

Prevalence of Clinical Diagnosis of Temporomandibular Disorders Based on DC/TMD, Axis I in Adult Ukrainians of Different Gender and Age

¹Svitlana M. Klochan, ²Roman H. Osnach, ³Ihor I. Palyvoda, ⁴Mykola V. Savchenko, ⁵Ihor H. Chaikovskiy

Abstract. *The article presents the results of the study, the purpose of which was to establish and analyze the prevalence of clinical diagnosis of Temporomandibular disorders (TMD) according to the Diagnostic Criteria for TMD, Axis I (DC/TMD, Axis I) among patients seeking medical advice. Gender and age distribution of TMD clinical diagnoses, as well as the nature and incidence of TMD combined diagnoses, were also of importance for the authors. To form homogeneous symptomatic groups, the DC/TMD Axis I clinical diagnostic protocol was used, which is a standardized tool for TMD diagnosis for research and clinical purposes. Based on the study, it was established that the use of unified diagnostic tools for TMD diagnosis, such as the DC/TMD, increased the consistency between independent studies of the prevalence of clinical diagnoses of TMD. The use of the DC/TMD allowed the obtaining and comparison of own TMD prevalence data with independent, identical studies conducted in different countries. The novelty of the article is the study of the prevalence of clinical diagnoses of TMD among the Ukrainian population, based on the use of the DC/TMD. The practical value of the study is due to the need to obtain data using the unified DC/TMD.*

Keywords: *temporomandibular disorders, clinical types, diagnostic criteria (DC/TMD), prevalence, Ukrainian population.*

I. Introduction

Currently, to study the prevalence of clinical types of TMD, many countries worldwide use an updated version of the standardized, valid Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), approved and published by

¹ Department of Dental Orthopedics, National Medical Academy of Postgraduate Education named after P.L.Shupyk, 04112, 9 Dorohozhytska Str., Kyiv, Ukraine

² Department of Dental Orthopedics, National Medical Academy of Postgraduate Education named after P.L.Shupyk, 04112, 9 Dorohozhytska Str., Kyiv, Ukraine

³ Department of Dental Orthopedics, National Medical Academy of Postgraduate Education named after P.L.Shupyk, 04112, 9 Dorohozhytska Str., Kyiv, Ukraine

⁴ Department of Dental Therapeutics, National Medical Academy of Postgraduate Education named after P.L.Shupyk, 04112, 9 Dorohozhytska Str., Kyiv, Ukraine

⁵ Department of Dentistry, National Medical Academy of Postgraduate Education named after P.L.Shupyk, 04112, 9 Dorohozhytska Str., Kyiv, Ukraine

the International Association for Dental Research in 2014,¹ translated into different languages. According to data,^{2,3,4,5} the prevalence of TMD based on the Diagnostic Criteria, Axis I (DC/TMD, Axis I) differs in patients among the European population (Table 1). Ukrainian scientists also study the prevalence of TMD⁶ but data obtained using the unified DC/TMD is lacking.⁷

Therefore, the studies and analyses of the prevalence of clinical diagnoses of TMD among the Ukrainian population based on the DC/TMD are urgent. The comparison of the data obtained and the results of foreign studies is also of interest.

Table 1. Prevalence of clinical diagnoses of TMD among the European populations

	Diagnosis	Muscle disorders %	Disc displacement%		Arthropatia %		Combined diagnoses %
			right	left	right	left	
A. Blanco-Hungría et al., Spain, 2016	RDC / TMD Axis I	88.7	4.2	3.9	2.6	3.2	—
M. Osiewicz et al., Poland, 2017	RDC / TMD Axis I	56.9	48.9		31.0		—
R. Celic et al., Croatia, 2004	RDC / TMD Axis I	64.9	3.1	2.7	2.4	2.6	
Manfredini D. et al., Italy, 2010	RDC / TMD Axis I	49.7	57.3		81.4		64.3
Y. Ribert, Ukraine, 2016	Common methods of clinical and laboratory examination of patients with TMD	36.4	38.8				19.0

