

# Prevalence and Severity of Attrition among Adult Class II Division I Malocclusion Patients

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## Abstract

Malocclusion is a deviation of occlusion that describes the malalignment of teeth which can lead to serious oral health problems. Untreated malocclusion can cause irritation to the gingiva and mouth, tooth decay due to cleaning difficulty and attrition of the occlusal surface. Long-term complications include temporomandibular problems, periodontal disease, obstructive sleep apnea and psychological disorders. Dental attrition is a mechanical process of hard tissue loss due to continuous rubbing between opposing teeth, not because of bacteria influence. Etiologies may be malocclusion, dental caries, trauma and carbonated drinks. Individuals with class II malocclusion have higher prevalence of dental attrition compared to other malocclusion. Data collection was done in a university setting. Data regarding patients having class II division I malocclusion were retrieved after analyzing all available case sheets, among which a total of 279 case records were selected. Excel tabulation and SPSS version 23 was used for data analysis. The following parameters were evaluated based on the dental records; age, gender and severity of attrition. A modified version of the tooth-wear index was used to assess the severity of attrition. 59 out of 279 patients with class II division I malocclusion had attrition of which the highest prevalence was seen in females than males. Common attrition type observed was incipient (57.7%) followed by moderate (14.3%). Dental attrition was associated with gender, it was more prevalent in women and was statistically significant,  $p$  value < 0.05. There was no statistical significance between age groups and attrition ( $p > 0.05$ ). Within the limits of current study, the high prevalence of attrition among class II division I malocclusion subjects was seen in females in the 20-30 years age range.

**Keywords:** Dental attrition; Malocclusion; Occlusal; Occlusion; Tooth wear

## Introduction

Tooth wear is the non-carious loss of hard dental tissue attributed by attrition, erosion and abrasion. [1] Attrition is the loss of tooth surface or occlusal restoration by the tooth to tooth contact during masticatory process, either normal or para-functional activities. [2,3] Attrition can be typified as shiny flattened occlusal surfaces and mostly seen equally in both upper and lower teeth when they contact together. [4] According to a study, dental attrition can be considered as one of the most visible signs of pathological wear and bruxism. Bruxism and clenching associated with temporomandibular joint disorders are drawing concern with the correlation of attrition. [5,6] Also, hypertrophic masseter muscle is a clinical sign of the impact of bruxism. Repetition of chronic trauma caused by grinding habits might alter come changes in muscle activity and therefore gradually stimulate a degenerative process. Other reported signs of bruxism include sensitive teeth, attrition, and cracked teeth syndrome, scalloped tongue, ridging of buccal mucosa and chipping of teeth or restoration. [7-9]

The main causes for dental attrition are masticatory forces and malocclusion. When there is an incorrect relation between approaching both jaws together, more muscle load is needed and increases the masticatory forces causing excessive tooth wear. [10-12] Masticatory movement is one of the elements that

may be related to the functional occlusal system, along with interactions between stomatognathic organs, proprioceptors function and brain centers. [13] The physiological patterns of chewing movements are mainly affected by the occlusion, temporomandibular joint and/or masticatory muscles. [14] Occlusion however may affect the masticatory pathway. [15,16] These are the essentials of influencing dental attrition.

Dental attrition is generally seen in all living mammals. [17,18] Severity of attrition is more marked in maxillary teeth [19] and commonly reported in men. [20] However, tooth wear appears to be reduced in these modern days. No single index of tooth wear has been universally accepted, making it difficult to assess and measure tooth wear. [21] Most studies aimed to focus on clinical evaluation of the lesions and estimation of the severity of attrition. [22] The measurement of tooth wear based on its severity is actually subjective from the patient's and dentist's perspective, challenging the decision of restoration required for the patients. It is equally dependent on the patient's demand and

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dentist's assessment. [4] In 1984, Smith and Knight proposed the tooth wear index. Both the index and its modification have been generally accepted. Previously our team has a rich experience in working on various research projects across multiple disciplines. [23-37] Now the growing trend in this area motivated us to pursue this project.

