Original Article

Effect of Temporomandibular Disorders on Cortisol Concentration in the Body and Treatment with Occlusal Equilibrium

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ABSTRACT

Background: Temporomandibular disorders (TMDs) are a group of symptoms concerning the temporomandibular joints, masticatory muscles, and occlusion, which include pain, restricted mouth opening and movement, joint tenderness, and intermittent joint noises. Women are more likely to suffer from temporomandibular problems than men. Patients with TMDs show a wide range of behavioral and psychosocial symptoms, including increased stress, anxiety, sadness, and somatization. **Materials and methods:** The patient group in this case–control research comprised 60 patients from the Department of Prosthodontics at Shri Dharmasthala Manjunatheswara College of Dental Sciences in Dharwad. Female subjects aged between 33 and 45 years, who were educated, had two children, and were housewives were included in the study. Only 96 individuals of those screened met the inclusion criteria, and these 96 patients were given a hair cortisol test. After 1, 2, and 3 months, cortisol testing was performed. **Results:** There were no significant differences between the groups at the start of the study; but after 30 min of the modified trier test, there was a statistically significant main effect across groups, as well as a significant main effect of salivary cortisol over time. **Conclusion:** The etiopathogenesis of TMD is complicated by psychosocial stress. When compared to men, women have a higher risk of TMD.

KEYWORDS: *Hypothalamic–Pituitary–Adrenal Axis, salivary cortisol, stress, temporomandibular joint disease*

INTRODUCTION

Temporomandibular disorders (TMDs) are a cluster of symptoms concerning the temporomandibular joints, masticatory muscles, and occlusion, which include pain, restricted mouth opening and movement, joint tenderness, and intermittent joint noises. The symptoms of all TMDs are similar; however, individuals with these illnesses also exhibit a high level of tension in their daily activities. Temporomandibular diseases have a complex etiology, although the relative importance of each particular component is still debated. Women are more likely to suffer from temporomandibular problems than men.[1,2] Patients with temporomandibular dysfunction show a wide range of behavioral and psychosocial symptoms, including increased stress, anxiety, sadness, and somatization.[1] TMD patients experience psychological discomfort as a result of their pain,[1] and the relevance of these elements has led to the concept that these illnesses are part of a larger set of somatoform disorders. According to the surveys conducted around the world, patients with high levels of stress are more prone to bruxism. The difficulties of studying TMD scientifically are discussed. The American Academy of Orofacial Pain (AAOP) published the revised criteria for the diagnosis and classification of various arrangements of TMDs in the fourth edition of its manual, splitting them into two categories (muscular and articular TMDs). There has been no progress in identifying a clear and universal cause of TMD.[3,4] Due to these assumptions, a better understanding of the elements relating to the psychophysiology of stress and their

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impact on the deterioration of these conditions, as well as of the role of cortisol, which is the major corticosteroid in humans and plays a role in the stress modulation system, is required. The ability to forecast periods of increased bruxism and concomitant aggravation of TMD symptoms justifies the study of these systems in the processes of disorders involving the temporomandibular joint. Psychosocial factors were shown to be considerably more prevalent in participants with TMD compared to healthy individuals[3-10] in the Orofacial Pain Prospective Estimation and Risk Assessment (OPPERA) study. When the teeth of both jaws occlude, occlusal balance occurs, in which the upper and lower components of the jaw are in harmony with one another. It is critical to attain occlusal balance in people with TMD.

Materials and Methods

The present study was conducted at the Department of Prosthodontics, Shri Dharmasthala Manjunatheswara College of Dental Sciences, Dharwad. In the study, 1357 patients were examined and screened.

Inclusion Criteria

- Educated female subjects aged between 33 and 45 years with two children and their occupa tion being housewives
- Those with orofacial pain
- Those satisfying the Research Diagnostic Criteria (RDC)/TMD criteria
- Those with bruxism
- Those with clenching

Exclusion Criteria

- Pregnant patients in their third trimester
- Subjects undergoing prednisolone therapy
- Patients with Cushing's syndrome
- Patients with severe depression
- Patients with hypercortisolism
- Patients with cardiovascular disease

Of all the patients who were screened, 96 satisfied the inclusion criteria, and these 96 patients where subjected to hair cortisol test. Cortisol tests were done after 1, 2, and 3 months, respectively. It was found that 32 (33.33%) patients showed higher cortisol levels. The remaining 64 (66.66%) patients were matched along with controls and were taken for the study. The participants were divided into two groups, one being the control group (CG) consisting of 64 healthy individuals and the other being the TMD group (CCG) consisting of 64 subjects satisfying the inclusion criteria, whose etiology is not stress. After the modified trier test was performed on the subjects for 30 min, a saliva sample was collected by asking the patients to chew on a sterilized cotton for a minute. After the test was completed, the patients were asked to rest for 20 min and another saliva sample was obtained from the subjects by asking the subjects to chew on a sterilized cotton for a minute.

