



## Relationship of Malocclusion with Periodontal Status among Adult Population in Chennai - A Case Control Study

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### ABSTRACT

Malocclusion is defined as an irregularity of the teeth or an incorrect placement of the dental arches that is outside the ideal range. Besides this irregularity of the teeth or jaws, malocclusion may cause periodontal problems, disturbances of oral function such as mastication, swallowing, and speech, and psychosocial problems related to impaired dentofacial aesthetics. Hence this study was conducted to find the relationship between orthodontic malocclusion with periodontal status among the adult population visiting private dental college in Chennai. A retrospective study was conducted using case records of patients attending private dental college from July 2019 - March 2020. A total of 932 case sheets of patients who had recorded for Russell's periodontal index were retrieved and used for statistical analysis. Descriptive statistics, chi-square and Pearson's correlation was used to analyze the data. Out of 932 participants class I malocclusion-96.24%, class 2 Div I - 1.82%, class division 2, class 2 subdivision, class 3 malocclusion, class 3 subdivision was 0.32%, 0.42%, 0.855 and 0.32% respectively. 10.73% of the study population have terminal disease which is a surprising finding when compared with other studies. The results of the study were subjected to statistical analysis. Negligible negative correlation was found between malocclusion and periodontal status and were statistically insignificant. No statistically significant association was found between orthodontic malocclusion and periodontal status and a negligible negative correlation was obtained, which shows that there was no relationship between malocclusion and periodontal status in this study population.



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### INTRODUCTION

Gardiner defines malocclusion as a condition in which there is a departure from the normal relation of the teeth to other teeth in the same arch or and to teeth in the opposing teeth (Garn, 1961). Malocclusion refers to the misalignment or the incorrect relation between the teeth of the upper-lower arches of the oral cavity. Some refereed malocclusion as a definite problem, while some it is not a disease but morphological variation (Salzmann, 1965; Akbari et al., 2014). Malocclusion, which causes improper maintenance of oral hygiene leads to den-

tal caries (Prabakar *et al.*, 2016, 2018c).

Orthodontics today is not considered in the creation of esthetics alone, but as a part of the health, profession concerned with creation of the emotional wellbeing of individuals. Malocclusion not only affects the appearance of an individual but also has a major influence in many ways such as abnormal muscle formation, speech defects, caries incidence more and increase in periodontal status (Prof-fit *et al.*, 2007). Usually, many patients having malocclusion before undergoing orthodontic treatment will restore even pits and fissures using the sealants (Prabakar *et al.*, 2018a; Khatri *et al.*, 2019). As malocclusion due to many factors, before starting orthodontic treatment, fluorosis of the teeth also should be checked as there may be more chances for enamel chipping during treatment (Kumar and Preethi, 2017)

As this is a retrospective prospective study, the data entered by the interns from the private college is retrieved (Kannan *et al.*, 2017). Lower socioeconomic status populations have more prevalence of periodontal diseases than middle and high socioeconomic status people, mainly early childhood caries and periodontal diseases in children (Samuel *et al.*, 2020). Periodontal patients usually have an increase in microbial organisms count in the oral cavity and plaque accumulation which eventually leads to periodontitis (Mathew *et al.*, 2020). Phytochemicals possess important therapeutic antioxidant properties that may promote oral health by reducing the risk of inflammations and periodontal infections (Pavithra and Jayashri, 2019). Adequate nutrition is important for prevention of many oral diseases as the role of nutrition plays a very important role in preventive dentistry (Neralla *et al.*, 2019; Prabakar *et al.*, 2018b). Oral hygiene can also be maintained by proper brushing of toothpastes, but it is very difficult in malocclusion patients to maintain good oral hygiene (Mohapatra *et al.*, 2019). Smoking can also leads to many oral diseases and stains over the palatal and lingual surfaces of the teeth (Harini and Leelavathi, 2019; Pratha and Prabakar, 2019). The negative impact of malocclusion on oral health quality of life starts to be perceived when children are 11 to 14 years, the age when they undergo major life changes and impact worsens as they grow older (Baskaradoss *et al.*, 2013). The literature however is consistent with the view that untreated malocclusion worsens the oral health related quality of life (PC275, 2018). Untreated malocclusion increases the risk for caries and poor gingival health, which causes pain and functional limitation too (Chokalingam and Felicita, 2014). Since, we need only malocclusion types,

we have taken Angle's malocclusion classification to categorize malocclusion for our study. For periodontal assessment, we have taken a standard index given by Russell. A (Russel's periodontal index). However, in the literature, there are only a few studies to analyse the relationship between malocclusion and dental problems like periodontal diseases and dental caries. Moreover, conflicting results have been obtained in studies, considering a positive relationship between malocclusion and periodontal status (Nair, 2014) while others have a straight opposite results. Thus, this study aims to determine the relationship between malocclusion and periodontal status among patients attending private dental college in Chennai.