II. Materials and methods

From 2011 to 2019, 2,476 patients who sought medical advice were examined at the Department of Orthopedic Dentistry, P.L. Shupyk Institute of Stomatology of the National Medical Academy. Total 256 adults over 18 years of age who agreed to participate in the study and met the inclusion criteria, were selected. The mean age (m/a) of the patients was 40.80 ± 14.61 years. The proportion of women (w) was 78.12% (200 patients) with the m/a of 41.57 ± 14.70 years; the proportion of men (m) was 21.88% (56 patients) with the m/a of 38.05 ± 14.07 , the ratio of men to women (m:w) was 1:3.6, respectively

According to the DC/TMD, Axis I, patients were to meet the following inclusion criteria:

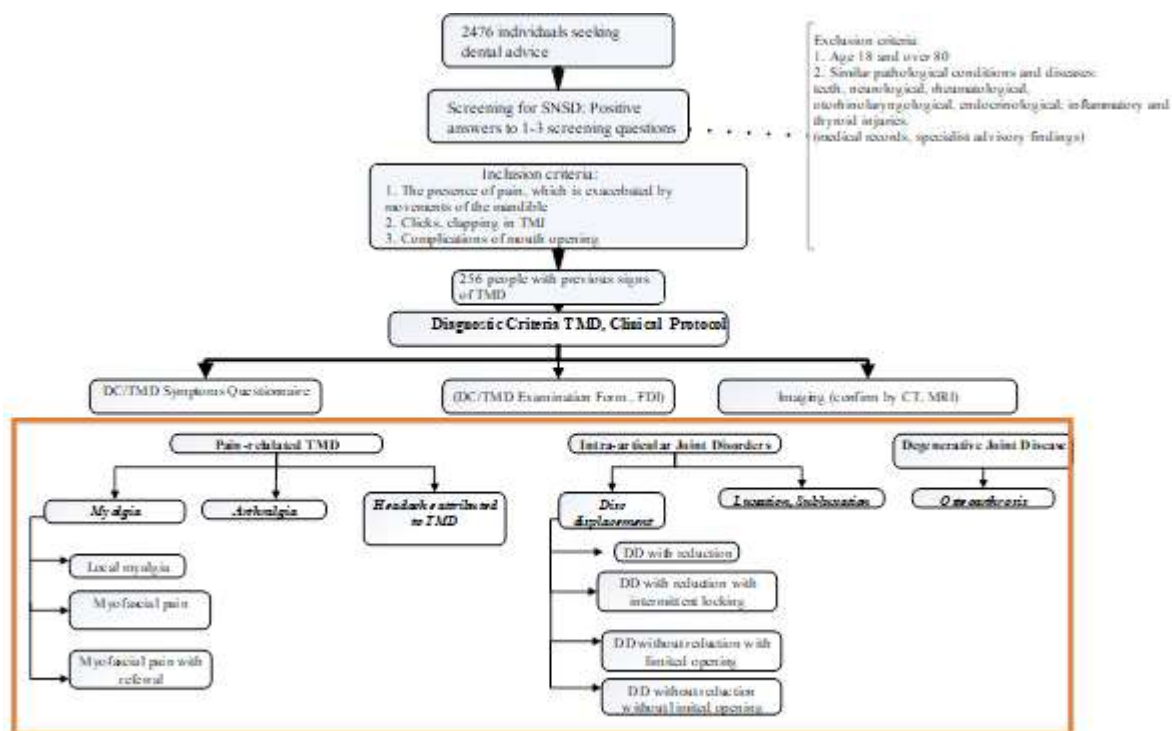
- One or more positive answers to 3 screening questions according to the DC/TMD Symptoms Questionnaire:¹ presence of pain which aggravates with the movements of the mandible, clicking in the temporomandibular joint (TMJ), difficulty in mouth opening.

- One or more TMD diagnoses according to the DC/TMD Axis I.

- Absence of signs or symptoms of diseases similar to those of TMD (fibromyalgia, hypothyroidism, lupus erythematosus, scleroderma, Parkinson's disease, Lyme disease, rheumatoid arthritis; neurological disorders: neuralgia, neuritis, tension headache, autonomic cephalgia, migraines, psychogenic pain, myositis, infectious-inflammatory processes or injuries, sinusitis), which were excluded by the consultants of other specialties with the provision of examination findings. After a detailed examination the following patients were excluded from the study: 5 patients under 18 years of age, neuralgia, trigeminal neuritis – 4, rheumatoid arthritis with TMJ involvement – 1, chronic pulpitis – 3, postoperative false joint in the lower jaw angle area with mandibular nerve damage – 1, temporal artery arteritis – 1.

