



The Open Dentistry Journal

Content list available at: www.benthamopen.com/TODENTJ/

DOI: 10.2174/1874210601711010710



RESEARCH ARTICLE

Risk Factors of Orofacial Pain: A Population-Based Study in West Java Province, Indonesia

Rasmi Rikmasari¹, Gilang Yubiliana² and Tantry Maulina^{3,*}

¹Prosthodontic Department, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia

²Community Dental Health Department, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia

³Oral Surgery Department, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia

Received: May 14, 2017

Revised: October 15, 2017

Accepted: December 06, 2017

Abstract:

Background:

The management of orofacial pain in Indonesia has not been well performed, which consequently led to an increase in the orofacial pain occurrences and a decreased quality of life. One of the possible reasons for this particular matter is the lack of evaluation on the risk factors that might induce orofacial pain in some individuals.

Objective:

The objective of the current study was to evaluate the risk factors of orofacial pain on productive age population in West Java province, Indonesia.

Methods:

One thousand and fifty-six participants (522 males; 534 females) were recruited for the study. A questionnaire that consists of demographic questions and questions evaluating several assumed risk factors for orofacial pain was used in a single interview. All data was analyzed by using Chi Square test to test the significance, Odds Ratio (OR), as well as Relative Risk (RR) by using SPSS version 23 (IBM Statistic, USA).

Results:

The result of the current study revealed that bruxism ($p < 0.01$), daytime clenching ($p < 0.01$), and unilateral chewing ($p < 0.01$) were significantly related to the occurrence of orofacial pain. It was also found that participants who performed multitude of heavy liftings at work have an increased risk (RR=1.19; 95% CI: 1.04 – 1.35) of having orofacial pain compared to those who do not.

Conclusion:

Risk factors for the occurrence of orofacial pain on productive age population in Indonesian sample consisted of oral parafunctional habits and non-parafunctional habits, such as heavy lifting. Further study in this particular topic is of importance.

Keywords: Orofacial pain, Risk factors, Oral parafunctional habits, Indonesia, Temporomandibular Disorders (TMD), Unilateral chewing.

1. INTRODUCTION

Orofacial pain is defined as pain occurring in the soft tissue as well as hard tissue of the head, including the oral region, face, and neck [1]. The complex structure of the oral and facial region has made orofacial pain as one of the

* All correspondence to this author at the Oral Surgery Department, Faculty of Dentistry, Universitas Padjadjaran, Jl. Sekeloa Selatan no. 1, Bandung 40132, West Java – Indonesia; Tel: +(62)-82115513030; E-mails: tantry.maulina@fkg.unpad.ac.id, tmau4292@uni.sydney.edu.au

challenging conditions to be treated by clinicians [2]. The fact that it impacted the patient's quality of life and caused high level of impairment [3 - 6] has been one of the highlights in the management of orofacial pain. Amongst the groups of patients who were affected by orofacial pain, the age group of 18-45 years old, is a productive age group that is mostly affected by orofacial pain in regards to work productivity. A study about orofacial pain and its associated impact on the community showed that this particular age group showed a high prevalence of orofacial pain [7]. Whilst previous studies about the impact of orofacial pain on work activities showed significant correlations between the duration and intensity of orofacial pain and impaired work activities [8, 9].

There are several factors that are considered to be the risk factors for orofacial pain. A model developed in a study by Maixner *et al*, (2011). based on a model proposed by Dworkin *et al*, (1992) about the biopsychosocial model of Temporomandibular Disorders (TMD) revealed that TMD and its pain and other accompanying symptoms were influenced proximally by two factors, psychological distress and pain amplification, with the later factor includes pro-inflammatory states, impaired pain regulation, cardiovascular function, and neuroendocrine function [10, 11]. Aside from these two assumed risk factors of orofacial pain, the two factors also assumed to be associated with the occurrence of orofacial pain are age and gender. In a study about gender difference in the occurrence of TMD, Bagis *et al*, (2012) showed that pain in the masseter muscle as well as TMJ pain while resting was found to be more frequent in female than male participants. In this study, age was also found to have a significant effect on the occurrence of TMD [12].

