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*Full Length Research Paper*

# Severity index by gender in adult patients with Temporomandibular Disorders (TMD)

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**Temporomandibular Disorders (TMD) are conditions characterized by pain or dysfunction of the Temporomandibular Joint (TMJ) and masticatory muscles. Females have been identified as the group most at risk of developing this pathology and the data indicate that females more frequently present grave symptoms, with greater tendencies to chronicity. The objective of this study is to determine the severity of TMD by gender in a group of outpatients of the clinic at the Faculty of Dentistry of Puebla. Observational study design, with 75 patients included (65% female). The severity of TMD, was evaluated with the Temporomandibular index (TMI) with three domains (function, articular, muscular), using the standardization of the researcher (kappa=0.96). Percentages and the mean of percentages of severity of TMD were calculated. The outcomes of TMI were compared by gender. Total of severity index between gender shows that the means of the three sub-indices and the total index were higher in women, but only the muscle index showed significant differences (p=0.022). The total of severity Index showed marginal differences between the gender (p=0.074). The women reported more grave signs and symptoms of TMD, specifically in the perception of pain.**

**Key words:** Temporomandibular disorders, gender, orofacial pain, severity of illness index, temporomandibular index, research diagnostic criteria for temporomandibular disorders (RDC/TMD).

## INTRODUCTION

Temporomandibular disorders (TMD) are defined as a cluster of conditions characterized by pain of persistent, recurrent or chronic nature and/or dysfunction of the temporomandibular joint (TMJ) and masticatory muscles (National Institutes of Health, 1996). They are considered a sub-classification of musculoskeletal disorders and are usually divided into three groups: myogenic, arthrogenic and/or combined (McNeill, 1980; Wiese, 2008).

The American Academy of Orofacial Pain estimates that 40 to 75% of the population has at least one sign and 33% has at least one symptom of TMD (Abou-Atme, 2006), indicating that TMD constitute a global health problem. Epidemiological studies show that over 50% of the population has presented signs and symptoms associated with TMD such as joint sounds, joint pain and limited mandibular movements (LeResche, 1999; Bastos, 2008).

The number of patients with TMD has increased. In actuality, more than 2 million Americans have experienced some symptom of TMD. These symptoms are most commonly found in adults. TMD have been found to be more common in women of reproductive age

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**Abbreviations: TMD;** Temporomandibular disorders, **TMJ;** temporomandibular joint, **RDC/TMD;** research diagnostic criteria for temporomandibular disorders.

in ratios of 2 to 1 to even 6 to 1 (Isberg, 1998; Grau, 2005; Yap, 2002).

The etiology of TMD is multi-factorial (Okeson, 2003; Clark, 1996). Most factors are physiological, such as mandibular discrepancies, skeletal abnormalities, parafunctional habits, and traumatic injuries of the TMJ (Kahn, 1999). But psychological factors (Sherman, 2004) like anxiety, psychoticism, and somatization, as well as social factors, such as work, socioeconomic status, school and family have become vitally important as well. Psycho-social factors have demonstrated a decisive etiological role in TMD and are an important contributor in the development of chronic orofacial pain (Bermejo, 1995; Morris, 1997; Korszun, 2002; Schwartz, 1955) and increase the probability of developing another type of TMD according to RDC/TMD Axis I (Huang, 2002; Wright, 2004). Studies have suggested that TMD are a psychological manifestation of stress (Korszum, 1998) because patients who suffer from TMD present psychological, somatic and behavioral symptoms with more frequency and severity in relation to stress. Females have been identified as the group most at risk of developing this pathology (Casanova, 2006). Other studies suggest that, besides the aforementioned factors, the genetic, evolutionary and pathologic-environmental factors also participate in the development of TMD (McNeill, 1980; Gale, 1989).

