Evaluating the prevalence of temporomandibular joint abnormalities in postmenopausal women

Evaluación de la prevalencia de anormalidades de la articulación temporomandibular en mujeres posmenopáusicas

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Abstract

Regarding the results from various and diverse reports on the relationship between sex hormones, especially estrogen, and the prevalence of TMD and its associated symptoms, it is quite clear that there are very contradictory and misleading results on the role of estrogen in the incidence of TMD and its associated symptoms in women before puberty, during puberty, before menopause, during and after menopause, which call for more quantitative and qualitative studies to be conducted. Therefore, we decided to conduct a study with the aim of evaluating the relationship between the presence of menopause and its absence with the prevalence of clinical symptoms of temporomandibular joint problems in patients requiring prosthesis who visited the Dental Prosthetics Department of School of Dentistry of Shiraz University. This is a cross-sectional, descriptive and analytical study. In this study, 140 women aged 45-55 years were examined. Of these, 71 were postmenopausal women and 69 were non-menopausal. These subject had no history of trauma, jaw abnormalities and orthodontics. The Helkimo's clinical index was used to measure the severity of TMJ dysfunction, and the data obtained were analyzed using Chi-square and Mann-Whitney tests and the statistical software of SPSS. The mean age for non-menopausal women was 46.87 and for postmenopausal women was 51.43. Among the symptoms examined, there was no significant relationship in the range of motion of mandible (P<0.187), however, the rest were significant. The most common symptom in postmenopausal women was dysfunction in TMJ function (33.3). This study showed that TMJ problems are one of the complications associated with menopause; therefore, this complication should be considered along with other problems such as joint arthritis and osteoporosis that are more prevalent during menopause phase and middle age, and appropriate dental treatments should be perform with respect to this issue.

Keywords: TMD, Menopause, Women, Prevalence.

Resumen

Con respecto a los resultados de varios y diversos informes sobre la relación entre las hormonas sexuales, especialmente el estrógeno, y la prevalencia de TMD y sus síntomas asociados, está bastante claro que hay resultados muy contradictorios y engañosos sobre el papel del estrógeno en la incidencia de TMD y sus síntomas asociados en mujeres antes de la pubertad, durante la pubertad, antes de la menopausia, durante y después de la menopausia, lo que requiere que se realicen más estudios cuantitativos y cualitativos. Por lo tanto, decidimos realizar un estudio con el objetivo de evaluar la relación entre la presencia de la menopausia y su ausencia con la prevalencia de síntomas clínicos de problemas de la articulación temporomandibular

en pacientes que requieren prótesis que visitaron el Departamento de Prótesis Dental de la Facultad de Odontología de la Universidad de Shiraz. Este es un estudio transversal, descriptivo y analítico. En este estudio, se examinaron 140 mujeres de 45 a 55 años. De estos, 71 eran mujeres posmenopáusicas y 69 no eran menopáusicas. Estos sujetos no tenían antecedentes de trauma, anormalidades de la mandíbula y ortodoncia. El índice clínico de Helkimo se utilizó para medir la gravedad de la disfunción de la ATM, y los datos obtenidos se analizaron utilizando las pruebas de Chi-cuadrado y Mann-Whitney y el software estadístico de SPSS. La edad media para las mujeres no menopáusicas fue de 46.87 y para las mujeres posmenopáusicas fue de 51.43. Entre los síntomas examinados, no hubo una relación significativa en el rango de movimiento de la mandíbula (P <0.187), sin embargo, el resto fue significativo. El síntoma más común en las mujeres posmenopáusicas fue la disfunción en la función de la ATM (33.3). Este estudio mostró que los problemas de ATM son una de las complicaciones asociadas con la menopausia; por lo tanto, esta complicación debe considerarse junto con otros problemas, como la artritis articular y la osteoporosis, que son más frecuentes durante la fase de la menopausia y la mediana edad, y se deben realizar tratamientos dentales apropiados con respecto a este tema.

Palabras clave: TMD, menopausia, mujeres, prevalencia.

