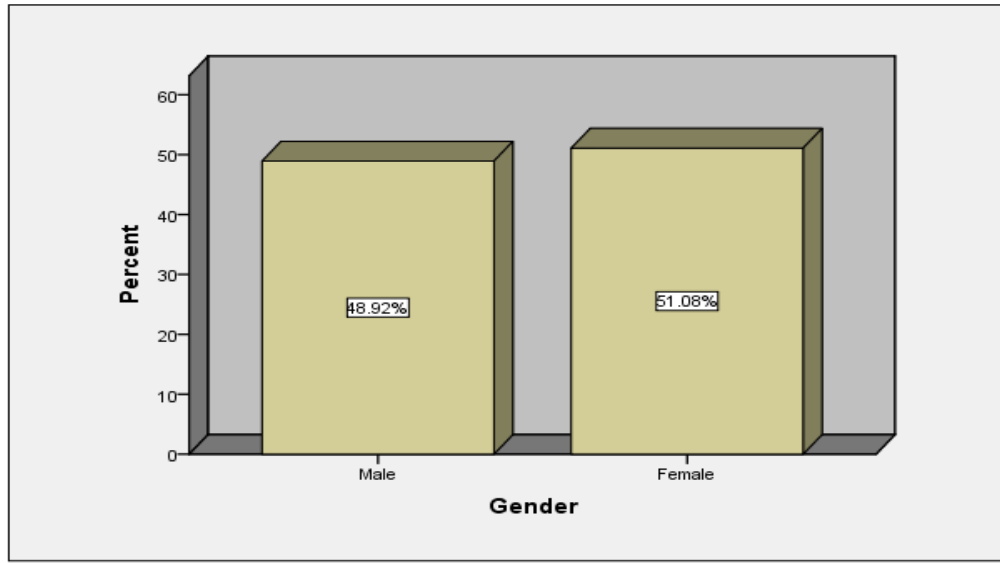**Figure 1:** Distribution of age groups of study population

Figure 2: Gender distribution of study population

Table 2: Tooth surface loss on mandibular teeth on basis of Smith and Knight TWI

Teeth Number (FDI)	Total Teeth	Score 0	Score 1	Score 2	Score 3	Score 4
#36	140	3(2.1%)	135(96.4%)	2(1.4%)	0	0
#35	140	2(1.4%)	137(97.9%)	1(0.7%)	0	0
#34	140	2(1.4%)	135(96.4%)	3(2.1%)	0	0
#33	140	3(2.1%)	125(89.3%)	12(8.6%)	0	0
#32	140	1(0.7%)	3(2.1%)	136(97.1%)	0	0
#31	140	1(0.7%)	3(2.1%)	136(97.1%)	0	0
#41	140	1(0.7%)	3(2.1%)	136(97.1%)	0	0
#42	140	3(2.1%)	4(2.9%)	133(95%)	0	0
#43	140	2(1.4%)	127(90.7%)	11(7.9%)	0	0
#44	140	2(1.4%)	132(94.3%)	6(4.3%)	0	0
#45	140	4(2.9%)	132(94.3%)	3(2.1%)	1(0.7%)	0
#46	140	4(2.9%)	131(93.6%)	5(3.6%)	0	0

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Table 3: Surfaces of maxillary teeth involved in tooth wear

Teeth Surfaces	Total Teeth	Score 0	Score 1	Score 2	Score 3	Score 4
Buccal	140	136 (97.1%)	3 (2.1%)	1(0.7%)	0	0
Occlusal	140	3(2.1%)	70(50%)	60(42.9%)	7(5%)	0
Cervical	140	77(55%)	60(42.9%)	3(2.1%)	0	0
Lingual	140	3(2.1%)	125(89.3%)	12(8.6%)	0	0

Table 4: Surfaces of mandibular teeth involved in tooth wear

Teeth Surfaces	Total Teeth	Score 0	Score 1	Score 2	Score 3	Score 4
Buccal	140	3 (2.1%)	136 (97.1%)	1(0.7%)	0	0
Occlusal	140	0	64(45.7%)	75(53.6%)	1(0.7%)	0
Cervical	140	80(57.2%)	57(40.7%)	3(2.1%)	0	0
Lingual	140	125(89.3%)	3(2.1%)	12(8.6%)	0	0

4. Discussion

Tooth surface loss is now recognized as a significant clinical concern, especially within the aging population. It is considered among the four risk factors for poor esthetics alongside acute trauma, the decrease in vertical dimension, and issues like caries and periodontal diseases, all impacting the longevity and functionality of human dentition. The rise in TSL is becoming increasingly worrisome, prompting a demand for greater understanding of this issue among clinicians who care for patients with TSL, researchers who conduct related studies, and the general public. This study aimed to evaluate the degree of tooth surface erosion within the adult population. This assessment aims to enhance patient education and facilitate the implementation of suitable interventions, ultimately improving their quality of life.

