ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at:www.ijdsir.com

Volume – 7, Issue – 1, January - 2024, Page No. :96 - 103

Prevalence of tooth wear in adult population of central Gujarat region: A prospective cohort study

[1]Dr. Meera Shukla, Post graduate student, Department of Prosthodontics, Crown & Bridgework and Oral Implantology, Faculty of Dental science, Dharmsinh Desai University, Nadiad, Gujarat

[2]Dr. Somil Mathur, Professor and Head, Department of Prosthodontics, Crown & Bridgework and Oral Implantology

[3]Dr. Meena Shah, Reader, Department of Prosthodontics, Crown & Bridgework and Oral Implantology

[4]Dr. Thanmai Taduri, Lecturer, Department of Prosthodontics, Crown & Bridgework and Oral Implantology

[5]Dr. Manan Shah, Lecturer, Department of Prosthodontics, Crown & Bridgework and Oral Implantology

Corresponding Author: Dr. Meera Shukla, Post graduate student, Department of Prosthodontics, Crown & Bridgework and Oral Implantology, Faculty of Dental science, Dharmsinh Desai University, Nadiad, Gujarat

Citation of this Article: Dr. Meera Shukla, Dr. Somil Mathur, Dr. Meena Shah, Dr. Thanmai Taduri, Dr. Manan Shah, "Prevalence of tooth wear in adult population of central Gujarat region: A prospective cohort study", IJDSIR- January - 2024, Volume –7, Issue - 1, P. No.96–103.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To assess the amount of tooth wear in dentate individuals of Central Gujarat region.

Materials & Method: A total of 524 participants were evaluated for the presence of tooth wear using the Tooth Wear Evaluation System 2.0 (TWES2.0). This was followed by a questionnaire to evaluate the risk factors associated with tooth wear. Tooth wear was assessed in two phases (i) screening and (ii) detailed tooth wear status. Final diagnosis was made which showed the severity, distribution and diagnosed whether the tooth wear was pathological or not.

Statistical analysis: The data was analyzed using the SPSS version 26.0. Chi-square test was used to find out the co-relation between tooth wear and various contributing factors such as bruxism, dietary habits, certain malocclusion etc.

Results: Out of the 524 participants, mild tooth wear was present in 274 participants, 112 had moderate, 73 had mild and moderate whereas 26 had moderate and severe tooth wear. The distribution was found to be localized in 165, generalized in 251 and both in 69 participants. Men showed more tooth wear than women. Tooth wear was found to be increased with age. Strong co-relation was found between the parafunctional habits, excessive consumption of soft drinks, consumption of alcohol, abrasive cleaning agents and certain malocclusions such as deep bite and angle's class 2 division 2.

Conclusion & Clinical Relevance: Severely worn dentition poses risk of disturbing functional occlusion

and subsequently developing temporomandibular joint disorders. It challenges function and aesthetics. Timely diagnosis and intervention can lower the progression of tooth wear, thereby reducing the risk of developing consequences.

Keywords: Tooth Wear, Soft Drinks, Alcohol

Introduction

Non-carious loss of dental tissue is a normal physiologic process and occurs throughout life. Theteeth undergo erosive, attractive and abrasive changes leading to variable degrees of tooth surface loss. Data on typical (physiological) wear of enamel of the occlusal surfaces of permanent teeth is scarce. Nevertheless, merging the results of these studies reveals that over a span of 60 years, molars show the most wear (1740 µm), followed by mandibular incisors (1460 µm), maxillary incisors and pre-molars (900 µm).[1]Pathological tooth wear is difficult to define and quantify. It is interpreted that the degree of ongoing tooth wear may be so severe that it may result in sensitivity, compromise aesthetics, or give rise to functional problems.

Eccles suggested that the term 'tooth surface loss' (TSL)should be used when a single aetiological factor was often difficult to identify.[2,3]However, Smith and Knight considered that 'TSL' belittled the severity of the problem and therefore, advocated the use of the term 'tooth-wear' to embrace all three a etiological conditions.[3,4]

Tooth wear is a multifactorial process that can lead to non-carious loss of dental hard tissues.[4]Traditionally, the terms erosion, abrasion, attrition and abfraction have been used. These terms specifically reflect the aetiological factors which are associated with the condition.

