

Temporomandibular Joint Pain: Clinical Presentations and Response to Conservative Treatments in a Nigerian Tertiary Hospital

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ABSTRACT

Aims and Objectives: The aims of this study are to determine the prevalence, pattern of presentation, and response to conservative (medical) interventions among patients who presented with temporomandibular joint (TMJ) pain in a Nigerian teaching hospital.

Material and Methods: Consecutive patients who presented in Oral Medicine and Periodontology Clinic of Obafemi Awolowo University Teaching Hospitals' Complex on account of TMJ pain from January 2015 to December 2015 were recruited for the study. They were all interviewed and examined. The severity of pain was recorded using visual analog scale (VAS). Patients were treated with medications and physiotherapy. They were reviewed at 2, 4, and 6 weeks. Those who could not make the appointment were contacted through phone. The findings were recorded and analyzed using STATA version 11.

Results: A total of 401 participants were seen, 55 presented on account of TMJ pain. The mean age of patients with TMJ pain was 54 ± 16.9 with 60% being female. Pain was present in all participants; other signs include clicking joint sound (85%), jaw deviation (64%), attrition (24%), and reduced mouth opening (23%). The left joint was more frequently affected (75%). Following 6 weeks of conservative treatments, none of the respondents had VAS score of more than 3.

Conclusion: The prevalence of TMJ pain was 13%. TMJ was found to be more common in participants above 50 years with female predilection. Pain was most common symptom seen, and response to conservative treatments as assessed using VAS following 6-week of treatment showed complete remission of the pain.

KEYWORDS: *Conservative treatments, pain, temporomandibular joints*

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INTRODUCTION

Temporomandibular joint (TMJ) is a complex load-bearing bilateral synovial joint that is formed by the head of the condyle and the squamous part of temporal bone.^[1] The joint is essentially a system of interdependent connective tissue which functions in the control of mandibular functions and also in the growth of the mandible.^[2] It is one of the structures, from which orofacial pain of nonodontogenic origin could originate from being located around the temporal region of the face and has been described as the most common cause of orofacial pain.^[3,4] The joint, when compared to the rest of the joints in the body exhibit some peculiarity, which may be responsible for its pathogenicity. These

peculiar features of TMJ pain include it is the only paired joint that move synchronously in the body, the only joint with fibrocartilage, the only joint with two joint cavities, and the only joint that is grossly affected by emotional stress of the body. Although associated with occlusion, occlusal abnormalities are not be considered a discriminant factor for temporomandibular disorder (TMD).^[5,6]

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TMJ disorder can be defined as the collection of symptoms associated with medical and dental conditions affecting the joint and muscles of mastication.^[4,7] It is the most common orofacial condition.^[4] It is also the second most common musculoskeletal condition (after chronic low back pain) resulting in pain and disability.^[8] Individuals with low self-esteem are more likely to suffer from TMD so also are people with psychological or emotional disorder.^[9,10] Pain from the TMJ is one of the cardinal signs of TMJ disorder, others are clicking sound from the joint, jaw deviation, and jaw stiffness. Studies have shown that TMJ pain greatly reduces the quality of life of the affected individuals.

TMJ pain is relatively common with a prevalence of 16-59% reporting symptoms and 33-86% exhibiting clinical signs with only twenty-five percent of these individuals proceeding to seek treatment.^[11] Female predisposition has also been reported, and the disease is known to be more common among young adults.^[12,13] People who have stressful occupation are also predisposed to TMJ pain. This may be as a result of accumulation of inflammatory mediators at the joints.^[9,14]

Clinical findings in patients with TMD have been documented in the literature and include pain, difficulty in mouth opening, difficulties on chewing headache, clicking sound from the joint, and jaw deviation.^[7,12,15] Most of the documented findings are from Caucasian population. Studies on pattern of presentation of TMJ pain among African populations are scanty. The present study is aimed at determining the prevalence, pattern of presentation and response to conservative (medical) interventions in our Oral Medicine Clinic.

MATERIAL AND METHODS

The study was designed as a prospective cross-sectional study. The study was conducted at Obafemi Awolowo University Teaching Hospitals' Complex (OAUTHC), Ile-Ife, Nigeria. The institution is a major referral center for Oral Medicine services in the Southwestern region of Nigeria. It is also a teaching hospital for the training of doctors, nurses, medical laboratory scientists, and medical health record officers.

