A Clinical Study to Evaluate Tooth Wear and Its Score Most Commonly Prevalent among Patients Using Smith and Knight's Index-A Cross-Sectional Survey

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ABSTRACT:

PURPOSE:

In the field of dentistry, tooth wear has been recognized as a growing oral health problem in children, adolescents, and the elderly; Tooth wear is a normal physiologic phenomenon, where, the teeth although worn remain functional throughout life until it becomes pathological via pulpal exposure. The aim of this study is to evaluate the tooth wear and its score most commonly prevalent among patients using Smith and Knight's index

MATERIALS AND METHODS:

The patients included in this survey were the dentate and partially dentate patients reporting to the department of prosthodontics at Adhiparasakthi Dental College and Hospital. All the teeth present are scored for wear according to the Smith and Knight's index, irrespective of how it occurred. The one with the greatest occurrence is recorded.

RESULTS:

150 individuals were randomly selected and all the surfaces of the teeth were examined clinically and the scores were recorded. After evaluation, results illustrate that the highest grade of tooth wear recorded was grade 2(47.5%) followed by grade 1(36.8%), grade 3(9.6%), grade 0(4.6%,) and grade 4(1.5%).

CONCLUSION:

There is reasonably strong evidence to suggest that tooth wear is an age-related phenomenon. The presence of dentinal hypersensitivity is found to be more common at the initial stages of tooth wear. As the severity increases, patients become more and more concerned about the condition and seek treatment.

SOURCE OF SUPPORT: Nil
CONFLICT OF INTEREST: None

Keywords: Tooth wear, Attrition rate, Smith and Knight's index.

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INTRODUCTION:

The loss of dental hard tissue caused by a chemical or mechanical process without the participation of microorganisms is known as tooth wear.[1] They have polished flat, rounded, sharply angled, or angular surfaces on the occlusal or incisal surfaces of the teeth, which may result from severe degradation from one tooth rubbing against another. Other variables that lead to the delamination of the occlusal and incisal surfaces include erosion and abrasion. When it comes to preserving the general long-term health of dentition, tooth wear in any form, including attrition, erosion, and abrasion, which was once thought to be a natural physiological phenomenon, is reaching its peak.[2]

The prevalence of tooth wear varies from person to person thereby, varying widely among populations. The amount and severity of tooth wear are in increasing trend due to an increase in the number of elderly people due to a decrease in mortality rate with the increase in the standards of life.[3] Although tooth wear can happen as a result of the natural aging process, it can also be exacerbated by the presence of various parafunctional habits like bruxism, malocclusion, consumption of carbonated beverages, stress, etc. Early detection of wear is crucial since the irreversible and multifaceted characteristics of the tooth wear process make it among the most difficult disorders to manage.[4]

The dentin may become exposed as a result of tooth wear, which can cause dentinal hypersensitivity and impair chewing ability. Serious implications from severe tooth wear include pulpal pathology, occlusal dysfunction, reduced function, and cosmetic disfigurement. To cure severe tooth deterioration, complex full-mouth dental rehabilitations may occasionally be required. Early detection of wear is crucial since the irreversible and multifaceted characteristics of the tooth wear process make it among the most difficult disorders to manage.[5]

Thus, it is crucial and vital to include early diagnosis, treatment, and preventative care and finally to create awareness among the subjects of these lesions in daily practice. In this study, the Smith and Knight tooth wear index was used for assessing the prevalence of tooth wear and the most common score among the subjects. The results of this study will be useful in creating awareness among the subjects, thereby organizing the essential preventive and therapeutic strategies for tooth wear.

Hence, the present study was planned with the following aim and objectives

AIM AND OBJECTIVES:

➢ To assess the prevalence of tooth wear using Smith and Knight's Tooth wear Index.
➢ To determine the most common score prevalent among the patients using Smith and Knight's Tooth wear Index.

MATERIALS AND METHODS:

BACKGROUND OF THE STUDY:

The current cross-sectional study was carried out amongst the patients reporting to the department of Prosthodontics, Adhiparasakthi Dental College, and Hospital using Smith and Knight's tooth wear Index. Adhiparasakthi Dental College and Hospital served as the recruitment site for the

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study's participants. This cross-sectional study was done during the period of July 2022 to October 2022.

ETHICAL CLEARANCE:

The Institutional Review Board, Adhiparasakthi Dental College, and Hospital approved a thorough study protocol outlining the goals and methodology of the investigation. Once the study had obtained ethical approval, it commenced assessing the Patients reporting to the department of Prosthodontics, Adhiparasakthi Dental College and Hospital.