Attrition is the mechanical wear of the incisal or occlusal surface because of functional or parafunctional movements of the mandible (tooth-to-tooth contacts). It also includes proximal surface wear at the contact area because of physiologic tooth movement.[5] Erosion is the wear or loss of tooth surface by chemical action in the continued presence of demineralizing agent's with low pH. Based on its aetiology, erosion can be intrinsic [eating disorders, gastro-oesophagal reflux Disorder (GERD), pepticulceretc.] or extrinsic. Dahl and Carlsson mentioned about a special type of erosion that is termed as "perimylolysis" or "perimolysis"[6]. It is thought to be caused by low pH along the tongue border accompanied by hyperactivity of the muscles of the tongue.

Abrasion is the abnormal tooth surface loss resulting from direct forces of friction between teeth and external objects or from frictional forces between contacting teeth components in the presence of an abrasive medium. Abfraction may be termed as strong eccentric occlusal force resulting in micro fractures at the cervical area of the tooth causing wedge-shaped defects is termed as abfraction.[5]

The European consensus statement proposed a differentiation between severe tooth wear and pathologic tooth wear. The term severe tooth wear is related to the amount of tooth substance loss and is defined by the highest grade of Tooth Wear Evaluation System (TWES 2.0), whereas the term pathological tooth wear is atypical for the age of the patient, causing pain and discomfort, functional problems, or deterioration of aesthetic appearance.[1]

The prevalence as well as the degree of tooth wear increases with age[7-13]. A recent study among the Dutch adult population revealed that mild to moderate tooth wear is a common condition with its prevalence and extent increasing with age.[1] A similar finding was observed in the United Kingdom as well, where a 2009 survey reported higher prevalence of tooth wear than a

similar survey that was conducted 1998[14].This can partly be explained by the fact that the population is retaining more natural tee thin to old age. However according to many epidemiological studies, over 30% children and adolescents have shown prevalence of erosion in permanent teeth. Robb reported that the prevalence of pathological loss of tooth tissue in patients less than 26 years of age was greater than in many older age groups[15]. The Child Dental Health Survey (1994) confirmed this when 32% of 14-year-olds had evidence of erosion affecting the palatal surfaces of their permanent incisors[16].

Severely worn dentition can pose risk of disturbing functional occlusion and subsequently developing temporomandibular joint disorders and it challenges functions as well as aesthetics. This can affect the quality of life. Patients with severe tooth wear may need complex and extensive restorative care, possibly consisting of full mouth rehabilitation. The nature and extent of these treatment options and the phasing of the care plan for the patient is normally challenging and time consuming. Timely diagnosis and intervention by the clinician can erase the progression of tooth wear, thereby reducing the risk of developing consequences.

Aims and Objectives

The aim of the present study was to assess tooth wear and associated contributing factors in the residents of central Gujarat region.

The objective of the present study was to determine the prevalence and the associated risk factors amongst the population belonging to the age group of 20-40 years in central Gujarat population. The findings of this study will be helpful in planning the preventive as well as treatment measures necessary for reducing tooth wear, hence increasing the longevity of dental hard tissues.

Materials And Methodology

Study sample and recruitment

The present study was a cross sectional study conducted amongst 524 participants belonging to the age group of 20-40 years who visited the out-patient department of Faculty of Dental Science, Dharmsinh Desai University and ND Desai medical college during the months of March 2023 and April 2023. This study was performed in Nadiad, a taluka and administrative center of Kheda district of the central Gujarat region that may be considered as representative of the general population in terms of sociodemographic indicators. The participants were chosen based on the set inclusion and exclusion criteria. Inclusion criteria included participants belonging to age group of 20-40 years and were willing to participate. The exclusion criteria included individuals with missing teeth and individuals with any condition that may cause difficulty in oral examination.

Method

The presence of tooth wear and the risk factors associated with it were assessed with the help of Tooth Wear Evaluation System 2.0 (TWES 2.0)1. Written consent of the participants was obtained before examination. All participants were asked a series of questions regarding their oral hygiene habits, dietary habits, lifestyle, and presence of any para-functional habits. Oral examination was done on a dental chair, with the aid of halogen light, a mouth mirror, a blunt probe, tweezers, disposable gloves, kidney trays and compressed air. Intra oral examination proceeded in an orderly manner from one tooth to adjacent tooth starting from upper right quadrant to lower right quadrant in a clockwise direction. Each tooth was examined for the presence of attrition, erosion, abrasion and abfraction.