SUBJECTS' SELECTION

Participants used for the study were consecutive consenting patients presenting at the Oral Medicine Clinics of the OAUTHC on account of TMJ pain within a 1-year period from January 2015 to December 2015. Simple random sampling technique was used for patients' selection since all consecutive patients who complained of TMJ pain during the study period and who met the inclusion criteria were recruited for the study.

SAMPLE SIZE CALCULATION

Sample size was calculated using the formula for estimating sample size for a descriptive study designed to measure characteristics in terms of a proportion as reported by Eng, 2003,^[16] as follows:

$$N = \frac{4 \times (Z_{\text{crit}})^2 P(1-P)}{D^2}$$

Where N is the total number of participants required and P is the prestudy estimate of the proportion to be measured. Oyetola *et al.*, 2014,^[3] had reported the prevalence of TMJ (P) pain to be 7.6%; hence, this reported prevalence was taken as P . Z_{crit} is a constant called standard normal deviance which is 1.96 at clinical significance of 0.05. D is the total width of expected confidence interval (CI) and was set at 0.14. Putting this in the above formula with power of 90% and significance level of 0.05. Sample size of 55 participants was obtained for the study as shown below.

$$N = \frac{4 \times 1.96^2 \times 0.076(1-0.076)}{0.14^2}$$

$$N = 55$$

INCLUSION CRITERIA

Patients with TMJ complaint and participants aged 18 years and above were included in the study.

EXCLUSION CRITERIA

Patients with debilitating illness and patients below 18 years were excluded from the study.

ETHICAL ISSUES

Ethical clearance was obtained from the Ethics and Research Committee, Obafemi Awolowo University, Ile-Ife, with reference number IPHOAU/12/688. The details of the study were explained to all participants, and each participant was given informed consent. Only consenting participants were recruited for the study. Participants are free to decline from participating in the study at any time during the study period. All information was treated with utmost confidentiality.

DATA COLLECTION

Data collection was done using a structured questionnaire designed with three sections.

- Section A collected information on the bio-data, age, weight, and occupation of the participants
- Section B collected information on the history of TMJ pain and other oral symptom(s) presented. Questions were asked on the onset of the pain, duration, nature/

character of the pain, relieving factor, side affected, and aggravating factors. History of habits such as bruxism, habitual teeth clenching, tongue sucking, tongue thrusting e.t.c were also elicited

- Section C recorded the findings of extra- and intraoral examinations. Examination was done on the dental chair in the clinic.

Extraoral examination was done by checking for facial asymmetry, submandibular lymph nodes, facial muscles, and TMJ. The examination of TMJ was carried out starting from palpating the head of condyle inside the joints, observing for tenderness, jaw deviation, clicking sounds, and jaw locking.

Mouth opening was assessed by measuring the interincisal distance as follows: each participant was asked to open his/her mouth as much as they could do. The vertical distance between upper and lower central incisors was measured with graduated meter rule. Lateral incisors were used in patients whose central incisor was missing. An interincisal distance of above 3.5 cm was taken as adequate whereas value below 3.5 cm was taken as limited.

Intraoral examinations include checking for occlusion, crowding, tooth wear lesions (attrition, abrasion, etc.), and other findings. Examination of all participants was done by the oral medicine specialist.

All participants did radiographic investigation which was transcranioblique view of the TMJ. The radiograph showed the joint space and articular surfaces. The findings were recorded.

PAIN ASSESSMENT

Objective assessment of the pain severity was done using visual analog scale (VAS). A graduated meter rule which ranges from 0 (no perceivable pain) to 10 (highest pain). Each participant was asked to mark a point that best corresponds to the intensity of their pain. This was done at first visit and subsequent visits.

STATISTICAL ANALYSIS

Data analysis was done using STATA 11 statistical software (Statacorp, College Station, Texas, USA). Both descriptive and inference statistics were done with appropriate tests. Analyzing for descriptive in the distribution of symptoms of TMJ pain includes checking for mean, media, modes, and range as appropriate. Prevalence of each symptom was calculated as percentages from the number of cases with the symptoms. Student's *t*-test was used for comparison between variables of the symptoms. Statistical significance was inferred at $P < 0.05$ and CI was set at 95% for all the analyses.

