

GENDER DIFFERENCES IN DIAGNOSTIC AND OCCLUSAL VARIABLES AND TMJ DYSFUNCTIONS

ПОЛОВИ РАЗЛИКИ ВО ДИЈАГНОСТИЧКИТЕ И ОКЛУЗАЛНИТЕ ВАРИЈАБЛИ И ДИСФУНКЦИЈИТЕ НА ТМЗ

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Abstract

Aim: The aim of this study is to investigate whether there are gender differences in diagnostic and occlusal variables and TMJ dysfunctions. It is important to note that these gender differences are based on general trends and may not be applicable to every individual. **Material and methods:** Twenty-six individuals (12 males; 14 females; mean age 28 years) with healthy jaw function were recruited from the UBT University Dental Clinic in Prishtina, Kosovo, for this study. The participants had an underbite of less than 3 mm, no history of extractions other than premolars, and exhibited some signs of TMJ discomfort and/or mild pain. Anamnestic data and inspection were used to collect data for the diagnostic variables. **Results:** Gender differences were observed in variables such as jaw protrusion or lateral movement, chewing gum, and resting the chin in the hands. Female participants experienced pronounced difficulties with open locking in the jaw, whereas males did not exhibit this issue. Furthermore, a significant percentage of females (over 66%) experienced closed locking of the jaw, while only 8.3% of the male participants encountered this problem. The variable of sleeping on the stomach displayed negative correlations with yawning and oral habits. **Conclusion:** The findings of this study highlight gender differences in specific diagnostic variables related to jaw position and habits. Women demonstrated a higher inclination towards chewing gum, holding their jaws forward or to the side, and resting their chin on their hands compared to men. This study provides insights into gender differences in jaw-related behaviors and occlusal variables. **Key words:** Occlusal variables, TMJ dysfunctions, chewing gum, oral habits, open locking of the jaw, closed locking of the jaw.

Апстракт

Цел: Целта на оваа студија е да открие дали постојат разлики помеѓу половите во дијагностичките и оклузалните варијабли и дисфункции на ТМЗ. Важно е да се забележи дека овие разлики се врз основа на општи трендови и не се однесуваат на секој поединец. **Материјал и метод:** Во оваа студија учествуваа дваесет и шест испитаници (12 мажи; 14 жени; со средна возраст 28 години), со здрава функција на вилицата. Испитувањето беше извршено на Универзитетската стоматолошка клиника на УБТ во Приштина, Косово. Учесниците имаа преклоп помалку од 3 мм, немаа историја на екстракции освен премолари, и сите од нив имаа некои знаци на непријатност и/или блага болка во ТМЗ. **Резултати:** Разликите меѓу половите беа откриени со варијаблите при држење на вилицата напред или настрана, при цвакање на гуми за цвакање и потпирање на брадата со рацете. Варијаблите при отворање и затворање на вилицата покажале дека испитаниците од женски пол имале изразен проблем со закочување на вилицата при отворање, за разлика од мажите кои немале таков проблем. Над 66% од испитаниците од женски пол имале закочување на вилицата при затворање, додека само 8,3% од машките испитаници го имале овој проблем. Варијаблата при спиење на стомак има негативна корелација со просевањето и оралните навики. **Заклучок:** Резултатите покажаа разлики помеѓу половите во одредени дијагностички варијабли поврзани со положбата и навиките на вилицата. Испитаниците од женски пол имаа поголема тенденција да цвакаат гуми за цвакање, да ги држат вилиците напред или настрана и да ја потпираат брадата со рацете, во споредба со мажите. Оваа студија ги открива разликите помеѓу половите кои се поврзани со однесувањето на вилицата и оклузалните варијабли. **Клучни зборови:** оклузални варијабли, дисфункции на ТМЈ, гуми за цвакање, орални навики, закочување на вилицата при отворање, закочување на вилицата при затворање.

Introduction

Problem statement

Temporomandibular joint (TMJ) dysfunction is a prevalent condition that affects millions of individuals world wide, resulting in pain and dysfunctional impairment in the jaw and surrounding structures. Various factors have been linked to the development of TMJ dys-

function, including gender differences and occlusal variables. This research aims to investigate the relationship between gender differences, diagnostic and occlusal variables, and TMJ dysfunction.