Grading and diagnostic criteria

The TWES 2.0 uses a stepwise approach which consists of, 1. A straightforward tooth wear screening part, 2. A more detailed tooth wear status part and 3. The management part. Also, the assessment of pathology from the European Consensus Statement (ECS)2 is included. The European Consensus Statement proposed a differentiation between severe tooth wear and pathological wear.

Tooth wear screening

For tooth wear screening, five-point ordinal scale was used for occlusal/incisal as well as non-occlusal/non-incisal surfaces. The goal was to identify patients with increased levels of tooth wear. Patients with prominent findings will undergo a more detailed and extended examination.

sextant 1	sextant 2	sextant 3
occlusal	occlusal	occlusal
	sextant 2	
	palatinal	
sextant 6	sextant 5	sextant 4
occlusal	occlusal	occlusal

Grading document for tooth wear screening.

The highest grade for each sextant is entered in the form, along with an additional grade for the palatal surfaces of the maxillary anterior teeth (sextant 2). The grades obtained from the tooth wear screening are interpreted as standalone values. No summation was performed.

Tooth wear status

This is an extensive, more detailed second diagnostic stage of Tooth Wear Evaluation System 2.0.Thisstageincludes following steps:

a) A detailed grading

b) Determining etiological factors

c) Determining if the tooth wear is pathological or not.

Grading

To determine the Tooth Wear Status, one individual grade is recorded for each tooth surface (incisal/occlusal, vestibular and oral). The diagnostic form divides the entire dentition into 6 sextants and the individual scores for tooth surfaces i.e., buccal, occlusal/incisal and palatal are recorded. The scores are based on five-point ordinal scale mentioned before: optionally the 8- point occlusal/incisal scale can be used. In contrast to the tooth wear screening, where the highest grade per sextant determines the overall evaluation, here in tooth wear status, the highest grade per tooth decides the overall assessment.

	sextant 1					sextant 2						sextant 3					
buccal																	buccal
occlusal/incisal																	occlusal/incisal
palatinal																	palatinal
maxillary teeth	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	maxillary teeth
mandibular teeth	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	mandibular teeth
lingual																	lingual
occlusal/incisal																	occlusal/incisal
buccal																	buccal
	sextant 6					sextant 5						sextant 4					

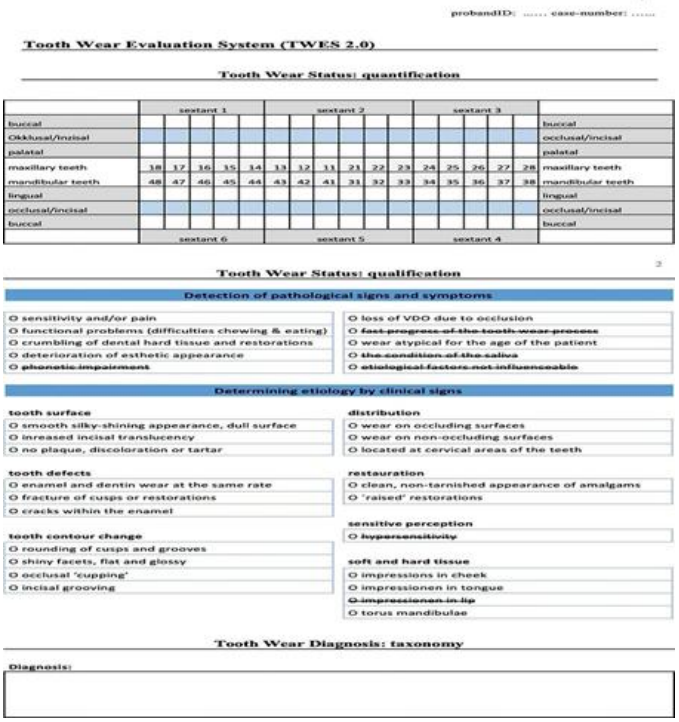
Determining aetiology by clinical signs (Wetselaar, Wetselaar-Glas, Katzer, Ahlers, 2019)