This index consists of four levels of attrition; no hard dental tissue loss, exposure of enamel (incipient), mild exposure of dentin (moderate) and severe dentin exposure (tooth wear into pulp). [38]

Considering lack of literature of tooth wear on specific malocclusions, a study was sought to determine the prevalence and severity of attrition among adults with class II division I malocclusion patients.

## Materials and Methods

This is a retrospective study assessing severity of attrition in adults with class II division I malocclusions reporting to Saveetha Dental College and Hospital. The approval for this study was obtained from the Institutional Ethics Committee, covered by the following ethical approval number; SDC/SIHEC/2020/DIASDATA/0619-0320. The advantage of this study was large data availability. However, it was conducted on a limited time frame and geographically only focused on the isolated population. Case sheets of patients were reviewed individually, and data was cross-verified by another examiner to avoid missing data. Sampling bias was minimized with the verification of photographs.

### Data collection

Data regarding patients having class II division I malocclusion were retrieved after analyzing all available case sheets, among which a total of 279 case records were selected, in the age range of 20 to 40 years. They were outpatients reported to Saveetha Dental College and Hospital for the correction of malocclusion. Internal validity of this study was all case records of attrition were included and external validity was epidemiology perspective. All subjects with class II division I malocclusion were included in this study. Exclusion criteria were temporomandibular joint disorders, airway problems, dental anomalies and deep caries restorations. Independent variables were age, gender and grades of dental attrition. The following criteria were recorded by reviewing the case sheets: age, sex and severity of attrition. Severity of attrition was graded based on the modification of tooth wear index by Smith and Knight and scored in numbers. Occlusal surfaces of posterior teeth were examined for attrition based on their photographs. The modifications made were additional code 4; applied for teeth that have been restored due to wear and code 9; for teeth that were not able to assess or missing teeth. Scoring was done as follows:

Score 1: Mild/incipient wear of enamel

Score 2: Mild wear of dentin/dentin exposure

Score 3: Severe exposure of dentin/tooth wear into pulp

Score 4: Restoration done due to tooth wear

Score 9: Could not be assessed/missing teeth

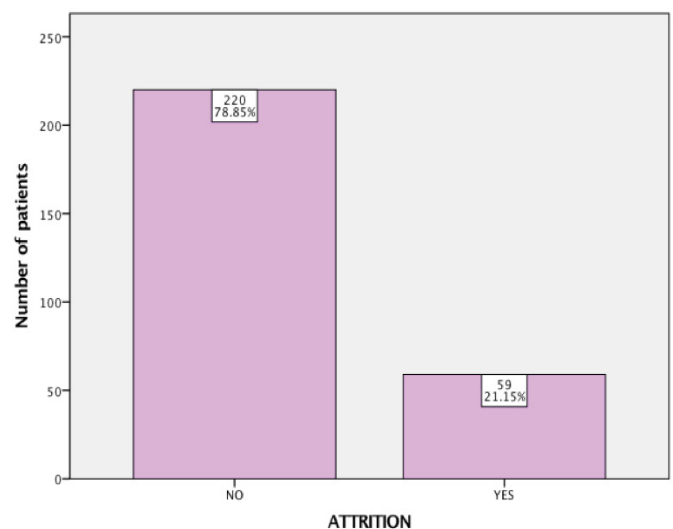
## Statistical analysis

All the data collected were tabulated in MS Excel and incomplete data was eliminated. Data analysis was carried out using IBM Statistical Package for Social Science (SPSS version 23). The statistical test used for the demographics was frequency distribution. Descriptive statistic was calculated using Chi-square t test. P value less than 0.05 was considered as statistically significant. Frequency distribution of age groups and gender were calculated for the associated attrition. Possible correlation between age, gender and severity of attrition were investigated with the use of correlation coefficient.