Based on the existing literature, it is obvious that chronic pain accompanies patients with TMD (Tsang, 2008), producing significant changes in their lifestyle. They principally affect women, a phenomenon which several authors have associated with hormonal changes (LeResche, 1999), so that the percentage in females with TMD is considerably higher than males, by as much as 70 to 90% (Carlsson, 1999). Moreover, the data indicate that females more frequently present grave symptoms, with greater tendencies to chronicity (Srikanth, 2005; LeResche, 1999). Apparently, women's estrogen level makes them a vulnerable group (Suárez, 2010) and other psychosocial condition more common to women, such as depression, anxiety and catastrophism, could contribute to increase the risk of pain associated with other pathologies (Weissman, 1995). In general, women more frequently suffer from severe, long-term chronic pain than men (Bastos, 2008; Unruh, 1996; Tsang, 2008; Srikanth, 2005; Riley, 2001; Fillingim, 2009).

Other authors support the fact that the prevalence of TMD is more common in women of fertile age. Huang et al. (2002) found a significant association between females and myofascial pain associated with arthralgia. Another study by Isberg (1998) about the effect of gender and age in relation to the presence of articular disk displacement reported that adolescent females are more susceptible. It also demonstrated that women of fertile age with symptoms of articular disk displacement will have the same symptoms for as long as one decade afterwards (Isberg, 1998; Haglund, 1998; Magnusson, 2000; Phillips, 2001).

In treating the disabilities that accompany patients with TMD, diagnosing them is not enough, yet is indispensable at the same time. It is necessary to establish the degree of severity of the condition in order to evaluate the decreased severity after treatment. Several diagnostic systems have been described by Krogh Paulsen (Zielinsky, 1982), Helkimo (1974), Friction and Schiffman (1986). However one of the most valuable systems was created in 2002 at the University of Minessota by Pehling (2002) who suggests using the temporomandibular index (TMI) to establish diagnosis and assess the severity of TMD, with the benefit of a single instrument that can assess both areas. The temporomandibular index consists of three aspects: Function index, muscle index and joint index, which has demonstrated validity and specificity (Pehling, 2002).

The differences about the TMD prevalence and pain between women and men had been established. However the studies about severity (pain, sound, disabilities) are limited and especially with a validated instrument (TMI).

For that reason the objective of the present study was to determine the severity of TMD by gender in a group of outpatients at the Faculty of Dentistry of Autonomous University of Puebla.

## MATERIALS AND METHODS

The present study was developed during the first half of the year 2011 in a group of outpatients from the clinic at the Faculty of Dentistry of Puebla. Using a comparative observational study design, the study included patients over 18 years of age, with any sign or symptom related to TMD during the last six months, with no systemic condition, having no more than 8 missing teeth and without previous TMD treatment. Informed consent was obtained from each patient. Patients were evaluated by standardized investigator (kappa 0.96) with research criteria diagnostic for temporomandibular disorders (RDC/TMD) proposed by Dworkin (1992), to confirm TMD diagnostic and translated to Spanish (Gonzalez 2003).

To measure the severity of TMD, temporomandibular index was used. It has three sub-indices: 1.- function index (FI), 2.- muscle index (MI) and 3.- joint index (JI). The answers to examination of sites without pain or displacements were scored as "0", and painful sites and mandibular displacements were scored as "1".

The function index includes 12 items related to mandibular movements. The muscle index measures muscular pain to bilateral digital palpation of some intraoral and extraoral muscles of mastication with a total of 20 sites (10 items), and the joint index registers the presence of sounds and pain at each TMJ (4 items). The total index of TMI is the mean of scores of three sub-indices; the subindex of outcomes was between "0" and

