Type of Manuscript: Original study

Prevalence of Attrition, Abrasion, Erosion and Abfraction Among Patients Visiting A Private College Hospital in Chennai - A Retrospective Study

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Abstract

Regressive changes of the teeth include a variety of alterations in the dental tissues, mechanical tear and wear of tooth is a consequence of both pathological and physiological means. Tooth surface loss can be classified primarily as attrition, abrasion, abfraction and erosion. To assess the prevalence of attrition, abrasion, erosion and abfraction among patients visiting private college hospital in Chennai. Data of the patients retrieved was from the dental records of the hospital. Patients with attrition, abrasion, erosion and abfraction were shortlisted. Total study sample, n=7300 patients. Data was tabulated in excel and statistically analysed. From the statistical analysis, it was significant that the most prevalent type of tooth wear was attrition(49.7%), followed by abrasion(48.3%), erosion(1%) and abfraction(0.97%) (chi square test- p-value= 0.000- significant). Within the limitations of this study, it showed that there was a significant prevalence of attrition followed by abrasion, erosion and abfraction with a male predilection, predominantly between the age group of 41-60 years, reported to private college hospital in Chennai.

***Key words**: attrition, abrasion, erosion, abfraction, tooth wear.*

Introduction

Regressive changes may not be necessarily related etiologically or pathologically, some of the changes may be due to general aging process or result of injury to the tissues [1]. Mechanisms most often occur together, each acting at different intensity and duration in a continuously changing salivary medium, producing immensely variable patterns and degrees of wear. Tooth wear is defined as a loss of dental hard tissue by a chemical or mechanical process not involving bacteria [2]. Tooth wear can be the result of a natural aging process [3,4] and be imperceptible to the majority of the patients. Some patients may experience tooth hypersensitivity and sometimes tooth wear may extend to the pulp. It has an impact on oral pain levels, dental appearance and function[5]. There are some other factors that contribute to tooth wear like dietary factors and environmental factors [6].

Attrition is defined as the wear process of the tooth tissue by direct tooth to tooth contact [7]. Attrition can be seen on cusps and grinding surfaces during empty-mouth grinding movements as in parafunctional habits like bruxism, several factors are reported to cause the awareness of attrition. Some of them include porcelain opposing natural teeth, occlusal collapse due to posterior support and any other abnormality [8].

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Abrasion is a type of non carious cervical lesion characterised by loss of tooth tissues with different clinical appearance [9]. It is caused by the sliding or rubbing of abrasive external objects against the tooth surface. The factors that cause abrasion include use of an abrasive toothpaste, hard bristles and a vigorous brushing technique [10]. This may also be caused by the use of toothpicks and miswaks, as well as consumption of abrasive foods. Hypersensitivity is not usually reported in case of abrasion due to the formation of a mechanical smear layer that blocks the exposed dentinal tubules [11].

Abfraction is a type of tooth surface loss believed to be caused by tensile stress generated from non-axial cyclic occlusal forces. Abfraction is the wear of hard tooth substance which is pathological, caused due to biomechanical loading forces; such loss is thought to be the result of flexure and chemical fatigue degradation of enamel and dentin at some point distant from the actual location of loading [12]. Some of the factors that cause abfraction are location, magnitude, duration and frequency of forces. The theory of abfraction is that the tooth flexure in the cervical area is caused by tensile stresses and compressive occlusal forces and results in microfractures of the hydroxyapatite crystals of the enamel and dentin with further deformation of the tooth structure [13].

Erosion is the progressive loss of dental hard tissue caused by acids from non bacterial, intrinsic or extrinsic sources. Erosion occurs due to high consumption of foods or drinks containing a variety of acids such as those from citrus and other fruits, fruit juices (citric acid) , soft drinks, urine and other carbonated drinks (carbonated acid and other acids) are the dietary causes[14]. The few cases of industrial and environmental erosion has been reported and associated to processes in the workplace (e.g. battery factories), which produce acid fumes or droplets and leisure activities such as swimming in chlorinated swimming pools [15].