Another study by Anggarwai *et al*, (2010) about the risk factors for the onset of chronic orofacial pain on adults aged 18-75 years that were patients from a general practice in the North West of England revealed that grinding, anxiety, depression, health anxiety, chronic widespread pain and irritable bowel syndrome were the factors that were significantly ($p < 0.05$) associated to the incidence of chronic orofacial pain. In this population-based prospective study that involved 1329 participants, it was also revealed that age was a risk factor for the onset of chronic orofacial pain, with those who are in the low age category is being the group that is more prone to chronic orofacial pain [13].

The variation of results in previous studies about the risk factors of orofacial pain as well as the high prevalence of orofacial pain in Indonesian sample in previous studies [8,14] emphasizes the need of a conduction of an epidemiological study that can evaluate the risk factors for the occurrence of orofacial pain in Indonesia. Therefore, the aim of the current study was to identify the risk factors of orofacial pain in the productive age group in Indonesia and associate these risk factors to the occurrence of orofacial pain.

2. MATERIALS AND METHODS

The current study randomly recruited 1056 (522 males; 534 females) participants from six regencies and three cities from West Java province that were selected by using the Cluster Sampling method. After the cities and regencies were selected, participants who were at the age of 18 - 45 years old were randomly selected by using the Simple Random Sampling (SRS) method. Prior to the start of the study, an ethical approval was gained from the Health Research Ethic Committee Faculty of Medicine Universitas Padjadjaran, Bandung, Indonesia. All procedures in the current study has been conducted in full accordance to the Declaration of Helsinki and prior to the start of data collection, all participants signed a written informed consent. All participants' demographical data that includes educational attainment (elementary school, junior high school, senior high school, college (3 years of higher education that resulted in a Diploma degree)and university (5 years of education that resulted in a Bachelor degree)), type of occupation (1: private sector worker; 2: entrepreneur; 3: laborer; 4: driver; 5: housewife; 6: government employee; 7: student; 8: unemployed; 9: health professional), as well as age and gender were recorded in Table 1. Two calibrated interviewers interviewed the participants by using a validated questionnaire in Bahasa Indonesia, which is the official language of Indonesia.

The questionnaire consists of twenty-five questions (Fig. 1) that evaluated several factors which were assumed to be the risk factors for orofacial pain, and one main question that evaluated the occurrence of orofacial pain within the last six months. Orofacial pain included in the current study is the pain occurring in the tooth (toothache), pain in the jaw joint/s, pain in the area just in front of the ear/s, pain in or around the eyes, pain when opening the mouth wide, shooting pains in the face or cheeks, pain in the jaw joint when chewing food, pain in and around the temples, tenderness of muscles at the side of the face, and a prolonged burning sensation in the tongue or other parts of the mouth. Prior to the start of the study, all field researchers were calibrated on performing the interview accordingly. After every question that was asked to the participant, the reviewer give a calibrated explanation to the participant regarding the meaning of the question.

Table 1. Participant's demographical data.

Categories	Number of Participants										
	Age	18 – 30 Years Old					31 –45 Years Old				
522					534						
Gender	Male			Female			Male			Female	
	272			250			251			283	
Educational Attainment	Elementary School		Junior High School		High School			College (3 years)		University (5 years)	
	201		304		478			32		41	
Occupation	1*	2*	3*	4*	5*	6*	7*	8*	9*		
	192	219	81	7	359	84	42	71	1		

*occupation categories: 1: private sector worker; 2: entrepreneur; 3: laborer; 4: driver; 5: housewife; 6: Government employee; 7: Student; 8: unemployed; 9: health professional.

The questionnaire was divided into the following sections: questions number 1 to 5 evaluated the participants' economical and occupational aspect, questions number 6 and 7 evaluated the participant' involvement in social activity, questions 8 to 10 evaluated the participants' residential location, questions 11 to 13 evaluated the participants' access to a dental health facility as well as dental health awareness, questions 14 to 16 evaluated the participants' dental habit, questions 17 to 19 evaluated the participants' daily habit regarding food consumption and workout habits, and questions 20-25 evaluated participants' oral parafunctional habits, such as smoking, unilateral chewing, bruxism, excessive gum chewing, nail and lip biting as well as daytime clenching. After the completion of the twenty-five questions, the participants were asked whether they experienced or experiencing orofacial pain within the last six months. All data were then recorded and analyzed by using the Chi Square test to test the significance and were analyzed for Odds Ratio (OR) as well as Relative Risk (RR) by using *SPSS* version 23 (IBM Statistic, USA).