Introduction

Temporomandibular joint disorders (TMDs) include a range of clinical problems that affects this joint, masticatory muscles or a combination of these two. Signs and symptoms of TMD are commonly classified into two categories of pain and dysfunction[1-3]. This category of diseases is also known as temporomandibular pain dysfunction disorders, and the most common manifestations of which are temporomandibular jaw joint sounds, limited jaw movement and the sensitivity of masticatory muscles. These disorders are very prevalent and are one of the most common and annoying problems in the region of head and face[4-7,60]. Sixty to seventy percent of people have a sign of the disorder in the stages of their life, and nearly 30 to 35 percent of the population manifest some of its symptoms that can affect individual's personal and social life, and thus reduce the quality of life[8]. TMD was first introduced in 1992 by Dworkin and Leresche. Comprehensive classification of TMD disorders includes: 1. Myofascial pain dysfunction (MPD) (the most common cause of pain and limitation of masticatory system), 2. Degenerative disc disease (DDD), 3. Degenerative joint disease (DJD), 4. Systemic arthritis, 5. Chronic recurrent temporomandibular joint dislocations, 6. Ankylosis, 7. Neoplasm in TMJ, and 8. Infections in TMJ[17]. The most common cause of temporomandibular disorders (TMDs) are muscular disorders, which are also called orofacial pain and dysfunction (OPD)[9]. Most articles have mentioned the malocclusion, parafunctional activities, stress and trauma as the causes of temporomandibular joint disorders[10-15], however, the contribution of each of these factors in development of temporomandibular joint disorders has not yet been completely identified[14-17]. TMD is characterized by the common triple symptoms of joint sound, joint pain, and limited mandibular movements[18], however, based on the Helkimo's clinical index, TMJ is identified by quintuple comprehensive and standard symptoms of dysfunction in mandibular movements and temporomandibular joint function and the presence of pain in TMJ, decuple masseter muscles and on mandibular movements. This disorder, after toothache, is one of the most common problems of visitors of dental clinics, and about 40-60% of the population suffer from at least one significant symptom of these disorders[19]. According to other studies, the percentage of people with TMD in the society is 60-50%[20].

Multiple evidence suggests a higher prevalence of TMD in women, even in some studies, the incidence of TMD in women has been reported to be 2.5 to 3.5 times that of men[21-23], which suggests the role of sex hormones, such as estrogen, in the pathogenesis of this disease[24-30,61]. Although the important role of estrogen in the etiology of postmenopausal osteoarthritis and rheumatoid arthritis in other organs (except TMJ) is well known, however, at the moment, there is little information available that show the relationship between estrogen and etiology of TMD. The severity of TMD symptoms in patients depends on the age[31,32]. Approximately 36 million women in the United States are in the postmenopausal phase of life[33]. However, in some studies, the average age of women at the onset of menopause has been stated as 50 to 51 years[33-36]. In Iran, according to various studies, the range of changes in the age of menopause is estimated to be 46 to 51 years[37,38]. Menopause is often associated with distinct changes in the oral and maxillofacial complex (similar to other parts of the body such as osteoporosis the bones of other parts of the body except the head and face)[39-44,62,63]. Hormonal changes and the presence of phenomena such as puberty, pregnancy and menopause in women have caused this group of people to be considered as specific individuals for many diseases. Recognizing the factors associated with the occurrence of TMD leads to an accurate diagnosis that can reduce its complications and extensive and costly therapies[10]. The results of study by Leresche et al. (2003), on the variables of pain in TMJ and other symptoms of TMD across the menstrual cycle of women, showed that TMJ pain is most severe in women when estrogen is at the minimum level, rapid changes in 11 estrogens during the monthly period are also associated with increased TMJ pain. They discovered that the maximum TMD pain would be present when the serum estrogen levels are minimal[25]. Thus, according to various and different reports that have been observed in the study of the prevalence of TMD and its associated symptoms and factors associated with the occurrence of TMD, it is possible that with a more complete and accurate understanding of the causes that af-

fect the temporomandibular joint problems, dentists will have the opportunity to refer these patients to a gynecologist when they are not getting enough medical care in order to receive appropriate hormonal medications for the elimination of symptoms of TMD. Also, regarding the results from various and diverse reports on the relationship between sex hormones, especially estrogen, and the prevalence of TMD and its associated symptoms, it is quite clear that there are very contradictory and misleading results on the role of estrogen in the occurrence of TMD and its associated symptoms in women before puberty, during puberty, before menopause, during and after menopause, which call for more quantitative and qualitative studies to be conducted. Therefore, we decided to conduct a study with the aim of evaluating the relationship between the presence of menopause and its absence with the prevalence of clinical symptoms of temporomandibular joint problems in patients requiring prosthesis visiting the Dental Prosthetics Department of School of Dentistry of Shiraz University.