**Table 1.** Demographic dates of patients with TMD included in the study (n=75).

| Variable | Women | | Men | |
|---|---|---|---|---|
| Gender | N | % | n | % |
| | 49 | 65.3 | 26 | 34.7 |
| **Marital status** | | | | |
| Single | 33 | 67.3 | 21 | 80.8 |
| Married | 13 | 26.5 | 4 | 15.4 |
| Divorced | 2 | 2.7 | - | - |
| Widow | 1 | 2.0 | 1 | 3.8 |
| **Occupation** | | | | |
| Student | 20 | 40.8 | 13 | 50 |
| Professional | 13 | 26.5 | 6 | 23.1 |
| Employee | 11 | 22.4 | 6 | 23.1 |
| Other | 5 | 10.2 | 1 | 3.8 |
| **Monthly income (dlls)** | | | | |
| 0-1150 | 24 | 48.9 | 1 | 3.8 |
| 1151-1920 | 7 | 14.3 | 5 | 19.2 |
| 1921-2690 | 12 | 24.5 | 2 | 7.7 |
| 2691-3770 | 4 | 8.2 | 7 | 26.9 |
| >3770 | 2 | 4.0 | 11 | 42.3 |
| | **Mean** | **SD** | **Mean** | **SD** |
| Age (years) | 29.41 | 11.314 | 27.46 | 10.085 |

"1", the highest score was "1" for more grave cases.

After their evaluations, all the patients started with conventional TMD treatment according to the literature; witch included educations, splint, medications and physical therapy (Greene, 2010; Michelotti, 2005; McNeely, 2006; Medlicott, 2007; Schiffman, 2007).

Statistical analysis of the data was realized using SPSS V17.0 program. The Chi-square test was used to calculate the descriptive statics and to compare percentages of severity of TMD by gender. The Mann-Whitney U test was used to compare outcomes of TMI. Both tests had a significance of less than .05.

## RESULTS

The study sample consisted predominantly of females (65.3%). The subjects were mostly single students, with low monthly incomes and an average age of 29, as shown in Table 1.

In analyzing the results, the twelve items of the function index showed similarities in the percentages between genders. However, women showed more percentage in the items related to pain, particularly in lateral movements (22.7%) compared with men (7.7%) although without statistically significant differences (p=0.108). In contrast, men presented a superior number of limitations of mandibular movements, with statistically significant differences at the maximal passive mouth opening (p=0.03) and the left lateral jaw motion (p=0.01), and a marginal difference in maximal active mouth opening (p=0.06) like is denoted in Table 2.

The comparison of the ten items of the muscle index between genders demonstrates that women have a higher percentage of muscle pain (20 sites explored). It was observed that the muscles most affected were: the body of masseter and anterior temporalis in women, and the lateral pterygoid in men. However, in the comparison of every muscle, none reached statistical significance (p>0.05) (Table 3).

The four items of the joint index denoted that the primary occurrence in both genders was joint sounds, specifically the click, and when comparing the genders, women had higher levels of joint index than men, but the differences were not statistically significant (p>0.05) like is presented in Table 4.

Finally, the mean of total scores of the sub-indices and the total of severity index between genders were compared. Table 5 shows that the means of the three sub-indices and the total index were higher in women, but only the muscle index showed significant differences (p=0.02). The total of severity index showed marginal

**Table 2.** Comparison percentages of the twelve items of the Function Index for gender (n=75).

| Function index | Women | | Men | | |
|---|---|---|---|---|---|
| | n | % | n | % | *p |
| Maximal comfortable mouth opening (≤39mm) | 14 | 28.6 | 2 | 7.7 | 0.342 |
| Maximal active mouth opening (≤39mm) | 2 | 4.1 | 2 | 7.7 | 0.062 |
| Pain to Maximal active mouth opening | 31 | 63.3 | 16 | 61.5 | 0.883 |
| Maximal passive mouth opening(≤39mm) | 0 | 0 | 1 | 3.8 | 0.039 |
| Pain to Maximal passive mouth opening | 32 | 65.3 | 15 | 57.7 | 0.516 |
| Right lateral jaw motion(≤6mm) | 16 | 18.4 | 8 | 30.8 | 0.660 |
| Pain to right lateral jaw motion | 7 | 14.3 | 3 | 11.5 | 0.737 |
| Left lateral jaw motion (≤6mm) | 13 | 26.5 | 11 | 42.3 | 0.011 |
| Pain to left lateral jaw motion | 11 | 22.4 | 2 | 7.7 | 0.108 |
| Protrusive jaw movement (≤6mm) | 31 | 63.3 | 16 | 61.5 | 0.616 |
| Pain to protrusive jaw movement | 7 | 14.3 | 1 | 3.8 | 0.163 |
| Alteration of mouth opening pathway | 39 | 79.6 | 20 | 76.9 | 0.788 |