The table of clinical signs comprises of 20 items and is divided into two sections, one indicating chemical tooth wear and the other one indicating mechanical tooth wear. The nature of tooth weare.g.,purely chemical/purely mechanical of the combination of both was decided according to the presence of clinical signs mentioned in the index. If the tooth wears was pathological or not was determined based on the presence of the signs and symptoms mentioned in TEWS2.0.The diagnosis was made based on the taxonomy provided in the TWES 2.0

Documentation

For recording the scores, a structured documentation form designed by TWES 2.0 was used. Patients 'details such as name, age, and gender, contact details and

email-address were entered. The degree of tooth wear, pathological signs as well as etiological factors were determined, and the diagnosis was made according to the taxonomy of tooth wear diagnosis.



probandID: ..... case-number: .....

Tooth Wear Evaluation System (TWES 2.0)

Tooth Wear Status: quantification

	sextant 1					sextant 2					sextant 3					
buccal																buccal
Okklusal/Incisal																occlusal/incisal
palatal																palatal
maxillary teeth	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	maxillary teeth
mandibular teeth	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	mandibular teeth
lingual																	lingual
occlusal/incisal																	occlusal/incisal
buccal																	buccal
	sextant 6					sextant 5					sextant 4					

Tooth Wear Status: qualification

Detection of pathological signs and symptoms

- O sensitivity and/or pain
- O functional problems (difficulties chewing & eating)
- O crumbling of dental hard tissue and restorations
- O deterioration of esthetic appearance
- O phonetic impairment
- O loss of VDO due to occlusion
- O fast progress of the tooth wear process
- O wear atypical for the age of the patient
- O the condition of the saliva
- O etiological factors not influenceable

Determining etiology by clinical signs

tooth surface
- O smooth silky-shining appearance, dull surface
- O inreased incisal translucency
- O no plaque, discoloration or tartar

distribution
- O wear on occluding surfaces
- O wear on non-occluding surfaces
- O located at cervical areas of the teeth

tooth defects
- O enamel and dentin wear at the same rate
- O fracture of cusps or restorations
- O cracks within the enamel

restauration
- O clean, non-tarnished appearance of amalgams
- O 'raised' restorations

sensitive perception
- O hypersensitivity

tooth contour change
- O rounding of cusps and grooves
- O shiny facets, flat and glossy
- O occlusal 'cupping'
- O incisal grooving

soft and hard tissue
- O impressions in cheek
- O impressionen in tongue
- O impressionen in lip
- O torus mandibulae

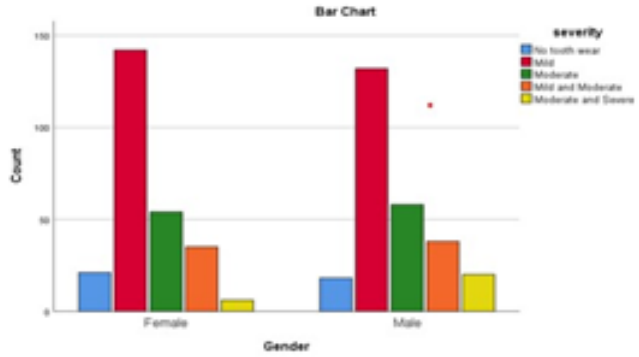
Tooth Wear Diagnosis: taxonomy

Diagnosis:

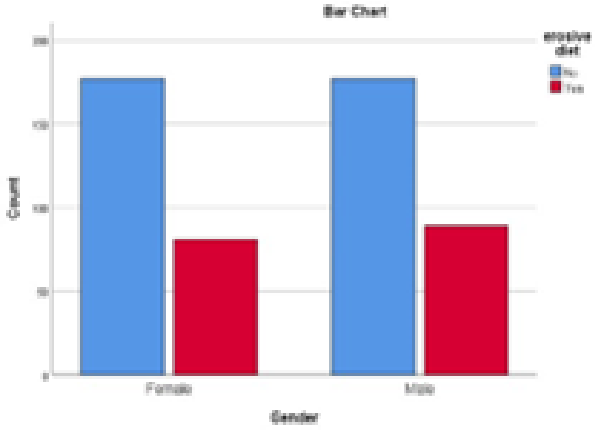
Results

Out of the total sample size of 524 patients with minimum age of 21 years and maximum age of40 years, the mean age of the participants is 28.34 ± 7.298. 258 were males and 266 were females. Out of 524 participants, 39 did not have tooth wear, 165 had localized, 251 had generalized and 69 had both localized and generalized tooth wear. 39 participants did not have tooth wear.