The existing evidence regarding the relationship between dental occlusion and TMJ dysfunction is inconclusive. While there is limited evidence supporting a strong association between these factors, occlusal factors may contribute to TMJ dysfunction in specific individu-

als. Occlusal splints can serve as both a diagnostic tool and a treatment option for certain patients with TMJ dysfunction. However, further research is necessary to fully comprehend the interplay between gender differences, diagnostic and occlusal variables and TMJ dysfunction.

A substantial body of literature addresses the relationship between dental occlusion and temporomandibular joint (TMJ) dysfunction. Dental occlusion pertains to the alignment of the teeth when the jaws are closed. TMJ dysfunction encompasses a range of conditions that affect the temporomandibular joint, which connects the jawbone to the skull.

Several studies suggest that inadequate dental occlusion can contribute to the development of TMJ dysfunction. For instance, improper teeth alignment can cause muscle tension and jaw imbalance, leading to symptoms such as TMJ pain, clicking or popping sounds, limited jaw movement, and other related manifestations.

However, other studies have failed to establish a significant correlation between dental occlusion and TMJ dysfunction. Some researchers argue that additional factors, such as stress, trauma, or genetic predisposition, may contribute to the development of TMJ dysfunction.

In conclusion, the relationship between dental occlusion and TMJ dysfunction remains a subject of debate among dental professionals and researchers. If you experience TMJ symptoms, it is important to consult a qualified dental professional to determine the underlying cause and develop an appropriate treatment plan.

Research suggests gender differences may contribute to variations in dental occlusion problems. For instance, studies have indicated that males have a higher likelihood of developing severe malocclusions, which involve misalignment of teeth and/or jaws, compared to females. Furthermore, females tend to experience more dental crowding and overbite problems in comparison to males.

However, it is important to acknowledge that individual factors, such as genetics, lifestyle, and habits, can also exert a significant influence on the development of occlusion problems. Therefore, further research is necessary to ascertain the precise causes and identify appropriate treatment options for dental occlusion problems.

Research Objectives and hypothesis

The objective of this study is to investigate whether there are gender differences in diagnostic and occlusal variables and TMJ dysfunctions. Dental occlusion problems can affect individuals of any gender, but there may be variations in the prevalence and types of occlusion problems between males and females.

For instance, studies have shown that females are more prone to Class II malocclusions, characterized by

upper teeth protruding over the lower teeth, where as males have a higher likelihood of Class III malocclusions, where the lower teeth protrude over the upper teeth. Additionally, females tend to have smaller jaws and dental arches compared to males, which can contribute to a higher risk of tooth crowding and misalignment.

It's important to note that these gender differences are based on general trends and may not be applicable to every individual. Conducting research on occlusion is essential to determine the specific causes of dental occlusion problems.

Hypothesis

We have developed two research hypotheses:

- H1 - There are differences between genders in both diagnostic and occlusal variables.
- H2 - Females have higher rates of occlusion problems.

Limitations of the study

One potential limitation of the research on gender differences in TMD is the lack of consistency in diagnostic criteria and outcome measures. Different studies may employ different diagnostic criteria or outcome measures, leading to difficulties in comparing results across studies. In addition, numerous studies have depended on self-report measures of pain and disability, which could be susceptible to bias and may not accurately reflect the severity of TMD.

Literature Review

Gender Differences in TMJ Dysfunction

Gender differences in diagnostic and occlusal variables and TMJ dysfunctions have been extensively researched. The temporomandibular joint, responsible for the lower jaw movement, is a complex structure surrounded by muscles, ligaments, and tendons. Dysfunction in the temporomandibular joint can lead to various symptoms such as pain, clicking, popping, and difficulties in chewing, speaking, and breathing (NIDCR, 2018).

Multiple studies suggest a higher prevalence of TMJ dysfunction in females compared to males. Manfredini et al.¹, discovered that women were 1.5 times more likely to develop TMJ dysfunction than men. Similarly, Fillingim et al.² found a higher prevalence of TMJ dysfunction in females. Okeson³ reported that TMD is more common in women, supported by studies, such as Kalamir et al.⁴, who observed that women had higher

levels of pain and disability related to TMD than men. Similarly, Wu et al.⁵ identified that female college students in China had a higher prevalence of bruxism, TMJ pain, and headaches compared to male students.

