FOLIA MEDICA CRACOVIENSIA
Vol. LXII, 2, 2022: 139–146
PL ISSN 0015-5616
DOI: 10.24425/fmc.2022.141706

A comparison of temporomandibular disorder headache in young adults in relation to perceived stress

Aneta Wieczorek, Małgorzata Pihut, Jolanta E. Loster

Department of Prosthodontics and Orthodontics, Institute of Dentistry, Faculty of Medicine, Jagiellonian University Medical College, Kraków, Poland

Corresponding author: Aneta Wieczorek, D.D.S., Ph.D.
Department of Prosthodontics and Orthodontics, Institute of Dentistry, Faculty of Medicine, Jagiellonian University Medical College,
ul. Montelupich 4, 31-155 Kraków, Poland
Phone: +48 12 424 55 51; E-mail: aneta.wieczorek@uj.edu.pl

Abstract: Chronic pain in the head and face region has a predicted prevalence of 20% in Europe, and is more common in women than men. The etiology of temporomandibular disorder (TMD) is multifactorial, and high levels of psychological stress amplify its symptoms. We were interested in how headache reported in RDC/TMD is associated with stress. Individuals with an average age of 18 years were included in the study. They were all volunteer participants in a research project. Clinical evaluation of each subject was performed using the RDC/TMD dual-axis diagnostic system. All participants filled out the PSS-10 questionnaire. A total of 138 individuals participated in the study, of which 107 were female. Headache was reported by 83 participants (59.4%), with females presenting higher scores on the PSS-10; this was statistically significant. A comparison between PSS-10 questionnaire results and headache level shows insignificant differences. However, the higher the stress level in the participant, the higher the headache score. Females are more susceptible to perceived stress, which can have an effect on TMD.

Keywords: pain, headache, PSS-10.

Submitted: 21-Feb-2022; **Accepted in the final form:** 30-Apr-2022; **Published:** 30-Jul-2022.

Introduction

Pain is a condition defined as "an unpleasant sensory and emotional experience associated with, or similar to the condition that associated with actual or potential tissue damage" [1]. Chronic pain in the head and face region has a predicted prevalence of 20% in Europe and is more common in women than men [2]. The etiology of temporomandibular disorder (TMD) is multifactorial, and high levels of psycho-

logical stress amplify symptoms [3–6]. The prevalence of TMD pain is about 10% in the adult population, and is higher in women than in men [2]. Von Korff *et al.* [7] found that patients with pain suffered more often from depression than pain-free people. Patients with chronic pain are at risk of developing major depression, which can result from prolonged stress [8].

The Research Diagnostic Criteria for TMD (RDC/TMD) was introduced in 1992 by Dworkin and LeResche. It has been widely used in both research and clinical settings, is the most commonly used diagnostic protocol for TMD research, and is used to evaluate physical investigation, as well as the psychosocial factors that might affect treatment and prognosis. In RDC/TMD, this biopsychosocial model of pain was integrated by adopting a two-axis model. RDC/TMD Axis I provides a physical assessment, while Axis II evaluates psychosocial status and pain-related disability. Since the introduction of RDC/TMD, it has been widely used in both research and clinical settings [9]. Nowadays, the biopsychosocial model and its influence on the etiology of TMD has received increased interest, fostering a broad debate about the impact of emotional factors [10]. Stress and anxiety can cause muscle hyperactivity and the development of parafunctional habits, leading to TMJ pain [11].

One tool that is used to examine psychosocial factors, especially in TMD patients, is the Perceived Stress Scale (PSS-10), a psychological scale designed by Cohen *et al.* [12, 13]. This questionnaire is a self-reported scale that estimates the level of perceived stress arising from problems and events that have happened to the patient over the last month. The research of Stocka *et al.* confirmed that physical pain plays a central role in psychoemotional conditions [14].

TMD is often associated with headache, which is the main problem, other than acoustic symptoms, that patients present at their dentist for [15, 16]. On the other hand, headache is much more often the problem for people with pain-associated TMD [17, 18]. We were interested in how headache reported in RDC/TMD is associated with stress.

Material and Method

Individuals included in the study were volunteers who took part in the research project described previously by Loster *et al.* [19] and Wieczorek *et al.* [20]. The volunteers were with an average age of 18 years old. The study group was chosen as a homogenous group of people who had reached the end of their stomatognathic development and in this age probability of pathological malformations is minimal. All subjects gave their informed consent for participation, and the Jagiellonian University Bioethics Committee approved the study program (KBET//89B/2009). The study was conducted following the Good Clinical Practice standard and the Declaration of Helsinki.

The inclusion criterion of the study was that each subject possessed full dental arches. The exclusion criteria were prosthetic restorations, active orthodontic treatment, periodontal disease, and the lack of data.