274 showed mild tooth wear, 112 had moderate, 73 had mild and moderate while 26 had moderate and severe tooth wear. Pathological tooth wear was present in 176 participants. In the present study, strong co-relation between severity of tooth wear and gender (graph 1.1, 1.2), para-functional habits (graph 2), erosive diet (graph 3), abrasive cleaning agent (graph 4) and occlusal discrepancy (graph 5.1) was found.

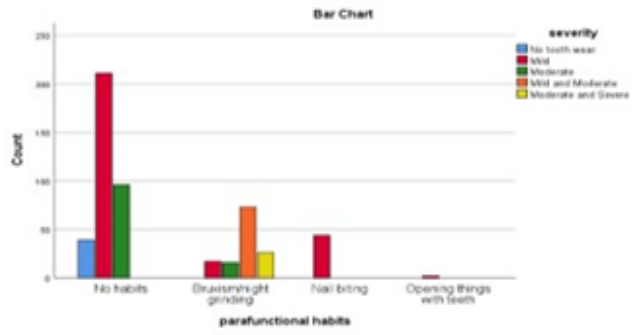


Graph 1.1

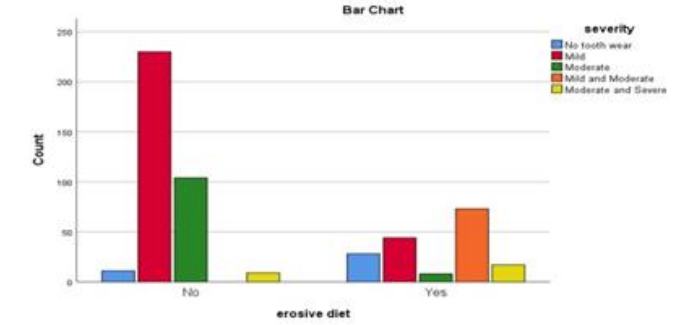


Graph 1.2

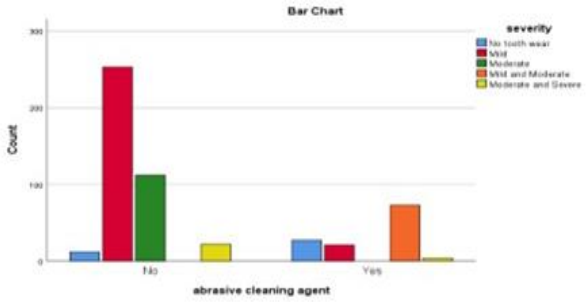
Graphs1.1 and 1.2 show a correlation between gender with severity and erosive diet respectively. A correlation between gender and severity of tooth wear, as well as erosive diet, was found as the p-value<0.05.



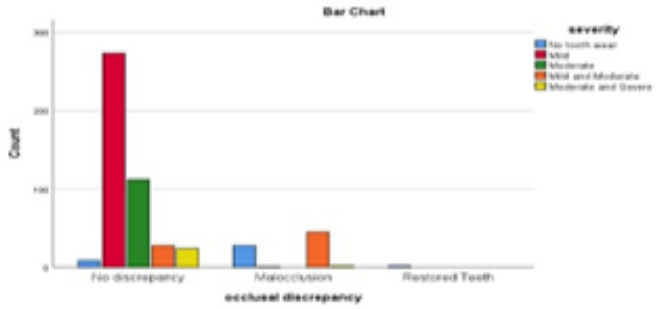
Graph 2: shows an association between para functional habits and severity of defects was found as the p-value < 0.05.



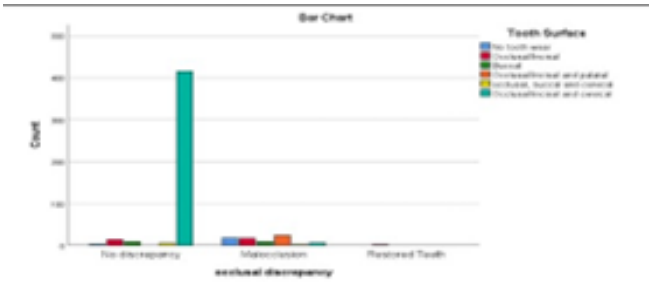
Graph 3: shows an association between erosive diet and severity was found (p-value<0.05)



Graph 4: shows the correlation between abrasive cleaning agent and severity (p-value<0.05)



Graph 5.1



Graph 5.2

Graph 5.1 and5.2: show the association between occlusal discrepancy and severity and the tooth surfaces involved respectively (p-value<0.05).