Keeping in mind these implications it would be important to develop preventive strategy guidelines for clinical practise which will be useful for all practising clinicians and also to the people in society [16,17,18,19] and to create awareness about the prevalence of the tooth surface loss, causative factors, symptoms, clinical presentation and treatment [20,21,22,23]. It is imperative to understand the incidence and prevalence of disease processes in the oral cavity so that it would be an indicator of the needs of the community [24,25,26,27]. The aim of this study was to evaluate the prevalence of type of tooth surface loss like attrition, abrasion, abfraction and erosion in different groups of age, gender and tooth which are commonly affected .

Materials and Methods

In this study a total of n=7300 patients of different age groups and genders visiting the hospital were considered. This study was conducted as a university setting including predominantly South Indian population. The approval for this study was provided by the institutional ethical board. This was a retrospective study in which the data of patients from June 2019 to April 2020 of all age groups and gender were collected from the dental records. Each tooth of 7300 patients were analysed for tooth surface loss. Total number of teeth analysed was 44011. All the cases were approved and verified by an external reviewer and cross verification was done using a photographic method to eliminate the errors made while recording. Inclusion criteria included the patients with attrition, abrasion, erosion and abfraction who visited the hospital for treatment. Exclusion criteria included the patients without attrition, abrasion, erosion and abfraction. Repeated and incomplete data of patients were also excluded.

The independent variables of this study were name, age, gender, ethnicity, number of teeth, occupation, systemic conditions, external factors like brushing, abrasives, beverages etc., Dependent variables were attrition, abrasion, erosion and abfraction. The data obtained was tabulated in excel and imported to SPSS by IBM software with variables defined. Analysis of this study was done using a statistical test Chi Square.

Results and Discussion

Out of the total patients visiting the hospital, n= 7300 patients were found to have tooth wear like attrition, abrasion, erosion and abfraction. The prevalence of attrition was found to be 49.7%, abrasion was 48.3%, erosion was 1% and abfraction was 0.97%. Therefore attrition was the most prevalent followed by abrasion, erosion and abfraction was the least prevalent (graph 1)

. Out of the total patients, 67.7% were males and 32.3% were females. In which higher incidence of tooth surface loss was seen in males patients in comparison with female patients (graph 3)

Tooth wear prevalence between 7 to 20 years were 0.6%, 21 to 40 years were 22%, 41 to 60 years were 57%, 61 to 80 years were 20% and 81 to 91 years were 0.4%. Therefore higher incidence of tooth surface loss was seen in patients with 41 to 60 years of age followed by 21 to 40 years of age, 61 to 80 years of age, 7 to 20 years of age and the least prevalence was seen in 81 to 91 years of age (graph 2).

The teeth prevalence of abfraction was maxillary incisor(9.6%), maxillary canine(9.6%), maxillary premolar(32.8%), maxillary molar(15.3%), mandibular incisor(3.8%), mandibular canine(3.5%), mandibular premolar(18.9%) and mandibular molar(6.4%). From the above, it was evident that abfraction was most commonly seen in maxillary premolars (graph 4) (chi square test- p-value= 0.000- significant). The teeth prevalence of abrasion was maxillary incisor(7.4%), maxillary canine(10.1%), maxillary premolar(31.4%), maxillary molar(10.9%), mandibular incisor(2.8%), mandibular canine(3.3%), mandibular premolar(28.4%) and mandibular molar(5.8%). From the above, it showed that abrasion was most commonly seen in maxillary premolars (graph 5) (chi square test- p-value= 0.000- significant). The teeth prevalence of attrition was maxillary incisor(8.9%%), maxillary canine(4.8%), maxillary premolar(9.6%), maxillary molar(12.3%), mandibular incisor(21%), mandibular canine(9.7%), mandibular premolar(15.2%) and mandibular molar(18.5%). From the above, it showed that attrition was most commonly seen in mandibular incisors (graph 6) (chi square test- p-value= 0.000- significant). The teeth prevalence of erosion was maxillary incisor(40.2%), maxillary canine(12.2%), maxillary premolar(10.4%), maxillary molar(3.8%), mandibular incisor(10.8%), mandibular canine(5.4%), mandibular premolar(9.7%) and mandibular molar(7.4%). From the above, it showed that erosion was most commonly seen in maxillary incisors (graph7) (chi square test- p-value= 0.000- significant). The Chi Square test results showed that the study was found to be statistically significant with p value less than 0.05 (table 1).