One potential explanation for the gender differences in TMD is related to occlusion variables. Occlusion refers to the alignment of teeth when the jaws are closed. Improper occlusion can stress the TMJ and surrounding structures, leading to dysfunction. Several studies have investigated the relationship between occlusion and TMD, with some suggesting that there is a correlation^{6,7}. However, other studies have failed to find a significant relationship^{8,9}.

One aspect of occlusion that has been studied in relation to TMD is the vertical dimension, which refers to the distance between the upper and lower teeth when the jaws are closed. Marpaung et al.⁸ conducted a systematic review of the literature and found that a decreased vertical dimension was associated with an increased risk of TMD. However, the authors noted the need for further research to confirm this relationship due to low-quality evidence.

Another potential contributing factor to the gender differences in TMD is the presence of malocclusion, which refers to any deviation from normal occlusion, such as crooked or crowded teeth. Machado et al.¹⁰ discovered that malocclusion was associated with an increased risk of TMD. However, the authors noted that the relationship between malocclusion and TMD is complex, requiring further research for a comprehensive understanding.

In addition to occlusion variables, other factors may also contribute to gender differences in TMD. For instance, psychosocial factors have been shown to play a role in the onset and progression of TMD. (11) Kalamir et al.⁴ found that women were more likely than men to report psychological distress and disability associated with TMD. This finding suggests that psychosocial factors may be a contributing factor to the gender differences observed in TMD.

Studies have suggested that women may have a higher likelihood of experiencing anxiety and depression, which could contribute to the development of TMJ dysfunction⁹. Furthermore, there is evidence to suggest that hormones may influence gender differences in TMD. Hormonal fluctuations during the menstrual cycle have been associated with an increased risk of TMD in women¹².

The menstrual cycle has been shown to influence pain perception and sensitivity, potentially influencing the development of TMJ dysfunction. Dao et al.¹³ found that women with TMJ dysfunction experienced more pain during their menstrual cycle compared to women without TMJ dysfunction. In addition, estrogen has been found to have a protective effect on the TMJ, and a

decrease in estrogen levels may lead to an increased risk of TMD¹⁴.

Diagnostic Variables and TMJ Dysfunction

Various diagnostic variables have been associated with the development of TMJ dysfunction. One notable variable is malocclusion, which refers to misalignment of the teeth and jaws. Malocclusion has been identified as a risk factor for TMJ dysfunction due to its potential to create an uneven distribution of forces on the TMJ, leading to inflammation and pain¹⁵.

Another diagnostic variable linked to TMJ dysfunction is bruxism, characterized by the grinding or clenching of teeth during sleep. Bruxism has been shown to be associated with TMJ dysfunction as it can lead to excessive force on the TMJ, resulting in pain and inflammation¹¹.

Additional diagnostic variables associated with TMJ dysfunction include jaw trauma, arthritis, and stress. Jaw trauma can cause damage to the TMJ, leading to inflammation and pain. Arthritis can also contribute to TMJ dysfunction by causing inflammation and damage to the joint. Stress has been shown to increase muscle tension, which can lead to TMJ dysfunction¹⁶.

Several studies have investigated gender differences in the diagnosis of TMD. For instance, Yap et al.¹⁷ found that women were more likely than men to be diagnosed with TMD. The authors noted that this discrepancy may be related to differences in pain perception and reporting between men and women. Similarly, La Touche, R et al.¹⁸ found that women with TMD were more likely to report pain in multiple locations than men with TMD.

Occlusal Variables and TMJ Dysfunction

Occlusal variables, specifically the relationship between the upper and lower teeth, have also been associated with the development of TMJ dysfunction. Several studies have suggested that malocclusion can contribute to the development of TMJ dysfunction by causing an uneven distribution of forces on the TMJ¹⁵.

One specific occlusion variable that has been linked to TMJ dysfunction is the vertical dimension of occlusion (VDO). The VDO refers to the distance between the upper and lower teeth when the jaws are in a relaxed position. Several studies have suggested that a decreased VDO may be associated with the development of TMJ dysfunction as it can result in increased muscle tension in the jaw and surrounding structures¹⁹.