Many dental healthcare providers typically emphasize prevention by focusing on early signs of tooth wear. Prevention is crucial across all stages of tooth wear, spanning from initial surface wear to severe cases. While early intervention receives significant attention, it's essential to remember that offering preventive advice, regardless of the severity, can curb further progression. Interventions include complete or partial coverage crowns.

In the current study, it is clear that TSL is more prevalent in the elder age bracket (60%) in contrast to the younger age group (40%). These findings align with previous research (3, 6, 8, 9, 13) which has consistently indicated that tooth wear tends to be more prevalent in older age groups than in younger ones. In a study conducted among a Yemeni population, it was observed that the prevalence of tooth wear reached 100% in the age bracket of 31-50 years, whereas it was 60% among individuals in the age group of 20-30 years.3 This phenomenon can be attributed to an innate natural progression occurring throughout one's lifetime, resulting in a gradual increase in tooth wear. As a result, this gradual process contributes to the decline of teeth in terms of their functionality, structure, and visual appeal.

The current study reveals a higher prevalence of TSL in the female population (51.08%) when compared to males (48.92%). Conversely, Shrestha et al.'s research on tooth wear prevalence reported no significant difference in tooth wear between males and females. 13 A study in the eastern province of Saudi Arabia showed that male have more tooth wear compared to females.6 The reason behind this discrepancy could be attributed to the significant difference in masticatory

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forces between males and females. However, our study's findings contrast with this observation, potentially due to variations in the ethnic composition of the study population, as well as the possibility that a greater number of females were included in our sample during that particular period.

In this study, it was noted that maxillary premolars exhibited more wear, while among mandibular teeth, the anterior ones showed a greater impact from tooth wear. According to the Smith and Knight TWI scoring system, score 2 was the most prevalent in mandibular anterior teeth, while score 1 was more common in maxillary premolars.8 These findings are in line with several other studies8,9,13 that have also indicated a greater occurrence of wear in anterior teeth compared to posterior ones. This pattern can be attributed to the thin incisal edges of anterior teeth, which are actively involved in both lateral jaw movements and the mastication process.

These results align with an earlier research study9 which noted TSL in both premolars on the right and left sides, with the predominant score being score 1. Pathological tooth wear tends to escalate as individuals age, indicating its correlation with the aging process. As people grow older, the guidance provided by the canines is gradually replaced by a group function due to the natural wear and tear of the canines. This transition results in heightened wear towards the posterior teeth. While front steering can help mitigate the risk of rear tooth wear, it can also elevate the likelihood of wear on the anterior teeth.

Furthermore, the research findings also confirmed that the occlusal surface was the most frequently affected, aligning with the results of a previous studies.8,9 These tooth surfaces are actively engaged in the process of chewing and occlusal patterns.

5. Limitations

The age ranges and sample size included were limited, and it is recommended to expand them to provide a more comprehensive view. This expansion would involve including participants from a wider age spectrum for a more representative sample. Secondly, the study was restricted to a single geographic zone. To enhance the findings' generalizability, it's advisable to extend the research to include a more diverse set of geographic areas. Furthermore, the study did not cover all aspects of tooth wear and possible risk factors associated with them.

6. Conclusion

Our study indicates that the mandibular anterior occlusal surfaces are particularly susceptible to the

impacts of tooth wear. This may lead to aesthetic concerns, exposure of pulp with advanced wear and occlusal imbalance, which will require extensive treatment. Hence, it is imperative to raise awareness among individuals regarding the early indicators and symptoms of tooth wear.

Conflict of Interest The author has indicated that they have no competing interests or conflicts of interest.

Acknowledgments We are grateful to all the participants who willingly participated in the study.

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