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Evaluation of association between Parafunctional Habits and Temporomandibular Joint Disorders among dental patients

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Abstract: Temporomandibular disorders (TMD) are degenerative, musculoskeletal conditions associated with morphological and functional deformities. The etiology of TMD is considered multifactorial in nature and has been related to trauma, malocclusion, parafunctional habits such as bruxism, nail-biting, and non-nutritional sucking. The occurrence of TMD associated with parafunctional habits is in the ratio of women to men in 4:1. The aim of the study was to evaluate the association between parafunctional habits and temporomandibular disorders among dental patients. In this retrospective study, 51 patients with TMD as cases and 51 patients without TMD as controls were included in the study. Presence of parafunctional habits like thumb sucking, tongue thrusting, nail biting, lip biting and mouth breathing were assessed in both the groups using case sheets. Demographic details like age, gender were recorded. Excel tabulation and SPSS version 23 was used for statistical analysis. Descriptive statistics was done to describe the age and gender of the study population and they were expressed in frequency and percentage. Chi-square t test was used to test the associations between parafunctional habits and TMD; age and parafunctional habits; gender and parafunctional habits and results obtained. In this study, of 102 patients, 54.90% were males and 45.10% were females and the 21-30 years age group had a maximum number of participants (50.98%). TMD was predominantly present (29.41%) in patients with parafunctional habits than in patients without parafunctional habits (22.55%) and the results were statistically significant. ($p = 0.001$). The association between age and parafunctional habits was statistically not significant ($p>0.05$). The association between gender and parafunctional habits was statistically not significant ($p>0.05$). Within the limits of the study, it is evident that there is a strong association between parafunctional habits and Temporomandibular disorders among the dental patients. Thus parafunctional habits can be considered as a risk factor for TMD. It was also observed that there was no significant association of age and gender of the patients with parafunctional habits.

Keywords: Bruxism, Masticatory function, Nail-biting, Parafunctional habits, Temporomandibular disorders, dental patients innovative technique

INTRODUCTION

The temporomandibular articulation is composed of bilateral, diarthrodial, temporomandibular joints (TMJs) (Zarb and Carlsson, 1999). Each joint is formed by a mandibular condyle and its corresponding temporal cavity (glenoid fossa and articular eminence) (Laskin, 1983). The TMJ and its associated structures play an essential role in guiding mandibular motion and distributing stresses produced by everyday tasks, such as chewing, swallowing and speaking (Tanaka, Detamore and Mercuri, 2008). Temporomandibular disorders (TMD) are degenerative, musculoskeletal conditions associated with morphological and functional deformities (Carlsson, 1999). TMDs are considered as the common cause of orofacial pain of non dental origin (Valentic-Peruzovic, 2010).

The American Academy of Orofacial Pain defined TMD as "a collective term embracing a number of clinical problems that involve the masticatory musculature, the temporomandibular Joint (TMJ) and associated structures, or both (Goho and Jones, 1991). These disorders have been principally characterized by pain in TMJ region or the muscles of mastication, limitations or deviations in the mandibular range of motion, TMJ sound during jaw functions, masticatory muscle soreness (Al-Khotani *et al.*, 2016). TMD include abnormalities of the intra articular discal position and/or structure as well as dysfunction of the associated musculature (McNeill, 1990). About 60-

