

## Evaluation of Association Between Partial Edentulism of Jaws and Temporomandibular Joint Disorders

Research Article

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### Abstract

Temporomandibular joint (TMJ) is a complex system that is able to perform multiple functions, which is mainly involved with mastication and speech. Any injury to the TMJ will cause pain and difficulty in opening of the mouth. Temporomandibular joint disorders (TMDs) may arise when there is associated injury to TMJ and masticatory muscles. Thus, causing reduction of efficacy of its functions. The aetiology of TMDs can be multifactorial. Most common aetiology are changes of occlusion, denture wearer, faulty prosthesis, traumatic injury to TMJ and parafunctional habits. The aim of this study was to evaluate the association between partial edentulism of jaw and temporomandibular disorders. Among 86000 dental patients reported to our institution from June 2019 to March 2020, about 60 cases were included in the study by a simple random sampling method. These included 30 patients with temporomandibular disorder, and 30 patients without temporomandibular disorder. Any completely edentulous patients were excluded from the study. Each patient's dental records, treatment reports and photographs were reviewed thoroughly. Presence of Partial edentulism of jaws was marked and the areas of missing teeth in jaws, dental arches were recorded. Demographic details like age, gender was also recorded. The collected data was validated, tabulated and analysed with Statistical Package for Social Sciences for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA) and results were obtained. P value < 0.05 was considered statistically significant. Prevalence of partial edentulism of jaws was seen more in females 35 patients (58.3%) compared to male 25 patients (41.7%). Partial edentulism of jaws was most prevalent in the age group of 31-40 years (46.7%). Missing teeth in the posterior region (86.7%) was more common than missing anterior teeth. Grouping teeth in both upper arch (40%) was higher compared to involvement of single arch. There was no statistically significant association present between TMD with area of missing teeth (chi square test,  $p = 0.315$ ). Also, there was no statistically significant association between TMD and arch involved (chi square test,  $p = 0.637$ ). Within the limit of study, prevalence of TMDs was not associated with partial edentulism of the jaws. Prevalence of partial edentulism of jaws was higher in females than in males, more in the middle age group than other age groups.

**Keywords:** Edentulism of Jaws; Partially Edentulous; TMDs; Temporomandibular Joints; Tooth Loss.

### Introduction

Temporomandibular joint (TMJ) is a complex system that is able to perform multiple functions, which is mainly involved with mastication and speech. It is a complicated articular system which allowed the mandible to function via a dynamic balance mechanism and allowed it to move within the three planes of space [1]. It can be isolated myofascial with relation to associated muscles or

arthrogenic which is related only to TMJ or combination of both [2]. Hence, any injury to the TMJ or the masticatory muscles will cause pain and difficulty in opening of the mouth. Thus, causing reduction of efficacy of its functions. Basically, temporomandibular disorders can be defined as “a collective term that embraces a number of clinical problems that involve the masticatory muscles, the TMJ and the associated structures [3].

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Next, there are three factors that are responsible for TMJ disorders [TMD], which are susceptibility, tissue changes and psychological factors [4]. The aetiology of TMDs can be multifactorial. Most common aetiology are changes of occlusion, denture wearer, faulty prosthesis, traumatic injury to TMJ and parafunctional habits [5]. Traumatic injury on the TMJ can occur due to physical trauma to the facial region which can be isolated or associated with multiple injuries [6]. This also can result in TMDs. Changes of occlusion is commonly encountered by patients with TMDs. It is usually related to missing permanent teeth in the oral cavity. It can change the occlusion of opposing teeth depending upon duration of missing teeth, area involved, span of edentulism and method of replacement of the missing teeth.

TMDs are also commonly associated with pain, due to conversion of arachidonic acid which is fatty acids present in the body to prostaglandins, which results in generation of pain [7]. Thus, most of the patients mainly come with the chief complaint of pain in the temporomandibular joint regions. Based upon this, the severity of TMDs may differ upon individuals. This may influence the general health of the individuals. Thus, it is important to consider oral health as a mirror of general health, which enables an individual to eat, speak and socialize without active disease, discomfort or embarrassment and which contributes to general well-being [8]. Assessing the status of their medical condition is also important [9].

Any underlying systemic diseases also should be identified such as infective endocarditis [10], HIV/AIDS [11] and oral cancer [12]. In a previous study, they reported that the incidence and intensity of TMDs was higher when there is greater tooth loss in the supporting area [5]. This is due to lack of support on the opposing teeth during mastication and speech. Therefore, more force is exerted on the area than in normal condition. Thus, dental prosthesis should be given as early as possible to these patients. However, in dentate individuals TMD signs also may arise due to faulty prosthesis. A study reported that a higher number of TMD signs were seen in dentate individuals, when compared with completely edentulous patients [13]. Thus, it is important to perform a thorough examination on the individuals, in order to identify the causes of the problems and provide better treatment modalities for them.