Materials and methods

This study is a cross-sectional, descriptive, analytical study. In this research, using random sampling, 140 women aged 45-55 years who referred to the Movable Prosthetics Department of School of Dentistry of Shiraz University in 2012 were examined and evaluated. Examinations were performed by two final year dental students who had received the necessary trainings. In the group of postmenopausal women, those were included in the study who had not consumed hormonal medications for at least three months, and at least one year had passed from their last menstrual cycle. This study evaluated the frequency and severity of temporomandibular dysfunction in women who were generally healthy and also had no history of trauma to the temporomandibular joint and severe jaw abnormalities. Before the start of the examination, the necessity of examining and the way of doing it were fully explained to each patient and after giving the necessary explanations, in the case of patient's compliance, they were examined. All subjects examined in this study were examined using a dental unit, a unit lamp and a caliper. Personal information including name, age, telephone number, and home or work address were taken from all individuals and recorded. The Helkimo's clinical index is used for identification of the incidence and severity of temporomandibular dysfunction. Using this marker, the following five signs or clinical indicators of D.M.T are evaluated and examined:

1. Mobility Index, 2.TMJ Function Index, 3. Muscle pain Index, 4.TMJ pain Index, and 5. Pain on movement of mandible Index.

At the end of the examinations that were carried out with complete accuracy, with the calculation of each score for each of the five indexes, five overall points obtained are summed up together and thus: the total dysfunction score is calculated from zero to twenty-five, and in the end, subjects are placed in one of the following four groups:

Di: Dysfunction Index

CDi: Clinical Dysfuction Index

A. (Di0) = If the total dysfunction score is zero, the person is clinically asymptomatic.

B. (DiI) = If the total dysfunction score is 1 to 4, the person suffers from a mild dysfunction

C. (DiII) = If the total dysfunction score is 5 to 9, the person suffers from a moderate dysfunction

D. If the total dysfunction score is more than 9, the person suffers from a sever dysfunction (45-48)

Finally, the obtained data were analyzed using Chi-Square and Mann-Whitney tests and SPSS ver.21 software.

Findings: After conducting precise studies and completing the forms, at first, each index is specified, and then, the total dysfunction index (TDI), which is the sum of scores derived from the five TMD indexes and from 0 to 25, is calculated for each subject. The frequency distribution of each of them was demonstrated in the form of a table. The total study population included 69 non-menopausal women and 71 postmenopausal women (equivalent to 49.2% non-menopausal women and 50.7% menopausal women). The mean age for non-menopausal women was 46.087 years and for postmenopausal women was 51.34 years (Table 1).

Table 1. The age of women examined in the Movable Prosthetics Department of School of Dentistry of Shiraz University in 2012 (Total = 140 subjects)

Variable (age by year)	Number	Standard deviation	Average
Group Non-menopausal women	69 people	1.947 years	46.87 years
Menopausal women	71 people	3.372 years	51.34 years

According to the results, in relation to temporomandibular joint function, there were significant relationship between the group of postmenopausal women and TMJ function index (P<0.0001), in relation to pain in decuple masseter muscles between postmenopausal women and pain in muscles (p <0.024), in relation to temporomandibular joint pain between postmenopausal women and pain in temporomandibular joint (p <0.013), and in relation to pain on mandibular movements between postmenopausal women and pain in mandibular movements (p <0.007).

According to the obtained results, there was no significant relationship in terms of the range of motion of mandible

between the group of postmenopausal women and the dysfunction index in the range of mandibular movements (P<0.187). According to the results, the prevalence of TMD clinical symptoms found in postmenopausal women was: 1. 25.4% pain in temporomandibular joint, 2. 26.8% pain on mandibular movements, 3. 31% partial dysfunction in mandibular movements, 4. 63.4% pain in decuple masseter muscles, and 5. 67.6% partial dysfunction in temporomandibular joint function, respectively. The prevalence of TMD clinical symptoms found in the group of non-menopausal women included: 1. 8.07% pain on mandibular movements, 2. 8.7% pain in the temporomandibular joint, 3. 18.8% pain in decuple masseter muscles, 4. 20.3% partial dysfunction in mandibular movements, and 5. 33.3%, partial dysfunction in temporomandibular joint function, respectively. Also, according to the results, the prevalence rate differences of TMD symptoms between two groups of menopausal and non-menopausal women included: 1. +10.7% partial dysfunction in mandibular movements, 2. +16.7% pain in the temporomandibular joint, 3. +44.6% pain in decuple masseter muscles, 4. +18.73% pain on mandibular movement, and 5. +34.3% partial dysfunction in temporomandibular joint function, respectively.