RESULTS

AGE AND SEX DISTRIBUTION OF THE RESPONDENTS

The total number of patients seen during the study period was 401 patients, of which 55 had TMJ pain, giving a prevalence of 13%. The mean age of the participants with TMJ pain was 54.2 ± 16.9 . Majority (66%) of those with TMJ pain are above 50 years and most of them were female [Table 1].

CLINICAL PRESENTATIONS OF TEMPOROMANDIBULAR JOINT PAIN AMONG THE RESPONDENTS

All participants presented with dull aching pain in the TMJ region and majority involved the left TMJ (75%). Majority (66%) experienced clicking sound on opening the mouth, 46 (46%) had jaw deviation to the left side of the face while conventional radiographic TMJ views show no abnormalities in 10 (18%) participants [Table 2].

Before treatment, majority (45, 82%) had VAS of 5 and above, but at the third visit (6 weeks of treatment), none had VAS above 3 [Table 3]. Most patients had VAS 0 at the third visit [Figure 1]

DISCUSSION

TMJ pain is becoming prevalent among the general population, and it constitutes one of the major reasons for medical and dental consultations. The present study was

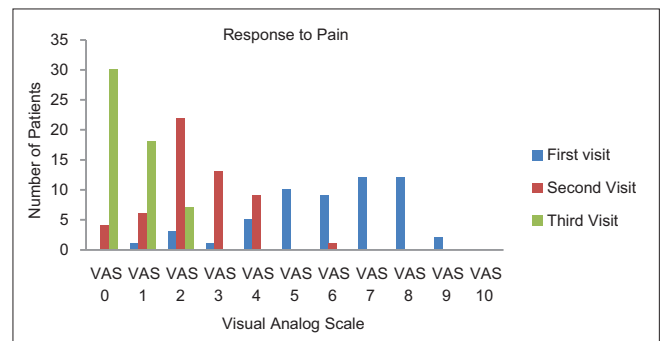


Figure 1: Pain assessment using visual analogue scale

Table 1: Age and sex distribution of the respondents (n=55)

Variable	Frequency (%)
Age categories	
21-30	7 (12.7)
31-40	6 (10.9)
41-50	5 (9.1)
51-60	15 (27.3)
61-70	13 (23.7)
>70	9 (16.4)
Sex	
Male	17 (30.9)
Female	38 (69.1)

Table 2: Clinical presentations of temporomandibular pain among respondents

Characteristics	Frequency (%)
Pain	55 (100)
Click	
On mouth opening	33 (66)
On mouth closing	7 (13)
No clicking	15 (27)
Total	55 (100)
Jaw deviation	
Right	10 (18)
Left	25 (46)
No deviation	20 (36)
Total	55 (100)
Muscle tenderness	
Present	15 (27)
No tenderness	40 (73)
Total	55 (100)
Malocclusion	
Present	14 (25)
Absent	41 (75)
Total	55 (100)
Headache	
Present	5 (9)
Absent	50 (91)
Total	55 (100)
Side affected	
Left	41 (75)
Right	14 (25)
Total	55 (100)
Attrition/wear facet	
Present	13 (24)
Absent	42 (76)
Total	55 (100)
Mouth opening	
Adequate (>3.5 cm)	42 (77)
Limited (<3.5)	13 (23)
Total	55 (100)
Teeth present	
Full compliment	37 (67)
At least one tooth missing	18 (33)
Total	55 (100)
Radiographic findings on the affected side	
Increased joint space	3 (5.4)
Radiolucency on the condyle (osteophyte)	5 (9.1)
Reduced joint space	2 (3.7)
Apparently normal finding	45 (81.8)
Total	55 (100)

aimed at determining the prevalence, pattern of presentation, and respond to conservative (medical) interventions in our routine clinical experience. The prevalence of TMJ pain in the present study was 13% higher than the reports of Oyetola *et al.*, 2014,^[3] who reported 7.6%. The increasing prevalence in the Nigerian population may be associated