The same specialists in prosthodontics performed a clinical evaluation in each of the subjects using the axis I RDC/TMD diagnostic system. The project participants completed a Polish version of the personal questionnaire that makes up part of the RDC/TMD diagnostic algorithm [21]. In that questionnaire (Axis I question number 1), the volunteers were asked to assess the presence and intensity of headache on the day of evaluation using a 4 point scale: 0: no headache, 1: mild headache, 2: moderate headache, 3: severe headache [22].

The diagnostic system involves using the results of the clinical trial form (Axis I) to classify patients into groups and subgroups. Group I deals with myofascial disorders, and has a subgroup for myofascial pain without limited mandibular opening (group IA), and a subgroup for myofascial pain with limited mandibular opening (group IB). Group II includes dislocation of the articular disk and has three subgroups: when the disk is unblocked (group IIA), where there is disk lock with a limited range of mandibular opening (group IIB), and where this is disk lock without a limited range of opening (group IIC). Group III relates to symptoms of the temporomandibular joint: specifically arthralgia (group IIIA), arthritis (group IIIB), and joint degeneration (group IIIC) [23].

All participants completed the PSS-10 questionnaire [12]. The scale contains ten questions on different subjective feelings connected with problems and personal events during the last month. The scale has ten issues related to feelings connected with problems and personal situations over the last month. Participants rated how often they felt a particular way over the past month on a scale from 0 to 4, where 0 means never, 1 hardly ever, 2 sometimes, 3 quite often, and 4 very often. For four items, the scoring is reversed, so that 0 means very often and 4 means never. All scores are then summed and one of the following labels is assigned: “low” perceived stress intensity 0–13 stens; “medium” perceived stress intensity: 14–19 stens; “high” perceived stress intensity 20–40 [13].

The data was analyzed as follows:

1. evaluation of PSS: ten subjects, according to the gender
2. evaluation of PSS: ten subjects, according to headache intensity (Axis I)
3. evaluation of PSS: ten subjects, according to the TMD diagnosis (Axis II)

The null hypothesis assumed a positive relationship between the level of headache and perceived stress measured by PSS-10 questionnaire.

Statistical analysis

The analysis of quantitative variables (i.e. expressed in number) was performed by calculating the mean, standard deviation, median, and quartiles. The analysis of qualitative (ie, non-numeric) variables was performed by calculating the number and percentage of occurrences of each value. The comparison of the values of quantitative variables in two groups was performed using the Mann–Whitney test. The comparison of the values of quantitative variables in three and more groups was performed using the Kruskal–Wallis test. A significance level of 0.05 was adopted in the analysis. Thus, all p values below 0.05 were interpreted as showing significant relationships.

Statistical calculations were performed using the R 4.1.1 statistical package [24].

Results

A total of 138 persons participated in the study, of whom 107 were female. In our study, 83 participants (59.4%) reported headache. TMD was recognized in 42 (30.4%) persons. Detailed values are presented in Table 1.

The correlation between males and females in the results of PSS-10 questionnaire results is presented in Figure 1. The difference in the results is statistically significant: females presented higher results.

Table 1. Distribution of the participant's diagnosis. PSS-10 1 — low, 2 — medium, 3 — high, Headache: 0 — no headache, 1 — mild headache, 2 — moderate headache, 3 — severe headache. Axis I myofascial pain without limited mandibular opening (group IA), dislocation of the articular disk, whether the disk is unblocked (group IIA), arthralgia (group IIIA).

Parametr		Count (%)
	1	35 (25.36%)
PSS-10 (score)	2	46 (33.33%)
	3	57 (41.30%)
Headache	0	56 (40.58%)
	1	15 (10.87%)
	2	56 (40.58%)
	3	11 (7.97%)
Axis I	0	96 (69.57%)
	IA	23 (16.67%)
	IIA	17 (12.32%)
	IIIA	2 (1.45%)

The comparison between PSS-10 questionnaire results and headache level shows statistically insignificant differences. However, the higher the stress level presented, the higher the level of headache results (Table 2).

In the final step of our analysis, we found that the diagnosis by RDC/TMD Axis I and PSS-10 questionnaire results were not comparable (Table 3).

Table 2. Level of point of PSS-10 according to the level of headache. p — Kruskal–Wallis test, p <0.05.

PSS-10	Headache				p
	0 (N = 56)	1 (N = 15)	2 (N = 56)	3 (N = 11)	
Medium ± SD	17.32 ± 6.65	18.27 ± 3.75	17.29 ± 5.57	19.82 ± 4.71	p = 0.438
Median	18	19	18	21	
Quartiles	12–22	16–21	13–21	17.5–22.5	

Table 3. Level of point of PSS-10 according to diagnosis by RDC/TMD — Axis I. p - Kruskal–Wallis test, p <0.05.