SAMPLE SIZE DETERMINATION:

The sample size of the study was determined using single proportion formula, based on the proportion of tooth wear pattern from a previous study (Mohammed G. Al-Azawi,2014)

The software received the following inputs: the alpha error was set at 5% (0.05), the power of the research was set at 80% (0.08), and the effect size was set at 0.226. The predicted sample size was 148. In order to account for potential dropouts, the sample size was increased to 150.

Thus,150 participants were thus chosen for the study.

In order to choose 150 samples from the Adhiparasakthi Dental College and Hospital, a conventional random sampling procedure was used.

MATERIALS:

1. Mouth Mirror

2. Explorer

3. Cotton Rolls

METHODS:

A cross-sectional study of the oral health condition of dentate and partially dentate patients regarding tooth wear was conducted from the month of July to October in the department of Prosthodontics at Adhiparasakthi dental college and Hospital.

The population included in the sample was examined the tooth wear on the four visible surfaces:

➢ Buccal
➢ Cervical
➢ Lingual
➢ Occlusal
➢ All the teeth present are scored for wear, irrespective of how it occurred.
➢ If in doubt, the one with the least score is taken.
➢ The highest value/score is calculated for every person examined by taking the values of all the teeth examined.
➢ The number of patients with tooth wear and their score is tabulated.

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➤   Intra and inter-calibration errors were excluded since the entire research was examined and tabulated by a single observer to ensure the proper application of diagnostic criteria and to obtain utmost accuracy.

Thereby, this study assesses the mean tooth wear score commonly present in the general dental population using statistical analysis

ELIGIBILITY REQUIREMENTS:

INCLUSION STANDARDS:

1) Dentate and partially dentate patients

2) Age>20 years

3) Willingness to consent and comply with the study protocol.

EXCLUSION STANDARDS:

1) Missing>14

2) Age<20 and >80

3) Adults with fixed orthodontic appliances.

DESIGN PRINCIPLE OF USING TOOTH WEAR INDEX:

PRINCIPLE:

Tooth wear indices are the only accurate method for determining changes to teeth in large populations.[6] The majority of indices measure wear by noting changes in the physical appearance of teeth. Some indices evaluate tooth wear on each tooth's surface, while others use certain places or surfaces.[7] The tooth wear index (TWI), created by Smith and Knight, is a comprehensive method that scores for wear on all teeth's four visible surfaces (occlusal/incisal, buccal, cervical, and lingual), regardless of how the wear occurred. The capacity to differentiate between normal and pathological levels of wear was another ground-breaking characteristic of this index, which was the first one created to measure and monitor multifactorial tooth wear. The TWI has certain drawbacks, though, including the length of time required to apply to an entire dentition, the volume of data produced, and comparisons with threshold values for each age group. The thresholds considered were high, erring more toward understating than highlighting pathological wear. Without computer aid, it is not possible to fully utilize the index as a research tool.[8]

TEST ENVIRONMENT:

Clinical examination was performed by a single observer (Dentist) inside the institution with the aid of a dental mirror and explorer. Teeth were dried using cotton rolls. The surfaces of all teeth were scored according to the tooth wear index by Smith and Knight Criteria.

SCORING CRITERIA:

SCORE	SURFACE	CRITERIA
0	B/L/O/I	NO LOSS OF ENAMEL SURFACE CHARACTERISTICS

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|	C	NO LOSS OF CONTOUR
1	B/L/O/I	NO LOSS OF ENAMEL SURFACE CHARACTERISTICS
	C	MINIMAL LOSS OF CONTOUR
2	B/L/O	LOSS OF ENAMEL EXPOSING DENTIN FOR LESS THAN 1/3rd OF THE SURFACE
	I	LOSS OF ENAMEL JUST EXPOSING DENTIN
	C	DEFECT LESS THAN 1 mm DEEP
3	B/L/O	LOSS OF ENAMEL EXPOSING DENTIN FOR MORE THAN 1/3rd OF THE SURFACE
	I	LOSS OF ENAMEL AND SUBSTANTIAL LOSS OF DENTIN
	C	DEFECT LESS THAN 1-2mm DEEP
4	B/L/O	COMPLETE ENAMEL LOSS-PULP EXPOSURE-SECONDARY DENTIN EXPOSURE
	I	PULP EXPOSURE OR EXPOSURE OF SECONDARY DENTIN
	C	DEFECT MORE THAN 2 mm DEEP-PULP EXPOSURE-SECONDARY DENTIN EXPOSURE

RESULTS:

In this study, not all the randomly selected individuals were involved in the study as those who were partially edentulous with missing teeth more than 14 and those aged less than 20, and those aged more than 80 were excluded from the study. Of the randomly selected 164 individuals,14 was excluded and the remaining 150 individuals were examined clinically to evaluate tooth wear. Among the 150 individuals,76 were males and 74 were females.