3. RESULTS

The current study recruited 1056 participants (mean age \pm 31 years old) who are considered to be at the productive age (18-45 years old). From the analysis of the demographical characteristics and occurrence of orofacial pain (Table 2), it was revealed that orofacial pain mostly occur in participants who were at the 31 - 45 years old age group (52.62%), female (50.28%), elementary school graduates (55.72%), and work as laborer (69.49%). Others demographical characteristic can be viewed in Table 2. An evaluation performed on dental related factors to the occurrence of orofacial pain can be viewed in Fig. (2)

Another analysis performed between these dental related factors to the occurrence of orofacial pain revealed an unusual results, where out of the 994 participants who do not have a regular dental visitation schedule, 513 (51.60%) participants have never experienced orofacial pain; and out of the 1034 participants who do not brush their teeth twice a day, about 50.29% (520) participants have never experienced orofacial pain; and that despite the fact that the nearest community health center located to their residential area has dental facilities, orofacial pain still occurred on 421 (out of 842) participants.

Significant associations between the occurrence of orofacial pain and oral parafunctional habits (bruxism ($p < 0.01$), unilateral chewing ($p < 0.01$), and daytime clenching ($p < 0.01$)), Odds Ratio (OR) as well as Relative Risk (RR) were also calculated in the current study and can be viewed in Table 3. One of the highest OR revealed in the study was the OR calculated to test the association between unilateral chewing to the occurrence of orofacial pain, which was 2.33, which means those who performed unilateral chewing on a regular basis, are 2.33 times more likely to have orofacial pain compared to those who chew bilaterally. It was also revealed that those who chew from one side of the mouth have a 55% increased risk (RR=1.55; 95% CI: 1.35 - 1.79) in having orofacial pain compared to those who do not chew from one side of the mouth only. A rather unusual finding regarding OR and RR were found when an association between regular dental visit twice a year and the occurrence of orofacial pain was tested. An OR of 3.34 was obtained regarding this particular association, which means those who went for a regular dental visitation twice a year are 3.34 times more likely to have orofacial pain compared to those who do not. A relative risk calculation regarding this particular association revealed that those who have a dental visitation schedule twice a year have an increased risk of 57% (RR=1.57; 95% CI: 1.34 - 1.83) in having orofacial pain compared to those who do not have a routine dental visitation schedule.

Name :
 Age :
 Gender :
 Occupation :
 Educational Attainment :

Please answer the question with a “Yes” or a “No”.

No	Question	Answer	
		Yes	No
1	Do you have a permanent job?		
2	Do you have a fixed income?		
3	Do you make more than 3.000.000 IDR / month?		
4	Does your work requires you to lift heavily on daily basis?		
5	Does your work stressed you out?		
6	Do you meet your friend or family for a routine (monthly, weekly) social event or meeting?		
7	Do you attend social gathering held by the office or local citizen’s committee?		
8	Do you live in a private housing complex/ cul de sac?		
9	Do you live in a rural area?		
10	Does your house located in the city center?		
11	Does your house located within 5 km to the nearest community health center or a private practice dentist?		
12	Does the nearest community health center to your house has a dental clinic?		
13	Did you go to a dentist or any other health professional when you experienced orofacial pain?		
14	Do you brush your teeth twice a day?		
15	Do you use oral/ mouth rinse?		
16	Do you go to the dentist for a routine check-up twice a year?		
17	Do you exercise at least once a week?		
18	Do you like to consume sweets?		
19	Do you consume fruit and veggie on a daily basis?		
20	Do you smoke?		
21	Do you chew on a certain side of the mouth?		
22	Do you have night bruxism?		
23	Do you chew gum (at least three times a day) on a daily basis?		
24	Do you bite your nail or lips frequently?		
25	Do you clench your teeth regularly during daytime?		
	Do you have or have had orofacial pain for the last six months?		

Fig. (1). Orofacial pain risk factors questionnaire (English version).

Table 2. The distribution of the occurrence of orofacial pain based on demographical characteristics of the participants.