Hence, this study is important to help in promoting awareness of people on temporomandibular disorder and its association with partial edentulism of jaw. A thorough medical history and examining the patient will help to formulate a comprehensive treatment plan with appropriate alterations to treatment will help to prevent disease progressions into severe states. Early diagnosis and interventions of these problems will provide better treatment plans and prognosis. However, the limitations of this study could be lack of information on patients' history may lead the dental professionals to contribute toward environment degradation [14] of the patients. There is lack of literature regarding prevalence of TMD among patients with partial edentulism in our Chennai population. Therefore, the aim of this study was to evaluate the association of partial edentulism of jaw and temporomandibular disorder in our institution among the regional population.

## Materials And Methods

## Study design and Study setting

This retrospective cross-sectional study was conducted in Saveetha dental college and hospital, Saveetha university, Chennai, to evaluate the association between partial edentulism of jaws and temporomandibular joint disorders among dental patients reporting from June 2019 to March 2020. The study was initiated after approval from the institutional review board with the following ethical approval number SDC/SIHES/2020/DIAS-DATA/0619-0320.

## Study population and sampling

Among 86000 dental patients reported to our institution from June 2019 to March 2020, about 60 cases were included in the study by a simple random sampling method to minimise sampling bias. These included 30 patients with temporomandibular disorder, and 30 patients without temporomandibular disorder. All missing or incomplete data, any completely edentulous patients were excluded from the study. Each patient's dental records, treatment reports and photographs were reviewed thoroughly. Cross verification of data for errors was done with the help of an external examiner [15].

## Data collection

A single calibrated examiner evaluated the digital case records of the patients collected from June 2019 to March 2020 who reported with and without TMJ disorders and reviewed the status of their dentition for edentulousness. Presence of Partial edentulism of jaws was marked and the areas of missing teeth in jaws, dental arches were recorded. Demographic details like age, gender was also recorded.

## Statistical Analysis

The collected data was validated, tabulated and analysed with Statistical Package for Social Sciences for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA) and results were obtained. Categorical variables were expressed in frequency and percentage; and continuous variables in mean and standard deviation. Chi-square test was used to test associations between categorical variables. P value < 0.05 was considered statistically significant.

## Results And Discussion

In our study, among 60 patients, there were an equal number of patients with TMDs (n=30) and without TMDs (n=30). 35 patients were females and 25 patients were males and all patients had partial edentulism. The patients had an age range of 11- 80 years with mean age of 41.4. years. Prevalence of partial edentulism of jaws was seen more in females 35 patients (58.3%) compared to male 25 patients (41.7%). [Figure 1]. Partial edentulism of jaws was most prevalent in the age group of 31-40 years (46.7%), followed in descending order by age group 41-50 years (25%), 21-30 years (16%), 51-60 years (11.7%), 71-80 years (3.3%), 11-20 years (1.7%) and 61-70 years (1.7%). [Figure 2].

In our study, Prevalence of patients with signs of symptoms of TMDs, and partial edentulism was seen to be more in females compared to male. The findings of this present study, was in line

with studies reported by AlZarea BK et al, Shet RGK et al, Wang MQ et al., and Yousef A L et al., [16-19] There were no exact attributes to explain the prevalence of TMDs in women. However, it mainly can occur due to biological or psychosocial or both genders or hormonal differences, menstrual cycle or to reduced pain threshold as women mastication systems have less ability to withstand harmful stimulation from abnormal occlusion [16-20]. In addition to this, stress response also may trigger a cascade of events resulting in a series of changes in humans [21] which is associated with pain symptoms in patients. In general, pain perception is categorised under psychological concepts [22]. Therefore, females were more prone to TMJ disorder as compared to male.

In association with age, the middle age group showed the highest prevalence of partial edentulism and TMD in our study. These results are similar to that reported by Wang MQ et al and Yousef A S et al that TMDs affect the young age group compared to older age groups [18, 19]. However, TMDs symptoms may decrease with increasing age, but TMD signs may increase with increasing age [19]. This was due to lots of reasons like missing natural teeth, bone loss and underlying systemic diseases.

Higher prevalence of missing teeth was seen in the posterior re-

gion (86.7%) followed by anterior region (6.7%) and both anterior and posterior regions (6.7%) of the jaws. [Figure 3]. In our study population, missing teeth in both upper and lower arch (40%) was higher compared to only in lower arch (38.3%) and only in upper arch (21.7%). [Figure 4].