4200 teeth were examined and the remaining 531 teeth were neglected due to restoration, caries, and Prosthesis. Each tooth was examined on all four surfaces which include Buccal, lingual, occlusal/incisal, and cervical aspects. Thereby, for the selected 4200 teeth,14676 surfaces were examined. They were scored from grades 0-4 based on the Smith and Knight's tooth wear index. The values obtained were tabulated and evaluated.

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THE TOTAL NUMBER OF PATIENTS SELECTED	150
NUMBER OF TEETH EXAMINED / PERSON	28
NUMBER OF SURFACES EXAMINED/TOOTH	4
THE TOTAL NUMBER OF TEETH TO BE EXAMINED	4200
THE TOTAL NUMBER OF SURFACES TO BE EXAMINED	16800
THE TOTAL NUMBER OF TEETH EXCLUDED	531
THE TOTAL NUMBER OF SURFACES EXCLUDED	2124
THE TOTAL NUMBER OF SURFACES FINALLY EXAMINED	16800-2124=14676

FIGURE1: PERCENTAGE OF OCCURRENCE OF DIFFERENT GRADES
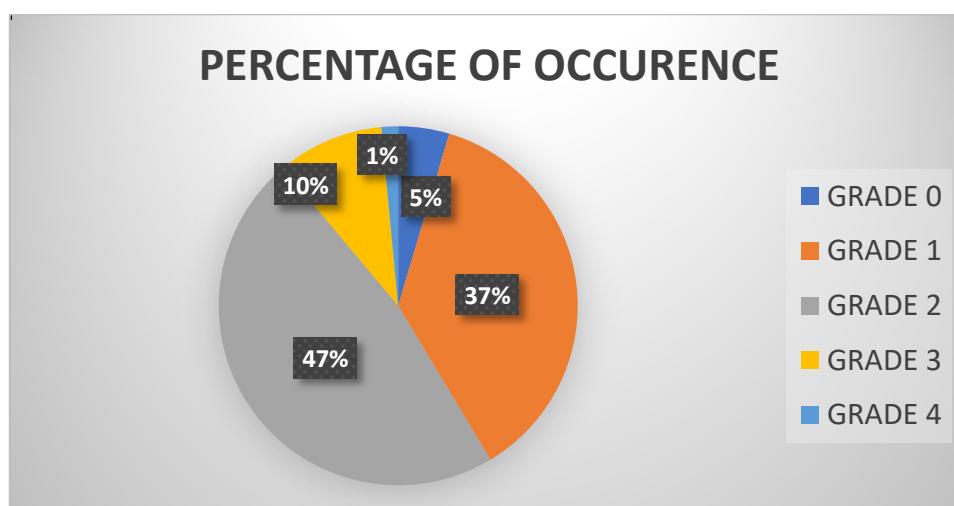
After evaluation, results illustrate that the highest grade of tooth wear recorded was grade 2(47.5%) followed by grade 1(36.8%), grade 3(9.6%), grade 0(4.6%), and grade 4(1.5%). Figure 1)illustrates the percentage of occurrence of different grades. Table 1) illustrates the percentage of occurrence of tooth wear with regard to grade and surfaces.

Figure 2) illustrates the difference in the severity of tooth wear among age groups. A statistically significant difference in tooth wear was recorded between different age groups.

TABLE 1: PERCENTAGE OF OCCURRENCE AND THE NUMBER OF SURFACES RECORDED.