*Chi-square test.

**Table 3.** Comparison percentages of the ten items of the Muscle Index for gender (n=75).

| Muscle index | Women | | Men | | |
|---|---|---|---|---|---|
| (Pain related with) | n | % | n | % | *p |
| Anterior temporalis | 16 | 32.7 | 5 | 19.2 | 0.222 |
| Middle temporalis | 16 | 32.7 | 5 | 19.2 | 0.126 |
| Posterior temporalis | 10 | 20.4 | 4 | 15.4 | 0.595 |
| Origin of masseter | 14 | 28.6 | 3 | 11.5 | 0.201 |
| Body of masseter | 22 | 44.9 | 5 | 19.2 | 0.087 |
| Insertion of masseter | 10 | 20.4 | 5 | 19.2 | 0.763 |
| Posterior mandibular región | 12 | 24.5 | 4 | 15.4 | 0.241 |
| Submandibular region | 10 | 20.4 | 6 | 23 | 0.590 |
| Lateral Pterygoid | 13 | 26.5 | 7 | 26.9 | 0.653 |
| Tendon of temporalis | 15 | 30.6 | 5 | 19.2 | 0.570 |

*Chi-square test.

**Table 4.** Comparison percentages of the four items of the Joint Index for gender (n=75).

| Joint Index | Women | | Men | | |
|---|---|---|---|---|---|
| (Pain related with) | n | % | N | % | *p |
| Lateral pole TMJ | 22 | 44.9 | 6 | 23.1 | 0.176 |
| Posterior insertion TMJ | 14 | 28.6 | 7 | 26.9 | 0.989 |
| Click to mandibular movement | 34 | 79.6 | 19 | 73.1 | 0.521 |
| Crepitation to mandibular movement | 4 | 8.2 | 2 | 7.7 | 0.943 |

*Chi-square test.

differences between genders (p=0.07).

## DISCUSSION

In the present study, females had more severity in the manifestation of temporomandibular disorders, specifically in the pain in relation with the disorder. The superiority of the severity in women agreed with conclusions reported by other authors (Bagis, 2012; Phillips, 2001; Castillo, 1995; LeResche, 1999; Riley, 2001; Bastos, 2008; Fillingim, 2009). However the

**Table 5.** Comparison of the Average of the sub-indexes and Total Result (TMI) for gender (n=75).

| TMI | Women | | Men | | |
|---|---|---|---|---|---|
| **Sub-indexes** | **Mean** | **SD** | **mean** | **SD** | ***p** |
| Function Index | 0.33 | 0.16 | 0.29 | 0.18 | 0.147 |
| Muscle Index | 0.19 | 0.20 | 0.12 | 0.20 | 0.022 |
| Joint Index | 0.32 | 0.19 | 0.30 | 0.20 | 0.701 |
| Total | 0.28 | 0.13 | 0.23 | 0.12 | 0.074 |

*Mann-Whitney U tests.

association between temporomandibular disorders and gender has been questioned by other investigators, who state that women more often seek professional help for these types of difficulties than men do (Helkimo, 1974; Tsang, 2008; Srikanth, 2005; Riley, 2001; Fillingim, 2009; Lázaro-Valdiviezo, 2009; List, 1999).

