Inter-Relationship of Temporomandibular Disorders and Maximal Bite Force: A Comparative Study

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ABSTRACT

Introduction: Para-functional habits like teeth clenching or bruxism may be a contributing factors for temporomandibular disorders (TMD). Herein, we evaluated and compare the maximal bite force in young patients suffering from TMD with healthy population. Study aimed to evaluate the maximal bite force (MBF) in the presence of TMD and bruxism (TMDB) in young adults. To compare MBF in TMDB and healthy population

Material and Methods: The number of participants in this study was fifty-four (thirty female and twenty four males). Symptoms of TMD were evaluated by a questionnaire and clinical signs/ symptoms were assessed during clinical examination. MBF was measured with a gnatodynamometer and the highest values were considered. The statistical tests employed data were descriptive statistics, Shapiro Wilks W-test, t tests both paired and unpaired or if indicated Mann-Whitney tests, and Fisher's exact test ($p < 0.05$) Statistical analysis was done using SPSS software (version 18).

Results: TMDB group presented with lower MBF values. In TMDB females least values of MBF were recorded, however MBF for TMDB men was similar to that of the control group.

Conclusion: Based on the survey findings, it was concluded that MBF was reduced in TMDB women. Stress was found to be non influencing factor for TMD and bruxism in men.

Keywords: Temporomandibular joint disorders; Bruxism; Bite force.

INTRODUCTION

Temporomandibular disorders (TMD) are classified as a variant of musculoskeletal disorders resulting from dysfunction of the stomatognathic system that leads to persistent and chronic pain in the masticatory muscles, temporomandibular joint, and orofacial structures.[1] Results of cross-sectional survey rank TMD pain as the prime cause of non-dental pain in the orofacial region.[1] The list of contributing factors for TMD is long and includes structural conditions, psychological morbidities, and behavioral problems such as parafunctional habits.[2,3] Among parafunctional habits, non-functional continuous teeth clenching is the most frequent contributing factor to masticatory muscle pain seen in TMD.[4] Hirose conducted a study and reported large stresses in the posterior part of the disc and retrodiscal tissue which remained constant during continuous clenching.[5] With this knowledge we designed the present study to assess the inter-relationship of temporomandibular disorders and maximal bite force.

MATERIAL AND METHODS

This cross-sectional comparative clinical study was conducted in the department of dentistry Sri sai hospital, Moradabad after taking ethical clearance from local authorities. Calculation for Sample size was done using the formula: n= [Zα/2^σ/E].[2] Thus, the study included twenty seven patients (fifteen females and twelve males) clinically diagnosed with temporomandibular joint disorders. Pregnant patients and those with history of orthodontic treatment, surgical or medical TMD treatment, skeletal or dental Class II and Class III malocclusion removable or fixed partial or total oral prosthesis were excluded. The inclusion criteria comprised willing subjects with complete dentition and normal dental occlusion with simultaneous bilateralcontact. Equal number of gender matched healthy individuals comprised the control group.

Evaluation of symptoms of TMD and bruxism

Symptoms of TMD were assessed using a structured questionnaire, adapted from Fonseca1.[6] Patients were evaluated for parafunctional habits by asking them closed ended questions about the presence or absence of tooth clenching, tooth-grinding at night, and oral habits such as biting nails, lip, cheek, and/or foreign objects. Stress evaluation was done using visual analogical scale (VAS).

Clinical examination of TMD

The examination of TMJ was done by a dental physician specialised in oral medicine and radiology. The examination criteria proposed by Dworkin, Le Resche (1992)was followed strictly for every patient.[7] During examination,TMJ was palpated laterally and posteriorly via the auditory meatus. TMJ sounds and pain during mandibular movements and TMJ and muscle pain upon palpation were evaluated in recorded in special preforma. The muscles palpated were both the origin and insertion of: temporalis muscle, medial and lateral pterygoid muscle, superficial portion of the masseter muscle, and of the sternocleidomastoid muscle. All muscles were palpated bilaterally, with a standard pressure of about 1,000 g.

Maximal bite force (MBF) measurement

To measure MBF, a gnatodynamometer commercially supplied as KFG-1-D16-11 by Kyowa Electronic Instruments CO., LTD., Tokyo, Japan was used. Prior to the actual test, the participants received detailed instructions, demo and they tested biting the equipment several times till both the participant and investigator were comfortable and confident of usage of the same. Next, all the subjects were asked to bite the device twice using maximal effort for 5 seconds and with a rest period of 1 minute. The

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Group	Group I male vs. Group I female	Group I male vs. Group II male	Group I male vs. Group II female	Group I female vs. Group II male	Group I female vs. Group II female	Group I male Vs. Group II female
MBF	0.011 t	0.045 tt	0.045 tt	<0.001t	<0.001 t	0.080t
VAS	0.784	0.172	0.010	0.072	0.002	0.402
t= Mann Whitney test; t=unpaired t test; MBF= Maximal Bite Force; VAS=Visual Analogical scale						

Table-1: Subgroup comparison of MBF and Stress levels.