Tooth surface loss is the dental hard tissue loss from the surfaces of the teeth. Attrition, erosion, abfraction and abrasion usually cause alterations of the tooth surface and manifest as tooth wear. These act by distinct progressions and exhibit unique clinical characteristics [28]. In the current study, prevalence of tooth surface loss based on gender was observed to have a higher male predilection. Tooth surface loss was higher in incidence, especially in males (67.7%) than females (32.3%). This is in concordance with the study done by Mithra 2018, that stated that male population showed higher tooth wear compared to the female population [29]. The study conducted by Joana 2010 also supported our study stating that high prevalence of tooth wear observed among males [30]. Hugoson also stated that men presented with more teeth with surface loss than women [31]. Our study is in concordance with the previous literature. This could be attributed to male predominance in the geographic limitation, aggressive habits and certain habits pertaining to males like increased compressive forces, industrial erosion, vigorous brushing technique, alcohol consumption , tobacco chewing [32] and parafunctional habits. Abfraction and abfraction are most prevalent in maxillary premolars, erosion in maxillary incisors and attrition in mandibular incisors in this study. According to the study conducted by Marcelle 2016, incisor and premolar are the most commonly affected teeth which is in concordance with this study and he also stated that tooth wear is more prevalent in mandibles. This is due to the increased occlusal and compressive forces in the premolars and molars and increased edge to edge contact in the anteriors [33].

In relation to the occurrence of tooth surface loss among different age group, maximum occurrence of tooth surface loss was seen in the age group between 41-60 years of age with 57%, followed by 21 to 40 years of age (22%), 61 to 81 years of age (20%), 7 to 20 years of age (0.6%) and least tooth surface loss prevalence was seen in age group greater than 81 years (0.4%). This result was in concordance with a study done by Mithra 2018, who reported that tooth wear was more prevalent in the age group of 40 to 60 years of age [29]. Vant 2009 reported an increase in prevalence of tooth wear from 3% at the age of 20 years to 17% at the age of 70 years [34]. Hugoson 1988 also reported an increase in tooth surface loss with age [31] and Nascimento 2016 reported an increase in tooth surface loss as the

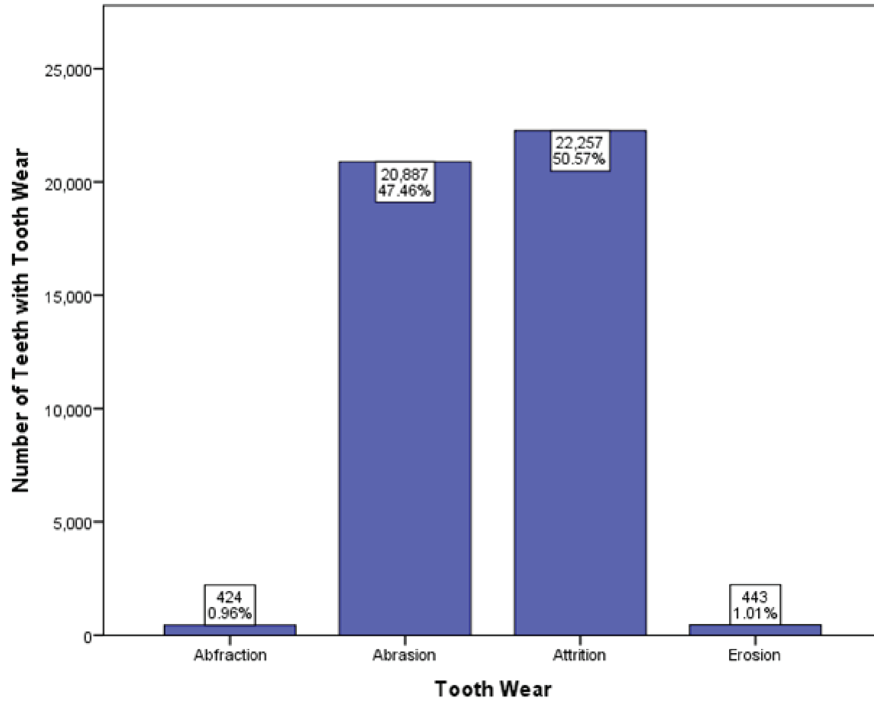
population ages [33]. Bernhardt reported that mean wear scores increased from 0.6 among 20 to 29 years to 1.4 in 70 to 79 years in a total score of 3 in which high scores indicate more severe levels of tooth wear. This shows that tooth wear score increases as the person's age increases [35]. Previous studies are in concordance with our study. This prevalence in aged people may be due to the teeth retained for a longer time but this prevalence which is increasing with age drops after the age of 60 years. This may be due to the increased missing teeth in older people and decreased number of patients seeking dental care with patients greater than 60 years. There is a study that explains the prevalence of tooth surface loss in younger people. According to Ayesha, prevalence of tooth surface is increasing and younger people are said to be at higher risk [36].