In the present study, it is evident in the analysis of muscle index that women clearly perceived painful muscles more often than men, with statistical differences in the comparison of the average of muscle index (p=0.02). However the comparison of percentages of every painful muscle between genders was higher descriptively, but without statistics differences. Only the body masseter muscle demonstrated a statistic tendency (p=0.08). This study reported lower percentages of muscle pain compared with those reported in by Espinosa et al. (2009). This is likely due to the fact that patients in Espinosa's study had been referred and were receiving Maxillofacial Surgery specifically for treatment of TMD, while patients evaluated in this study had received external consultation in clinics of the Faculty of Dentistry of Autonomous University of Puebla and were diagnosed with TMD for first time.

In the present study, the masseter muscle (body) was the most painful muscle (45% in women), which coincides with the international literature (Shedden, 2012). This suggests that the neuromuscular system of the stomatognathic system is more specialized in the masseter muscle than any other (Shimada, 2012). Others authors (Medeiros, 2005) consider the masseter muscle as the main cause of what has been termed "strong bite", and in this order the use of laser therapy to treat patients with orofacial pain has been evaluated and particularly between genders (Aldridge, 2004).

In regards to the joint index, the joint sounds (specifically the clicks) were the most committed independent of gender. The pain associated with joint structures was more often reported by the women. In contrast, men more often reported no pain. Men also had limitation of mandibular movement, which coincides with the results found by Corsini et al. (2005) in Chile, who established that the symptom most commonly seen in men was the joint noise (37.9%). Furthermore, another study (Jiménez, 2007) showed that the percentage of respondents with clinical signs of dysfunction were higher than those who reported any symptoms, (predominantly females). Solberg (1979) and Hasson (1983) showed that women had a higher prevalence of joint sounds and muscle tenderness although statistically significant differences were not found.

Many studies have concluded that women have a greater number of problems associated with TMD than men (Srikanth, 2005). Isberg (1998) established the effect of gender and age on the prevalence of articular disk displacement, and reported that females in the age of adolescence are the most affected and also will present the symptoms a decade later. In 1993, De Kanter studied the Dutch population, and found that women were the gender most affected at a ratio of 1:1.3. Magnusson et al. (2000) confirmed that the signs and symptoms of TMD occur most often in people between 20 and 40 years old. This fact is very interesting, because studies require that women aged between 25 and 35 years had accentuated TTM (Isberg, 1998; Irving, 1999; Sipila, 2002; Casanova, 2006), and they considered the estrogen status an important factor in the development of TMD, although other factors can contribute, such as the emotional, occlusion and mandibular parafunction, among others (Castillo, 1995).

TMD are difficult to diagnose, so it is necessary to use valid and reliable methods to be compared later with the findings of other authors around the world. Furthermore, it is necessary to establish the severity of the condition with validated methods (Pehling, 2002). The results of this study support the use of temporomandibular index (TMI) as an auxiliary primary tool of diagnosis, as it is the only instrument that provides a representative numerical value of the severity of this condition, which serves as a guideline for assessing established treatments for TMD.

A limitation of the present study was the fact that the patient's emotional status was not evaluated. This factor could have demonstrated the contribution of the emotional status to the TMD severity differences between genders.

In conclusion, TMD are frequent in the population. It affects females more severely; pain is the main manifestation and the primary reason they seek professional help. TMD can produce disability and affect lifestyle. In the present study, statistical significant differences were found in relation with the severity of TMD by gender; women reported more grave signs and symptoms of TMD, specifically in the perception of pain.

## REFERENCES

Abou-Atme YS, Zawawi KH, Melis M (2006). Prevalence, intensity and correlation of different TMJ symptoms in Lebanese and Italian population. J. Contemp. Dent. Pract., 7(4): 71-78.