According to the results, among the TMD clinical symptoms, the lowest prevalence found in this study in menopausal women was pain in TMJ, and in non-menopausal women was pain on mandibular movements. Among the TMD clinical symptoms found in this study, partial dysfunction in TMJ function had the highest prevalence in both groups of menopausal and non-menopausal women, however, its prevalence in menopausal women group was almost twice as high as non-menopausal women group. Also, among prevalence differences found in this study in TMD clinical symptoms in both groups of menopausal and non-menopausal women, the partial dysfunction in mandibular movements showed the least difference in two groups, and partial dysfunction in TMJ function showed the greatest difference in two groups.

TMD clinical dysfunction index based on codes 0, 1 and 5 in women examined in the Movable Prosthetics Department of School of Dentistry of Shiraz University is shown in Table 2.

Table 2. TMD clinical dysfunction index based on codes 0, 1 and 5

Variable (di)		Mid-level statistics	Standard deviation	Average	Number
Non-menopausal women	group	1.000	1.20580	0.9565	69
Postmenopausal women		2.000	1.73460	2.1831	71

The total clinical dysfunction index based on codes 0-25 in women examined in the Movable Prosthetics Department of School of Dentistry of Shiraz University is shown in Table 3. (Note: in the clinical symptoms of B and C, the score of five did not occur in both groups, but clinical signs of A, D and E had six cases of score of five, all of which were in the group of postmenopausal women).

Table 3. Total clinical dysfunction index based on codes 0-25

Percentage	Number	Variables	
74.3		0	Range of mandibular movements
25	74.3	1	
0.7	25	5	
100	0.7	Total	
49/3	100	0	Temporomandibular joint function
50/7	49/3	1	
100	50/7	Total	
72.1	100	0	The pain in the tangent muscles
27.9	72.1	1	
100	27.9	Total	
82.9	100	0	Pain in temporomandibular joint
14.3	82.9	1	
2.9	14.3	5	
100	2.9	Total	
82.1	100	0	Pain when moving the lower jaw
17.1	82.1	1	
0.7	17.1	5	
100	0.7	Total	

Discussion and conclusion

Women encounter a phenomenon called menopause in their late fifties or early sixties, in other words, they enter the postmenopausal phase after menopause, and on average they spend one third of their lives at this phase[49]. The incidence of TMD is more common in women than men[19,31]. Various studies have reported that TMD is more common in women than men, which suggests the role of sex hormones such as estrogen in the pathogenesis of this disease[24-24,59]. Hormonal changes and the presence of such phenomena as puberty, pregnancy and menopause in women have caused this group of people to be considered as specific individuals for many diseases. Recognizing the factors associated with the incidence of TMD leads to an accurate diagnosis that can reduce its complications and extensive and costly therapies[10]. In this study, except for the partial dysfunction in mandibular movements in postmenopausal women compared to non-menopausal women that had no significant difference (P<0.178), all other indices had a significant difference. The findings of this study showed that, based on the prevalence of all five TMD symptoms based on the Helkimo's clinical index in the group of postmenopausal women compared to the group of non-menopausal women in the same age range are associated with increased probability of occurrence of scores 5 and 1 (higher intensity of TMD symptoms) and reduced probability of occurrence of score 0 (lower intensity of TMD symptoms) related to these five TMD symptoms. In the studies by Leresche et al.[25], the TMJ pain index in women

was most severe when estrogen levels were at a minimum level, which is consistent with the results of present study that showed TMJ pain index caused a 16.7% increase in mild intensity (score 1) in the group of postmenopausal women compared to the group of non-menopausal women. Also, in the studies by Alamoudia[16] and Haskin[50], it was concluded that there may be an inverse relationship between the levels of estrogen in the bloodstream and joint pain, which is consistent with the results of present study. In a study by p.cheng[51], it has generally been suggested that estrogen plays an important and decisive role in the development and progress of TMJ pain, which is consistent with the results of present study, in which the reduction of estrogen secretion during menopause led to reduced development and progress of TMJ tissue components and increased prevalence of all five TMD symptoms based on the Helkimo's clinical index in the group of postmenopausal women compared to non-menopausal women in the same age range.