Results

The collected saliva samples were sent to a laboratory where cortisol testing was done by radioimmunoassay. After the test was performed, the sensitivity of the assay was found to be 0.069 nmol. Analysis of variance (ANOVA) test was performed to find the difference in cortisol levels in two different groups in response to stress, with the level of significance set at 0.05. There were no significant differences between groups at baseline. There was a statistically significant main effect between the groups ($F = 8.67$, $P < 0.01$) after 30 min of modified trier test and a significant main effect of salivary cortisol over time ($F = 7.50$, $P < 0.01$), as seen in Table 1.

Discussion

According to extensive research, women account for 80% of TMD sufferers.[7-10] The degree of symptoms is also affected by the patient's age. Pain usually begins after puberty and peaks throughout the reproductive years, with the highest prevalence found in women aged 20–40 and the lowest in children, adolescents, and the elderly. The gender and age distribution of TMD points to a probable relationship between the female hormonal axis and its etiology.[1-5] According to epidemiologic studies, TMDs are more common in women than men. TMD affects between 7% and 15% of the adult population worldwide, with women accounting for 80% of TMD cases. The degree of symptoms is also affected by the patient's age. TMD's gender and age distribution suggests that estrogen may play a role in its etiology. Estrogen has been connected to the temporomandibular joint's formation, repair, and metabolism, as well as associated components like bone, cartilage, and the articular disk. The pain regulatory mechanism can also be influenced by estrogen. The role of estrogens in TMD has been proved in this study, based on the fact that women account for the vast majority of TMD sufferers.[6-10] In 64 TMD patients and 64 healthy controls, the relationship between salivary cortisol response and stress, in addition

Table 1: Salivary cortisol testing time

	CG	CCG
Baseline	5.28	6.72
After 30 min	7.58	10.94
After 50 min	6.17	8.49

CCG=Temporomandibular disorder group, CG=Control group

to temporomandibular problems, was studied. A modified social trier exam was administered to the subjects. The outcomes of this case–control study demonstrated significant disparities between individuals with TMD (CCG) and those in the control group (CG). Salameh *et al.*'s[1] study supports these conclusions. They discovered that patients with TMDs had higher salivary cortisol levels. These findings are consistent with Rai and Kaur's[4] study, which identified high levels of salivary cortisol and salivary melatonin in TMD patients, and Jones *et al.*'s[9] study, which discovered a twofold link between TMD symptoms and stress response. The TMD group was found to be diverse, with one group having a cortisol response to stress that was considerably unlike that of the control group and another having a cortisol response that was not pointedly unlike that of the control group.[10] Salivary cortisol levels on waking were not different between patients and controls, according to another study.[6] Despite the success of appliance therapy, Doepel *et al.*[11] undertook a study in TMD patients with myofascial pain to investigate treatment-induced changes in salivary cortisol, IgA, and flow rate values. They discovered no changes in salivary parameters as a result of the treatment. TMD sufferers, on the other hand, were found to have higher degrees of melancholy and somatization, according to Celic *et al.*[12] Differences in study design and demographic and socioeconomic characteristics may have contributed to the disparities in findings. Women have been found to be more susceptible to this sickness (70%). This study is in line with Casanova-Rosado *et al.*'s[13] findings, which revealed that women are at an increased risk of TMD. Another study found that women are more likely than men to suffer from TMD.[14] This could be attributable to the fact that women seek medical counseling and treatment more frequently than men, or the hormonal differences in men and women could be a contributing factor.

Conclusion

According to the findings, psychosocial stress has a significant impact in the etiopathogenesis of TMD. When compared to men, women have a higher risk of TMD.

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Conflicts of interest

There are no conflicts of interest.

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