Aldridge RD, Fenlon MR (2004). Prevalence of

temporomandibular dysfunction in a group of scuba divers. Br. J. Sports Med., 38: 69-73.
Bagis B, Ayaz EA, Turgut S (2012). Gender difference in prevalence of signs and symptoms of temporomandibular joint disorders: a retrospective study on 243 consecutive patients. Int. J. Med. Sci., 9(7): 539-544.
Bastos JL, Gigante DP, Peres KG (2008). Toothache prevalence and associated factors: A population based study in southern Brazil. Oral Dis., 14: 320-326.
Bermejo A (1995). Introducción al estudio de los desórdenes témporomandibulares. Medicina Oral. Barcelona: Masson, pp. 542-552.
Carlsson CR (1999). Epidemiology and treatment need for temporomandibular disorders. J. Orofacialpain, 13: 232-237.
Casanova J, Medina C, Vallejos A, Casanova A, Hernández B, Ávila L (2006). Prevalence and associated factors for temporomandibular disorders in a group of Mexican adolescents and youth adults. Clin. Oral Invest., 10: 42-49.
Castillo HR, Grau AR, Caravia MF (1995). Asociación de las variables oclusales y la ansiedad con la disfunción temporomandibular. Rev. Cubana Ortod., 10(1): 11-17.
Clark GT (1996). Diagnóstico y tratamiento de las alteraciones temporomandibulares dolorosas. Clin. Odontol. Norteam, 31(4): 801-29.
Corsini G, Fuentes R, Bustos L, Borie E, Navarrete A, Navarrete D, Fulgeri B (2005). Determinación de los signos y síntomas de los trastornos temporomandibulares, en estudiantes de 13 a 18 años de un colegio de la comuna de Temuco, Chile. Int. J. Morphol., 23: 345-352.
De Kanter RJ, Truin GJ, Burdersdijk RC (1993). Prevalence in the Dutch Adult Population and a Meta-Analysis of signs and symptoms of temporomandibular disorders. J. Dent. Res., 72(11): 1509-1518.
Espinosa SI, Lara MC, Saavedra GM, Vargas GH (2009). Comparación de los aspectos psicosociales (eje II) de los pacientes c trastornos temporomandibualres, de acuerdo a la combinación de diagnósticos físicos (eje I) de los criterios diagnósticos para la investigación de los trastornos temporomandibulares (CDI/TTM). Oral 10(30): 477-481.
Fillingim RB, King CD, Ribeiro DMC, Rahim-Williams B, Riley JL (2009). Sex, Gender, and Pain: A Review of Recent Clinical and Experimental Findings. J. Pain, 10(5): 447-485.
Friction J, Shiffman E (1986). Reliability of a Craneomandibular Index. J. Dent. Res., 65: 1359-1364.
Gale EN, Dixon DC (1989). A simplified psychologic questionnaire as a treatment planning aid for patients with temporomandibular joint disorder. J. Prosthet. Dent., 61: 235-238.
Gonzalez Y (2003). Criterios Diagnósticos para la Investicación de los Trastornos Temporomandibulares. Feb. 26: 1–33. Available: http://www.rdc-tmdinternational.org/TMDAssessmentDiagnosis/RDCTMD/Translations/Spanish.aspx.
Grau LI, Fernández LK, González G, Osorio NM (2005). Algunas consideraciones sobre los trastornos temporomandibulares. Rev Cubana Estomatol., 42(3):0-0. Available: <http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0034-75072005000300005&lng=es&nrm=iso.
Greene C (2010). Diagnosis and treatment of temporomandibular disorders: emergence of a new care guidelines statement. Oral Surg. Oral Med. Oral Pathol. Oral Rad. End, 110(2): 137-139.
Haglund A, Paesani M (1998). The effect of age and gerder on the onset of symtomatictemporomandibular joint disk displacement. Oral Surg. Oral Med. Oral Pathol. Radiol. Endod., 85: 52-257.
Hasson L, Hasson T, Petersson A (1983). A comparison between clinical and radiografic finding in 259 temporomandibular joint patients. J. Prosthetic Dentristy, 50(1): 89-94.
Helkimo M (1974). Studies on fuction and disfunction of the masticatory system (Analyses of anamnestic and clinical recordings of dysfunction with the aid of indices). Sweden Dent. J., 67: 1-18.
Huang GJ, LeResche L, Critchlow CW, Martín MD, Drangsolt MT (2002). Risk factors for Diagnostic Subgroups of painful Temporomandibular Disorders TMD. J Dent Res., 81: 284-288.
Irving J, Wood GD, Hackett AF (1999). Functional disorders or the masticatory system: I distribution of symptoms by questionnaire. Dental Update, 26(9).
Isberg A, Haglund M, Paesani D (1998). The effect of age and gender on the onset of symptomatic temporomandibular joint disk displacement. Oral Surg. Oral Pathol. Oral Radiol. Endod., 85: 252-257.
Jiménez QZ, De los Santos SL, Sáez CR, García MI (2007). Prevalencia de los trastornos temporomandibulares en la población de 15 años y más de la Ciudad de La Habana. Revista Cubana de Estomatología, 44(3).
Kahn J, Tallents RH, Katzberg RW, Ross ME, Murphy WC (1999). Prevalence of dental oclusal variables and intrarticulartemporomandibular disorders: molar relationship, lateral guidance, and nonworking side contacts. J. Prosthet. Dent., 82: 410-415.
Korszum A (2002). Facial pain, depression and stress-connections and directions. J. Oral Pathol. Med., 31: 615-619.
Korszum A, Papadopoulos E, Demitrack M, Engleberg E, Crofford L (1998). The relationship between temporomandibular disorders and stress-associated syndromes. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 86: 416-420.
Lázaro VJ, Alvarado MS (2009). Validación del Índice Anamnésico Simplificado de Fonseca para el Diagnóstico de Trastornos Temporomandibulares. Clín.

