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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 performed with respect to this issue.

KEYWORDS: TMD, Menopause, Women, Prevalence.

AUTHOR NOTES

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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, anomalías 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 dysfunction¹⁻³. 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 life⁸. 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 TMJ¹⁷. 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 disorders¹⁰⁻¹⁵, however, the contribution of each of these factors in development of temporomandibular joint disorders has not yet been completely identified¹⁴⁻¹⁷. TMD is characterized by the common triple symptoms of joint sound, joint pain, and limited mandibular movements¹⁸, 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 disorders¹⁹. 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 men²¹⁻²³, 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 life³³. However, in some studies, the average age of women at the onset of menopause has been stated as 50 to 51 years³³⁻³⁶. 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 therapies¹⁰. 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 minimal²⁵. 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 affect 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

using random sampling, 140 women aged⁴⁵⁻⁵⁵ years who referred to the Movable Prosthetics Departme

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 Dysfunction Index

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

B. (Di1) = 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)

TABLE 1
The age of women examined in the Movable Prosthetics Department
of School of Dentistry of Shiraz University in 2012 Total 140 subjects

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

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

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

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

TABLE 3
Total clinical dysfunction index based on codes 0-25

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

DISCUSSION & 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 phase⁴⁹. 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 therapies¹⁰. 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 Alamoudia¹⁶ and Haskin⁵⁰, 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.cheng⁵¹, 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 Galal⁵⁷, C.H. Henry et al.⁵⁸. Most articles have stated malocclusion, parafunctional activities, stress and trauma as the cause of temporomandibular joint disorders²⁰⁻³¹, 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.

REFERENCES

1. Okeson J. Orofacial pain. IL, USA: Quintessence Publishing; 1996.p.43-47.
2. Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord 1992; 6 (4): 301-55.
3. McNeill C. Management of temporomandibular disorders: concepts and controversies. J Prosthet Dent 1997; 77 (5): 510-22.
4. LeResche L. Epidemiology of temporomandibular disorders: implications for the study of etiologic factors. Crit Rev Oral Biol Med 1997; 8(3):291-305.
5. Carlsson GE. Epidemiology and treatment for temporomandibular disorders. J Orofacial Pain 1999; 13(4):232-7.
6. Mundt T, Mack F, Schwahn C, Bernhardt O, Kocher T, Biffar R. Association between sociodemographic, behavioral, and medical conditions and signs of temporomandibular disorders in gender: results of the study of health in Pomerania (SHIP-0). Int J Prosthodont 2008; 21(2):141-8.