70% of the general population has at least one sign of temporomandibular joint dysfunction (TMD), but only one out of four individuals is aware of these symptoms and reports them to a specialist (List *et al.*, 1999).
There are various factors associated with the occurrence of TMD which includes dietary habits, parafunctional habits, stress, socioeconomic status. The etiology and pathogenesis of this condition is poorly understood, therefore treatment of temporomandibular joint diseases is sometimes difficult (Karan, 2010). TMD affects both adults as well as children. After 5 years of age, growth velocity diminishes significantly. The TMJ is sufficiently formed at an early age, to be affected by parafunctional habits. The etiology of TMD in children and adolescents is considered multifactorial in nature and has been related to trauma, malocclusion, parafunctional habits such as bruxism, nail-biting,and non-nutritional sucking (Goho and Jones, 1991). In adolescents, along with parafunctional habits factors such as increased level of stress, somatic complaints play a prominent role than dental problems (Conti *et al.*, 2003). The occurrence of TMD associated with parafunctional habits, in the ratio of women to men in 4:1(Al-Khotani *et al.*, 2016).
The term oral parafunctional habit is used to describe any abnormal behaviour or functioning of oral structures and associated structures. Abnormal behaviours commonly include bruxism, clenching, excessive gum chewing, lip and nail biting or non-nutritive sucking. During parafunctional activities, it seems that neuromuscular protective mechanism is suppressed and therefore not fully capable of protecting masticatory components, especially masticatory muscle from high level of their activities, this leads to increased parafunctional activity (Cortese and Biondi, 2009). While treating TMD, the dentists give less attention to oral parafunctional habits than other factors. The factors leading to oral parafunctional habits include psychological disturbances, which are also seen in patients with TMD. Hence, studies and comparisons are necessary for better understanding. As late, diagnosis of TMDs may result in irreversible and destructive effects on TMJ. So early evaluation plays an important role in the treatment process.
Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Abraham *et al.*, 2005; Devaki, Sathivel and BalajiRaghavendran, 2009; Neelakantan *et al.*, 2010, 2015; Arja *et al*., 2013; Ramshankar *et al.*, 2014; Sumathi *et al*., 2014; Surapaneni and Jainu, 2014; Surapaneni, Priya and Mallika, 2014; Ramamoorthi, Nivedhitha and Divyanand, 2015; Manivannan *et al.*, 2017; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; J *et al*., 2018; Ravindiran and Praveenkumar, 2018; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Krishnaswamy *et al.*, 2020; Samuel, Acharya and Rao, 2020; Sathish and Karthick, 2020)
The idea for this survey stemmed from the current interest in the community.
So this study aims to evaluate the association between parafunctional habits and Temporomandibular disorders among dental patients.

MATERIALS AND METHODS

Study design and Study setting: This retrospective study was conducted in Saveetha dental college and hospital, Saveetha university, Chennai, to evaluate the association between parafunctional habits and temporomandibular joint disorders among dental patients reporting to the outpatient department of oral and maxillofacial surgery from June 2019 to March 2020. The study was initiated after approval from the institutional review board - SDC/SIHEC/2020/DIASDATA/0619-0320.

Study population and sampling: Among 86000 dental patients reported to our institution from June 2019 to March 2020, about 102 adult patients were included in the study by a simple random sampling method to minimise sampling bias. These included 51 patients with temporomandibular disorder, and 51 patients without temporomandibular disorder. All missing or incomplete data, nutritionally debilitated patients and patients with severe systemic illnesses 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.

Data collection and tabulation: 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 for presence of parafunctional habits. Information on the patients' name, age, gender, dietary habits, parafunctional habits and presence of TMD were collected from the patients' case records. Age of the patients were categorized for statistical convenience as 11-20, 21-30, 31-40, 41-50 and 51-60. Parafunctional habits which include thumb sucking, tongue thrusting, nail biting, lip biting and mouth breathing were considered in the study. Data was entered in excel and imported to SPSS. The variables were defined.

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. Descriptive analysis was done to describe the age and gender of the study population. Categorical variables were expressed in frequency and percentage; and continuous variables in mean and standard deviation. Chi-square test was used to

test association between parafunctional habits and TMD; age and parafunctional habits; gender and parafunctional habits. P value < 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Our study which consisted of 102 patients, the age group of the study population ranged between 11-60 years, subdivided into 5 groups. The 21-30 years age group had a maximum number of participants (50.98%) and the least was in the age group of 51-60 years (3.92%). Out of 102 patients, 12.75% belonged to the 11-20 age group, 24.51% belonged to 31-40 years age group and 7.84% belonged to 41-50 years age group [Figure 1].

Out of 102 patients, 54.90% were males and 45.10% were females [Figure 2].Thus the majority of patients in our study were males rather than females. On evaluating the association between parafunctional habits and Temporomandibular disorders it was seen that in patients with parafunctional habits 29.41% had TMD. In patients without parafunctional habits 22.55% of the patients had TMD. Thus, TMD was predominantly present (29.41%) in patients with parafunctional habits than in patients without parafunctional habits (22.55%) and the results were statistically significant. (Pearson Chi square= 10.734, p = 0.001). Thus a statistically significant association was present between parafunctional habits and temporomandibular disorders. [Figure 3 and Table 1].