PSS-10 points	Axis I			p
	0 (N = 96)	IA (N = 23)	IIA lub IIIA (N = 19)	
Medium ± SD	17.65 ± 6.26	18.74 ± 4.09	16.05 ± 5.03	p = 0.38
Median	18	19	18	
Quartiles	13–22	16.5–21	11.5–20	

Discussion

Headache is often the cause of the overuse of painkillers. Migraine, tension-type, and cluster headaches are classified as primary headaches with no organicity [25]. Some researchers showed that perceived stress had been given due importance in understanding and managing pain: it appears that perceived stress can trigger tension-type headaches. Research has shown that headache sufferers perceive higher levels of subjective stress, and all participants who report higher levels of stress employ a disengagement coping style. Tension-type headaches cause pain that spreads in a band-like fashion bilaterally from the forehead to the occiput [26]. Pain often spreads to the neck muscles, and is characterized as tightness, tension, or regular ache. Treatment of tension-type headaches typically requires the use of analgesics. The use of painkillers

more than twice weekly places patients at risk for change to chronic daily headache. Painkillers combined with butalbital or opiates are often helpful for tension-type pain. Among the usually used modalities are biofeedback, relaxation training, self-hypnosis, and cognitive therapy [26]. In our group, 11 individuals (7.97%) of participants suffer severe headaches, which push them to seek help and take painkillers.

Perceived stress is important in understanding and managing pain, and can trigger tension-type headaches. Research has shown that headache sufferers perceived higher levels of subjective stress, and that all participants who reported higher levels of stress are using the disengagement coping style [27].

The literature also shows that stress is common among patients with complaints of masticatory muscle pain; these often coexist with general health problems [28]. In our study, we wished to determine whether there is any comparison between stress, and the problem of TMD according to the axis I of RDC/TMD diagnosis and headache. We found that the female group greater scores points than in the men group. The medium PSS-10 result among women was 18.24 ± 5.71; in the male group, this was significantly lower at 15.42 ± 5.71. Our comparison between PSS-10 scores and headache yielded statistically insignificant results, but the medium scores were higher in those with higher PSS-10 scores. Stocka *et al.* found that the lowest scores in the PSS-10 were noted in approximately 29% of study subjects, medium scores in nearly 40%, and the highest scores in almost 31%; although 49% complained of headache, the researchers did not compare headache with perceived stress [14].

Hirsch and Turp [8] examined 455 adolescent between 14 and 17 years. They compared TMD with depression and found that, the more pain was mentioned, the higher the depression score was. In our study group, a similar comparison was found between pain and headache diagnosis.

In the study of Nascimento *et al.* [3], the problem of violence in TMD patients was examined. Such psychological pressure had never been previously addressed in TMD patients. It was found to correlate with stress and depression as a defense reflex. Females were more exposed to different types of physical abuse than men. This correlates with our results, where females received higher results in the PSS-10 questionnaire.

Najam *et al.* [26] found a significant difference between PSS-10 scores in male and female headache patients, but the study group was very small: a total of forty participants, with twenty migraine patients (ten female and ten male) and twenty tension-type headache patients (ten female and ten male), aged 20–50. The inclusion criterion was education level, including reading ability. Our group had more participants and was homogenous in age and education level: they were all high school students. We could not confirm that perceived stress has directly influenced on the headache and development of the TMD. One limitation of our study group that the number of male and female participants were not comparable: there were only a small number of male

volunteers. We also used RDC/TMD instead of DC/TMD, since there is no Polish version of the latter. One strength of the study is the homogeneous age of the participants. The null hypothesis was not supported.

Conclusion

Females are more susceptible to perceived stress, which can affect TMD symptoms.

Acknowledgments

This study was supported by a grant from the Ministry of Education and Research for Jagiellonian University Medical College and completed within MNiSW project no. N N403 589138.

The Ethical Committee of Jagiellonian University approved the research (KBET// 89B/2009).

Conflict of interest

None declared.