- 7- Gonçalves DA, Dal Fabbro AL, Campos JA, Bigal ME, Special JG. Symptoms of temporomandibular disorders in the population: an epidemiological study. *J Orofac Pain* 2010; 24(3):270-8.
8. Reservoir E. Changes in temporomandibular disorders after treatment with new complete dentures. *J Oral Rehabil* 2004; 31(4):320-6.
9. Myron r. tucker, james r. hupp, EDWARD ELLIS, LARRY J. PETERSON, *Oral and Maxillofacial Surgery*, Translated by Dr. Masoud Yaghmaee and Dr. Seyed Amir Saeed Yavari, Fourth Edition, Tehran, Mir, 2003, Chapter thirty (Treatment of temporomandibular disorders, page 678-656)
10. Ockson JP. Management of temporomandibular disorder and occlusion. 6th ed. St. Louis: Mosby Co; 2008: P. 349.
11. Gavish A, Halachmi M, Winocur E, Gazit E. Oral habit and their association with signs and symptoms of temporomandibular disorder in adolescent girls. *J Oral Rehabil* 2000; 27 (1): 22-32.
12. Sari S, Sonmez H. Investigation of the relationship between oral parafunctions and temporomandibular joint dysfunction in Turkish children with mixed and permanent dentition. *J Oral Rehabil* 2002; 29 (1): 108-12.
13. Widmalm SE, Christiansen RL, Gunn SM, Hawley LM. Prevalence of signs and symptoms of craniomandibular disorders and orofacial parafunction in 4-6 year old African-American and Caucasian children. *J Oral Rehabil* 1995; 22 (2): 87-93.
14. PovedaRoda R, Bagan JV, Diaz Fernandez JM, HernandezBazan S, Jimenez Soriano Y. Review of temporomandibular joint pathology. Part I: Classification, epidemiology and risk factors. *Med Oral Patol Oral Cir Bucal* 2007; 12 (4): 292-8.
15. Winocur E, Littner D, Adams I, Gavish A. Oral habits and their association with signs and symptoms of temporomandibular disorders in adolescents: a gender comparison. *Oral Surg Oral Med Oral Pathol Oral RadiolEndod* 2006; 102 (4): 482-7.
16. Alamoudia N. Correlation between oral parafunction and temporomandibular disorders and emotional status among Saudi children. *J ClinPediatr Dent* 2001; 26 (1): 71-80.
17. Schiffman EL, Friction JR, Haley D. The relationship of occlusion, parafunctional habits and recent life events to mandibular dysfunction in a non-patient population. *J Oral Rehabil* 1992; 19 (3): 201-23.
18. Galand P, Leroy F and Chretien J: Effect of estradiol on cell proliferation and histological changes in the
19. Mc Neil C. Temporomandibular disorders. 2nd ed UK: Linois; 1993. P. 23531. Martin A. Psychotherapy for the MPDS. *J Am Dent Asso.* 1974; 84 (3): 924-8.
20. Ockson J. Management of T.M.D and occlusion. 5th ed. Louis: Mosby; 2003. pp. 149-92,245-91,321-59
21. Madani A., Mehdizadeh F. Prevalence and Symptoms of TMJ in Patients Referring to Mashhad Dental School, Faculty of Medicine. *Shahid Beheshti Dentistry*. 1381. Vol. 20. No. 2- page 51-242
22. Manfredin D, Mixture M, Bertacci A, Bimotti G, Bosco M. Diagnosis of temporomandibular disorders according to RDC / TMD axis I findings a multicenter Italian study. *Minerva Stomatol* 2004; 53 (7-8): 429-38
23. Suvinen TI, Nystrom M, Evalahti M, Kleemol AE, Waltimo A, Kononen M. An 8-year follow-up study of temporomandibular disorder and sychosomatic sympotoms from adolescence to adolescence. *J Orofac Pain* 2004; 18 (2): 126-30.
24. L. LeResche Epidemiology of temporomandibular disorders: implications for the study of etiologic factors *Crit Rev Oral Biol Med* 8 (1997), pp. 291-305
25. L. LeResche, L. Mancl, J.J. Sherman, B. Gandara, and S.F. Dworkin Changes in temporomandibular pain and other symptoms throughout the menstrual cycle *Pain* 106 (2003), pp. 253-261
26. A. Johansson, L. Unell, G.E. Carlsson, B. Söderfeldt, and A. Halling Gender differences in symptoms associated with temporomandibular disorders in a population of 50-year-old subjects *J Orofac Pain* 17 (2003), pp. 29-35
27. M.P. Warren, and J.L. Fried Temporomandibular disorders and hormones in women *Cells Tissues Organs* 169 (2001), pp. 187-192
28. J. Wang, Y. Chao, Q. Wan, and Z. Zhu The possible role of estrogen in the incidence of temporomandibular disorders *Med Hypotheses* 71 (2008), pp. 564-567

29. D. Gesch, O. Bernhardt, and D. Alte Prevalence of signs and symptoms of temporomandibular disorders in a rural and urban population. Results of a population-based study of health in Pomerania Quintessence Int 35 (2004), pp. 143-150
30. A. Nekora-Azak, G. Evlioglu, A. Ceyhan, H. Keskin, S. Berkman, and H. Issever Estrogen replacement therapy in postmenopausal women and its effects on signs and symptoms of temporomandibular disorders Cranio 26 (2008), pp. 211-215
31. Greenberg S. Burket's oral medicine. 10th ed. USA: Bc Decker; 2003 p. 279.
32. Mc Neil C. Temporomandibular disorders. 2nd ed UK: Linois; 1993 p. 235
33. Ben Aryeh H, Gottlieb I, Ish-Shalom S, David A, Szargel H, Laufer D. Oral complaints related to menopause. Maturitas 1996; 24(3):185-9.
34. Tarkkila L, City M, Tiitinen A, Lindqvist C, Meurman JH. Oral symptoms in menopause-the role of hormone replacement therapy. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001; 92 (3): 276-80. 35. McCann AL, Bonci L. Maintaining women's oral health. Dent Clin North Am 2001; 45(3):571-601.
36. Arrieta-Blanco JJ, Bartolome-Villar B, Jimenez-Martinez E, Saavedra-Vallejo P, Arrieta-Blanco FJ. Dental problems in patients with diabetes mellitus (II): gingival index and periodontal disease. Med Oral 2003; 8(4):233-47.
37. Mohammad K, Sadat Hashemi SM, Farahani FK. Age at Natural Menopause in Iran. Maturitas 2004; 49(4):321-6.
38. Ayatollahi SM, Ghaem H, Ayatollahi SA. Menstrual-reproductive factors and age at natural menopause in Iran. Int J Gynaecol Obstet 2003; 80(3):311-3.
39. Friedlander AH. The physiology, medical management and oral implications of menopause. J Am Dent Assoc 2002; 133(1):73-81.
40. Kumar P, Clark M. Clinical medicine. 4th. London: Bailliere Tindall; 1998. p. 342-356.
41. Icos. In: Bulln and patient oncolg te RE, Bermejo A. Asistencia odontolg Oa odontológica en pacientes médicamente P, Machuca G, editors. La atención comprometidos. Madrid: Laboratorios Normon; 1996. p. 387-414.
42. Zakrzewska JM. Women as dental patients: are there gender differences? Int Dent J 1996; 46(6):548-57.
43. Von Wowern N, Klausen B, Kollerup G. Osteoporosis: a risk factor in periodontal disease. J Periodontol 1994; 65(12):1134-8.
44. Yalcin F, Gurgan S, Gurgan T. The effect of menopause, hormone replacement therapy (HRT), alendronate (ALN), and calcium supplements on the sebum. J Contemp Dent Pract 2005; 6(2):10-17.
45. Helkimo M: Studies on function and dysfunction of the masticatory system II. Index for anamnestic and clinical dysfunction and occlusal state. Sven Tandlak Tidskr 1974, 67, 101-121.
46. Alanen P, Kuttilla M, Le Bell Y. Fluctuation of temporomandibular disorders in accordance with two classifications: The Helkimo dysfunction index and treatment need grouping. Acta Odontol Scand 1997; 55: 14-17.
47. Dr. Soghra Yasai, Dr. Mohammad Hossein Tudeh Zaem, Dr. Jamileh Kargar, Journal of Dental School, Mashhad, 2008, No. 32, Page 249
48. Rice VM. Strategies and issues for managing menopause-related symptoms in diverse populations: ethnic and racial diversity. Am J Med 2005; 118 Suppl 12B: 142-7.
49. Akhavan Karbasi MH, Aghahosseini F. An investigation on the stimulated salivary flow rate in menopause and postmenopausal women. J Dent Med 2003; 16(2):39-45.
50. C.L. Haskin, S.B. Milam, and I.L. Cameron Pathogenesis of the degenerative joint disease in the human temporomandibular joint Crit Rev Oral Biol Med 6 (1995), pp. 248-277
51. P. Cheng, X. Ma, Y. Xue, S. Li, and Z. Zhang, Effects of Estradiol on the Proliferation and Rabbit Mandibular Condylar Cartilage Cells in Vitro Chin Med J 116 (2003), pp. 1413-1417
52. N.M. Flake, T.O. Hermansteyne, and M.S. Gold Testosterone and estrogen have opposing actions on inflammation-induced plasma extravasation in the rat temporomandibular joint Am J Physiol Regul Integr Comp Physiol 291 (2006), pp. R343-R348

