Prevalence of Temporomandibular Disorders (TMDs) in Relation to Estrogen Levels among Females in Aseer Region, Saudi Arabia

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ABSTRACT:
Aim: To determine the relationship between estrogen levels in females and prevalence of temporomandibular joint disorders (TMDs) in Aseer region of Saudi Arabia.
Context: TMDs were considered to be the most common musculoskeletal disorders that cause orofacial pain. The complex chronic nature of TMDs may affect the quality of life negatively. Studies have shown different prevalence of TMDs among different populations which could be related to variations in methodologies, diagnostic criteria, or classifications. Females are affected more commonly than males with the highest prevalence reported during the reproductive years. One possible explanation, although debatable, is related to female reproductive hormones, especially estrogen. Estrogen could have influence on the structural development, metabolism, and physiologic pain perception of temporomandibular joints.
Methodology: After the Approval taken from the Scientific Research Committee, College of dentistry, King Khalid University, Abha. A written informed consent was drawn from subjects and total of 227 Saudi and Non-Saudi female subjects were selected randomly and were examined. Research Diagnostic Criteria for TMDs (RDC/TMD) Axes I and II were used for diagnosing the most common TMDs and for assessing the psychosocial and behavioral factors, respectively. Procedures followed were in accordance with the ethical standards given in the Declaration of Helsinki of 1975, as revised in 2000. Estrogen test results were retrieved from the latest hormonal analysis of estradiol (E2) blood tests and statistical analysis was done using SPSS Version 16.0. Kolmogorov-Smirnov, Mann-Whitney U, and Kruskal-Wallis tests.
Results: The prevalence of TMDs in females in Aseer region is 26%. Myofascial pain is the most common diagnosis based on RDC/TMD diagnostic criteria, with 22% myofascial pain only and 4% myofascial pain with limited opening. 19.8% reproducible clicking and 9.7% clicking and catching. There was no significant difference of the estrogen levels reported. The mean value of estrogen levels reached its highest in 41-50 age groups.
Conclusions: No significant association found between the tested demographic parameters and TMDs diagnosis or Estrogen levels. TMDs cases showed significantly lower Estrogen levels in comparison to normal cases which are consistent with some published studies but should be interpreted carefully. Further Investigations are needed to assess the relationship of Estrogen levels and TMDs.

Key words: Temporomandibular joint disorders, Estrogen, Myofascial pain

INTRODUCTION

The American Academy of Orofacial Pain defines Temporomandibular disorders (TMDs) as a group of musculoskeletal and neuromuscular conditions that involve the temporomandibular joints (TMJs), the masticatory muscles, and all associated tissues. The clinical signs and symptoms may include pain, limitations of the mandibular movements, and sounds in the TMJ during function such as clicking, popping, or crepitus. The prevalence of chronic pain related to TMDs has been estimated to be between 10-15% in both developed and developing countries. The peak of occurrence is between 20 and 40 years of age. TMDs were considered to be the most common musculoskeletal disorders that cause orofacial pain, being second only to pain of odontogenic origin in the orofacial region. Pain is a common feature among the affected cases and is the main reason to seek the medical attention. The complex chronic nature of TMDs may affect the quality of life negatively. Estrogen could have influence on the structural development, metabolism, and physiologic pain perception of temporomandibular joints. Females are affected more commonly than males with the highest prevalence reported during the reproductive years. One possible explanation, although debatable, is related to female reproductive hormones, especially estrogen. Studies have shown different prevalence of TMDs among different populations which could be related to variations in methodologies, diagnostic criteria, or classifications. The etiological factors could be described as biopsychosocial factors collectively, which include biologic, biomechanical, neuromuscular, and psychological, and social factors. The genetic and epigenetic contribution to the development of TMDs is limited.