Establishing the prevalence of different types of tooth surface loss, attrition was the most prevalent with 49.7%, followed by abrasion (48.3%), erosion (1%) and abfraction (0.97%). This is in concordance with a study conducted by Mithra 2018, that revealed attrition in 29% out of 40.6% tooth wear patients, followed by abrasion in 23.7%, erosion in 4.6% and abfraction in 6.3% [29]. There are scarce studies that discuss the prevalence of type of tooth wear and it is important to analyse the prevalence of tooth wear due to the increasing population and modern lifestyle. Erosion was higher in people consuming alcohol and soft drinks with gastric regurgitation. Attrition was significantly higher among tobacco chewers [37] and in patients with parafunctional habits such as bruxism. This can be utilised for patient education and increasing the awareness regarding tooth wear which is vital for arresting irreversible disease progress and well-being. This is because most of the tooth surface loss in patients is asymptomatic and patients are unaware of this condition. The photographic method of verification plays an important role in accuracy of this study [38]. Most commonly revealed only on clinical examination by the dental practitioners.

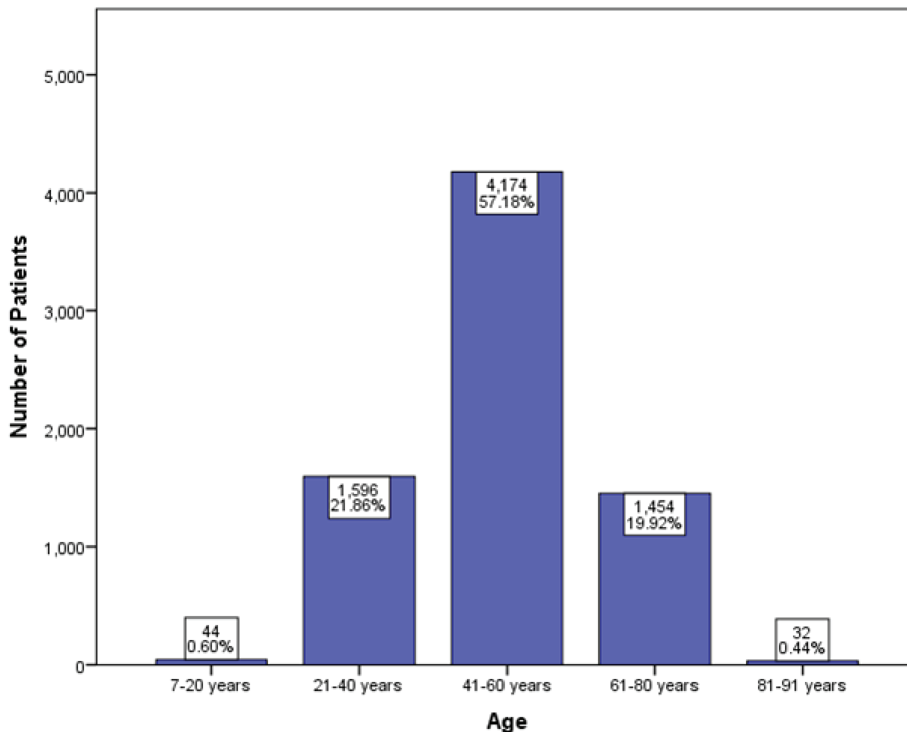
Tooth wear progression appears to occur at a relatively slow rate once the tooth wear has been diagnosed, this happens particularly where preventive advice of the practitioner has been successfully implemented. So, it is very much important for the dental practitioner to diagnose the tooth wear and implement the appropriate preventive measures [39]. Topical application of fluoride has been known to provide protection against subsequent tooth wear. A neutral sodium fluoride gel or mouth rinse can be recommended which helps to combat acid damage. Mouth rinses with less pH value should be advised. Remineralizing toothpaste such as Enamelon is recommended as it is known to increase the surface hardness of teeth exposed to acidic substances and have a greater impact. Potassium containing toothpaste is appropriate for the management of dentin sensitivity [40]. A reduction in the frequency and quantity of consumption of fruits, fruit juices, carbonated drinks or other acidic substances would be a beneficial advice. They also should be advised to limit their consumption of erosive foods or beverages. Increased intake of calcium products is known to decrease the erosion and promote re-hardening of enamel. The avoidance of aggressive tooth brushing, avoid swishing beverages in the mouth, avoid drinking acidic beverages through a wide bore straw, avoid abrasive toothpastes and refraining habits like pen or pencil biting will also help. In cases of nocturnal bruxism, a full coverage hard acrylic occlusal splint should be advised [41]. The dentine bonding agent and fissure sealant application is helpful in providing a certain level of protection and decreasing dentin hypersensitivity [42]. Medication can be used to reduce acid reflux and acid production like antacids. The primary goal for the tooth wear management of any patient is to prevent further pathological wear. In many cases of tooth surface loss, an early diagnosis followed by successful implementation of preventive measures may prove to be sufficient as a definitive management. So it is important to accurately assess and diagnose a patient presenting with tooth wear Majority of the cases can be successfully treated by preventative, passive measures which require long term maintenance and monitoring [43].

