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RESEARCH ARTICLE

MUSCULOSKELETAL ETIOLOGY AND MANIFESTATIONS OF TEMPOROMANDIBULAR JOINT DISORDERS IN BETHLEHEM AND JERUSALEM/PALESTINE

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ABSTRACT

Background: Temporomandibular joint (TMJ) disorders are multifactorial in etiology and clinical presentation, leading to challenges in its diagnosis and management. **Objectives**: The main objectives of this study is to highlight the musculoskeletal etiology and manifestations for Temporomandibular joint disorders (TMDs) in patients from Bethlehem and Jerusalem. **Materials and Methods: A** case control study was conducted in on a convenient sample of 96participants (48 case with diagnosed TMDs and 48 control without TMDs). Data was collected by giving patients with TMDs and their matched (for age and gender) control group personal data sheet about the medical history and a check list of TMDs clinicalsymptoms and risk factors to be answered on a scale of 5 where 1 meant strongly disagree, and 5 strongly agree, in addition to a functional examination, which included ROM, MMT, VAS scale and palpation for tenderness. These together helped to determine musculoskeletal etiology and manifestations of Temporomandibular joint disorders (TMDs). **Results**: The result showed that 75% of sample that had TMDs were female, while 25% male. Para functional habit of resting head on the hand was the most common risk associated with TMDs (mean =3.87). TMJ pain was exacerbated by eating and yawing (mean= 3.44), and 37% of participants had pain in both sides of the joint. Along with this, Participants mainly complained of pain in the TM joint(mean = 3.85), forehead pain (3.56), other symptoms were clicking in the joint, shoulder pain, pressing on teeth, pain when yawing and chewing, and pain in neck. Furthermore, there was an association between missing teeth and pain in joint ($P<0.05$), and there was no correlation between age of participant and limitation in the ROM of TMJ ($p> 0.05$). **Conclusion**: TMDs are associated with female gender, parafunctions like resting head on hand, main clinical symptoms appeared in eating and yawing, TMDs were associated with regional referred pain.

INTRODUCTION

Temporomandibular joint (TMJ) is one of the mostimportant joints in human body that performs many functions, such as mastication and speech (Alomar *et al.,* 2007). Temporomandibular joint is a Ginglymoarthrodialjoint, this term is divided to two terms: ginglymus, which means a hinge joint that permits backward and forward movements, and Arthrodial, meaning a joint that allows a gliding motion of the surfaces (Alomar *et al.,* 2007). Temporomandibular joint (TMJ) disorder refers to multifactorial etiology which is characterized by multiplicity of clinical signs and symptoms, making its diagnosis and management a challengingtask for the clinician (Buescher, 2007). Temporomandibular disorder (TMD) may cause pain in a person's jaw joint and in the muscles that are responsible on the jaw movement (TMJ, 2015). Also studies shows that the disorder is most prevalent in individuals aged between 20-40 years (Wright and North, 2009).

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In another study, it shows that up to 75% of adults show at least one sign of joint dysfunction on examination and as many as one third have at least one symptom (Rutkiewicz *et al.,* 2006). The main objective of this study is investigate the musculoskeletal etiology and manifestations of TMJ problems in patients from Bethlehem and Jerusalem, and addressing the main signs that may be causing or caused by TMDs

MATERIALS AND METHODS

Data collection: Inclusion criteria of this case group was any patients having a Muscular and TMJ Malfunction, and for the control group, People without any signs and symptoms of TMD and matched for age and gender with the case group. Exclusion criteria of this study were people over 50, people less than 18, people who were not from Bethlehem or Jerusalem, patients who made a surgery for their TMJ, or who were receiving cortisone injections because this will affect the results. Participants who refused to sign the consent form were also excluded. Researchers contacted dental clinics in