References

1. *Loeser J.D., Treede R.D.*: The Kyoto protocol of IASP Basic Pain Terminology. Pain. 2008; 137: 473–477.
2. *Barjandi G., Kosek E., Hedenberg-Magnusson B., Velly A.M., Ernberg M.*: Comorbid Conditions in Temporomandibular Disorders Myalgia and Myofascial Pain Compared to Fibromyalgia. J Clin Med. 2021; 10.
3. *Nascimento M., Dahllof G., Cunha Soares F., Mayer T., Kvist T., Colares V.*: Self-reported symptoms of temporomandibular pain and jaw dysfunction in adolescents are associated with exposure to violence. J Oral Rehabil. 2021; 48: 765–773.
4. *Slade G.D., Ohrbach R., Greenspan J.D., et al.*: Painful Temporomandibular Disorder: Decade of Discovery from OPPERA Studies. J Dent Res. 2016; 95: 1084–1092.
5. *Speciali J.G., Dach F.*: Temporomandibular dysfunction and headache disorder. Headache. 2015; 55 Suppl 1: 72–83.
6. *Srivastava K.C., Shrivastava D., Khan Z.A., et al.*: Evaluation of temporomandibular disorders among dental students of Saudi Arabia using Diagnostic Criteria for Temporomandibular Disorders (DC/TMD): a cross-sectional study. BMC Oral Health. 2021; 21: 211.
7. *Von Korff M., Dworkin S.F., Le Resche L., Kruger A.*: An epidemiologic comparison of pain complaints. Pain. 1988; 32: 173–183.
8. *Hirsch C., Turp J.C.*: Temporomandibular pain and depression in adolescents—a case-control study. Clin Oral Investig. 2010; 14: 145–151.
9. *Reissmann D.R., John M.T., Aigner A., Schon G., Sierwald I., Schiffman E.L.*: Interaction Between Awake and Sleep Bruxism Is Associated with Increased Presence of Painful Temporomandibular Disorder. J Oral Facial Pain Headache. 2017; 31: 299–305.
10. *Ekici O.*: Association of stress, anxiety, and depression levels with sleep quality in patients with temporomandibular disorders. Cranio. 2020: 1–9.

11. *Winocur E., Gavish A., Finkelshtein T., Halachmi M., Gazit E.*: Oral habits among adolescent girls and their association with symptoms of temporomandibular disorders. J Oral Rehabil. 2001; 28: 624–629.
12. *Cohen S., Kamarck T., Mermelstein R.*: A global measure of perceived stress. J Health Soc Behav. 1983; 24: 385–396.
13. *Zieliński G., Ginszt M., Zawadka M., et al.*: The Relationship between Stress and Masticatory Muscle Activity in Female Students. J Clin Med. 2021; 10.
14. *Stocka A., Kuć J., Sierpińska T., Gołębiewska M., Wieczorek A.*: The Influence of Emotional State on the Masticatory Muscles Function in the Group of Young Healthy Adults. Biomed Res Int. 2015.
15. *Costa Y.M., Porporatti A.L., Stuginski-Barbosa J., Bonjardim L.R., Speciali J.G., Rodrigues Conti P.C.*: Headache Attributed to Masticatory Myofascial Pain: Clinical Features and Management Outcomes. J Oral Facial Pain Headache. 2015; 29: 323–330.
16. *Ferreira Kdos S., Speciali J.G.*: Epidemiology of chronic pain in the office of a pain specialist neurologist. Arq Neuropsiquiatr. 2015; 73: 582–585.
17. *Goncalves D.A., Speciali J.G., Jales L.C., Camparis C.M., Bigal M.E.*: Temporomandibular symptoms, migraine, and chronic daily headaches in the population. Neurology. 2009; 73: 645–646.
18. *Wieckiewicz M., Grychowska N., Nahajowski M., et al.*: Prevalence and Overlaps of Headaches and Pain-Related Temporomandibular Disorders Among the Polish Urban Population. J Oral Facial Pain Headache. 2020; 34: 31–39.
19. *Loster J.E., Osiewicz M.A., Groch M., Ryniewicz W., Wieczorek A.*: The Prevalence of TMD in Polish Young Adults. J Prosthodont. 2017; 26: 284–288.
20. *Wieczorek A., Loster J., Loster B.W.*: Relationship between occlusal force distribution and the activity of masseter and anterior temporalis muscles in asymptomatic young adults. Biomed Res Int. 2013; 2013: 354017.
21. *Osiewicz M.A., Lobbezoo F., Loster B.W., Wilkosz M., Naeije M., Ohrbach R.*: Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) — The Polish version of a dual-axis system for the diagnosis of TMD. RDC/TMD Form. J Stoma. 2013; 66: 576–649.
22. *Wozniak E., Loster J.E., Wieczorek A.*: Relation between Headache and Mastication Muscle Tone in Adolescents. Pain Res Manag. 2018; 2018: 7381973.
23. *Dworkin S.F., LeResche L.*: Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992; 6: 301–355.
24. *R Core Team*: A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna, Austria, 2019.
25. *Millea P.J., Brodie J.J.*: Tension-type headache. Am Fam Physician. 2002; 66: 797–804.
26. *Najam N., Aslam S.*: Perceived Stress and Coping Strategies in Headache (Migraine & Tension-Type Headache) Patients. Journal of Behavioural Sciences. 2010; 20: 1–15.
27. *Myers T.C., Wittrock D.A., Foreman G.W.*: Appraisal of subjective stress in individuals with tension-type headache: the influence of baseline measures. J Behav Med. 1998; 21: 469–484.
28. *Maslak-Beres M., Loster J.E., Wieczorek A., Loster B.W.*: Evaluation of the psychoemotional status of young adults with symptoms of temporomandibular disorders. Brain Behav. 2019; 9: e01443.