Discussion

Out of the total sample size of 524 participants, 39 (7.4%) did not have any tooth wear. Mild tooth wear was present in 274 (52.3%) participants, 112 (21.4%) had moderate, 73 (13.9%) had mild and moderate whereas 26 (5%) participants had moderate and severe tooth wear. The distribution was found to be localized in 165(31.5%), generalized in 251 (47.9%) and both in 69 (13.2%) participants.

It was noticed that prevalence of these lesions increased with age. Similar results were found in a study conducted in the United Kingdom by Bartlett et al. in 201117, Ahmed et al. in Pakistan in 200918 and Al-Zarea et al in northern Saudi Arabia in 201219 where the prevalence of tooth wear increases with age.

The increase in tooth wear with age is due to the accumulation of etiological factors which results in increased severity and tooth surface loss over time. The tooth wear was significantly higher i.e., males showed more moderate and severe tooth wear (graph 1.1). With respect to the diet, there is evidence that men consume more acidic drinks than females (graph 1.2), both in adolescents [Hasselkvist et al., 2016]20 as well as adults [Heuer et al., 2015]21, resulting in more (chemical) tooth wear. In addition, it might be hypothesized that men's masticatory muscles exert higher forces [Van der Glas et al., 1996]22, leading to more mechanical wear.

The present study shows a significant correlation between the parafunctional habits such as bruxism, nocturnal grinding and tooth wear (graph 2).The normal vertical loss of enamel due to natural wear was estimated to be about 65 µm/year, while it was found to be 3-4 times higher in bruxers23-24 Tooth wear due to bruxism or mechanical tooth wear showed characteristic clinical signs such as enamel and dentin

wear at the same rate, cracks within the enamel, fracture of cusps and restorations etc. Gastric regurgitation, excessive soft drink consumption and alcohol consumption were also analyzed as they contribute to erosive tooth wear as well.

Participants who gave history of gastroesophageal acidic reflux syndrome showed characteristic erosive patterns on the palatal surfaces of their maxillary anterior teeth. Youngsters who gave history of binge drinking and the frequent vomiting that followed, showed similar kind of erosion. Also, adding soft drinks to alcohol contributes to the erosive (chemical) kind of tooth wear. Excessive soft drinks consumption in both men as well as women also seemed to cause dental erosion (graph 3).

Tooth wear due to erosion or chemical causes also showed characteristic signs such as increased incisal translucency, preservation of enamel cuff at gingival crevice, occlusal cupping, incisal grooving, cratering, rounding of cusps and grooves, raised restorations, etc.Teeth cleaning agents with coarse abrasive particles caused tooth wear at cervical region which is wedge shaped and have small dimensions in terms of depth and width (graph 4). Applying excessive forces during brushing as well as use of hard bristled brush also causes wedge shaped cervical wear. People who applied excessive forces typically showed more tooth wear on the opposite side of their dominant hand. In rural population, use of dant-manjan for teeth cleaning is a common practice. Dant-manjan has more coarse particles when compared to toothpastes.

This caused characteristic wedge-shaped defects at cervical region of the teeth. Participants who presented with malocclusion such as deep bite and Angle's class 2 div 2 showed increased tooth wear typically on the incisal edges of their lower anteriors (graph 5.1, 5.2). Participants who had fixed dental prosthesis with high occlusal points tend to grind their teeth which led to mechanical type of toot wear, muscle fatigue and some of the participants also reported with pain in their temporal region due to the same.

Conclusion

Based on the findings and limitations of this study, it can be concluded that: The main cause of enamel and dentine wear, however, is occlusal contact during chewing and thegosis and is particularly prevalent in sufferers of hyper function such as bruxism. The major influencing factor on all the different mechanisms is the acidity of the oral environment. Oral hygiene habits and the right or left handedness of the patients when toothbrushing affects the prevalence and distribution of non-carious cervical lesions.