Association of area missing teeth with temporomandibular joint disorders was shown in Figure 5. Among patients with TMDs, missing teeth was seen most in the posterior region (n=28), followed by anterior (n=1) and both areas (n=1). In patients without associated TMDs symptoms, more missing teeth were also seen in the posterior region (n=24) followed by anterior region (n=3) and involvement of both anterior and posterior regions (n=3). Thus, missing teeth were present predominantly in the posterior region both in patients with TMD and without TMD and the results were statistically not significant. Chi square test,  $p = 0.315 (>0.05)$ . Thus, there was no association between the area of missing teeth and TMD.

Our study shows significantly higher prevalence of TMDs in patients with missing posterior teeth than missing anterior teeth. However, the area of missing teeth showed no statistically significant association with TMD disorders. Our study results were

Figure 1. Bar chart depicting gender wise distribution of partial edentulism of jaws. X axis represents the genders of the patients and Y axis represents the number of patients with partial edentulism of jaws. Partial edentulous was seen more in females 35 patients (58.3%) compared to male 25 patients (41.7%).

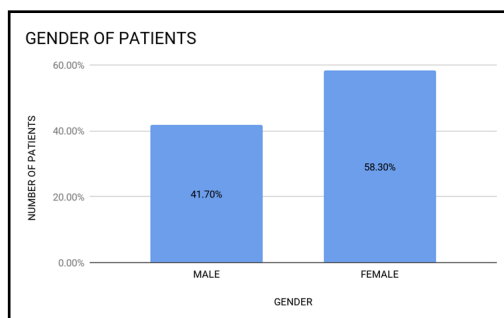


Figure 2. Bar chart depicting age wise distribution of partial edentulism of jaws. X axis represents the age group of the patients and Y axis represents the number of patients with partial edentulism of jaws. Partial edentulism of jaws was predominantly seen in the age group of 31-40 years (46.7%), followed by age groups 41-50 years (25%), 21-30 years (16%).

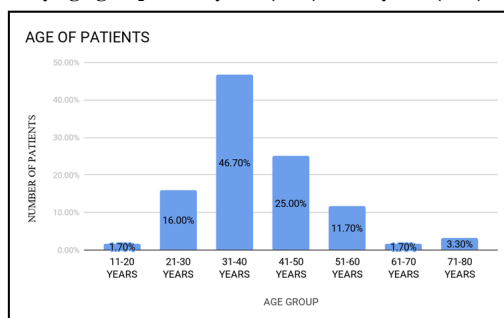


Figure 3. Bar chart shows Distribution of Area of Missing Teeth. X axis represents the area of missing teeth and Y axis represents the number of patients with partial edentulism of jaws. Missing teeth was seen more in the posterior region (86.7%) followed by anterior region (6.7%) and both anterior and posterior regions (6.7%) of the jaws.

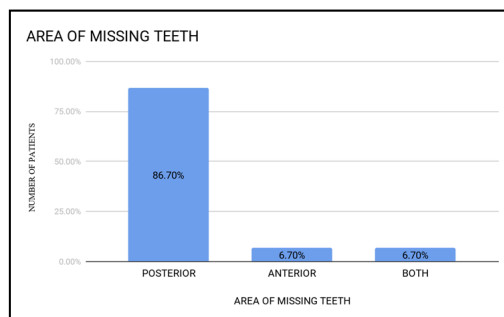


Figure 4. Bar chart depicting Distribution of partial edentulism among dental arches. X axis represents the arch involved and Y axis represents the number of patients with partial edentulism of jaws. Missing teeth were predominantly present in the both upper and lower arches (40 %) followed by only lower arch (38 %) and only upper arch (22%).

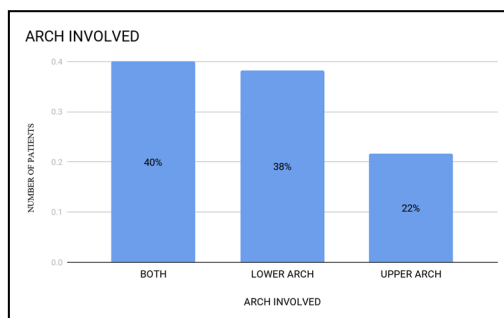


Figure 5. Bar chart depicting Association between temporomandibular disorders and Area of Missing Teeth. The X axis represents the partial edentulism of jaws in anterior, posterior or both areas. Y axis represents the number of patients with and without TMD. Missing teeth were more prevalent in the posterior region than in other regions in patients with TMD and without TMD and the results were statistically not significant. Chi square test,  $p = 0.315 (>0.05)$ . Thus, there was no association between the area of missing teeth and TMD.