The guidelines should include the symptoms, causes, clinical presentation, preventive measures and treatment of tooth surface loss in elegant, all respective languages and distributed widely which will decrease the prevalence of tooth surface loss and this study sets an pavement for the construction of guidelines. Limitation of this study was that it covers only limited parts of the south Indian population and it was an uni-centric study. To ascertain the results of this study, a multi-centric study should be done. Future scope is to increase the population size for better ethnicity and results. This study is used to analyse the prevalence of tooth wear and

to reduce the prevalence of this irreversible progression disease.

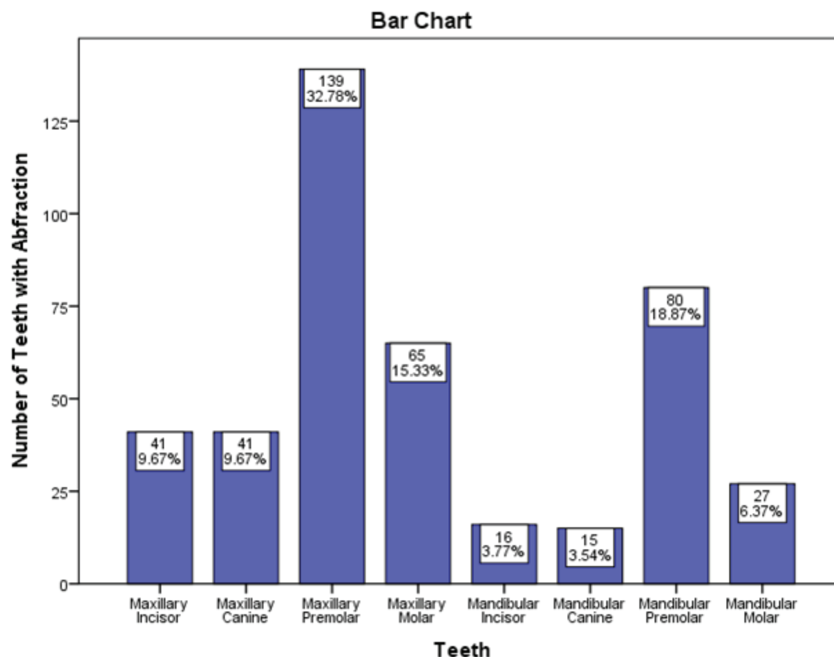


Graph 1- Bar graph representing the prevalence of attrition,abrasion, erosion and abfraction. The x-axis represents attrition, abrasion, erosion and abfraction and y-axis represents the total number of teeth with attrition, abrasion, erosion and abfraction. There is a prevalence of attrition followed by abrasion, erosion and abfraction.