No	Demographical Characteristics	Occurrence of Orofacial Pain			
		Yes		No	
		Number	Percentage (within demographical characteristic)	Number	Percentage (within demographical characteristic)
1	Age				
	18 – 30 years old	247	47.32%	275	52.68%
	31 – 45 years old	281	52.62%	253	47.38%
2	Gender				
	Male	260	49.71%	263	50.29%
	Female	268	50.28%	265	49.72%
3	Educational attainment				
	Elementary school	112	55.72%	89	44.28%
	Junior High School	147	48.36%	157	51.64%
	Senior High School	243	50.84%	235	49.06%
	College (3 years)	12	37.5%	20	62.5%
	University (5 years)	14	34.15%	27	63.85%

(Table 4) contd.....

No	Demographical Characteristics	Occurrence of Orofacial Pain			
		Yes		No	
		Number	Percentage (within demographical characteristic)	Number	Percentage (within demographical characteristic)
4	Occupation				
	Private sector worker	99	51.56%	93	48.44%
	Entrepreneur	106	48.40%	113	51.60%
	Laborer	49	69.49%	32	39.51%
	Driver	2	28.57%	5	71.43%
	Housewife	185	51.53%	174	48.47%
	Government employee	34	40.48%	50	59.52%
	Student	25	59.52%	17	40.48%
	Unemployed	28	39.44%	43	60.56%
	Health professional	0	0%	1	100%

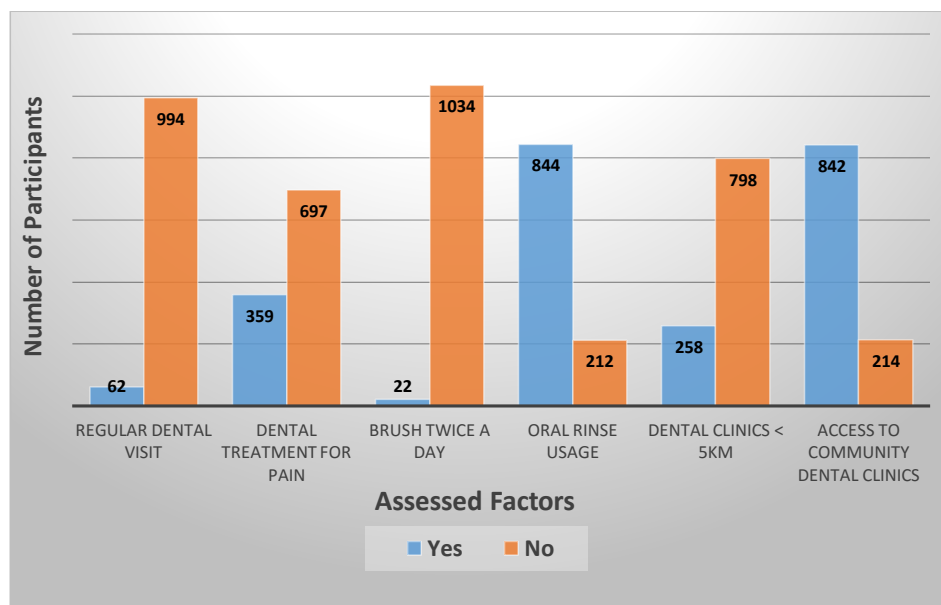


Fig.(2). Participants distribution on dental related factors evaluation.

Table 3. Significant associations, Odds Ratios (OR), and Relative Risks (RR) for the occurrence of orofacial pain and assessed risk factors.

No	Risk Factors	p-value	OR	RR (95% CI)
1	Heavy lifting at work on daily basis.	0.02	1.4	1.19 (95% CI; 1.04 - 1.35)
2	Regular dental visit (2x/year)	< 0.01	3.34	1.57 (95% CI; 1.34 - 1.83)
3	Unilateral chewing	< 0.01	2.33	1.55 (95% CI; 1.35 - 1.79)
4	Bruxism	< 0.01	1.6	1.26 (95% CI; 1.09 - 1.45)
5	Daytime clenching	< 0.01	1.9	1.33 (95% CI; 1.13 - 1.57)

4. DISCUSSION

The result of the current study suggested that several oral parafunctional habits, which are bruxism, unilateral chewing, and daytime clenching were potential risk factors for the occurrence of orofacial pain. Oral parafunctional habits have been known for their short or long term effect on the oral structures. One of the oral parafunctional habits

that are assumed to be closely related to the occurrence of TMD pain is bruxism, which is a type of oral parafunctional habit consists of clenching and grinding due to possible abnormalities in the masticatory system. Bruxism might be caused by psychological, morphological, as well as pathophysiologic factors [15]. A study conducted by Ahlberg *et al.*, (2005) about the association between perceived orofacial pain and reported bruxism showed that orofacial pain experienced by the research participant in recent time was significantly associated to frequent bruxism [16].