Other occlusion variables that have been associated with TMJ dysfunction include occlusal interferences, tooth wear, and tooth loss. Occlusal interferences refer to

areas where the teeth do not meet properly, causing uneven pressure on the TMJ. Tooth wear can also contribute to TMJ dysfunction by altering the way the teeth come together, leading to an uneven distribution of forces on the TMJ. Tooth loss has also been linked to TMJ dysfunction as it can lead to changes in the way the remaining teeth come together, creating an imbalance in the force distribution on the TMJ Machado et al.¹⁰

Treatment of TMJ Dysfunction

The treatment of TMJ dysfunction typically involves a multidisciplinary approach that addresses the underlying cause of the disorder. Conservative treatment options may include lifestyle modifications, such as stress management techniques, and physical therapy. Medications, such as nonsteroidal anti-inflammatory drugs (NSAIDs), may also be prescribed to manage pain and inflammation associated with TMJ dysfunction²⁰.

In more severe cases of TMJ dysfunction, surgical intervention may be required to correct the underlying cause of TMJ dysfunction. Surgical options may include arthroscopy, which involves the insertion of a small camera into the joint to visualize the area and perform necessary repairs, or open-joint surgery, which involves making an incision to access the joint and make any required repairs²¹.

Methodology and data collection

Study Population/Sampling

Twenty-six individuals (12 males; 14 females; mean age of 28 years) with healthy jaw function participated in the study at the UBT University Dental Clinic in Prishtina, Kosovo. The participants had an under bite of less than 3 mm, no history of extractions other than premolars, and all of them had some signs of TMJ discomfort and/or mild pain. Anamnestic data and inspection

were used to collect data for the diagnostic variables: holding the jaw forward or to the side, chewing gum, resting the chin in the hands, sleeping on the stomach, tightness of the muscles without clenching, chewing food on one side.

The study was conducted in accordance with the Helsinki Declaration and good clinical practice and each participant signed an informed consent document.

Data Collection Methods/Instruments

The data involved the use of the statistical software SPSS for Windows Version 26. Non-parametric statistical methods were employed to analyze the ordinal and categorical data. The Mann-Whitney test was utilized to examine the differences between genders. Correlations between variables that are indicators of diagnostic criteria and those that are indicators of occlusion were analyzed through Spearman's correlation. The validation of associations between occlusion variables based on gender was assessed using the Chi-square test. A p-value of less than 0.05 is considered statistically significant, for the Mann-Whitney test and the chi-square test, while for Spearman's correlation, only a value of $p < 0.01$ is considered statistically significant

Data Analysis

Gender Differences in Diagnostic Variables

Table 1 presents the differences between genders through the Mann-Whitney test for diagnostic variables. Differences between the males and females were found only in the variables holding the jaw forward or to the side ($U=44.5$, $sig=.032$), chewing gum ($U=42$, $sig=.039$), and resting the chin in the hands ($U=37$, $sig=.019$). These results demonstrate that women have a higher inclination to chew gum, hold their jaws forward or to the side, and exhibit a habit of resting their chin on their hands more frequently than men.

Table 1. Mann-Whitney Test Results for Gender Differences in Diagnostic Variables

	Gender	U	Mean Rank	Sum of Ranks	U	Sig.
Holding the jaw forward or to the side ²⁰	Female	10	17.05	170.50	44.5	.032
	Male	16	11.28	180.50		
Chewing gum	Female	10	17.30	173.00	42	.039
	Male	16	11.13	178.00		
Resting the chin in the hands	Female	10	17.80	178.00	37	.019
	Male	16	10.81	173.00		

Table 2. Chi-square Test Results for Gender Differences in Occlusion Variables

		F n (%)	M n (%)	P value
Open Locking of the jaw	PO	4 (44.4)	0(0.0)	X ² =6.11
	JO	5(55.6)	11(100)	sig=.013
Closed Locking of the jaw	PO	6(66.7)	1(8.3)	X ² =7.87
	JO	3(33.3)	11(91.7)	sig=.005

Table 3. Correlation of diagnostic variables with occlusion

	Yawning	Oral Habits	Chewing	Other habits	Closed locking of the jaw
Sleeping on the stomach	-.523*	-.587*			
Tighten of the muscles without clenching			.609**		
Resting of the chin on the hands					-.592**
Chewing food on one side				-.767**	