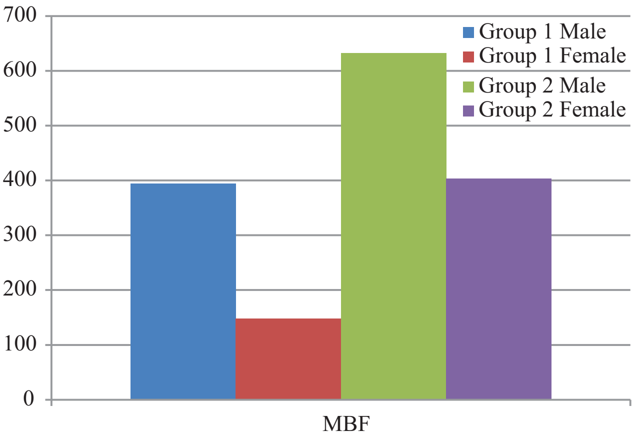

Figure-1: mean values of MBF (Maximal Bite Force) in group 1 and group 2.

bite force was recorded in Kgf and converted to Newton. The maximum values between the two trials were considered as subjects MBF.

STATISTICAL ANALYSIS

For ease in documentations, all the records were tabulated using Microsoft excel (version2010). Normality of the distributions was assessed using the Shapiro-Wilks W-test. Descriptive statistics analysed the data and sides, groups and genders comparisons were performed using t tests both paired or unpaired or Mann-Whitney tests, as indicated, taking into concern the respective powers ($\alpha = 0.05$). Fisher's exact test evaluated the proportions of signs and symptoms of TMD between genders in the TMDB group. There was two-tailed statistical tests, and a p value < 0.05 was considered statistically significant.

RESULTS

Group 1 comprised of 12 males(mean age ± Standard deviation= 23.5±1.31) and 15 females (mean age ± Standard deviation= 23.8±1.59). Group 2 comprised of 12 males (mean age ± Standard deviation= 22.3±1.49) and 15 females (mean age ± Standard deviation= 22.2±1.43). Thus both the samples consisted of young individuals and did not reveal any statistically significant differences with respect to age or gender. The MBF values were significantly lower in females in group I while men had greater MBF values than women in both groups. The values are as shown in Figure 1. The mean stress scores of all the participants are presented in table 1. Women of the control group showed stress free levels compared to both genders of the group I.

DISCUSSION

This study comprised of young adults with TMD and bruxism who were evaluated for the effect of same on magnitude of bite force and the results were then matched with helathy control subjects. The results showed that TMD with bruxism in women had a reduced magnitude of bite force when compared to men of TMDB group and to both genders in the control group (Figure 1, Table 1). However in males of both groups there was no statistical difference in MBF (Table 1).This finding could be attributed to men generally reporting greater pain thresholds and tolerance.[8] Current study shows, for men in group I MBF was similar to that of men and women in the control group. While women in group I had significantly lower bite forces than those in the group II (Figure 1), suggestive of females being more affected.

These results, confirms that there is gender differences in perception of pain, as females show more clinical pain, reduced pain threshold and reduced tolerance levels than males.[8] It is hypothesized that because of differences in the generic pain mechanism and unidentified factors, unique to the craniofacial system, there is increased prevalence of chronic orofacial pain in females.[8]

Stress is known to be an initiator as well as a highly predisposing and perpetuating factor for physical impairment, sleep disorders and psychological symptoms[1] while bruxism was found to be closely associated with TMD.[9] This study, was in accordance with Lobbezoo et al. As both studies showed lower stress scores in women of group II.[10] An emotionally stressed individual is more likely to imbibe constant tooth clenching.The capability of the stomatognathic system to adapt physiologically to the altered bite force depends on the individual's system. Few people overcome stress without pathologic manifestations, which might have occurred in men of the control group. Thus, perceived stress is a factor that should be taken into account when treating bruxism-related temporomandibular pain.[1]

CONCLUSION

In the current study, the maximal bite force was less in women with TMD while higher values were recorded in men. TMD and bruxism did not significantly reduce men's bite force. Stress was not an influencing factor on TMD and bruxism among men. On the contrast TMD, bruxism and stress lead to altered bite force in women.

ABBREVIATIONS

MBF: Maximum Bite Force, TMD: Temporomandibular Disorders, TMDB: Temporomandibular Disorders and Bruxism, VAS: Visual Analog Scale

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