Another oral parafunctional habit that was found to be significantly associated to the occurrence of orofacial pain in the current study was daytime clenching. This particular result of the current study is in line with a study that was performed to evaluate the association between several oral parafunctional habits and several diagnoses classified to TMD subgroup. In that study, daytime clenching was found to be a significant risk factor for myofascial pain, of which people who frequently did daytime clenching are 4.9 times more likely to get myofascial pain compared to those who did not do it as frequent as those who did [17]. Another study that evaluated the association between oral parafunctional habits and painful TMD showed that those who were doing two or three concomitant oral parafunctional habits were more likely to develop painful TMD [18].

Another study that showed similar result to the current study is the one that was performed by Velly *et al.*, (2003) about contributing factors of chronic masticatory myofascial pain. The result of this investigational study showed that clenching and grinding were found to be associated to masticatory myofascial pain [19]. Clenching or what is identified as an activity of bringing the teeth in contact with high level of force, causes the masticatory muscles to tighten more than normal. A repetition of this mechanism will cause an accumulation of substrates that will interfere with the intracellular pH and the conduction of action potential necessary for muscle activation [20]. This will finally lead to muscle fatigue and in the end, muscle pain.

The result of the current study also revealed a significant association between unilateral chewing to the occurrence of orofacial pain. A study by Santana-Mora *et al.*, (2013) about the habitual chewing side syndrome on temporomandibular disorder revealed that habitual chewing on a certain side of the mouth is significantly associated to the painful side being complained by TMD patient [21]. Whilst a study by Reinhardt *et al.*, (2006) revealed that individual with unilateral chewing habit showed more signs and symptoms of TMD [22], Another result of the current study was the significant association between heavy lifting and the occurrence of orofacial pain. Heavy lifting or weight lifting has been closely related to TMD and that the symptoms might vary from sensation of pain in the temporomandibular joint to limited jaw opening [23]. During heavy lifting or any other maximal muscular activity, voluntary clenching is somehow a very common thing to do [24]. Considering that the participants are at work in most days and repeatedly performed the heavy lifting, and as a consequence repeatedly clenched their teeth voluntarily, the occurrence of orofacial pain seems to be logically associated.

The last significant association found in the current study was the association between having a regular dental visitation schedule twice a year to the occurrence of orofacial pain. It was revealed that participants who had a regular dental visit twice a year had an increased risk of 57% of having orofacial pain compared to those who did not have regular dental check-up. This particular finding of the current study might be caused by several factors, such as participants' overall dental condition prior to the visit. The question asked in the questionnaire did not explore when the participant started the regular dental visit, whether they have been visiting the dentist regularly for years or have just been visiting for the last year. If the later was the condition, then a poor oral health status might be the participants' starting point. Therefore, when they started to regularly visit the dentist, they are more aware with dental and oral problems that might manifest as orofacial pain. This condition might result as if the regular dental visit was associated with the occurrence of orofacial pain. Further study exploring the association between these factors might provide clearer explanation regarding this particular result.

As for the rest of the assumed risk factors assessed in the current study (*i.e.* age, gender, educational attainment, stress), despite the fact that these factors were found to be significantly associated to the occurrence of orofacial pain in previous studies, there were no other significant association between these factors and the occurrence of orofacial pain were found in the current study. According to previous studies, [13, 25 - 27] there are several factors that might be potential risk factors for the occurrence of orofacial pain, such as age, educational attainment, gender, psychosocial, genetic, environment, pain sensitivity, and oral parafunctional habits. In relation to this, the current study also assessed the association between nail biting as one of the oral parafunctional habits that was found to be associated with the occurrence of orofacial pain in previous studies. Unlike the finding on previous study by Macfarlane *et al.*, (2003) about the association between mechanical factors and the occurrence of orofacial pain [26], there was no association found between nail biting with the occurrence of orofacial pain. In their study, Macfarlane *et al.*, revealed that nail biting is

significantly associated with the occurrence of orofacial pain [26].