SCORE	PERCENTAGE OF OCCURRENCE	NUMBER OF SURFACES
0	4.60%	671
1	36.80%	5404
2	47.50%	6975
3	9.60%	1402
4	2%	224

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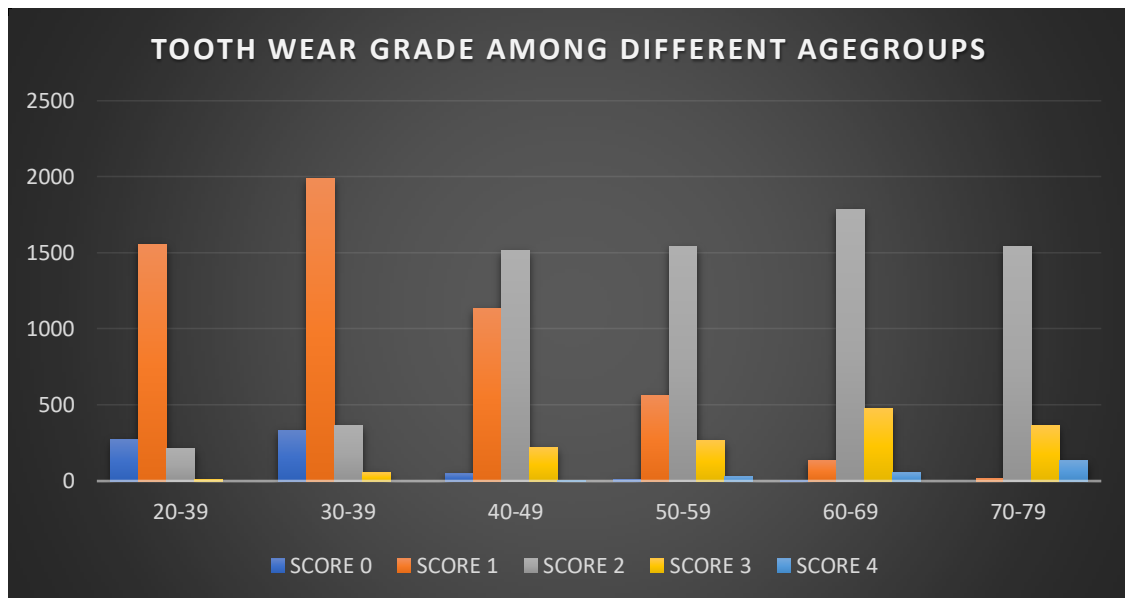
FIGURE 2: DIFFERENCE IN THE SEVERITY OF TOOTH WEAR AMONG AGE GROUPS

ANOVA:

ANOVA					
	SUM OF SQUARES	Df	MEAN SQUARE	F	P-Value
BETWEEN GROUPS	6207144.467	4	1551786.117	6.733	.001
WITHIN GROUPS	5761698.333	25	230467.933		
TOTAL	11968842.800	29			

POST HOC TESTS:

Multiple Comparisons						
(I) grade	(J) grade	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0	1	-788.833	277.169	.122	-1709.55	131.89
	2	-1050.667*	277.169	.019	-1971.39	-129.95
	3	-121.833	277.169	.995	-1042.55	798.89
	4	74.500	277.169	.999	-846.22	995.22
1	0	788.833	277.169	.122	-131.89	1709.55
	2	-261.833	277.169	.923	-1182.55	658.89
	3	667.000	277.169	.248	-253.72	1587.72
	4	863.333	277.169	.075	-57.39	1784.05
2	0	1050.667*	277.169	.019	129.95	1971.39
	1	261.833	277.169	.923	-658.89	1182.55
	3	928.833*	277.169	.047	8.11	1849.55
	4	1125.167*	277.169	.011	204.45	2045.89

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3	0	121.833	277.169	.995	-798.89	1042.55
	1	-667.000	277.169	.248	-1587.72	253.72
	2	-928.833*	277.169	.047	-1849.55	-8.11
	4	196.333	277.169	.972	-724.39	1117.05
4	0	-74.500	277.169	.999	-995.22	846.22
	1	-863.333	277.169	.075	-1784.05	57.39
	2	-1125.167*	277.169	.011	-2045.89	-204.45
	3	-196.333	277.169	.972	-1117.05	724.39
*. The mean difference is significant at the 0.05 level.						

INFERENCE:

On comparing the grades using one-way ANOVA, it shows $F_{(4,25)}=6.733$, $p=0.001$, which conveys that there is a significant difference among the grades.

To know more in detail multiple comparisons have been made which shows the significance as below:

The Scheffe Post hoc Analysis results there is a significance difference among
Grade 2 & Grade 0
Grade 2 & grade 3
Grade 2 & grade 4

Also, the mean difference of grade 2 is seen high when compared to all other grades

DISCUSSION:

A prevalent issue, tooth wear is frequently ignored. The prevalence figures suggest that tooth wear must be the fourth-dimension risk factor for the aesthetics, function, and longevity of the human dentition behind acute trauma, caries, and periodontal disease.[9-11]

Compared to the global population, which is growing at a rate of 1.2% each year, the population of people 65 and older is growing at a rate of 2.3%.[12] Because it affects older people more frequently than younger people, tooth wear is seen as a worldwide issue that is only becoming worse. Wear on the teeth is a physiologic occurrence that comes with aging. With time, tooth surface loss develops and is macroscopically irreversible. A number of pathogenic endogenous and external variables speed up this process.[12,13] According to Lambrechts, normal vertical enamel loss due to physiological wear ranges from 20 to 38 micrometers each year.[14]

In this study, results demonstrate that grade 2 was the highest score, while the least was grade 4. This was in agreement with a study done by AlZarea[15] whose sample's age was from 15-65 among Saudi adults. Similarly, Mohammed G. Al-Azawi[16], in his study to find the distribution of tooth wear among institutionalized residents (50-89 years old) in Baghdad city\ Iraq found grade 2 to be the highest prevalent grade.