The RDC/TMD guidelines were proven to be reliable, valid, and useful tools in diagnosis and classification of TMDs cases. They have been widely used internationally as standardized diagnostic criteria in the TMDs clinical research since 1992. RDC/TMD guidelines reflect the complexity of the biopsychosocial nature of TMDs by focusing on two axes. Axis I includes the clinical examination and diagnostic classification of TMDs. Axis II covers the psychological and the social factors related to TMDs pain. Many questions about the etiology and the pathogenesis of TMDs remain unanswered. There is no objective markers of the disease, comorbidity adds to the complexity, and treatment options are limited sometimes. The mechanism of pain perception is not well known, although pain received more attention of research than internal derangement studies have not shown a solid evidence to link TMDs and hormonal changes. Currently, the conservative treatment is the treatment of choice for the majority of the TMDs cases. Targeting chronic pain to monitor the response of the treatment may lead to substance abuse in some patients which reveals the need for identifying different therapeutic approaches.

MATERIALS AND METHODS

This is a cross-sectional, multi-center study aiming to assess the prevalence of temporomandibular disorders (TMDs) in relation to estrogen levels among females in Aseer region, Saudi Arabia. The participating hospitals included Abha Maternity and Children Hospital, Khamis Mushayt Maternity children hospital, Al-Namas General Hospital and Mustasharak Medical Center. A total of 227 Saudi and non-Saudi female patients were selected randomly and were examined. Training and calibration lead to typical examiner reliabilities. Approval was taken from the Scientific Research Committee, College of dentistry, King Khalid University, Abha. Written, informed consent was taken from the subjects. Procedures followed were in accordance with the ethical standards given in the Declaration of Helsinki of 1975, as revised in 2000. Research Diagnostic Criteria for TMDs (RDC/TMD) Axes I and II were used for diagnosing the most common TMDs and for assessing the
psychosocial and behavioral factors, respectively. Estrogen test results were retrieved from the latest hormonal analysis of estradiol (E2) blood tests recorded. The statistical analysis was done using SPSS Version 16.0. Kolmogorov-Smirnov, Mann-Whitney U, and Kruskal-Wallis tests were applied.

RESULTS
The prevalence of TMDs in females in Aseer region is 26%. The most common TMDs diagnosis was myofascial pain. No significant association found between the tested demographic parameters and TMDs diagnosis or Estrogen levels. TMDs cases showed significantly lower Estrogen levels in comparison to normal cases. Of the 227 patients in the study, 26% were reported to have TMDs. The demographic distribution revealed that the highest number of TMDs cases reported were in the age group 31-40 (37.2%) followed by 21-30 (28.8%). The least reported in age groups 11-20 (10.16%), 41-50 (18.6%) and 51-60 (5%) respectively. The number of TMDs cases based on education was reported in descending order Graduates, high school, no-schooling, and elementary level. Myofascial pain is the most common diagnosis based on RDC/TMD diagnostic criteria, with 22% myofascial pain only and 4% myofascial pain with limited opening. 4% had limited opening, 19.8% reproducible clicking, and 9.7% clicking and catching. There was no significant difference of the estrogen levels reported. The mean value of estrogen levels reached its highest in 41-50 age group.

Figure 1(A, B): Distribution of TMD cases based on age & marital status

It is clear from the above graphs that majority of TMD cases in our study was found in age group of 31-40 years (37.2%) followed by 21-30 years (28.8%) and (18.6%) in 41-50 years of age. And contrary it was observed that most of the cases occur in Married households (54.2%) when compared to unmarried (20.3%). It was inferred from the above graph that most of the TMD cases in our study occur in younger and married subjects.
There was a gradual increase of the number of the TMDs cases with higher levels of education. Patients with no schooling were also noted to have higher chances to develop TMDs (A). Furthermore, our demographic distribution showed that most TMD patients with low-moderate income 49 cases (83%) (B) and those who were not working 38 cases (64%) (C).

It was observed from our study that there was no drastic difference in TMD occurrence in reference to the subject’s general and oral health. Our findings showed that almost all TMDs cases expressed a good or a very good perception of their general health as well as oral health.
It was found that Myofascial pain (22%) was the most common TMD diagnostic symptom with Reproducible clicking (19.8%) based on RDC for distribution of TMD cases, followed by locking and catching (9.7%) and MPDS with limited opening in (4%). Overall in our study it was observed that 26% of the study group has TMD and 74% without TMD.