Table 3: Response to pain following conservative treatments

Visual analog scale (%)	First visit (%)	Second visit (%)	Third visit (%)
0	0	4 (7.3)	30 (54.5)
1	1 (1.8)	6 (10.9)	18 (32.7)
2	3 (5.4)	22 (40.0)	7 (12.7)
3	1 (1.8)	13 (23.6)	0
4	5 (9.1)	9 (16.4)	0
5	10 (18.2)	0	0
6	9 (16.3)	1 (1.8)	0
7	12 (21.8)	0	0
8	12 (21.8)	0	0
9	2 (3.6)	0	0
10	0	0	0

with higher prevalence of stress which is a major predisposing factor to TMJ pain.^[15,17] However, reports on the prevalence of TMJ pain from various parts of the world range from 6.7% to 39.2%.^[4,12,13,15,18,19]

Our study showed a female predilection of TMJ pain; this is in agreement with many reports in the scientific literature.^[12,13,15,19,20] Fischer *et al.*, 2008,^[21] in an experimental research on rats attributed the female predilection of TMJ pain to the consequence of hormonal fluctuation during the reproductive cycle. This followed their observation increased sensitivity to TMJ pain during low endogenous estradiol serum level; female sex is also more frequently associated with emotional stress which is a major predisposing factor of TMJ pain.^[15,17] TMJ pain is most frequently observed (50% of cases) between ages of 51 and 70 years in this study with a mean age of 54.2 ± 16.9 years. This finding is in agreement with Johansson *et al.*^[13] who reported TMJ to be more common in participants above 50 years. Most predisposing factors of TMJ pain such as stress, TMJ arthritis, and attrition are more common as the age increases.^[22]

TMJ rarely affects both joints simultaneously probably due to unilateral chewing. In the present study, TMJ pain was more frequently associated with the left TMJ seen in 41 (75%) participants. Whether the reason for the unilateral chewing is peripheral or central is not clear.^[23] However, some of the highlighted factors in the literature include asymmetry of the occlusal surface area and occlusal force, unilateral pain, and clicking as well as unilateral pain in facial muscles and TMJs.^[23,24] The central reason may be related to the dominant hemisphere that is peculiar to each individual as it is being reflected in handedness of the individual,^[23] most (70, 93%) of the participants were right handed.

Consistent with majority of the earlier studies,^[11,12,19,25,26] the common symptoms associated with TMJ disorder

were pain (75, 100%), clicking (33, 66%), jaw deviation (64, 85%), headache (41, 75%), and reduced mouth opening in 42 (77%) participants. In an epidemiological study, Bagis *et al.*^[27] reported clicking sound as one of the most common symptoms of TMJ disorder, unlike the present study, their study involved the entire population within which those with TMJ problems were highlighted. All participants in our study had pain unlike in the study by Yamaoka *et al.*^[28] where only 90 out of 150 participants with TMJ disorder presented with joint pain. Since most people tend to present for treatment only when there is pain. Pain from the TMJ is essentially resulted from the inflammation of tissues around the joint.^[11]

Pathologic features as seen in the radiographic investigation in the present include reduced joint space, increase joint space, and radiolucency at the articular surfaces. Majority shows apparently normal radiographic features (45, 81.8%). Conventional radiographs generally give little information on the diagnosis of TMJ disorders; however, it is still relevant in the management as it shows bone loss around the joint and also helps to rule out other possible differentials such as condylar fracture or growth in the joint region. Magnetic resonance imaging gives a better picture of the articular disc.^[29]

Management of TMJ disorders is usually achieved either through conservative treatments or surgical approach.^[7,12,30,31] A recent study, however, called for cation in recommending TMJ lavage for the treatment of TMJ disorder.^[32] We employed conservative methods of treatment in this study. Such methods include prescription of medications such as muscle relaxants, antidepressants, analgesic, and physiotherapy. Our results showed marked improvement using VAS after the review 2, 4, and 6 weeks, similar to earlier findings.^[28,31] The prompt response to conservative approaches can be connected to the understanding of the etiopathogenesis of the disorder which showed the etiology of the disorder to be largely related impaired metabolism in one form or the other which is being precipitated by psychological or emotional stress.^[11,21] These etiological agents and the resulting pain can easily be targeted by the appropriate medications (e.g., anticonvulsant and antidepressant analgesic), and hence considerable relief is expected which was actually clearly shown in this study.