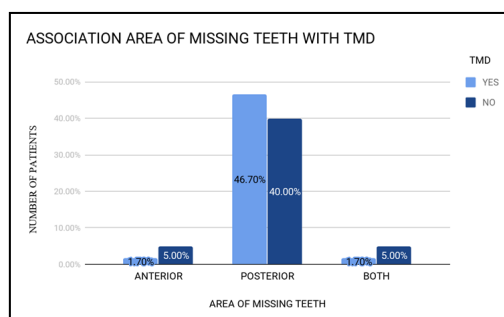
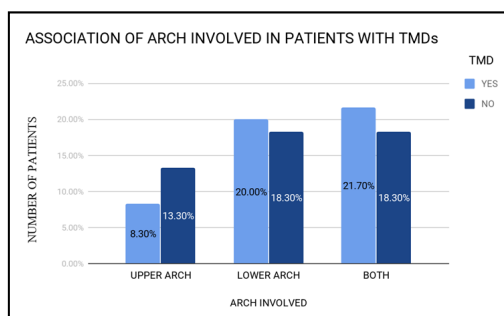


Figure 6. Bar chart depicting association between TMD and Arch Involved with missing teeth. X axis represents the number of patients with partial edentulism of jaws in relation to upper arch, lower arch or both arches. Y axis represents the number of patients with and without TMD. Partial edentulism of both arches and only lower arch was most commonly present in patients with TMDs and the results were statistically not significant. Chi square test,  $p = 0.637 (>0.05)$ . Thus, there was no association between arch involved in partial edentulism and temporomandibular joint disorders.



contradicted by the findings reported by Shet RGK et al, Fallahi H. R et al, Wang MQ et al, and GithanjaliManchikalapudi et al, in which they showed significant associations with TMD and areas of partial edentulism [4, 17, 18, 23]. No associations between areas of missing teeth and TMD were obtained in our study and it may be due to smaller sample size used in our study, compared to previous study. The edentulous span of missing posterior teeth also could affect the association with TMDs.

One of the possible reasons might be the fact that loss of a number of teeth in the posterior area might result in TMDs may due to no contact in the posterior region, which results in overload of joints to appear [17]. This was due to changes in the position of the condyle in the fossa and TMJ disorders, as results of tilting or migration of the adjacent teeth towards the edentulous area [4]. Therefore, the posterior region was commonly affected as it acts as a supporting area of oral cavity and TMJ to perform their balanced dynamic functions.

Association of arch involved in partial edentulism with temporomandibular joint disorders is illustrated in Figure 6. Among patients with signs and symptoms of TMDs, prevalence of partial edentulism in both arches was higher than only in the lower arch or only in the upper arch. In patients without associated TMDs symptoms, prevalence of partial edentulism of both arches and only in the lower arch was higher than only in the upper arch. Therefore, partial edentulism of both arches and only lower arch was most commonly seen both in patients with TMDs and without TMDs and the results were statistically not significant. Chi square test,  $p = 0.637 (>0.05)$ . Thus, there was no association between arch involved in partial edentulism and temporomandibular joint disorders.

Next, although there was no statistically significant association between TMD and arch involvement, prevalence of TMDs was seen more when teeth were missing in both arch and only in the lower arch. This was supported by Shet RGK et al, and Wang MQ et al [17, 18]. In normal conditions, a uniform distribution of the den-

tal contact of mandibular arches will be seen along the maxillary arches during clenching. However, when there are missing teeth, especially in the posterior region it may cause overloading of TMJ. Thus, causing restriction and pain on movement and functions of TMJ [17]. In fact, missing of mandibular posterior teeth also may accelerate the development of degenerative joint disease [24]. In addition to this, occlusal relationships will act as aggravating factors in triggering pain on muscles during chewing and TMJ dysfunction [19].

The relationship between the severity of TMJ disorders and loss of teeth has always been a controversial issue. So, the limitations of the present study should be discussed. First and foremost, the sample size should be increased in order to provide a wide coverage of population distribution thus, significant results can be obtained. A thorough diagnosis should be done on TMDs signs and symptoms, in order to identify the severity of TMJ problems. The severity of each patient will differ, depending upon their gender, age, area and number of missing teeth as well as edentulous span. Any association with habits like bruxism also may cause TMDs. Displacement of jaws also can influence the dimension of the airway at all levels [25]. Therefore, dental practitioners also must be aware of the aetiology of the diseases in order to aid patient compliance with suitable treatment.

In future, TMDs should be classified based upon its severity and association with etiological factors. Hence, this will help to increase awareness of people on association of partial edentulism of jaws with TMDs as well as improving their knowledge by providing continuous education and adapting preventive measures. This study also should create more awareness and knowledge among the general population about basic procedures [26], that could be given to the patient for management of TMDs. Therefore, people would be more aware on the important of replacement of missing natural teeth in order to improve their physiologic functions [27], as well as to reduce risk of TMDs and progression of disease. With the advent of technology, newer non-invasive medical management also should be introduced to manage TMDs [28].

## Conclusion

Within the limit of study, prevalence of TMDs was not associated with partial edentulism of the jaws. According to our study, the prevalence of partial edentulism of jaws was more in females than in males, more in the middle age group than other age groups.

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