**Graph 1:** Pain plotting among TMD cases along VAS scale in period of 6 months

**Graph 2 (A, B):** Significance of estrogen levels and TMD status
Our study showed significantly lower estrogen levels in comparison to normal cases. The lowest levels of estrogen hormone detected were found to be within the most affected age group which was 31-40 years.

**Figure 5 (A, B):** Distribution of TMD cases based on reported history and limited activities

![Distribution of TMD cases based on reported history and limited activities](image1)

**Figure 6:** Distribution of TMD cases based on causes of distress

![Distribution of TMD cases based on causes of distress in the last month](image2)

**DISCUSSION**

The aim of this study was to assess the prevalence of temporomandibular disorders (TMDs) in relation to estrogen levels among females in Aseer region, Saudi Arabia. This study shows that the prevalence of TMDs in females in Aseer region is 26% (Fig. 4C). The most common TMDs diagnosis was myofacial pain (Fig. 4A). No significant association found between the tested demographic parameters and TMDs diagnosis or estrogen levels (Graph 2B). TMD cases showed significantly lower estrogen levels in comparison to normal cases (Graph 2A). The RDC/TMD diagnostic criteria, in spite of the updated version, have proven to be a reliable evidence-based biopsychosocial model that can be utilized in deciphering the natural complexity of the TMDs. The RDC/TMD biaxial assessment, Axis I and II, enables clinicians to evaluate TMDs from different biological and sociopsychological aspects. It should be noted that the availability of RDC/TMD multiple resources in different regions is important. 

languages, makes it possible to compare different studies from all around the world. This has resulted in a better understanding, diagnosis, and treatment of TMDs. Estrogen level assessment was suggested to improve data reliability.

The prevalence of TMDs in females in Aseer region is 26% (Fig. 4C), this is relatively higher than some reported values in other studies. The National Institutes of Health/National Institute of Dental and Craniofacial Research reported that the prevalence of TMDs signs and symptoms ranged from 5% to 12% globally. The prevalence of TMDs symptoms reported to be from 16% to 56% in non-patient population studies and from 45% to 50% in clinical studies. Women were reported to be affected three times more commonly than men approximately. The prevalence of TMDs increases after puberty, reaching its peak during reproductive years in women aged 20–40, and then drops significantly after menopause. This is consistent with our findings with the highest number of cases 39 (66%) fell in that range of age group and gradual dropping of the number was noted after 40 years of age. (Graph 2B)

The TMDs prevalence varies widely among the reported studies internationally. There are no universal standards to control data collection or examination methods furthermore, the differences may be related to TMDs as complex multifactorial disorders and to differences in study samples and targeted groups. This study found that the most common TMDs diagnosis was myofascial pain (Fig. 4A). It is defined as the pain that is caused by excessive muscle activity involving only the muscles of mastication and associated fascia. Females were reported to have high predilection in all subgroups of TMDs including myofascial pain disorders. The greater psychosocial distress, Anxiety, depression may lead to bruxism and other parafunctional habits which contribute to myofascial pain. Myofascial pain could constitute more than 50% of TMDs cases. Pain was reported to be the most common characteristic feature. As a result, the clinical management of myofascial pain is an integral part of the TMDs treatment. Our result is consistent with several epidemiological studies. The differences in the studied populations and the associated psychosocial factors could explain the variation in comparison to previous studies. Many studies reported a contradictory role of estrogen hormone on TMDs pathogenesis. For example, the intensity of pain was reported to change during the menstrual cycle, with highest pain levels occurring at times of low estrogen and rapid estrogen fluctuation. In contrast, other studies found that pain intensity increased by 30% on estrogen replacement after menopause and by 20% in women who used oral contraceptives. In this study, TMDs cases showed significantly lower Estrogen levels in comparison to normal cases (Graph 2A). The lowest levels of estrogen hormone detected were found to be within the most affected age group which was 31–40 years (Graph 2B). These results are consistent with some published studies. It may reflect the effect of estrogen hormone on myofascial pain specifically, which is why it is recommended to narrow the tested parameter against different levels of estrogen. No significant association found between the tested demographic parameters and TMDs diagnosis or Estrogen levels, however, it is worth noting that there was a gradual increase of the number of the TMDs cases with higher levels of education (Fig. 2A). This was consistent with other previous reports. Patients with no schooling were also noted to have higher chances to develop TMDs (Fig 2A). Furthermore, our demographic distribution showed that most TMD patients were married 31 cases (52.5%) (Fig. 1B) not working 38 cases (64%) (Fig 2B), with low-moderate income 49 cases (83%) (Fig. 2C) These results could highlight the importance of overall socioeconomic status of the TMDs patients. The amount of distress experienced by the TMDs patients is expected to rise especially in a very highly demanding and
stressful lifestyle nowadays. The quality of life could be affected negatively from different aspects.\(^{19,23,17}\) Many patients reported clicking sound, grinding noise, ringing of ears, and headache or migraine\(^ {(Fig.5A)}\). Prevented or limited activities were also reported during chewing, eating hard foods, smiling, laughing, and yawning \(^{(Fig.5B)}\). Several causes of distress were found to be relatively high including headache, feeling lonely, feeling blue, trouble in falling asleep, and hot or cold spells\(^{(Fig.6)}\). This study could help in understanding the needs to improve our knowledge and clinical practice in management of TMDs patients in this region of Saudi Arabia. Applying the diagnostic criteria of RDC/TMD would enable comparison of similar studies universally. Combining the RDC/TMD guidelines and reporting the estrogen levels simultaneously would add another perspective in evaluating different aspects of a complex disorder like TMDs.