Científ., 8(2): 163-168.
LeResche L (1999). Gender considerations in the epidemiology of chronic pain, in Crombie IK (ed): Epidemiology of Pain. Seattle, IASP Press, pp. 43-52.
List T, Wahlund K, Wenneberg B, Dworkin SF (1999). TMD in children and adolescents: prevalence of pain, gender differences, and perceived treatment need. J. Orofac Pain. 13(1): 9-20.
Magnusson T, Egermark I, Carlsson GE (2000). A longitudinal epidemiologic study of signs and symptoms of temporomandibular disorders from 15 to 35 years of age. J. Orofacial Pain, 14(4): 310-319.
McNeely M, Armijo S, Magee D (2006) A Systematic Review of the Effectiveness of Physical Therapy Interventions for Temporomandihular Disorders. Phy. Therapy, 86(5): 710-725.
McNeill C, Danzig W, Farrar W, Gelb H (1980). Craniomandibular (TMJ) disorders: state of the art. J. Prosthet Dentistry, 44(4): 434-437.
Medeiros JS, Vieira GF, Nishimura PY (2005). Laser application effects on the bite strength of the masseter muscle, as an orofacial pain treatment. Photomed. Laser Surg., 23(4): 373-6.
Medlicott MS, Harris SR (2007) Limited evidence to support the use of physical therapy for temporomandibular disorder. Evidence-Based Dent., 8: 110-111.
Michelotti A, De Wijer A, Steenks M, et al. (2005) Home-exercise regimes for the management of non-specific temporomandibular disorders. J. Oral Rehab., 32: 779–785.
Morris S, Benjamin S, Gray R, Bennett D (1997). Physical, psychiatric and social characteristics of the temporomandibular disorder pain dysfunction syndrome: the relationship of mental disorders to presentation. Br. Dent. J. 182: 255-260.
National Institutes of Health: Management of temporomandibular disorders: national Institutes of Health Technology Assesment Conference Statement (1996). J. Am. Dent. Assoc., 127: 1595-606.
Okeson, PJ (2003). Tratamiento de Oclusión y afecciones temporomandibulares. 5ª edn. Mosby, pp. 151-159.
Pehling, J (2002). Interexaminer Reliability and Clinical Validity of the Temporomandibular Index: A New Outcome Measure for Temporomandibular Disorders. J. Orofacial Pain, 16(4): 296-305.
Phillips JM, Gatchel RJ, Wesley AL, Ellis E (2001). Clinical implications of sex in acute temporomandibular disorders. J. Am. Dent. Assoc., 132(1): 49-57.
Riley JL III, Gilbert GH (2001). Orofacial pain symptoms: An interaction between age and sex. Pain, 90: 245-256.
Schiffman E, Look J, Hodges J (2007) Randomized Effectiveness Study of Four Therapeutic Strategies for TMJ Closed Lock. J. Dent. Res., 86(1): 58-63.
Schwartz LL (1955). Pain associated with the temporomandibular joint. J. Am. Dent. Assoc., 51: 393-397.