Jerusalem and Bethlehem to identify and interview patients with TMDs and invited those who met the inclusion criteria to participate in this study. We explained the purpose of the study to potential participants and told them about the study goals. Following this, researchers invited them to participate in the study a written informed consent was signed by each participant. After patients with TMDs were identifies a matched for age and gender control were recruited, then data collection sheet was filled that included personal data, participants history in terms of clinical manifestations and risk factors of TMDs, where 38 items about the different signs and symptoms, and activities that may cause pain or other symptoms. The patient should answer these questions by putting (X) on the choices which are never if they didn't have the signs or symptoms, rarely item if they didn't feel the signs or symptoms, exist item if the sign is existing, sometimes item if the symptoms or the signs feels in interrupted form, most of the time if they feel the signs or symptoms for a long period of time, and always item if they feel the signs and the symptoms roughly all the day, also they should determine if it is in the right or left area. In the same questionnaire, there was another table containing 14 items. This section contained items about whether or not they could open their mouth normally or over range, also if they have any injury to their joint, if they lost any teeth and other factors. In this table, the answer should be answered by yes or no and the person should give brief description to his/her answer. Also, Functional tests for TMJ were applied. in this section test that are related to5 examinations about the active ROM of TMJ movements, 4 of them measures the muscles strength during doing TMJ movements, and the physiotherapist should see the degree for each movements, Other 5 items related to the pain intensity in different activities and the participant should answer this items by giving a scoring from 0 to 10 where 10 means severe pain and 0 means no pain, 4 assessment elements related to the click sound in which activity it was happening, and 2 items to measure the tenderness on VAS 10 points scale in some muscles which are temporal is and masseter.

RESULTS

In terms of gender 75% of total sample were females, Average age of case group was 25.45 years while the control group mean age was 25.41 ($p>0.05$). Pain was one of the major symptoms of TMD that impacted on TMJ function. As shown in Figure 1, which explains that the severity of pain, with a scale from 1 to 5; where 1 (not present), 2 (rare), 3 (present), 4 (sometimes), 5 (most of the time), and 6 (always). We found that the most severity of pain in Temporomandibular joint was during eating and yawing (mean = 3.4 /4.0) comparing to severity of pain during shouting, talking, and static. As shown in Figure 2, pain according to the side of temporomandibular joint was highest in the case where the pain was in both sides' (right and left) (37.5% of total sample). In the case group, study found that the most prevalent symptom was TMJ pain (mean 3.8) comparing with other symptoms included forehead pain, clicking in the joint, shoulder pain, pressure on teeth, pain when yawing, pain when chewing, and pain in neck ($p>0.05$). According to TMD etiologies, As shown in Figure 3, Resting head on hand was the most prevalent habit among participants (mean 3, 8). Followed by high stress then chew gum $P<0.05$). There were a significant differences between case and control group according to TMD etiologies ($P = .000$). See Table 1.