On evaluating the association between age and parafunctional habits, it is seen that parafunctional habits are present mostly in the 21-30 years age group (14.70%) and 31-40 years age group (14.70%). Parafunctional habits were seen least in the 51-60 years age group (0.98%). Parafunctional habits were present in 7.84% of the patients in 11-20 years and 2.94% of the patients in 41-50 years. However this association between age and parafunctional habits was statistically not significant (Pearson Chi square= 0.010, p= 0.920 (>0.05)) [Figure 4 and Table 2].

On evaluating the association between gender and parafunctional habits, it is seen that parafunctional habits are present slightly more in males (21.56%) when compared to females(19.60%). Thus prevalence of parafunctional habits are slightly higher in males than females. However this association between gender and parafunctional habits was statistically not significant (Pearson Chi square= 0.181, p= 0.670 (>0.05)) [Figure 5 and Table 3].

Temporomandibular disorders include alterations of the Temporomandibular joint (TMJ) and associated structures, including facial and neck muscles (Dimitroulis, 1998). Parafunctions are defined as impaired or altered functions of TMJ. Of these, excess gum chewing,teeth clenching and bruxism have been extensively studied as possible risks of TMD (Feteih, 2006).

In case of selection of control group, we selected a control group from among the patients seeking dental case instead of general population sample, in order to control potential bias associated with the variable "active seeking of treatment". Although signs and symptoms of TMD are frequent in the general population, people are considerably less likely to seek treatment probably because such disorders are considered to have only a slight or moderate impact upon quality of life and in many cases tend to improve or resolve spontaneously (Magnusson, Egermark and Carlsson, 2000).

In our study, we found a statistically significant association between parafunctional habits and Temporomandibular disorders. The results were similar to the study conducted by Kriti.et al (Agarwal, Saha and Sinha, 2016), Fragoso et al (Fragoso *et al.*, 2010) where they observed strong association between parafunctional habits and TMD. This is due to the fact that during parafunctional activities, the neuromuscular protective mechanism of protecting the masticatory components is suppressed, as a result of which parafunctional activities are increased, resulting in TMD symptoms like auricular pain, joint noises during movements. Also study by Motghare et al (Motghare, 2015) shows that there is a strong association between bruxism and TMD symptoms based on theory according to which the repeated over use of TMJ determines functional abnormalities. They also stated that this parafunction may result in condylar bone remodelling and articular cartilage degeneration and may contribute to the development of osteoarthritis of the TMJ (Poveda-Roda *et al.*, 2009). They also stated that association between parafunctional habits and TMD is strong enough in children and adolescents than in adults, as TMJ is significantly affected at an early age by parafunctional habits, whereas in adults, the TMD symptoms and causes are usually dental in origin.

However literature by Fale et al (Fale *et al.*, 2018) and Marshall et al (Singh *et al.*, 2012) showed no association between parafunctional habits and TMD. Study by Seraj et al (Seraj *et al.*, 2009) showed that parafunctional habits like bruxism and nail biting were more prevalent in the 15 -19 age group but were not statistically significant. The reasons for these contraindications would be differing sample size , geographic location, examiner's subjectivity.

In our study, we found that parafunctional habits were seen predominantly in the 21-30 years age group and 31-40 years age group. However it was not statistically significant. However, this was contradictory to the study by Magnusson et al (Magnusson, Egermark and Carlsson, 2000) where parafunctional habits like nail biting and lip biting were more prevalent in the 11-20 years age group, though it was statistically not significant. The TMJ is sufficiently formed at an early age, to be affected by parafunctional habits. So mostly people in the younger age group like children are most affected with TMD related to parafunctional habits. In adults, TMD may be due to various reasons like stress, socioeconomic status and mainly due to dental origin like malocclusion. The reasons for varied results in several studies would be differing sample size, geographic location, examiner's subjectivity.

On evaluation of the association between gender and parafunctional habits, we found that parafunctional habits were present predominantly in males than in females. However this was contradictory to the study by Khotani et al (Al-Khotani *et al.*, 2016) where they stated that the occurrence of TMD associated with parafunctional habits was in the ratio of women to men in 4:1. Nail-biting and bruxism is most commonly seen in females, who are more prone to stress due to their hectic regular activities when compared to men. Again reasons for varied results in the studies would be geographic location, examiner's subjectivity.