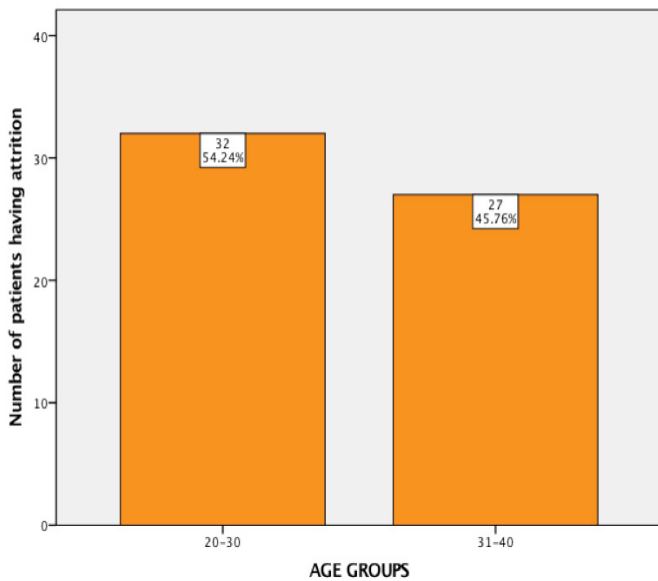
## Results and Discussion

Occlusion is very important in maintaining the physiological cycle of mastication, in which tooth wear can happen if it is deviated from the normal functioning occlusion. [39] Therefore, malocclusion is one of the main etiologic factors of causing tooth wear. Other etiologies of attrition are dental caries, psychological stress, trauma and acidic food or drinks. Most young people's attrition was influenced by their quality of life and prevalence of habits. Hence, it is very important to seek orthodontic correction at a young age. [40] Bigger problems are prevented down from the road if early diagnosis and treatment were done at early stages. [41]

A total of 279 patient case records with class II division I malocclusion were selected for this study. 220 of them (78.9%) were free from tooth wear and the rest 59 patients (21.2%) had attrition in their posterior teeth, as shown in Figure 1. The results showed dental attrition commonly seen in the range of 20-30 years [Figure 2], suggesting the likelihood of having parafunctional habits or untreated malocclusion and age limit. This finding was in disagreement with a study by Rasool et al. He concluded dental wear was more extensive in the older age of Nigerian population. [42] Also, the prevalence of dental attrition increased 1.74 times with the increase of age annually. There is some evidence showing positive correlation between



**Figure 1:** Bar graph shows the distribution of attrition among patients with class II division 1 malocclusion. X axis represents the presence or absence of attrition and Y axis represents the number of patients having class II division 1. Majority of the patients were free (n=220) from attrition and 22 patients had attrition.



**Figure 2:** Bar graph shows the age-wise distribution of attrition among patients with class II division 1 malocclusion. X axis represents the age groups and Y axis represents the number of patients having attrition. The highest population was in the age group of 20-30 years (n=32) followed by 31-40 years (n=27).

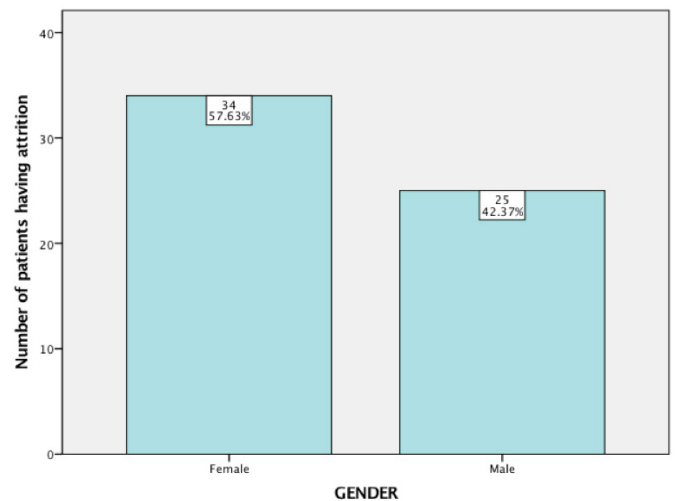
malocclusion and perception of stress level and emotional disturbances. The class II malocclusion had a definite interaction with attrition on groups of higher stress levels. [43] A significant association was found between gender and severity of attrition, in corroborating with Seligman et al. [5] Females in our study had higher attrition scores than males. This can be explained because of socioeconomic status in the South Indian population and associated emotional and mental disturbances. However, this should be considered as a random occurrence and should not be over interpreted, as there is a minimal absolute difference in wear scores. Our institution is passionate about high quality evidence based research and has excelled in various fields. [44-50] We hope this study adds to this rich legacy.