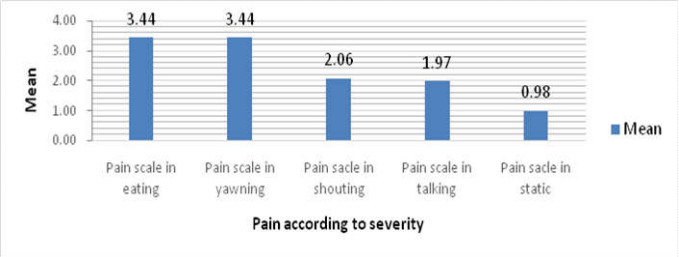

Figure 3. Pain according to severity

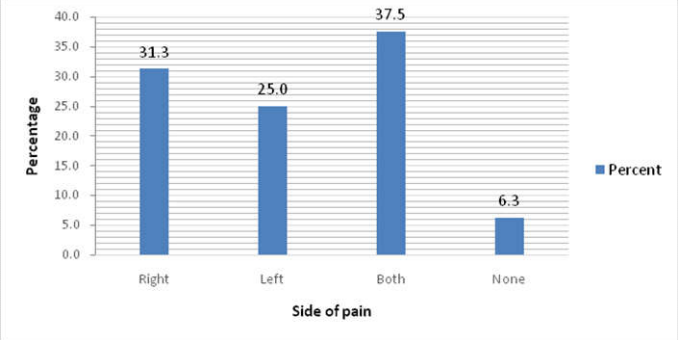

Figure 4. Side of TMJ pain

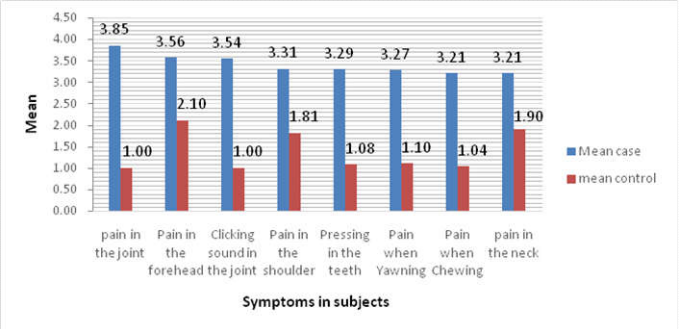

Figure 5. Symptoms in subjects

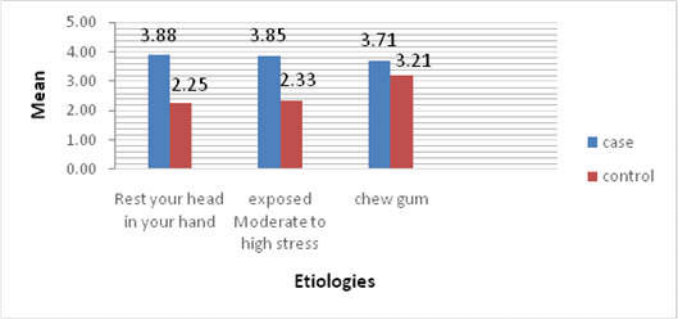

Figure 6. Most frequent etiologies

Table 1. The differences between case and control according to TMD manifestations

Test Statistics[a]			
	exposed Moderate to high stress	Rest your head in your hand	chew gum
Mann-Whitney U	583.000	540.000	952.500
Wilcoxon W	1759.000	1716.000	2128.500
Z	-4.280	-4.630	-1.491
Asymp. Sig. (2-tailed)	.000	.000	.136

Opening the mouth is one of major movements of TMJ and it has involvement in other movements. So, there was a correlation between active opening of mouth from the center and active opening of the mouth from the right and left ($p=.000$). See Table 2.

Table 2. Correlation Between ROM of the Mouth opening

	Active opening of the mouth from the left	Active opening of mouth from the Right side
Active opening of the mouth from the center	.892**	.820**
	.000	.000

Table 3. Pain in Eating

	Active opening of mouth from the Right side
Pain scale in eating	-.260*
	.037

Table 4. Side of Clicking

Percent	Frequency	Type		
100.0	1	System	Missing	.
20.8	10	Right	Valid	case
31.3	15	Left		
29.2	14	Both		

Table 5. Correlation Between Dizziness, Ringing Sound in the ears, and Forehead

Correlations						
Type				Dizziness	Ringing sound in the ears	Pain in the forehead
Case	Spearman's rho	Dizziness	Correlation Coefficient	1.000	.171	.398**
			Sig. (2-tailed)		.245	.005
			N	48	48	48
		Pain in the forehead	Correlation Coefficient	.398**	.178	1.000
			Sig. (2-tailed)	.005	.226	
			N	48	48	48

Table 6. Correlation Between Missing Teeth, Pain in joint.

Type		pain in the joint
Case	Mann-Whitney U	192.500
	Wilcoxon W	402.500
	Z	-1.966
	Asymp. Sig. (2-tailed)	.049

As shown in Table 3, depending on statistics which test the correlation, pain during eating was affected on active opening of the mouth from the right side ($p<0.05$). On other hand, the present study found that 31.3% of participants had clicking sound in the right side, while 29% of participants had clicking in both sides, and 20.8% on right side. In relation to dizziness, there was no correlation between pain in TMJ and dizziness in case group. However, there was a correlation between dizziness as an independent variable, also forehead as dependent variable, and vice versa ($P< 0.05$). See Table 5. With regard to the correlation between missing teeth as independent variable, with pain in joint as dependent variables, we found that there was correlation between missing teeth and joint pain joint ($p<0.05$).