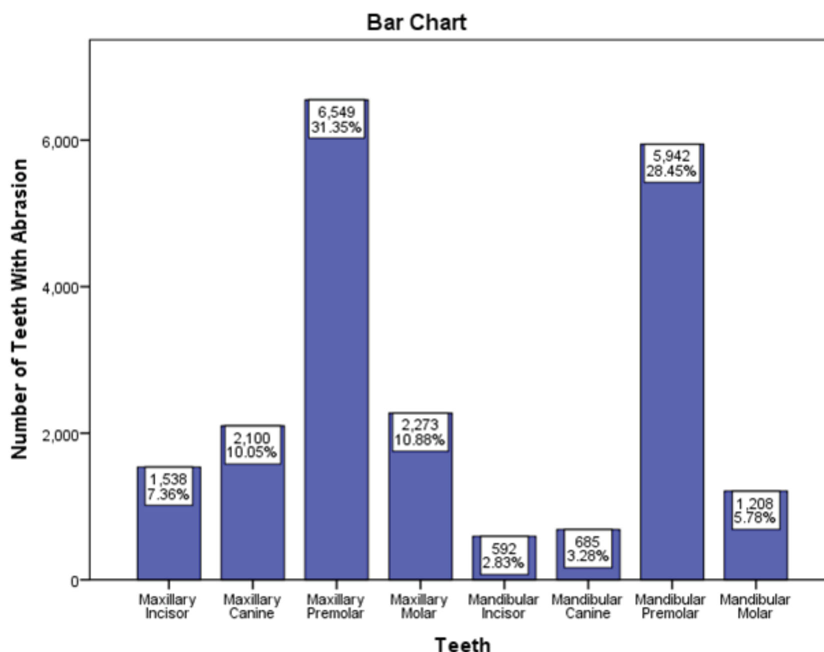


Graph 2- Bar graph representing the age distribution of this study. The x-axis represents the age group and y-axis represents the number of patients with tooth wear. There is a prevalence of tooth surface loss in the 41-60 years age group in the spacing scale.

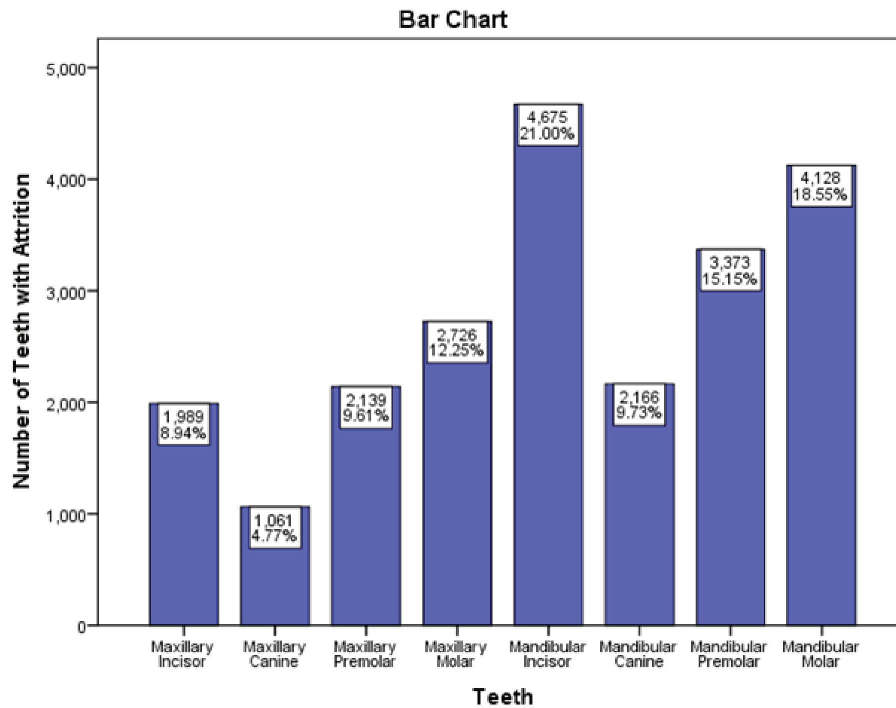
Graph 3- Bar graph showing the gender distribution of this study. The x-axis represents the gender and y-axis represents the number of patients with tooth wear. There is a prevalence of tooth surface loss in males in this study.