CONCLUSION

To conclude, from the finding of the current study it can be summarized that the occurrence of orofacial pain in Indonesian sample might be associated to certain oral parafunctional habits, work activity, as well as regular dental visits. Further study based on the result of the current study is an avenue for future investigation. Future studies that evaluated other suspected risk factors of orofacial pain, such as genetic factor that might resulted in a more tailored treatment for an individual with orofacial pain [25] would also be of great importance. Last but not least, a study that thoroughly evaluated the involvement of psychological factor should also be considered for future investigation.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

An ethical approval was gained from the Health Research Ethic Committee Faculty of Medicine Universitas Padjadjaran, Bandung, Indonesia.

HUMAN AND ANIMAL RIGHTS

The reported experiments are in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2008 (<http://www.wma.net/en/20activities/10ethics/10helsinki/>).

CONSENT FOR PUBLICATION

All participants signed a written informed consent.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the Indonesian Ministry of Research, Technology, and Higher Education that funded the current research through the *Penelitian Unggulan Perguruan Tinggi* (PUPT) Research Grant.

REFERENCES

- [1] de Leeuw R, Klasser GD. Guidelines for assessment, diagnosis, and management. 5th ed. Illinois: Quintessence Publishing Co, Inc 2013.
- [2] Romero-Reyes M, Uyanik JM. Orofacial pain management: Current perspectives. *J Pain Res* 2014; 7: 99-115. [<http://dx.doi.org/10.2147/JPR.S37593>] [PMID: 24591846]
- [3] Shueb SS, Nixdorf DR, John MT, Alonso BF, Durham J. What is the impact of acute and chronic orofacial pain on quality of life? *J Dent* 2015; 43: 1203-10. [<http://dx.doi.org/10.1016/j.jdent.2015.06.001>] [PMID: 26073033]
- [4] Oberoi SS, Hiremath SS, Yashoda R, Marya C, Rekhi A. Prevalence of various orofacial pain symptoms and their overall impact on quality of life in a Tertiary Care Hospital in India. *J Oral Maxillofac Surg* 2014; 13: 533-8. [<http://dx.doi.org/10.1007/s12663-013-0576-6>] [PMID: 26225024]
- [5] Barros VdeM, Seraidarian PI, Côrtes MI, de Paula LV. The impact of orofacial pain on the quality of life of patients with temporomandibular disorder. *J Orofac Pain* 2009; 23: 28-37. [PMID: 19264033]
- [6] Kumar S, Badiyani BK, Kumar A, Dixit G, Sharma P, Agrawal S. Orofacial pain and quality of life in early adolescents in India. *Int J Adolesc Med Health* 2016. [<http://dx.doi.org/10.1515/ijamh-2016-0037>] [PMID: 27542197]
- [7] 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. [<http://dx.doi.org/10.1034/j.1600-0528.2002.300108.x>] [PMID: 11918576]
- [8] Maulina T, Yubiliana G, Rachmi CN, Wulansari D, Rikmasari R. A population-based study about the prevalence of orofacial pain and its association to demographical factors in West Java Province, Indonesia. *Int J Clin Dent* 2016; 9: 171-82.
- [9] Constante HM, Bastos JL, Peres KG, Peres MA. Socio-demographic and behavioural inequalities in the impact of dental pain among adults: A population-based study. *Community Dent Oral Epidemiol* 2012; 40: 498-506. [<http://dx.doi.org/10.1111/j.1600-0528.2012.00701.x>] [PMID: 22607027]