DISCUSSION

Many studies explore the musculoskeletal etiology and manifestations of temporomandibular joint problems. However, there is a lack of studies that talk about TMD and the large number of people who suffered from it in Palestine. Therefore, we decided to study TMD in Bethlehem and Jerusalem/Palestine. The aim from our study was to investigate the musculoskeletal etiology of TMJ problems, signs and symptoms of TMJ problems. TMJ pain was one of the symptoms of TMD, and it was the most common symptom experienced, especially when eating and yawing in comparison to the severity of pain during shouting, talking, and static state. The reason for this is, when the patient is eating, he is doing repetitive movements in TMJ with force to chew the food, especially hard food. Therefore, if the patient's muscles are not strong enough, TMD will develop. Furthermore, the study found that pain was exacerbated by yawing, it might be as a result of involuntary rapid movement, which affected the disc position and made a quick stretch for muscles and joint structures that might lead to imbalance in bite and loss of control in the joint. This theory was proven in other article, such as a TMJ disorder article that was carried out by National Institute of Dental and Craniofacial Research in 2014 (National Institute of Dental and Craniofacial Research, 2014). There was a significant difference between case and control group according to the musculoskeletal manifestations ($p<0.05$). We found that the most symptoms was reported by case group was TMJ pain (mean 3.8542) and forehead (3.562 5) in comparison to other symptoms. Meanwhile in the control group, we found that pain in forehead was the highest compared to the previous symptoms. The reason for the difference between the control and case group is that the case group had neck pain (3.2083) more than control group (1.8958). So, muscle spasm in neck, such as, sternocleidomastoid, scalene and other muscles lead to neck pain and this caused compression on C1 and C2, which is the major reason forehead and cervico-genicpain in both group. However, in the case group whom had TMJ pain more than forehead, this is due to severe muscles spasm in neck, that lead to muscles spasm around the TMJ. Muscles involved include; masseter, temporalis, pterygoid, and this causes tenderness and pain in the Joint area (Biondi, 2005). Although the forehead pain and neck pain were the highest symptoms that were associated with TMD that approved in the introduction that temporomandibular joint symptoms were also

significantly improved when neck was treated (Aloosi *et al.,* 2016). But, the result of our study explained that TMD can cause others symptoms. like, forehead pain, neck pain, clicking sound, pain in shoulder, pressing teeth, and pain when yawing and chewing. The mean of them were near the highest mean (forehead, and neck pain). Our results supported that TMD caused other symptoms were similar to other authors results. Such as, Thilander, Rubio, Pena and de Mayorgain 2002, and Bonjardim, Gavião, Pereira, Castelo and Garcia in 2005, Rantala and his colleagues in 2003, Karibe and his colleagues in 2015, Fateih 2006, kitsoulis and his colleagues in 2011, De Souza Barbosa and his colleagues in 2008, Pergamalian, Rudy, Zaki, and Greco in 2003, and LaTouche and his colleagues in 2015 (BONJARDIM, 2005; De Souza Barbosa *et al.,* 2008; Feteih, 2006; Karibe *et al.,* 2015; Kitsoulis *et al.,* 2011; La Touche *et al.,* 2015; Pergamalian *et al.,* 2003; Rantala *et al.,* 2003). At the same time, there was a correlation between forehead pain and dizziness. To explain that, the major reason for had a dizziness was a forehead pain which was caused by TMJ. So, pain in TMJ was lead to neck pain and tightness in neck the muscles which causes compression on C1 and C2 as we explained above, and tightness in the neck muscles lead to tightness in the muscles around the TMJ. Such as, temporalis, which was one of the major muscles that tightness in it could cause forehead pain which leaded to dizziness. To approve that there was study that talked about The Local and Referred Pain From Myofascial Trigger Points in the Temporalis Muscle Contributes to Pain Profile in Chronic Tension-type Headache was done by Fernández-de-las-Peñas,Ge, Arendt-Nielsen, Cuadrado, and Pareja, in 2007, Freund, and Schwartz in 2002 (Fernández-de-las-Peñas *et al.,* 2007). The interesting thing was, we found that age of participants had no effect on the ROM of TMJ and pain in eating. To explain that, we thought that the quality of life for the participants played important role in having TMD, and there were a lot of factors in the recent descent that increased the chance of having TMD. So, the TMD didn't depend on age, and there were studies which were done by Helöe in 1978. Also, in another study indicated that there was no relation between increased risks of craniomandibulardys function with aging (Öterberg *et al.,* 1992).