This study had evaluated the effects of conservative measures in the treatment of TMJ problems, and the results have been encouraging more studies are thus necessary to evaluate the effects of the respective conservative measures so as to make the management of TMJ pain an easy task, especially in the developing countries with limited resources.

LIMITATION OF THE STUDY

Due to limited resources, this study was done only in one center using a convenient sampling. No randomization of participants was done.

CONCLUSION

This study showed the prevalence of TMJ pain to be 13%. Male predilection with male-to-female ratio of 1:2 was also reported. Majority (66%) of those affected were above 50 years with a mean age of 54.2 ± 16.9 years. The left joint is more frequently affected in 75% of cases. Pain was found in all participants, other signs among participants include clicking sound (85%), jaw deviation (64%), attrition (24%), limited mouth opening (23%), and reduced (3.7%) and increased (5.4%) joint space on conventional radiograph. Majority had a good response to treatment after 6 weeks of treatment following conservative treatment approach.

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Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Wang JR, Pan X, Mi CB. Anatomy of temporomandibular joint and condyle position in Uyur adult patients evaluated with cone-beam CT. *Shanghai Kou Qiang Yi Xue* 2016;25:461-4.
2. Adams K, Schulz-Kornas E, Arzi B, Failing K, Vogelsberg J, Staszuk C. Functional anatomy of the equine temporomandibular joint: Collagen fiber texture of the articular surfaces. *Vet J* 2016;217:58-64.
3. Oyetola E, Agbelusi G, Dayo A. Pattern of presentations of non-odontogenic pain in oral medicine clinic of Lagos university teaching hospital. *Br J Med Med Res* 2014;4:4117-26.
4. Gauer RL, Semidey MJ. Diagnosis and treatment of temporomandibular disorders. *American family physician*. 2015;91:378-86.
5. Manfredini D, Perinetti G, Stellini E, Di Leonardo B, Guarda-Nardini L. Prevalence of static and dynamic dental malocclusion features in subgroups of temporomandibular disorder patients: Implications for the epidemiology of the TMD-occlusion association. *Quintessence international* (Berlin, Germany: 1985). 2015;46:341-9
6. Manfredini D, Perinetti G, Stellini E, Di Leonardo B, Guarda-Nardini L. Prevalence of static and dynamic dental malocclusion features in subgroups of temporomandibular disorder patients: Implications for the epidemiology of the TMD-occlusion association. *Quintessence Int* 2015;46:341-9.
7. Sidebottom A, Shahme F, Casarini L. Current management of temporomandibular joint (TMJ) disease. *J Arthritis* 2014;3:138.
8. Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet JP, *et al.* Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: Recommendations of the International RDC/TMD Consortium Network* and Orofacial Pain Special Interest Group. *J Oral Facial Pain Headache* 2014;28:6-27.
9. Gerke DC, Goss AN, Bassett DL. Psychological factors