Shedden MM, Weber D, Borkowski S, Rief W (2012). Nocturnal masseter muscle activity is related to symptoms and somatization in temporomandibular disorders. J. Psychosom. Res., 73(4): 307-312.
Sherman JJ, LeResche L, Huggins KH, Manell LA, Dworkin SF (2004).The Relationship of Somatization and Depression to experimental pain response in women with Temporomandibular disorders. Psychosomatic Med., 66: 852-860.
Shimada A, Yamabe Y, Baad-hansen L, (2012). Measurement of dynamic bite force during mastication. J. Oral Rehab., 39(5): 349-356.
Sipila K, Zitting P, Siira P (2002). Temporomandibulardiosrders, occlusion, and neck pain in subjects with facial pain: a case-control study. J. Craniomand Pract., 20(3): 158-164.
Solberg W, Woo M, Houston J (1979). Prevalence of mandibular dysfuction in voung adults. J. Am. Dent. Assoc., 98(1): 25-34.
Srikanth VK, Fryer JL, Zhai G, Winzenberg TM, Hosmer D, Jones G (2005). A meta-analysis of sex differences prevalence, incidence and severity of osteoarthritis. Osteoarthritis Cartilage, 13: 769-781.
Suárez Hernández, Dulce Miriam (2010). Inicio del ciclo menstrual como factor de riesgo para desarrollar signos y síntomas de trastorno temporomandibular. (Tesis de licenciatura, Facultad de Estomatología - Benemérita Universidad Autónoma de Puebla).
Tsang A, Korff MV, Lee S, Alonso J, Karam E, Angermeyer MC, Borges GL, Bromet EJ, de GG, De GR, Gureje O, Lepine JP, Haro JM, Levinson D, Browne MA, Posada VJ, Seedat S, Watanabe M (2008). Common chronic pain conditions in developed and developing countries: Genderand age differences and comorbidity with depression-anxiety disorders. J. Pain, 9: 883-891.
Unruh AM (1996). Gender variations in clinical pain experience. Pain, 65(23): 123-167.
Weissman MM, Olfson M (1995). Depression in women: implications for health care research. Science. 269: 799-801.
Wiese M, Svensson P, Bakke M, List T, Hintze H (2008). Association between temporomandibular joint symptoms, signs, and clinical diagnosis using the RDC/TMD and radiographic findings in temporomandibular joint tomograms. J. Orofac. Pain, 22: 239-251.
Wright AR, Gatchel RJ W ildenstein MA, Riggs R, Buschang P, Ellis E (2004). Biopsychological differences between high risk and low risk patients with acute TMD- related pain. J. Am. Dent. Assoc., 135: 474-483.
Yap AUJ, Tan KBC, Chua EK, Tan HH (2002). Depression and somatization in patients with temporomandibular disorders. J ProsthetDent. 88: 479-484.

Zielinsky L (1982). Batería de nueve tests de Krogh-Paulsen para determinar la existencia de disfunción del sistema estomatognatico. Ateneo Arg. De Odontología, 17(1): 37-40.