- [10] Maixner W, Diatchenko L, Dubner R, *et al.* Orofacial pain prospective evaluation and risk assessment study: The OPPERA study. *J Pain* 2011; 12: T4-T11. [<http://dx.doi.org/10.1016/j.jpain.2011.08.002>] [PMID: 22074751]
- [11] Dworkin SF, Von Korff M, LeResche L. Epidemiologic studies of chronic pain: A dynamic-ecologic perspective. *Ann Behav Med* 1992; 14: 3-11.
- [12] 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. [<http://dx.doi.org/10.7150/ijms.4474>] [PMID: 22991492]
- [13] Aggarwal VR, Macfarlane GJ, Farragher TM, McBeth J. Risk factors for onset of chronic oro-facial pain: Results of the North Cheshire orofacial pain prospective population study. *Pain* 2010; 149: 354-9. [<http://dx.doi.org/10.1016/j.pain.2010.02.040>] [PMID: 20304556]
- [14] Maulina T, Rachmi CN, Akhter R, Whittle T, Evans RW, Murray GM. The association between self-report of orofacial pain symptoms with age, gender, interference in activities, and socioeconomic factors in Indonesian community health centers. *Asian Pac J Dent* 2014; 14: 23-34.
- [15] Seraj B, Ahmadi R, Mirkarimi M, Ghadimi S, Beheshti M. Temporomandibular disorders and parafunctional habits in children and adolescence: A review. *J Dent Tehran Univ Med Sci* 2009; 6: 37-45.
- [16] Ahlberg K, Ahlberg J, Kõnönen M, Alakuijala A, Partinen M, Savolainen A. Perceived orofacial pain and its associations with reported bruxism and insomnia symptoms in media personnel with or without irregular shift work. *Acta Odontol Scand* 2005; 63: 213-7. [<http://dx.doi.org/10.1080/00016350510019937>] [PMID: 16040443]
- [17] Michelotti A, Cioffi I, Festa P, Scala G, Farella M. Oral parafunctions as risk factors for diagnostic TMD subgroups. *J Oral Rehabil* 2010; 37: 157-62. [<http://dx.doi.org/10.1111/j.1365-2842.2009.02033.x>] [PMID: 20002533]
- [18] Fernandes G, Franco-Micheloni AL, Siqueira JT, Gonçalves DA, Camparis CM. Parafunctional habits are associated cumulatively to painful temporomandibular disorders in adolescents. *Braz Oral Res* 2016; 30: 30. [<http://dx.doi.org/10.1590/1807-3107BOR-2016.vol30.0015>] [PMID: 26910021]
- [19] Velly AM, Gornitsky M, Philippe P. Contributing factors to chronic myofascial pain: A case-control study. *Pain* 2003; 104: 491-9. [[http://dx.doi.org/10.1016/S0304-3959\(03\)00074-5](http://dx.doi.org/10.1016/S0304-3959(03)00074-5)] [PMID: 12927621]
- [20] Busanello-Stella AR, da Silva AMT, Corrêa E. Research on fatigue in facial and jaw muscles: Review of the literature. *Rev CEFAC* 2014; 16: 1627-38. [<http://dx.doi.org/10.1590/1982-0216201427112>]
- [21] Santana-Mora U, López-Cedrún J, Mora MJ, Otero XL, Santana-Penín U. Temporomandibular disorders: The habitual chewing side syndrome. *J PLoS One* 2013; 8: e59980. [<http://dx.doi.org/10.1371/journal.pone.0059980>] [PMID: 23593156]
- [22] Reinhardt R, Tremel T, Wehrbein H, Reinhardt W. The unilateral chewing phenomenon, occlusion, and TMD. *Cranio* 2006; 24: 166-70. [<http://dx.doi.org/10.1179/crn.2006.027>] [PMID: 16933456]
- [23] Jerolimov V. Temporomandibular injuries and disorders in sport. *Med Sci* 2010; 34: 149-65.
- [24] Huang DH, Chou SW, Chen YL, Chiou WK. Frowning and jaw clenching muscle activity reflects the perception of effort during incremental workload cycling. *J Sports Sci Med* 2014; 13: 921-8. [PMID: 25435786]
- [25] Seltzer Z, Dorfman R. Identifying genetic and environmental risk factors for chronic orofacial pain syndromes: Human models. *J Orofac Pain* 2004; 18: 311-7. [PMID: 15636014]
- [26] Macfarlane TV, Blinkhorn AS, Davies RM, Worthington HV. Association between local mechanical factors and orofacial pain: Survey in the community. *J Dent* 2003; 31: 535-42. [[http://dx.doi.org/10.1016/S0300-5712\(03\)00108-8](http://dx.doi.org/10.1016/S0300-5712(03)00108-8)] [PMID: 14554070]
- [27] Huang GJ, LeResche L, Critchlow CW, Martin MD, Drangsholt MT. Risk factors for diagnostic subgroups of painful temporomandibular disorders (TMD). *J Dent Res* 2002; 8: 284-8. [<http://dx.doi.org/10.1177/154405910208100412>] [PMID: 12097315]