

Incidence of abnormalities in temporomandibular joints in a population of 1,100 urban and rural patients lacking teeth and other parafunctions in 2003-2008. An international problem

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Abstract

Introduction and objective. A hectic lifestyle and everyday stress are direct causes of parafunctions. The objective of the presented study was to examine the relation of sleep disorders, distant pain symptoms, symptoms of pathological tooth wear in rural and urban patients with parafunctions.

Materials and methods. The patient group consisted of 836 women and 274 men aged 9-82, and divided into groups taking into account the following criteria: number of patients in certain age groups, number of women and men, place of residence, presence of missing teeth problem, presence of occlusal and non-occlusal parafunctions, symptoms of tooth wear, distant pain symptoms, and sleep disorders.

Results. 354 (31.89%) of the patients came from the rural environment. Distant pain symptoms were more frequent in patients performing parafunctions than in those who did not perform parafunctions ($n = 1110$, $RR = 1.10$, $CI = \text{from } 1.04 \text{ to } 1.16$). Sleep disorders were more frequent in patients performing parafunctions than in those who do not perform parafunctions ($n = 1110$, $RR = 1.06$, $CI = \text{from } 1.00 \text{ to } 1.12$). Symptoms of pathological tooth wear were more frequent in patients performing parafunctions than in those who did not perform parafunctions ($n = 1110$, $RR = 1.08$, $CI = \text{from } 1.02 \text{ to } 1.13$).

Conclusions. It is extremely important (as it is international problem) to introduce prophylactic care to prevent the occurrence of parafunctional activity in patients from the rural environment. Parafunctions, therefore, should be taken into account in the diagnosing procedure of such disorders and pathological symptoms as pathological tooth wear, sleep disorders, cervicgia, neck myalgia, shoulder girdle myalgia, and dorsalgia.

Key words

bruxism, parafunctions, dysfunction of masticatory system, painful symptoms

INTRODUCTION

Health is essential for the effective and efficient activity of every man. A hectic lifestyle and stress are direct causes of parafunctions, such as unconscious, harmful and often repetitive movements that differ in quality and quantity from physiological movements. A number of kinds of parafunctions can be found in the available literature. Accounting for the type of tissue and foreign body type, the following kinds of parafunctions may be specified: DD (dens – dens), DC (dens – corpus alienum), DM (dens – mucosa). Therefore, occlusal and non-occlusal parafunctions may be specified according to different classifications. Occlusal parafunctions are habits that involve opposing teeth contact, such as gnashing of teeth or/and habitual clenching of teeth. Non-occlusal parafunctions are habits that do not involve opposing teeth contact, e.g. tongue, lips, and/or mucus membrane biting, biting on objects, nail biting [1, 2, 3, 4, 5, 6].

Functional disorders of the masticatory system are the third most frequent disorders of the stomatognathic system

(except for caries and periodontal diseases). The etiology of these disorders is multi-layered and dependent on the disturbed adaptability mechanisms of individual elements of the masticatory system (temporomandibular joint, teeth, muscles of mastication, and periodontitis [7, 8].

The performance of occlusal and non-occlusal parafunctions is connected with abnormal mandibular movement patterns; consequently, intra-articular dysfunctions in the temporomandibular joints, painful and painless symptoms may occur. The main painless symptoms are: mandibular movement aberrations, periodontal changes, tooth wear, and the occurrence of acoustic symptoms, such as clicks and crackles. Painful symptoms are divided into distant and local. The first group consists of pain in pressured areas of the temporomandibular joint, and masticatory muscle pain. The second group involves distant pain symptoms that manifest themselves as neck myalgia, shoulder girdle myalgia, pain located in the cervical, thoracic, and lumbosacral region of the spine [9, 10, 11].

With increasing age, the face height measured between the points *nasion* and *gnathion* tends to decrease in the lower section. The main cause of the change, *inter alia*, is loss of teeth in support areas responsible for maintaining the bite

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height. The areas of support are the parts of the dental arch in which occlusal contact between opposing teeth during central occlusion occurs. In full dentition, the 4 support areas can be enumerated within the molars and pre-molars. Reduction of the height of the face in the lower section can also be caused by teeth wear, teeth movement or leaning of the teeth. This adversely affects the functioning of the entire stomatognathic system. After empty spaces in support areas appear, the lower and upper jaw come closer. This leads to adverse shift of the head of the jaw and causes uncoordination of muscle work. Both changes result in a decrease of face height, and parafunctions affect the functioning of the temporomandibular joints [12, 13].