The limitations of the study were less sample size, single centered study and the confounders were not taken into account. The future scope of this study is to do extensive research with large sample size and prevalence of different types of parafunctional activities. This would help in evaluation of TMD by diagnosing at an early stage without delaying the treatment which would result in better prognosis. Also, patients can be educated and motivated regarding the adverse effects of parafunctions on their TMJ, so that early intervention can be made in case of TMD and preventive measures can be implemented to prevent their recurrence.

CONCLUSION

Within the limits of the study, it is evident that there is a strong association between parafunctional habits and Temporomandibular disorders. Thus parafunctional habits can be considered as a risk factor for TMD. It was also observed that there was no significant association of age and gender of the patients with parafunctional habits.

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AUTHOR'S CONTRIBUTION

First author Vaishali. S performed data collection, analysis and interpretation and wrote the manuscript. Second author Santhosh Kumar contributed to conception, study design, analysis, interpretation and critically revised the manuscript. Third author Revathi Duraisamy contributed to review the manuscript. All the authors have discussed the results and contributed to the final manuscript.

Conflict of interest: None

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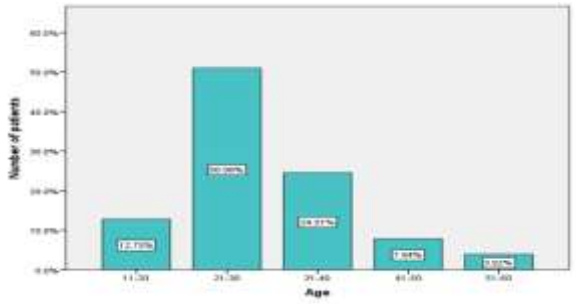

Fig.1: Bar chart shows age wise distribution of the study population. X axis denotes the age group and Y axis denotes the number of patients in each age group. 21-30 years age group had the maximum number of participants (50.98%) and the least was in the age group of 51-60 years (3.92%).

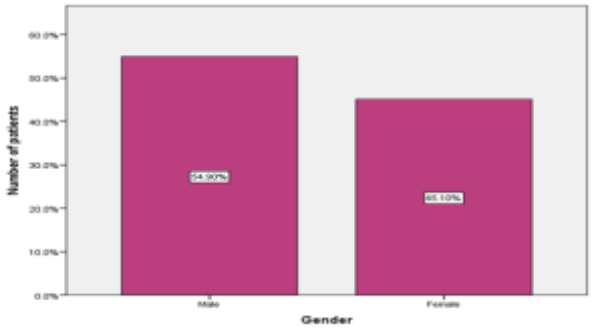

Fig.2: Bar chart shows gender wise distribution of the study population. X axis denotes the gender (Male and Female) and Y axis denotes the number of patients in each gender. The majority of patients in our study were males (54.9%) rather than females (45.1%).

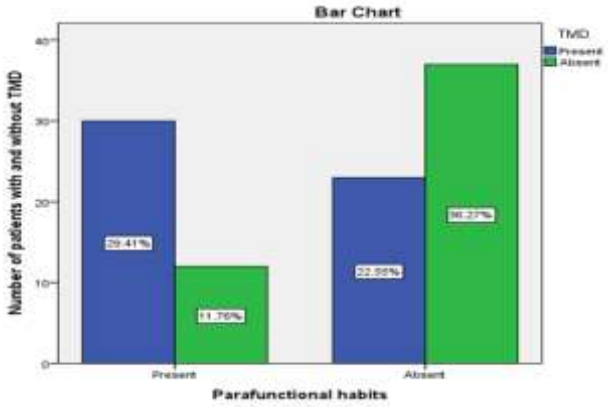

Fig.3: Bar graph shows association between parafunctional habits and temporomandibular joint disorders. X axis denotes parafunctional habits present and parafunctional habits absent and Y axis denotes number of patients with and without TMD. (Pearson Chi square= 10.734, p = 0.001

(<0.05), hence statistically significant). TMD disorder (Blue) was predominantly present (29.41%) in patients with parafunctional habits than in patients without parafunctional habits (22.55%) and the results were statistically significant.