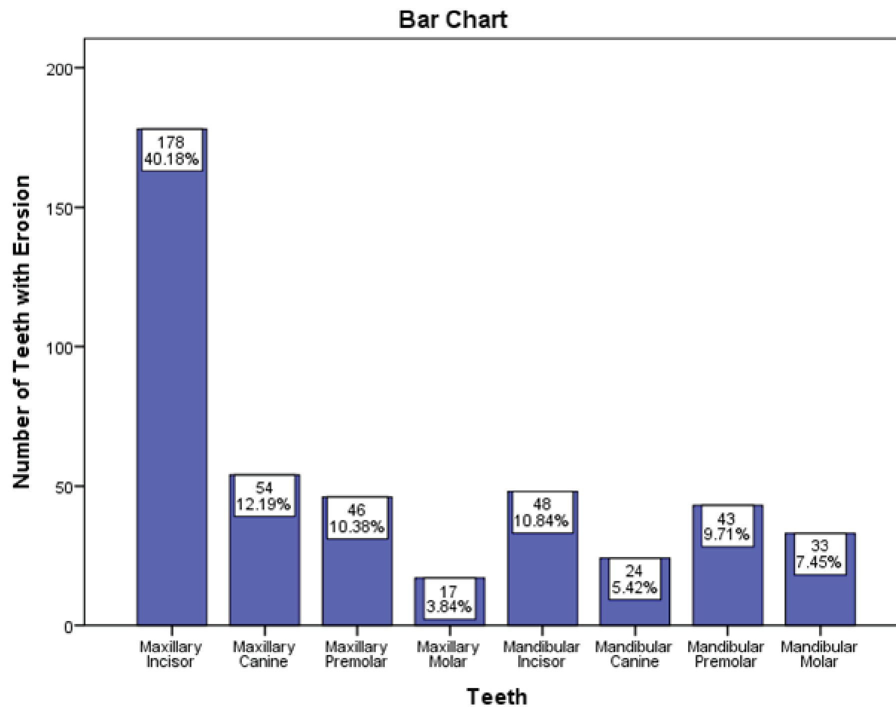
Graph 4- Bar graph representing the association between teeth and abfraction. The x-axis represents the teeth and y-axis represents the total number of teeth with abfraction. Chi square test was done and the association was found to be statistically significant. Pearson's Chi Square value: 2227.283, DF: 7, p value: 0.000(<0.05) hence statistically significant. Abfraction is most commonly seen in maxillary premolars (32.8%).



Graph 5- Bar graph representing the association between teeth and abrasion. The x-axis represents the teeth and y-axis represents the total number of teeth with abrasion. Chi square test was done and association was found to be statistically significant. Pearson's Chi Square value: 14510.210, DF: 7, p value: 0.000(<0.05) hence statistically significant. Abrasion is most commonly seen in maxillary premolars (31.4%).



Graph 6- Bar graph representing the association between teeth and attrition. The x-axis represents the teeth and y-axis represents the total number of teeth with attrition. Chi square test was done and association was found to be statistically significant Pearson's Chi Square value: 3641.525, DF: 7, p value: 0.000(<0.05) hence statistically significant. Attrition is most commonly seen in mandibular incisors (21%).



Graph 7- Bar graph representing the association between teeth and erosion. The x-axis represents the teeth and y-axis represents the total number of teeth with erosion. Chi square test was done and association was found to be statistically significant. Pearson's Chi Square value: 330.327, DF: 7, p value: 0.000(<0.05) hence statistically significant. Erosion is most commonly seen in maxillary incisors (40.2%).

Conclusion

Within the limits of this study, attrition was the most prevalent condition. From the analysis, there was a significant prevalence of attrition followed by abrasion, erosion and abfraction with a male predilection, predominantly between the age group of 41-60 years, reported to the private college hospital in Chennai.

Acknowledgments: The authors would like to acknowledge the help and support rendered by the department of oral pathology and information technology of Saveetha Dental College and Hospital, SIMATS and the management for their constant assistance with the research.

Conflict of Interest: None declared.

Source of Funding : Self.

Ethical Clearance: It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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