There is a dependence between some pain symptoms of the temporomandibular joint and sleep disorders in some patients, therefore the analysis of night rest is essential for the diagnosis. Patients with sleep disorders should also be examined to account for disturbances of the masticatory system, especially in those suffering from pain and muscle tension just after awakening [14, 15]).

OBJECTIVE

The aim of this study was to examine the relation of sleep disorders, distant pain symptoms, symptoms of pathological tooth wear in rural and urban patients with parafunctions, and to define the differences and dependencies between the resulting factors.

MATERIAL AND METHODS

The patient group consisted of 836 women and 274 men aged 9-82 treated in the Functional Disorders Laboratory at the Medical University of Lublin in 2003-2008. Patients were divided into groups, taking into account the following criteria: age (Tab. 1), place of residence (Tab. 2), average number of missing teeth (Tab. 3), gender (Tab. 4), existence of occlusal and non-occlusal parafunctions (Tab. 5), existence of pathological tooth wear (Tab. 6), occurrence of distant pain symptoms (Tab. 7), and the occurrence of sleep disorders (Tab. 8). The relation between the above criteria was examined.

Statistical analysis results carried out by the Student's T-test, RR and IC to evaluate the significance of differences between average values. A relative risk of 1 = no difference in risk between the 2 groups. An RR of < 1 = the event is less likely to occur in the experimental group than in the control group. An RR of > 1 = the event is more likely to occur. IC gives the high and low boundaries for an asymmetric confidence interval around the relative risk.

Approval to undertake the study was granted by the local Ethics Committee.

Table 1. Age of patients divided into 4 groups: under 18, 18-30, 30-60 and over 60 (n = 1,089. 21 patients did not state their age)

Age of the patients							
Age under 18 (x < 18)		Age 18-30 (18 ≤ x < 30)		Age 30-60 (30 ≤ x < 60)		Age 60 and over (60 ≤ x)	
Women	Men	Women	Men	Women	Men	Women	Men
132	56	370	119	288	88	28	8
15.79%	20.44%	44.26%	43.43%	34.45%	32.12%	3.35%	2.92%

Table 2. Number of patients with missing teeth (n = 1110)

Patients with missing teeth	
Women 371 44.38% (% of all women)	Men 99 36.13% (% of all men)

Table 3. Place of residence of patients (n = 1110; 15 patients did not state their place of residence)

Place of residence of patients	
Urban dwellers 741 66.76%	Rural dwellers 354 31.89%

Table 4. Gender of patients (n = 1,110)

Gender of patients	
Women 836 75,32%	Men 274 24,68 %

Table 5. Number of patients performing parafunctions involving teeth contact/not involving tooth contact (n = 1,110)

Type of parafunction	
Involving tooth contact 760 68.47% (% of all patients)	Not involving tooth contact 678 61.08% (% of all patients)

Table 6. Patients with pathological tooth wear (n = 1,110)

Patients with pathological tooth wear symptoms	
Present 487 43.87%	Absent 623 56.13%

Table 7. Patients with distant pain symptoms (n = 1,110)

Patients with distant pain symptoms	
With distant pain symptoms 539 48,56%	Without distant pain symptoms 571 51,44%

Table 8. Patients with sleep disorders (n = 1,110)

Patients with sleep disorders	
Present 687 61.89%	Absent 423 38.11%

RESULTS

The average age of the patients was 29 years, with women constituting the majority of examined patients (75.32%). Average age of women – 29.78 years, men – 28.54 years. The biggest group among men and women comprised patients aged 18-30 years (44.26% and 43.43% of women and men, respectively).

354 (31.89%) of the patients came from the rural environment. Women constituted the majority of the examined patients (74.01%). The average age of the rural patients was 32.61 years. The biggest group among the women comprised patients aged 18-30 (41.60%); among the men, the largest group comprised patients aged 30-60 years (39.13%).