- in temporomandibular joint dysfunction: Life events. *Aust Prosthodont J* 1990;4:29-34.
10. Manfredini D, Landi N, Bandettini Di Poggio A, Dell'Osso L, Bosco M. A critical review on the importance of psychological factors in temporomandibular disorders. *Minerva Stomatol* 2003;52:321-6, 327-30.
 11. Milam SB. Pathophysiology and epidemiology of TMJ. *J Musculoskelet Neuronal Interact* 2003;3:382-90.
 12. Gonçalves DA, Dal Fabbro AL, Campos JA, Bigal ME, Speciali JG. Symptoms of temporomandibular disorders in the population: An epidemiological study. *J Orofac Pain* 2010;24:270-8.
 13. Johansson A, Unell L, Carlsson GE, Söderfeldt B, Halling A. Gender difference in symptoms related to temporomandibular disorders in a population of 50-year-old subjects. *J Orofac Pain* 2003;17:29-35.
 14. Iturriaga V, Bornhardt T, Manterola C, Brebi P. Effect of hyaluronic acid on the regulation of inflammatory mediators in osteoarthritis of the temporomandibular joint: A systematic review. *Int J Oral Maxillofac Surg* 2017;46:590-5.
 15. Ryalat S, Baqain ZH, Amin WM, Sawair F, Samara O, Badran DH. Prevalence of temporomandibular joint disorders among students of the university of Jordan. *J Clin Med Res* 2009;1:158-64.
 16. Eng J. Sample size estimation: How many individuals should be studied? *Radiology* 2003;227:309-13.
 17. Mottaghi A, Razavi SM, Pozveh EZ, Jahangirmoghaddam M. Assessment of the relationship between stress and temporomandibular joint disorder in female students before university entrance exam (Konkour exam). *Dent Res J (Isfahan)* 2011;8 Suppl 1:S76-9.
 18. Macfarlane TV, Blinkhorn AS, Davies RM, Kincey J, Worthington HV. Oro-facial pain in the community: Prevalence and associated impact. *Community Dent Oral Epidemiol* 2002;30:52-60.
 19. Zwiri AM, Al-Omiri MK. Prevalence of temporomandibular joint disorder among North Saudi University students. *Cranio: the journal of craniomandibular practice* 2016;34:176-81.
 20. Choudhary SH, Kale LM, Mishra SS, Sodhi S, Muley PB, Pandey ND. An institutional survey for knowledge-based and self-awareness assessment in temporomandibular joint disorders among dental students. *Indian J Dent Res* 2016;27:262-7.
 21. Fischer L, Torres-Chávez KE, Clemente-Napimoga JT, Jorge D, Arsati F, de Arruda Veiga MC, *et al.* The influence of sex and ovarian hormones on temporomandibular joint nociception in rats. *J Pain* 2008;9:630-8.
 22. Monteiro NM, Balogun SK, Oratile KN. Managing stress: The influence of gender, age and emotion regulation on coping among university students in Botswana. *Int J Adolesc Youth* 2014;19:153-73.
 23. Martinez-Gomis J, Lujan-Climent M, Palau S, Bizar J, Salsench J, Peraire M. Relationship between chewing side preference and handedness and lateral asymmetry of peripheral factors. *Arch Oral Biol* 2009;54:101-7.
 24. de Matos LF, Pereira SM, Kaminagakura E, Marques LS, Pereira CV, van der Bilt A, *et al.* Relationships of beta-blockers and anxiolytics intake and salivary secretion, masticatory performance and taste perception. *Arch Oral Biol* 2010;55:164-9.
 25. Al Moaleem MM, Okshah AS, Al-Shahrani AA, Alshadidi AA, Shaabi FI, Mobark AH, *et al.* Prevalence and severity of temporomandibular disorders among undergraduate medical students in association with khat chewing. *J Contemp Dent Pract* 2017;18:23-8.
 26. Franco R, Basili M, Venditti A, Chiaramonte C, Ottria L, Barlattani A Jr., *et al.* Statistical analysis of the frequency distribution of signs and symptoms of patients with temporomandibular disorders. *Oral Implantol (Rome)* 2016;9:190-201.
 27. Bagis B, Ayaz EA, Turgut S, Durkan R, Özcan M. Gender difference in prevalence of signs and symptoms of temporomandibular joint disorders: A retrospective study on 243 consecutive patients. *Int J Med Sci* 2012;9:539-44.
 28. Yamaoka M, Yamamoto M, Furusawa K. Responses to conservative treatment in temporomandibular disorders with locking versus with muscle pain. *Cranio* 1997;15:296-9.
 29. Niraj LK, Patthi B, Singla A, Gupta R, Ali I, Dhama K, *et al.* MRI in dentistry - A future towards radiation free imaging - Systematic review. *J Clin Diagn Res* 2016;10:ZE14-9.
 30. Gesslbauer C, Vavti N, Keilani M, Mickel M, Crevenna R. Effectiveness of osteopathic manipulative treatment versus osteopathy in the cranial field in temporomandibular disorders - A pilot study. *Disabil Rehabil* 2016;28:1-6.
 31. Criado L, de La Fuente A, Heredia M, Montero J, Albaladejo A, Criado JM. Electromyographic biofeedback training for reducing muscle pain and tension on masseter and temporal muscles: A pilot study. *J Clin Exp Dent* 2016;8:e571-6.
 32. Bouchard C, Goulet JP, El-Ouazzani M, Turgeon AF. Temporomandibular lavage versus nonsurgical treatments for temporomandibular disorders: A systematic review and meta-analysis. *J Oral Maxillofac Surg* 2017. pii: S0278-239131315-5.