In this study, the prevalence of tooth wear across the gender, class II division I malocclusion was greater in females than males [Figure 3]. This is contradictory with a study conducted by Yoithappabhunath et al. as attrition was more prevalent among males. [10] The findings of Yadav et al. among Caucasian population also stated the same. 80% of the subjects were males and some were associated with bruxism. He also concluded that tooth wear and sensitive teeth and ridging of buccal mucosa had a significant relation. [7] An American population study found that attrition was common in males with association of periodontal diseases and had a history of using occlusal splints. [51] Also, attrition was more subjected to males in Romanian population. [1] These contradictions may be due to the limitation of sample size population and habits prevalence.

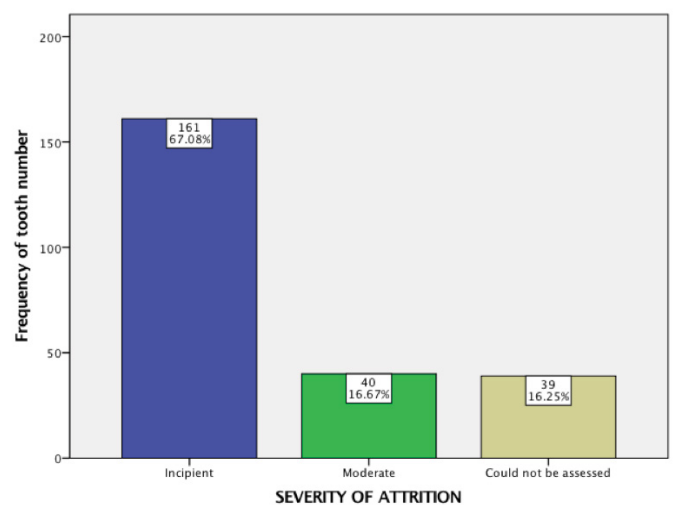
Some existing literature suggested a correlation between attrition and malocclusion while certain other authors disagreed the same. A study by Janson et al. found that both the normal occlusion group and the class II malocclusion group exhibited tooth wear with different patterns. Attrition was greater in palatal surfaces of anterior teeth in normal occlusion patients.

Meanwhile, class II malocclusion showed more tooth wear in the posterior teeth. Normal occlusion group had more attrition in the anterior region possibly due to the normal anterior tooth relationships, thus considering this as physiological tooth wear. The attrition should be more severe in normal occlusion to be considered as pathologic. Large overjet seen in class II malocclusion is best explained why posterior teeth had greater attrition. Interferences between posterior teeth increases when the mandible is advanced due to the large overjet in class II malocclusion. [52]

Patients were more subjected to incipient attrition (57.7%) and only 14% had moderate dental attrition in this study [Figure 4]. No severe attrition exposing dentin or into the pulp were observed, supporting a previous literature. [53] Janson et al also reported high frequency of incipient lesions and no severe lesions were found which is corroborating with the current



**Figure 3:** Bar graph shows the gender-wise distribution of attrition among patients with class II division 1 malocclusion. X axis represents the gender and the Y axis represents the number of patients having attrition. There is more prevalence in females (n=34) compared to males (n=25).



**Figure 4:** Bar graph shows the distribution of severity of attrition among patients with class II division 1 malocclusion. X axis represents the severity of attrition and the Y axis represents the frequency of tooth number. Majority of the attrition type was incipient (n=161), followed by moderate attrition (n=40).

study. This should be considered as physiologic wear after considering its low amount of wear. In addition to this, most patients that have severe attrition are more likely linked with systemic diseases and a higher degree of parafunction which is not associated in the study. The conditions of tooth wear such as attrition, abrasion and erosion often occur together and thus, it is quite challenging to differentiate each of them in every case. [54] Nevertheless, there is some uniqueness of attrition where all wear only located in occlusal surfaces if it is attrition. Buccal and lingual surfaces will be included if only there is mandibular movement that can make opposing teeth in contact to each other in these regions. Attrition also has shiny flattened and sharp edged wear facets, which is way distinguishable from abrasion and erosion. Besides, equal amount of attrition can be noted in

both opposing teeth and occlusal contact is achieved in worn teeth during mandibular position. [55]

Further clinical studies need to be taken to measure the association between masticatory forces and types of malocclusion. This present study had few limitations. As the study design is a retrospective study, it is subjected to numerous biases as a result. Also, this study had failed to assess the severity of dental attrition based on each surface of each group of teeth [Figures 5 and 6].