Among the group of 1,100 patients, 470 (42,34%) suffered from missing teeth. The missing teeth ratio in women was 44.38%; in men – 36.13%. 146 (41.24%) rural patients suffered

from missing teeth (40.45%, 43.47% of men and women, respectively).

The average missing teeth ratio was 3.53 (5.44 in women, 4.73 in men). The highest average number of missing teeth (12.94) was noted in the group aged 60 and over. The average ratio of missing teeth among the rural patients was 3.43 (3.61 in men, 3.03 in women). The highest average missing teeth ratio (10.50) was noted in the group aged 60 and over.

83.24% of the patients performed occlusal and/or non-occlusal parafunctions. 68.47% of all patients performed occlusal, whereas 61.08% non-occlusal parafunctions. Rural patients performing occlusal and/or non-occlusal parafunctions constituted 81.92% of the examined group. Among all patients, 67.80% performed occlusal and 58.47% non-occlusal parafunctions.

The percentage of patients with pathological tooth wear was 43.87%, whereas 48.56% of the patients suffered from distant pain symptoms, and as much as 61.89% of the patients suffered from sleep disorders. In the examined group of rural patients 46.33% manifested pathological tooth wear, 52.26% distant pain symptoms, and 55.65% with sleep disorders.

Distant pain symptoms occurred on average more often in patients with parafunctions than those without – 50.97% and 37.10%, respectively (n=1,110, RR=1.10, CI=1.04-1.16). In the group performing parafunctions, 43.75% showed distant pain symptoms, whereas in the group of people who do not perform parafunctions these symptoms were noted in 54.14% (n=354, RR=1.08, CI=0.98-1.19). Distant pain symptoms were more likely to occur in patients performing parafunctions than in those not performing parafunctions (Fig. 1).

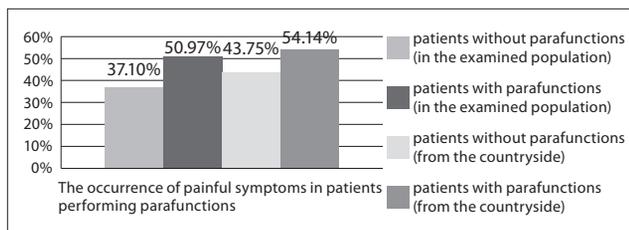


Figure 1. Occurrence of painful symptoms in patients performing parafunctions

In the examined group, 55.38% of patients not performing parafunctions, and 63.20% of patients performing parafunctions suffered from sleep disorders, respectively (n=1,110, RR=1.06, CI=1.00-1.12). Within the group of rural patients not performing parafunctions and performing parafunctions, 50.00% and 56.90%, respectively, suffered from sleep disorders (n=354, RR=1.05, CI=0.95-1.16). Sleep disorders were more likely to occur in patients performing parafunctions than in those who did not do so (Fig. 2.).

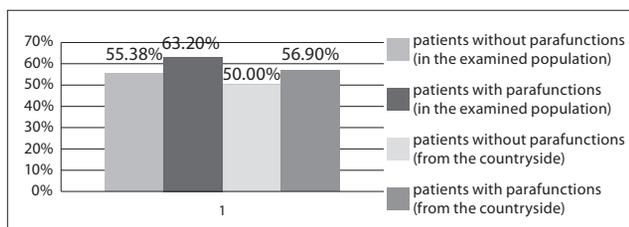


Figure 2. Occurrence of sleep disorders in patients performing parafunctions

In the examined group, 34.95% of patients who do not perform and 45.67% of patients performing parafunctions

manifested pathological tooth wear symptoms (n=1,110, RR=1.06, CI=1.00-1.12). Within the group of rural patients who did not perform parafunctions and who did perform parafunctions, 43.75% and 47.24%, respectively, manifested symptoms of pathological tooth wear (n=354, RR=1.03, CI=0.93-1.13). The symptoms of pathological tooth wear were more likely to occur in patients performing parafunctions than those who did not do so (Fig. 3).