The results obtained from the present study were contradictory to the study done by Daly et al[17] who found that the highest grade was grade 1 (81%), among 18-80 years Malizian adults.

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As expected, tooth wear was found in a majority of the individuals. High-risk level of tooth wear increases with age. It was found that the rate of dentin exposure differs between teeth, with more rapid wear occurring in premolars and molars. This might be found to occur due to the chewing tendency of the individuals predominantly in the premolar and molar regions. There is a piece of strong evidence which suggests that the form and the patterning of tooth wear may be functionally related to the habitual modes of tooth use. In addition, it was found that the prevalence and the severity of tooth wear were higher among males compared to females. Serious implications from severe tooth wear include pulpal pathology, occlusal dysfunction, reduced function, and cosmetic deformity. Sometimes complicated complete-mouth dental rehabilitations are necessary to treat severe tooth wear.[18] The challenge facing the dental team is to raise patients' awareness of the problems associated with tooth wear. At an early stage of development, patients with tooth wear might not notice their problem, but some may be concerned with the aesthetics and appearance especially if anterior teeth are involved. Timely diagnosis and preventive care can limit the amount of tooth surface loss and thus creating awareness amongst the general population regarding the ill effects of tooth wear is a must.[19]

FIGURE 3: PROGRESSION OF TOOTH WEAR TO SEVERITY WITH AGE
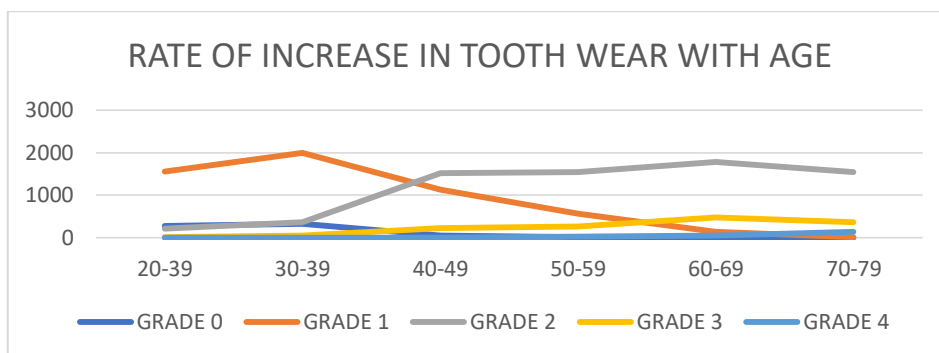
CONCLUSION:

The present cross-sectional study was conducted to find the prevalence of tooth wear and assess the most common grade of tooth wear prevalent among patients during a limited period of time. The study was conducted from the month of July to October in the department of Prosthodontics at Adhiparasakthi dental college and Hospital.

A cross-sectional study consisting of a total of 150 who met the eligibility criteria was included. The study was carried out in a clinical setup to examine the buccal, lingual, occlusal, incisal, and cervical aspects of the teeth and the tooth wear was recorded according to smith and knight's tooth wear index

The results revealed that,

- There is a significant difference noted between the grades and the rate and the severity of tooth wear increases with age.
- Reports shows that grade 2(47.5%) is most commonly prevalent, followed by grade 1(36.8%),grade 3(9.6%),grade 0(4.6%) and grade 4(1.5%).

The prevalence and clinical appearance of tooth wear increase with age. The rate of tooth wear increases with age as it is multifactorial in nature. There isn't currently a perfect index that can be used for epidemiological prevalence studies, therapeutic staging, and monitoring, thus it might be important to recognize that there isn't yet a single index that can satisfy all the needs of clinical and research teams.[20]. There is incomplete knowledge regarding the validity of current diagnostic criteria for different forms of tooth wear. Therefore, further research is needed to aid in diagnosis and validation, so that the incidence and progression of tooth wear to severity can be addressed, prevented, and treated at the earliest.

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