## MATERIALS AND METHODS

### Study setting and sample selection

The present retrospective study was conducted by reviewing 86000 patient records from July 2019-March 2020 visiting our University Hospital. Among them, 932 case records of patients aged 18-75 years who had recorded for Russell's periodontal index were retrieved. Among them 65.02% were males and 34.97% were females who were selected by simple random sampling. CASE - Patients with malocclusion and periodontitis. CONTROL- Patients with malocclusion

### Ethical approval

Ethical clearance was obtained from the Institutional Review Board (IRB) of the University to use the data from case records (SDC/SIHEC/2020/DIASDATA/0619-0320). Informed consent was obtained from the patient at the time of the screening procedure. Case sheets with informed consent were included in the study.

### Screening

The screening for each subject included a detailed record of patients demographic details such as name, age, gender, mobile number, residential location, oral health status and oral health practice

### Inclusion and exclusion criteria

Case records of the patients with malocclusion, bleeding on probing and with gingivitis were included in the study. Any case records with chronic systemic diseases, previous history of orthodontic treatment and missing of all first molars were excluded from the study.

### Examiner calibration

Each patient was examined by every single well trained examiner (Interns / postgraduate student) at the time of screening.

**Data collection tools**

Angle's malocclusion classification was used to assess the malocclusion (Angle, 1907). Class I malocclusion, class II division 1, class II division 2, class II subdivision, class III malocclusion, class III subdivision malocclusion were graded as 1,2,3,4,5 and 6 respectively. The presence and severity of periodontitis was evaluated by Russell's periodontal index. Russell classified the condition of gingivitis as clinically normal gingiva, simple gingivitis, beginning destructive periodontitis, establishes destructive periodontitis and terminal disease.

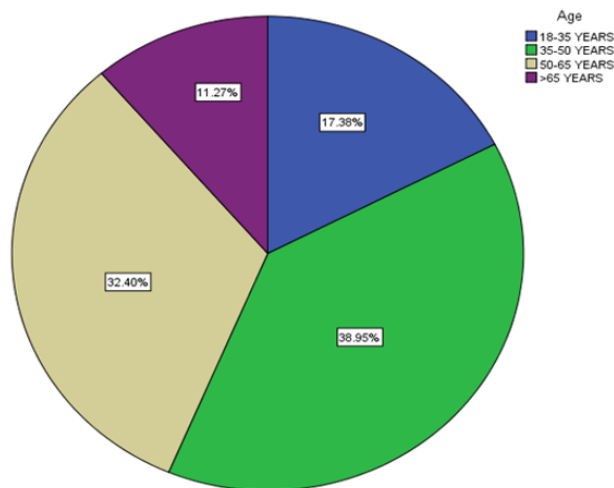
**Data analysis**

The data collected were retrieved and entered in the microsoft word excel sheet and data obtained was analysed using SPSS VERSION 23.0 (Statistical package for social services) for descriptive statistics and to determine the statistical tests of significance(P-value - 0.05). Frequency distribution was done for age and gender of the population and association between malocclusion and periodontal status was evaluated by chi-square test. Correlation between malocclusion and periodontal status was done by Pearson's correlation where a critical P < 0.05 was considered as statistically significant.

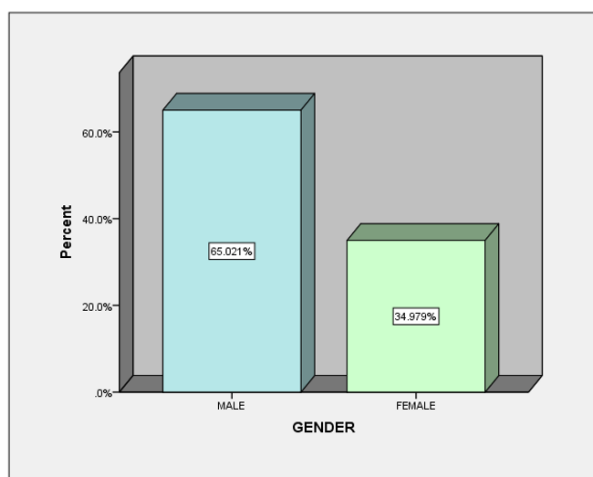
**RESULTS AND DISCUSSION**

Malocclusion and periodontal status are conditions that constitute a hazard to the maintenance of oral health and interfere with well being of a person. The measurement of malocclusion as a public health problem is more difficult since most orthodontic treatment is undertaken for esthetic reasons and it is very difficult to estimate the severity of malocclusion. The sample included participants above 18 years who had no history of orthodontic treatment and no systemic diseases. It is to be noted that in studies concerning malocclusion and periodontal status, material should be obtained by a well-defined and large enough population. The present sample seems to satisfy those requirements.