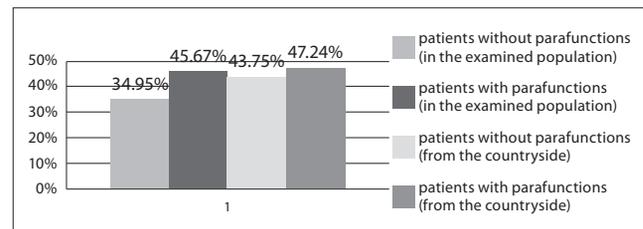


Figure 3. Occurrence of pathological tooth wear symptoms in patients performing parafunctions

DISCUSSION

The results of the presented study show that the parafunctions performed by patients help to minimize tension *ad hoc*, but simultaneously cause painful symptoms and irreversible changes in the temporomandibular joint. Patients are unaware of the parafunctions and their consequences and it is therefore extremely important to introduce prophylactic care and adequate education in this matter. This will help both urban and rural inhabitants who constitute over 30% of the examined patients (Tab. 2) to avoid civilization diseases and the symptoms of unknown etiology, such as: filling of eyes with tears, headaches, overall fatigue, pathological tooth wear, sleep disorders, cervicalgia, neck myalgia, shoulder girdle myalgia, and pain located in the cervical, thoracic, and lumbosacral regions of the spine. The efficient and effective development depends mainly on good health and overall wellness. Chronic pain, such as that caused by dysfunctions of the temporomandibular joint, regardless of the development of treatment methods, may significantly disturb everyday functioning. One of the most important duties of tertiary care services, besides basic treatment, is to minimize painful symptoms of a disease. Caring for the comfort of everyday life without pain, nowadays is a new challenge for medicine.

Preventive treatment, diagnosis and treatment of temporomandibular joint dysfunctions becomes essential while the average rate of patients suffering from pain dysfunction syndrome of masticatory system continues to grow. The phenomena is associated with stress experienced by patients, which is considered to be the main cause of parafunctions. Therefore, it seems extremely important to draw attention to this issue, the frequency of which is increasing steadily as a result of stress in daily life that leads to parafunctions of the temporomandibular joints. It is assumed that due to the frequency of the occurrence, parafunctions within the temporomandibular joint – including the etiology – in the nearest future may be considered as occupational diseases. The problem concerns the professions that involve permanent stress, such as the uniformed services, economists, traders, etc [16, 17, 18, 19, 20, 21].

Parafunctions play a crucial role in the formation of disorders of the masticatory system that result in intra-articular disorders

of the temporomandibular joint. This leads to painful and painless symptoms. The most common symptoms include abnormal condylar motions, pathological sounds (clicks and crackles), pain in pressured areas of the temporomandibular joint, and free mandibular movement [22, 23, 24, 25, 26, 27].

Sleep disorders should be highlighted among all the symptoms of temporomandibular joint dysfunction. Patients suffering from pain and the muscle tension shortly after awakening, tend to manifest increased movement activity while asleep. As is widely known, stress along with emotional strain may cause the formation of disorders of the masticatory system. The influence of stress and emotional strain can be examined by assessing the psychosomatic symptoms, such as high blood pressure, gastritis, peptic ulcer, and irritable bowel syndrome. The existence of the above factors and sleep disorders can serve as an excellent addition to the documentation. Moreover, it proves the existence of chronic stress, which is the main cause of parafunctions and bruxism. The results of the research confirm that sleep disorders are strictly connected with performing the described parafunctions. Furthermore, sleep disorders occur more frequently in patients who perform parafunctions than in those who do not (Fig. 2). The presented study shows that the phenomenon is statistically significant [28, 29].

The most common symptom of temporomandibular joint dysfunction is revealed during dental assessment as pathological tooth wear, evidenced by the existence of flat and shining surfaces of crowns which differ from normal crown shape. Pathological tooth wear is at the core of parafunctions, but may also be a consequence of some systemic diseases. The diseases that reduce the pH level in mouth, such as bulimia or gastroesophageal reflux disease, cause tooth tissue loss in patients who do not perform parafunctions. Pathological tooth wear related with parafunctions is a symptom of dysfunctions of the masticatory system. Reduction of the bite height, caused by acidic conditions in the oral cavity, can also lead to dysfunctions of the masticatory system. Thus, proper diagnosis of pathological tooth wear accounting for systemic diseases, consequential rebuilding of the tooth tissue and preventive treatment of parafunctions, seem very reasonable. The presented study shows that the symptoms of pathological tooth wear are related to the occurrence of parafunctions in patients. The symptoms most frequently manifest themselves in patients who perform parafunctions than those who do not (Fig. 3). The presented study also shows that the phenomenon is statistically significant [30, 31, 32, 33].