* Correlation is significant at p<0.05,

** Correlation is significant at p<0.01

Correlation coefficients of diagnostic variables with occlusion

Table 3 displays the correlation coefficients between select diagnostic variables and occlusion variables. Only significant correlations (p<0.05) are presented in the table. The variable “Sleeping on stomach” demonstrates negative correlations with yawning (r=-.523) and oral habits (r=-.587). The variable “Tightening of the muscles without clenching” shows a correlation with chewing (r=.609). The variable “Resting of the chin on the hand variable exhibits a negative correlation with closed locking of the jaw (r=-.592). Furthermore, the variable “Chewing food on one side only” displays a negative correlation with other activities of the jaw, such as talking, opening the mouth, or kissing.

Discussion, conclusion, and recommendation

The results revealed gender differences in certain diagnostic variables related to jaw position and habits. Specifically, women showed a higher tendency to chew gum, hold their jaws forward or to the side, and rest their chin on their hands in comparison to men. These find-

ings suggest the existence of gender-specific behaviors or preferences related to these activities.

Furthermore, the chi-square test indicated significant differences between genders in occlusion variables, specifically open locking, and closed locking of the jaw. Female respondents exhibited a higher prevalence of open locking of the jaw, while closed locking of the jaw was more prevalent among female respondents as well. On the other hand, male respondents had a lower incidence of both open and closed locking of the jaw. These outcomes indicate that gender may have an influence on the occurrence of specific jaw-related problems.

The correlation analysis demonstrated significant associations between diagnostic variables and occlusion. Specifically, sleeping on the stomach was negatively correlated with yawning and oral habits, suggesting that individuals who adopt this sleeping position may experience less frequent yawning and engage in fewer oral habits. The variable indicating the tightening of muscles without clenching exhibited a positive correlation with chewing, indicating that individuals who tighten their muscles without clenching may also exhibit a tendency to chew more frequently. Additionally, resting the chin on the hand was negatively correlated with closed locking of the jaw, implying that individuals who frequently rest their chin on

their hand may have a lower likelihood of experiencing closed jaw locking. Finally, the variable representing chewing food on one side only showed a negative correlation with other jaw activities, such as talking, opening the mouth, or kissing, suggesting a possible connection between chewing preferences and overall jaw movement.

The results of this study highlight gender differences in specific diagnostic variables and occlusion among respondents. Women exhibited a higher tendency to chew gum, position their jaws forward or to the side, and rest their chin on their hands compared to men. Moreover, female respondents were more prone to open and closed locking of the jaw. These findings suggest that gender may influence jaw-related behaviors and problems.

Furthermore, the correlation analysis revealed connections between certain diagnostic variables and occlusion. Sleeping on the stomach was associated with reduced yawning and oral habits, while the tightening of muscles without clenching was linked to increased chewing. Resting the chin on the hand was negatively correlated with closed locking of the jaw, and chewing food on one side only showed a negative association with other jaw activities. These findings provide insights into the potential relationships between different behaviors and jaw-related issues.

Based on the findings of this study, several recommendations can be proposed. Firstly, healthcare professionals should take into account gender differences when evaluating and treating patients with jaw-related conditions. Understanding the specific behaviors and habits more prevalent in women, such as chewing gum or resting the chin on their hands, can assist in developing customized treatment approaches.

Secondly, individuals who frequently experience open or closed locking of the jaw, particularly females, may benefit from targeted interventions aimed at managing and preventing these issues. This could involve exercises to improve jaw mobility, stress management techniques, or the use of oral appliances, depending on the underlying causes.

Additionally, the associations between certain behaviors and occlusion variables should be considered. For instance, individuals who tend to chew on only one side may benefit from guidance on proper chewing techniques to minimize the risk of developing imbalances or jaw discomfort.

Further research is needed to explore the underlying factors contributing to the observed gender differences and associations between diagnostic variables and occlusion. Longitudinal studies could provide valuable insights into the development and progression of jaw-related conditions, aiding in their refinement of diagnostic criteria and treatment strategies.

Overall, this study sheds light on gender differences in jaw-related behaviors and occlusion variables, emphasizing the significance of considering these factors in clinical practice and further research endeavors.

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