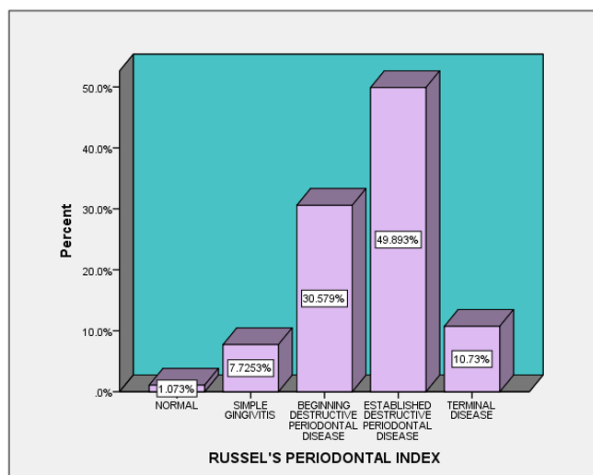
The purpose of the study is to find the relationship between malocclusion and periodontal disease. Angle's malocclusion was used to categorize the malocclusion. Pie chart represents the distribution of study subjects based on age. Among 932 participants, 17.38% of participants were between 18-35 years, 38.95% were between 35-50 years, 32.40% were between 50-65 years and 11.27% were above 65 years of age (Figure 1). Pie chart represents distribution of study subjects based on gender. Among 932 participants 606 participants were males, and 326 participants were females (Figure 2).



**Figure 1: Pie chart depicting the distribution of study subjects based on age.**



**Figure 2: Simple bar chart depicting the distribution of study subjects based on gender.**



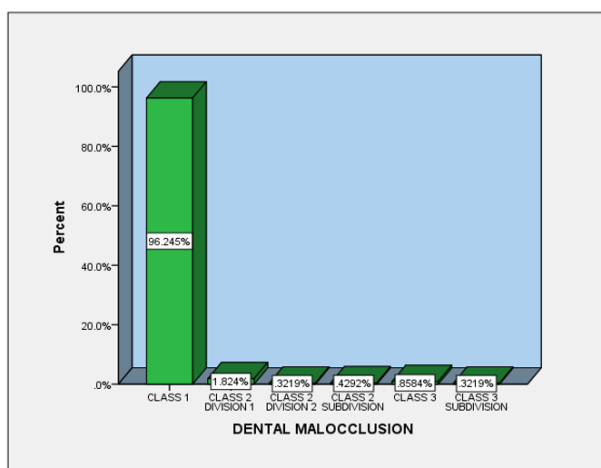
**Figure 3: Simple bar chart represents the severity of periodontal disease among study subjects.**

**Table 1: Represents the Association between Malocclusion and Periodontal Diseases.**

Malocclusion	Russell's periodontal index					Chi-square value	P-value
	Normal N(%)	Simple gingivitis N(%)	Beginning destructive periodontal disease. N(%)	Established destructive periodontal disease N(%)	Terminal diseases N(%)		
Class 1	10(1.1%)	70(7.8%)	274(30.5%)	446(49.7%)	97(10.8%)	13.595	0.850
Class 2 Div 1	0(0%)	0(0%)	4(23.5%)	11(64.7%)	2(11.8%)		
Class 2 Div 2	0(0%)	0(0%)	0(0%)	3(100%)	0(0%)		
Class 2 Subdivision	0(0%)	1(25%)	2(50%)	0(0%)	1(25%)		
Class 3	0(0%)	1(12.5%)	4(50%)	3(37.5%)	0(0%)		
Class 3 Subdivision	0(0%)	0(0%)	1(33.3%)	2(66.7%)	0(0%)		

**Table 2: Represents the Correlation Between Malocclusion and Periodontal Disease using Pearson's correlation.**

Variables	Pearson's Correlation Value (r )	P-value
Dental malocclusion and periodontal index	-0.021	0.525



**Figure 4: Simple Bar chart Distribution of severity of malocclusion among study subjects.**

As it is a universally accepted method, it has more advantages like high reproducibility and validity. Application and examining using this is very easy and not more time consuming. Russell's periodontal index, found by Russell's, universally acceptable with more reliability was used to determine the periodontal status of the patients.1.073% have normal gingival status, 7.725% have simple gingivitis, 30.58% have beginning destructive periodontal disease, 49.89% have established destructive periodontal disease and 10.73% have terminal disease

(Figure 3).