In the results of studies by FLAKE et al.[52], a direct relationship between estrogen levels and inflammation rate in the temporal joint was obtained, which is inconsistent with the results of the present study that showed decreased estrogen secretion during menopause increased inflammation and therefore increased the incidence and severity of five symptoms of TMD. It is also in contrast with the results from the study by G.GUAN et al.[53], which show that reduced plasma estrogen levels weaken and lower the impact of factors affecting the inflammation in TMJ.

In the results of the study by A.Nekora et al.[30], the relationship between the prevalence and symptoms of TMD and sex hormones such as estrogen was not significant and it has been suggested that sex hormones are contributing factors or contributors in etiology of TMD and its symptoms. These results were inconsistent with the results of present study (except for the partial dysfunction in mandibular movements index in the group of postmenopausal women compared to non-menopausal women, which had no significant difference). Contrary to the results of this study, which showed that the reduction of estrogen secretion during menopause is associated with an increase in the prevalence of all five categories of TMD symptoms based on the Helkimo's clinical index in the group of postmenopausal women and non-menopausal women in the same age range, in the studies by N.LANDI et al.[54], it has been reported that increased levels of estrogen hormones are associated with increased TMD and it is even dose dependent in this relationship. In studies such as the study by Xianghui Xing et al.[55], similar to the results of our study, an inverse relationship between estrogen levels and the incidence of TMD and the severity of its symptoms has been demonstrated, however, in contrast to other studies such as the study by Takeo et al.[56], it has been suggested that estrogen is effective on development of inflammation and destructive inflammatory agents of TMJ tissue structure and development of TMD. Serum estrogen or foreign estrogen may also not be sufficient as a single factor in explaining the incidence of TMD in women (sex hormones may have more of a role of "predisposing or auxiliary factor", which is consistent with the studies by Nadia Galal[57], C.H. Henry et al.[58]. Most articles have stated malocclusion, parafunctional activities, stress and trauma as the cause of temporomandibular joint disorders[20-31], in which trauma, occlusion and malocclusion dysfunctions, stress, parafunctional habits and orthodontic treatment are more common in young people, and posterior edentulism is more common in older people. Systemic diseases may be more common in the elderly; thus, the factors affecting TMD are more common in young people, however, considering the lack of inclusion of patients with trauma and orthodontic problems, as well as the same age range of both groups of postmenopausal women and non-menopausal women and the lack of inclusion of patients with occlusion and malocclusion dysfunction, stress and parafunctional habits in this study, all the factor effective on the incidence of TMD (except for hormonal issues) were considered, therefore, by isolating other factors effective on the incidence of TMD, the role of hormonal issues in this study has been emphasized. Overall, this study showed that TMD is one of the problems in the phase of menopause; therefore, this problem should be addressed along with other problems such as arthritis or osteoporosis that are more prevalent in postmenopausal phase and middle age, and appropriate medical and dental treatments should be carried out according to this. In the results of this study, it was found that the indices of pain in (TMJ, decuple masseter muscles and on mandibular movements) in women are most severe when estrogen levels are at a minimum; it was also found that decreased estrogen secretion in postmenopausal phase (due to lack of follicular function of the female gonads) caused increased inflammation and reduced development and progress of TMJ tissue components which is the reason for increased incidence and severity of all five symptoms of TMD based on the Helkimo's clinical index in the group of postmenopausal women compared to non-menopausal women in the same age group. Among the TMD clinical symptoms, the lowest prevalence in this study was TMJ pain in the group of postmenopausal women, and pain on mandibular movements in the group of non-postmenopausal women. The partial dysfunction in TMJ function in both groups of postmenopausal and non-menopausal women was the most commonly observed TMD clinical symptom in this study. Among the differences in the prevalence of TMD clinical symptoms in both groups of postmenopausal and non-menopausal women, the partial dysfunction in mandibular movements showed the least difference in both groups, and partial dysfunction in TMJ function showed the greatest difference in both groups.

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