Table 1: Table shows association between parafunctional habits and TMD. (Pearson Chi square= 10.734, p = 0.001 (<0.05), hence statistically significant).TMD was predominantly present (29.41%) in patients with parafunctional habits than in patients without parafunctional habits (22.55%) and the results were statistically significant.

		Temporomandibular	disorders	Total
		Present	Absent	
Parafunctional habits	Present	30	12	42
	Absent	23	37	60
Total		53	49	102
Chi Square Test				
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		10.734	1	0.001

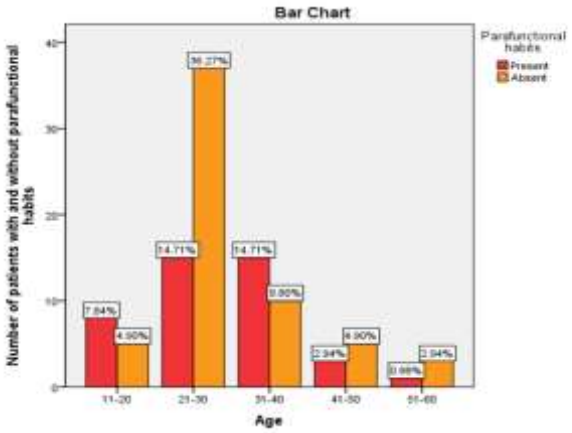

Fig.4: Bar graph shows association between age and parafunctional habits. X axis denotes the different age groups and Y axis denotes the number of patients with and without parafunctional habits.(Pearson Chi square= 0.010, p= 0.920 (>0.05), hence statistically not significant). Parafunctional habits were predominantly present (Red) in the 21-30 years age group (14.70%) than other age group. However this association between age and parafunctional habits was statistically not significant.

Table 2: Table shows association between age and parafunctional habits.(Pearson Chi square= 0.010, p= 0.920 (>0.05), hence statistically not significant). Parafunctional habits were predominantly present in 21-30 years age group (14.70%) and 31-40 years age group (14.70%). Parafunctional habits were least seen in the 51-60 years age group (0.98%). However this association between age and parafunctional habits was statistically not significant.

		Parafunctional	habits	Total
		Present	Absent	
	Group 1 (11-20 yrs)	8	5	13
	Group 2 (21-30 yrs)	15	37	52
Age (in yrs)	Group 3 (31-40 yrs)	15	10	25
	Group 4 (41-50 yrs)	3	5	8
	Group 5 (51-60 yrs)	1	3	4
Total		42	60	102
Chi Square Test				
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		0.10	4	0.920

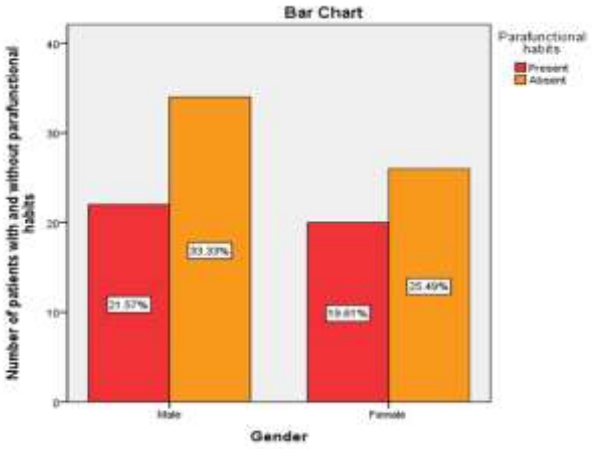

Fig.5: Bar graph shows association between gender and parafunctional habits. X axis denotes the gender (Male and Female) and Y axis denotes the number of patients with and without parafunctional habits. (Pearson Chi square= 0.181, p= 0.670 (>0.05), hence statistically not significant). Parafunctional habits are present (red) slightly more in males (21.56%) when compared to females (19.60%). However this association between gender and parafunctional habits was statistically not significant

Table 3: Table shows association between gender and parafunctional habits. (Pearson Chi square= 0.181, p= 0.670 (>0.05), hence statistically not significant). Parafunctional habits are present slightly more in males (21.56%) when compared to females (19.60%). However this association between gender and parafunctional habits was statistically not significant.

		Parafunctional	habits	Total
		Present	Absent	
Gender	Males	22	34	56
	Females	20	26	46
Total		42	60	102
Chi Square Test				
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		0.181	1	0.670