The RDC/TMD diagnostic criteria and clinical examination have improved the skills and knowledge of clinicians in managing TMDs patients.\(^{(17)}\) Although, females with TMDs pain seek healthcare more often than males, our data showed that all the TMDs cases selected in this study did not seek any medical or dental attention.\(^{(29,16,25,18)}\) Pain reported to be the main reason to seek treatment.\(^{(17,19)}\) The quality of pain could be of low frequency or intensity.\(^{(16)}\) In this study, pain intensity scale was recoded to be around 4 of most TMDs cases\(^{(Graph 1)}\). Symptoms may be ignored by some patients.\(^{(28)}\) Different cultures may affect perception and expression of pain.\(^{(4)}\) Our findings showed that almost all TMDs cases expressed a good or a very good perception of their general health as well as oral health\(^{(Fig.3A, 3B)}\). There are many organic or psychogenic sources of orofacial pain.\(^{(5)}\)

TMD pain could be radiating to the ears, neck, and head making it harder to a patient to seek the proper care from dental or non-dental care providers.\(^{(23,22,28,32)}\) Headache and migraine are commonly affect females with TMDs.\(^{(25)}\) The reported history of the studied TMDs cases showed that headache and migraine constituted a common finding among the patients and a common cause of their distress\(^{(Fig.5A)}\). These possible causes highlight the importance to increase patients’ awareness and the necessity of more public education program.\(^{(29,22,28,18)}\) It is also important to improve the academic training with greater emphasis on the comprehensive management approach for such patients.\(^{(16,3,4,5)}\) It has been reported that only 66% to 75% of programs provided the necessary skills to perform the proper TMDs examination in US and Canadian dental schools.\(^{(35)}\) Chances are much less for physicians to get the needed training on evaluation and diagnosis of TMDs. Only 1 lecture on TMDs was estimated to be delivered to physicians during their formal academic years.\(^{(35)}\) The current results should be interpreted with caution. The sample size is relatively small, and the study is targeting female patients only, so gender differences should also be considered.\(^{(24,16,26,31,25,2)}\) Many factors can affect the hormonal levels and their recorded values. Those factors include age, natural rapid fluctuation of hormonal levels, and timing of recording those values. Accordingly, there is a weak evidence to link TMDs and Estrogen levels variation based on our observation.\(^{(22,20,33)}\) In conclusion, the prevalence of TMDs in females in Aseer region is 26% and the most common TMDs diagnosis was myofascial pain. No significant association found between the tested demographic parameters and TMDs diagnosis or Estrogen levels. TMDs cases showed significantly lower Estrogen levels in comparison to normal cases. These results are consistent with some published studies but should be interpreted carefully. Further Investigations are needed to assess the relationship of Estrogen levels and TMDs.

**Competing Interests:** The authors declare that they have no competing interests.

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