Dysfunctions of the masticatory system also manifest themselves as painful symptoms located within the temporomandibular joints, or distant pain symptoms (neck myalgia, shoulder girdle myalgia, pain located in the cervical, thoracic, and lumbosacral regions of the spine). MRI-based and CT-based studies have shown that the existence of distant pain symptoms is related with compound (anteromedial, anterolateral) and simple displacements of the temporomandibular joint disc in the coronal plane. According to the reference literature and results of the presented study, parafunctions lead to strains in the joint which result in painful symptoms, caused by the repetitive movement, known as repetitive strain injury. The study also shows that the presence of the distant pain symptoms is related to the occurrence of parafunctions in patients. The symptoms most frequently manifest themselves in patients who perform parafunctions than those who do not (Fig.

1). The study additionally shows that the phenomenon is statistically significant [34, 35, 36, 37, 38].

Symptoms manifesting themselves within the organs of vision and hearing belong to a large group of symptoms resulting from dysfunctions in temporomandibular joints. These symptoms include ocular pain, filling of eyes with tears, feeling of blasting from the orbit of the eye, eyelid ptosis, visual sensations, inflammation of the iris, decreased visual acuity, ear pain, feeling of blockage, noise or ringing, ear wax retention, and itching. However, the clinical problem is very often associated neither with these symptoms nor with the disorder of temporomandibular joints, which might lead to a wrong diagnosis. Therefore, it seems extremely important to draw attention to this issue in view of recent research [39, 40, 41, 42, 43, 44].

According to Mazengo and Kirveskari, TMJ disorders is a universal problem. In a random sample of 100 adult Tanzanians, 26% of them informed about at least one symptom, and 40% of the patients had at least one clinical sign. Symptoms increased significantly with age and in the Tanzanians patients were not dissimilar to those observed in the developed countries [45]. A study by Winocur et. al evaluated TMJ disorders among Israeli-Jewish people and to compare the results with United States, Swedish, Asian and Israeli-Arab patients. Israeli-Jewish TMJ disorder patients showed similar results to those demonstrated in other countries [46]. According to Wright et al., TMJ disorders are a very common problem affecting about 33% of patients. TMJ disorders have many similarities to musculoskeletal disorders of other parts of the body [47]. Akhter et. al examined a random group of 1,200 high school students from 3 communities – rural, semi-urban and urban – by means of a questionnaire on dietary habits, and checked against the occurrence of symptoms of TMJ disorders. Patients from rural area had higher prevalence of clicking and pain in the TMJ than patients living in an urban area ($p < 0.01$ and $p < 0.01$). Patients with DMFT ≥ 1 showed higher prevalence of restricted mouth opening ($p < 0.01$) and clicking ($p < 0.01$) [48]. Nourallah et al. examined the prevalence of TMJ disorders in a selected young male Saudi population. Almost two-thirds of the patients had no signs or symptoms of TMJ. The prevalence of signs and symptoms of TMJ disorders in the patients from a non-Western population compared favourably to that found in Western countries [49]. Miyazaki et al. examined patients from the city of Kitakyushu, Japan. 81% of all the examined patients had no unusual signs in their TMJ. A clicking sound was the most frequent symptom (17%) [50].

CONCLUSIONS

Over 30% of the examined patients with parafunctions came from the rural environment. It is therefore extremely important to introduce prophylactic care in these areas to prevent the occurrence of parafunctional activity.

- The highest missing teeth ratio was in patients aged 60 and over ($60 \leq x$), among whom tooth wear and tooth loss leading to a decrease in bite height was observed.
- Because parafunctions are a frequent phenomenon, they should be taken into account when diagnosing diseases and pathological symptoms, such as tooth wear, sleep disorders, neck myalgia, shoulder girdle myalgia, and pain located in the cervical, thoracic, and lumbosacral regions of the spine.
- TMJ disorders are an international and worldwide problem.

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