Certain malocclusions and occlusal discrepancies due to raised restorations also cause tooth surface loss.

References

1. Loomans B, 'Severe Tooth Wear: European Consensus Statement on Management Guidelines', J Adhes Dent, vol. 19, no. 2, 2017, p. 111-117.
2. Warreth A, 'Tooth surface loss: A review of literature', Saudi Dent J, vol. 32, no. 2, 2020, p. 53-60.
3. Eccles JD, 'Tooth surface loss from abrasion, attrition and erosion', Dent Update, vol. 9, no. 7,1982, p.373-381.
4. Smith BG, 'Some facets of tooth wear', Ann R Australas Coll Dent Surg, vol 11, 1991, p. 37-51.
5. Shellis RP, 'The interactions between attrition, abrasion and erosion in tooth wear', Monogr Oral Sci, vol. 25, 2014, p.32-45.
6. Pindborg JJ. Pathology of the dental hard tissues. Copenhagen: Munksgaard, 1970, p. 294-325.

7. Beyron H, 'Occlusal relations and mastication in australian aborigines', Acta Odontol Scand, vol. 22, 1964, p.597-678.
8. Ekfeldt A, ' An Individual tooth wear index and an analysis of factors correlated to incisal and occlusal wear in an adult Swedish population', Acta Odontol Scand, vol. 48, no. 5, 1990, p.343-349.
9. Hansson T, 'A study of the occurrence of symptons of disease of the temporomandibular joint masticatory musculature and related structures', J Oral Rehabil, vol. 2, no. 4, p. 313-324.
10. Pöllmann L, 'Age and dental abrasion', Gerodontics, vol. 2, no. 2, 1987, p-94-96.
11. Hugoson A, 'Prevalence and severity of incisal and occlusal tooth wear in an adult Swedish population', Acta Odontol Scand, vol. 46, no. 5, 1988, p-255-265.
12. Seligman DA, 'The prevalence of dental attrition and its association with factors of age, gender, occlusion, and TMJ symptomatology', J Dent Res, vol. 67, no. 10, 1988, p.1323-1333.
13. Salonen L, 'Prevalence of signs and symptoms of dysfunction in the masticatory system: an epidemiologic study in an adult Swedish population', J CraniomandibDisord, vol. 4, no. 4, 1990, p. 241-250.
14. Roberson TM Heymann H Swift EJ Sturdevant CM. Sturdevant's Art and Science of Operative Dentistry. 5th ed. Edinburgh: Elsevier Mosby; 2006.
15. Wetselaar P, 'Diagnosing tooth wear, a new taxonomy based on the revised version of the Tooth Wear Evaluation System (TWES 2.0)', J Oral Rehabil, vol. 47, no. 6, 2020, p-703-712.
16. Oginni O, 'The prevalence, aetiology and clinical appearance of tooth wear: the Nigerian experience', Int Dent J, vol. 52, no. 4, 2002, p. 268-272.
17. Bartlett DW, 'The association of tooth wear, diet and dietary habits in adults aged 18-30 years old', Journal of dentistry, vol. 39, 2011, p. 811.
18. Ahmed K.Understanding tooth wear: aetiology, diagnosis, and management (2009).
19. Al-Zarea BK, 'Tooth surface loss and associated risk factors in northern saudiarabia' ISRN Dent, 2012.
20. Hasselkvist A, 'Dental erosion and soft drink consumption in Swedish children and adolescents and the development of a simplified erosion partial recording system', Swed Dent J, vol. 34, no. 4, 2010, p.187-195.
21. Heuer T, 'Food consumption of adults in Germany: results of the German National Nutrition Survey II based on diet history interviews', Br J Nutr, vol. 113, no. 10, 2015, p.1603-1614.
22. Van der Glas HW, 'Influence of the thickness of soft tissues overlying human masseter and temporalis muscles on the electromyographic maximal voluntary contraction level', Eur J Oral Sci, vol. 104, no. 2, 1996, p. 87-95.
23. Lambrechts P, 'Quantitative evaluation of the wear resistance of posterior dental restorations: a new three-dimensional measuring technique', J Dent, vol. 12, no. 3, 1984, p. 252-267.
24. Pavone BW, 'Bruxism and its effect on the natural teeth', J Prosthet Dent, vol. 53, no. 5, 1985, p. 692-696.