Bar graph (Figure 4) represents the severity of malocclusion. Among all the participants 96.24% of participants were recorded as class I malocclusion ,1.824% as class II div 1, class II div 2 with 0.31%, 0.429% with class II subdivision malocclusion, 0.854% have class III malocclusion and finally 0.32% have classIII subdivision malocclusion. This results is similar to a study conducted in Yemeni (Al-Zubair, 2014). However, recent studies show that most common malocclusion in adolescents is class2 malocclusion (Gelgör et al., 2007; Bilgic et al., 2015; Sultana and Hossain, 2019).

Malocclusion important factor in etiology of periodontal disease. Irregularities in the teeth can have adverse effects on periodontal health of the teeth, increasing plaque accumulation which leads to periodontal disease (Baskaradoss et al., 2013). Gingivitis was seen to be at increased level in patients with malocclusion compared with those without malocclusion (Hanna et al., 2015). In another study malocclusion was not associated with periodontal status (Pereira et al., 2009). In a study with mean age of 12.38, there was no correlation between periodontal disease and irregularities in teeth. Similar to the results of these studies, there was no statistically significant relationship between RI scores and malocclusion classification in our study(P=0.850)

(Table 1). Due to the difference between the sample groups and the methods used, different results could be obtained when evaluating the relationship between periodontal status and malocclusion.

Occlusal irregularities and crowding may be responsible for periodontal disease (Gupta *et al.*, 2016). From our study results, there is a negligible correlation (-0.021) between malocclusion and periodontal disease and has no statistically significant difference (Table 2). Similar results, no correlation between malocclusion and periodontal treatment need has been described by Helm and Peterson (1989) (Helm and Petersen, 1989; Gabris *et al.*, 2006).

Our study has a few limitations. First, it is a case-control study retrospective study. So results cannot be generalized. Second, it is not examined by a single examiner, so chances of bias are more. Despite these limitations, study provides evidence suggesting that malocclusion has deleterious effects on periodontal status of the population.

Figure 1 shows most of the participants belong to 35-50 years with 38.95% followed by 50-65 years with 32%, 17.38% of the participants belong to the age group between 18-35 years and 11.27% of the participants belong to the age group > 65 years. Descriptive statistics were done.

Figure 2 shows male predominance was noted from the results. The X-axis represents the gender among the participants. Y-axis represents the percentage of the gender. 65.02% of the participants were males and remaining 34.979% of the participants were females.

Figure 3 shows X-axis represents Russell's periodontal index interpretation and the Y-axis represents the percentage of the interpretation. Most of the participants have established destructive periodontal diseases with the prevalence of 48.893% followed by 30.57% of the participants with beginning destructive periodontal disease, 10.73% of the participants have terminal disease, 7.72% of the participants have simple gingivitis and 1.07% of the participants have normal gingiva. Descriptive statistics were done. X-axis represents the interpretation of Russell's periodontal index. Y-axis represents the percentage of the group to which it belongs.

Figure 4 shows X-axis represents the dental malocclusion and Y-axis represents the percentage of the malocclusion. Most of the participants have Angle's class 1 malocclusion with the prevalence of 96.245%, followed by 1.82% have Angle's class 2 div 1 malocclusion, 0.85% have Angle's class 3 malocclusion, 0.49% have Angle's class 2 subdivision malocclusion and 0.32% have Angle's class 3 subdivi-

sion and Angle's class 2 div 2 malocclusion.

In Table 1 a statistically insignificant association was found between Malocclusion and Periodontal Diseases using Chi-square test (Chi-square value- 13.595; p-value - 0.850). Among the participants having Class 1 malocclusion(49.7%), class 2 div 1(64.7%), class 2 div 2(100%) and class 3 subdivision(66.7%), most of the participants have established destructive periodontal disease whereas with patients having class 2 subdivision (50%) and class 3 malocclusion (50%), most of the participants have Beginning destructive periodontal disease.

In Table 2 It shows a negligible correlation (-0.021) which interprets no association between malocclusion and periodontal status. Pearson's correlation was done to determine the correlation between malocclusion and periodontal status.

## CONCLUSION

No statistically significant association was found between periodontal status and malocclusion with negligible correlation. This indicates that malocclusion and periodontal status have no relationship in this present study. Further studies, involving large populations are necessary in different age groups, which can even give better knowledge about malocclusion and periodontal status.

## Conflict of interest

The authors declare that they have no conflict of interest for this study.

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