53. G. Guan, C.C. Kerin, L.L. Bellinger, and P.R. Kramer Estrogenic effect on swelling and monocytic receptor expression in an arthritic temporomandibular joint model TJ Steroid Biochem Mol Biol 97 (2005), pp. 241-250
54. N. Landi, I. Lombardi, and D. Manfredini Sexual Hormone Serum Levels and Temporomandibular Disorders. A preliminary study Gynecol Endocrinol 20 (2005), pp. 99-103
55. Xianghui Xing, Shuhui Liang, Feifei Li, Yongqi Li, Meiqing Wang, Zhaofeng Ma, Effect of estrogen on the temporomandibular joint, Chin Med, 2008, p. 1-2.
56. Takeo C, Negishi E, Nakajima A, Ueno K, Tatsuno I, Saito Y, Amano K, Hirai A. Association of cytosine-adenine repeat polymorphism of the estrogen receptor-beta gene with menopausal symptoms. Gend Med 2005; 2: 96-105. [PubMed: 16115604]
57. Nadia Galal, Waleed El Beialy, Yoshiaki Deyama², Yoshitaka Yoshimura, Tetsuya Yoshikawa, Kuniaki Suzuki, et al., Effect of estrogen on bone resorption and inflammation in the temporomandibular joint cellular elements, International Journal Of Molecular Medicine 21: 785-790, January 25, 2008, p.
- 58 . C.H. Henry, G.T. Tull, J.A. Whittum-Hudson, and L.M. Wolford Analysis of estrogen binding sites of the posterior ligament of the human TMJ Oral Surg Oral Med Oral Pathol Oral Radiol Endod 105 (2008) , pp. 698-701
59. Mehrabifar A, Mansouri A, Gholami K, Ghaeli P, Javadi M. Investigation of Medication Errors in a Teaching Psychiatric Hospital using Chart Reviews. Medbiotech Journal. 2017;01(02):60-4.
60. Mohammadi N, Gupta R. Investigation of Emulgen Possibility of Piroxicam and Developing of the Method. Medbiotech Journal. 2017;01(02):73-8.
61. Al-Esami, H. H., AL-Ramadhan, Z., Ahmed, A. S., Shihab, Z., & Farhan, F. K. (2018). Improve the surface hardness of the blend PMMA/n-MgTiO₃ to resist caries and bacteria. Electronic Journal of General Medicine, 15(6).
62. KUMAR, N. H., NARENDRA, B., UPENDRA, K., & RAJESH, K. (2019). A review on Adverse drug reactions monitoring and reporting. International Journal of Pharmacy Research & Technology, 9 (2), 12-15.
63. Özer G. The impact of serum vitamin D concentration on median nerve conduction. J Clin Exp Invest. 2018;9(2):63-6. <https://doi.org/10.5799/jcei.433800>