Furthermore, we found that there are correlation between pain in eating and active opening of mouth from the right side ($p<0.05$) which means if the pain in eating increased, the active opening of mouth from the right side will decrease. So, the highest percentage of participants who had clicking on the left side and the active opening of the mouth from the right side was decreased, which means they had a deviation of mandible toward the right. Also, this indicated that the large number of participants concentrated during eating on the right side, and the pain will be more in both side (left side who has a TMD, and Right side who do a compensation work). Also, we thought that subjects who had problem in both side started in one of the TMJ joint and, as a result, developed imbalance in mandible, deviation toward one side more than other, loosen of ligaments, and tightens in the muscles around the joint lead to develop bilateral TMJ pain (Religioso, 2015). In addition to that, having a bad bite (malocclusion) causes an imbalance in the jaw-to-skull relationship, which in turn twists the jaw into a strained position that refers pain to the muscles in the neck, shoulders, and back. And because muscles work as a team, seldom does a single muscle work without other muscles in the team joining in. The bones in the neck, especially the atlas and axis, are intimately involved with the muscles of chewing, biting, talking, breathing, and head posture (TMJ, 2016). If the bite of the upper and lower teeth is not aligned properly, everyday jaw motions can cause stress to muscles, tendons, and nerves surrounding the jaw joints (Ettienne Van Zyl, 2016). Furthermore, there were significant differences between case and control groups according to TMD etiologies ($p<0.05$). All of those symptoms could occur for many reasons but the prevalent cause that we found was resting of the head on the hand which was one of the parafunctional habits that are done during our life. After that, stress that participants were exposed to andgum chewing. Those habits were the major causes which put pressure and force on the joint, which lead to an imbalance in the mandible, change in bite, clicking sound, tightness in the muscles among other things. Which was approved by the results of other authors in chapter 2 .Such as the study that was done by Mottaghi, Razavi, Pozveh,, and Jahangirmoghaddam (2011) which found that the level of anxiety and occurrence of Temporomandibular disorders were highest in TMD group (Mottaghi *et al.,* 2011). In addition to all of those causes that lead to TMJ pain, there are others contributing factors, which could cause TMJ pain such as: Missing teeth, which play an important role in TMD and TMJ pain, because participants with missing teeth have a space in the place of missed teeth, which lead the movement of the teeth toward the space and change of the bite. And, the number of missed teeth played also important role, because if the participant has a large number of missing teeth, will focus during doing the functional activities on the side has more teeth in it, and this will lead to imbalance in the mandible, and change in the bite which will lead to TMD. Results of other studies supported our results, such as the study done by Himawan *et al.* in 2007.

Conclusion

In conclusion this study this study has been crucial in determining musculoskeletal etiology and manifestations of temporomandibular joint problems, which was found to be more common in females than males. The most common causes for TMD are parafunctional habits like rest head on hand, gum chewing or from exposure to high stress. In addition, severity of pain increased during eating and yawning in TMD patients in both side (right and left). Also, those complained mostly from pain in joint, forehead pain which may lead to dizziness and a clicking sound. It is also important to mention that missing teeth will increase the severity of joint pain. This will lead to dysfunction in active mouth opening. In addition to the aforementioned symptoms, they may experience shoulder pain, neck pain and teeth pressure.

REFERENCES

Alomar, X. et al. 2007. "Anatomy of the temporomandibular joint." Seminars in Ultrasound, CT and MRI. Vol. 28. No. 3.

Aloosi, S., Mohammad, S., Qaradakhy, T. and Hasa, S. 2016. "Contribution of Cervical Spine in Temporomandibular Joint Disorders: A Cross-Sectional Study". *JBR Journal of Interdisciplinary Medicine and Dental Science,* 04(05).

Biondi, D. 2005. Cervicogenic Headache: A Review of Diagnostic and Treatment Strategies. [online] Jaoa.org. Available at: http://jaoa.org/article.aspx?articleid=2093083 [Accessed 25 Apr. 2017].

BONJARDIM, 2005. Gavião, Pereira, Castelo,and Garcia .Signs and symptoms of temporomandibular disorders in adolescents. *Braz. oral res.* [online]. Vol. 19, n.2, pp.93-98.

ISSN 1807-3107. http://dx.doi.org/10.1590/ S1806-83242005000200004.

Buescher J. J. 2007. Temporomandibular joint disorders. American Family Physician, 76(10):1477–1484. [PubMed]. Available at: https://www.ncbi.nlm.nih.gov/pubmed/ 18052012

De Souza Barbosa, T., Miyakoda, L. S., de Liz Pocztaruk, R., Rocha, C. P. and Gavião, M. B. D. 2008. Temporomandibular disorders and bruxism in childhood and adolescence: review of the literature. *International Journal of Pediatric Otorhinolaryngology*, *72*(3), 299-314.

Ettienne Van Zyl, 2016. TMJ Disorder - Causes, Symptoms & Classifications. DocShop.com

Fernández-de-las-Peñas, C., Ge, H. Y., Arendt-Nielsen, L., Cuadrado, M. L. and Pareja, J. A. 2007. The local and referred pain from myofascial

Feteih, R. M. 2006. "Signs and symptoms of temporomandibular disorders and oral parafunctions in urban Saudi Arabian adolescents: a research report". *Head & Face Medicine,* 2(1), 25.