### Conclusion

Within the limits of this study, the findings of this current study revealed that high prevalence of attrition among class II division I malocclusion subjects was seen in the 20-30 yr old patients but the association was not significant. When gender was associated with severity of attrition moderate attrition of the teeth involved was common among 20-30 yr old females.

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### Authors Contributions

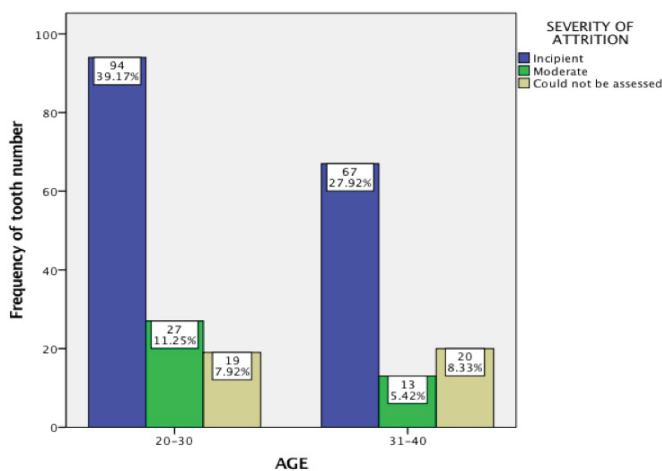
Conceptualisation: Nor Masitah and Jain RK; methodology: Nor Masitah and Jain RK ; validation: Nor Masitah and Jain RK ; statistical analysis: Nor Masitah and Jain RK ; draft preparation: Nor Masitah; writing-review and editing: Jain RK; visualisation: Arthi B

### Conflict of Interest

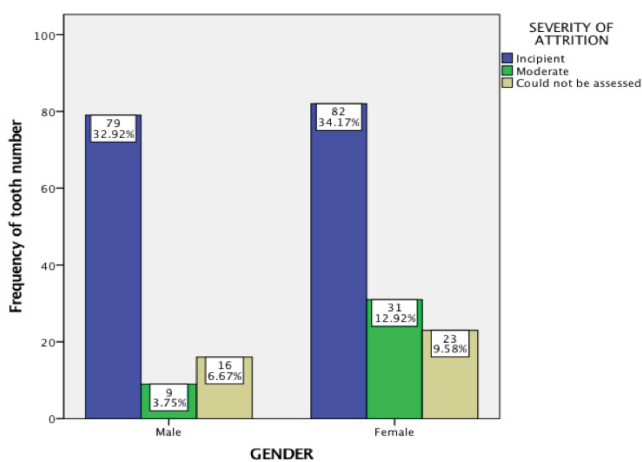
There was no conflict of interest.

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**Figure 5:** Bar graph depicts the association between age and severity of attrition. X axis represents age groups and the Y axis represents the frequency of teeth involved in attrition. Chi square test was done and association was found to be statistically non-significant between age groups and severity of attrition. Pearson’s Chi-square value=2.867; p=2.39 (p>0.05), hence statistically non-significant. However 20-30 yr old individuals with class II malocclusion had more number of attrited teeth.



**Figure 6:** Bar graph depicts the association between gender and severity of attrition. X axis represents gender and the Y axis represents the frequency of tooth number. Chi square test was done and association was found to be statistically significant between gender and severity of attrition. Pearson’s Chi-square value=9.311; p=0.01 (p<0.05), hence statistically significant. Proving, females with class II malocclusion had more number of moderately attrited teeth than males.

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