Freund, B. J. and Schwartz, M. 2002. Relief of Tension-type Headache Symptoms in Subjects with Temporomandibular Disorders Treated with Botulinum Toxin-A. *Headache: The Journal of Head and Face Pain*, *42*(10), 1033-1037.

Helöe, B. and Helöe, L. A. 1978. The occurrence of TMJ-disorders in an elderly population as evaluated by recording of» subjective «and» objective «symptoms. *Acta Odontologica Scandinavica,* 36(1), 3-10.

Himawan, L. S., Kusdhany, L. S. and Ariani, N. 2007. Temporomandibular disorders in elderly patients. *Medical Journal of Indonesia,* 16(4).

Karibe, Shimazu, Okamoto, Kawakami, KatoandWarita-Naoi, 2015. Does gum chewing increase the prevalence of temporomandibular disorders in individuals with gum chewing habits? - pubmed- NCBI.

Kitsoulis, P., Marini, A., Iliou, K., Galani, V., Zimpis, A., Kanavaros, P. and Paraskevas, G. 2011. Signs and symptoms of temporomandibular joint disorders related to the degree of mouth opening and hearing loss. BMC Ear, Nose and Throat Disorders, 11(1).

La Touche, R., Paris-Alemany, A., Gil-Martínez, A., Pardo-Montero, J., Angulo-Díaz-Parreño, S. and Fernández-Carnero, J. 2015. Masticatory sensory-motor changes after an experimental chewing test influenced by pain catastrophizing and neck-pain-related disability in patients with headache attributed to temporomandibular disorders. *The Journal of Headache and Pain*, *16*, 20. http://doi.org/10.1186/s10194-015-0500-1

Mayoclinic.org. 2016. Overview-TMJ disorder-Mayo Clinic.

Mottaghi, A., Razavi, S. M., Pozveh, E. Z., and Jahangirmoghaddam, M. 2011. Assessment of the relationship between stress and temporomandibular joint disorder in female students before university entrance exam (Konkour exam). *Dental Research Journal,* 8(Suppl1), S76–S79.

National Institute of Dental and Craniofacial Research, 2014. Facial Pain. Availabe at: https://www.nidcr.nih.gov/Data Statistics/FindDataByTopic/FacialPain/

Öterberg, T., Carlsson, G. E., Wedel, A. and Johansson, U. 1992. A cross-sectional and longitudinal study of craniomandibular dysfunction in an elderly population. Journal of Craniomandibular Disorders, 6(4).

Pergamalian, A., Rudy, T., Zaki, H. and Greco, C. 2003. "The association between wear facets, bruxism, and severity of facial pain in patients with temporomandibular disorders". The journal of prosthetic dentistry, 90(2).

Rantala, M., Ahlberg, J., Suvinen, T. and Könönen, M. 2003. *Symptoms, orofacial pain, neck pain, headache, and psychosocial factors among non-patients*. [online] Research Gate. Available at: https://www.researchgate.net/ publication/9036139_Temporomandibular_joint_related_painl ess_symptoms_orofacial_pain_neck_pain_headache_and_psyc hosocial_factors_among_non-patients [Accessed 30 Apr. 2017].

Religioso, E. D, and F. 2015. Technique Highlight: TMJ Manual Techniques.

Rutkiewicz T, Kononen M, Suominen-Taipale L, Norblad A, and Alanen P. 2006. Occurrence of clinical signs of temporomandibular disorders in adult Finns. *J Orofac Pain.,* 20:208-17.

Thilander, B, Rubio, G., Pena, L. and Mayorga, C. 2002. "Prevalence of Temporomandibular Dysfunction and Its Association With Malocclusion in Children and Adolescents: An Epidemiologic Study Related to Specified Stages of Dental Development". *The angle orthodontist Journal,* 72(2).

TMJ - Temporomandibular Joint Disorder – TMD, 2016. Dentist Information, Dentistinfo.com

TMJ Association, ltd, 2015.TMD Basics/TMJ.org.Available at: http://www.tmj.org/site/content/tmd-basics [Accessed 26 Jan. 2017].

Wright, E. F., and North, S. L. 2009. Management and Treatment of Temporomandibular Disorders: A Clinical Perspective. *The Journal of Manual & Manipulative Therapy,* 17(4), 247–254.

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