The design of the study is presented in Figure 1. Patients were examined according to the DC/TMD clinical diagnostic protocol. The DC/TMD, Axis I assessment was based on the questionnaires, clinical examination and radiographic findings of CT and MRT for certain diagnoses.¹ This resulted in a single or combination clinical diagnosis in one patient with existing TMD symptoms.

Figure 1. Study design



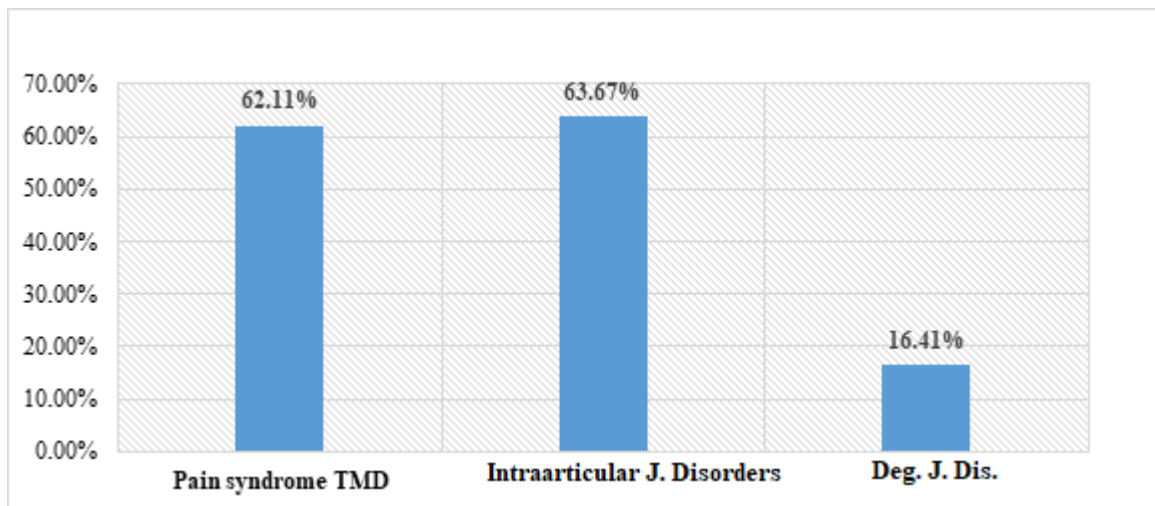
The patient database was created in Excel spreadsheets. Preliminary data processing was performed: cleaning, normalization, reconstruction of TMD hierarchical structure, according to which statistical prevalence figures were calculated. Statistical calculations were performed using an application created using the Python programming language and the Pandas, Matplotlib and Seaborn libraries.

All patients had a good command of the Ukrainian language and signed a written informed consent to participate in the study. The study was carried out in accordance with the requirements adopted by the international community – the Declaration of Helsinki and the current regulatory acts of Ukraine. The Ethics Commission of the P.L. Shupyk NMAPGE granted a permission to conduct this clinical study in accordance with the current legislation of Ukraine, current ethical standards and principles of scientific clinical studies (minutes of the commission meeting No. 8 of 23.10.2017).

III. Results

According to the statistical data processing and calculations, *Pain syndrome TMD* was diagnosed in 62.1% (159) patients with the m/a of 42.25 ± 14.54 , in particular, the proportion of men (m) was – 23.27% (37) patients, women (w) – 76.73% (122) patients, ratio of men to women (m:w) was 1:3.3. The m/a of women in this group was higher than that of men, 43.29 ± 14.27 years and 38.84 ± 15.08 years, respectively. *Intraarticular Joint Disorders* were observed in 63.67% (163) of patients with the m/a of 35.99 ± 12.63 years, including m – 21.47% (35) with the m/a of 33.11 ± 10.88 years, w – 78.53% (128) with the m/a of 36.78 ± 12.99 years, ratio of m:w – 1:3.7. *Degenerative Joint Diseases* were observed in 16.41% (42) patients with the m/a of 48.88 ± 15.83 years, men – 14.29% (6) with the m/a of 45.67 ± 16.94 years, women – 85.71% (36) with the m/a of 49.42 ± 15.82 years, ratio of m:w – 1:6 (Figure 2).

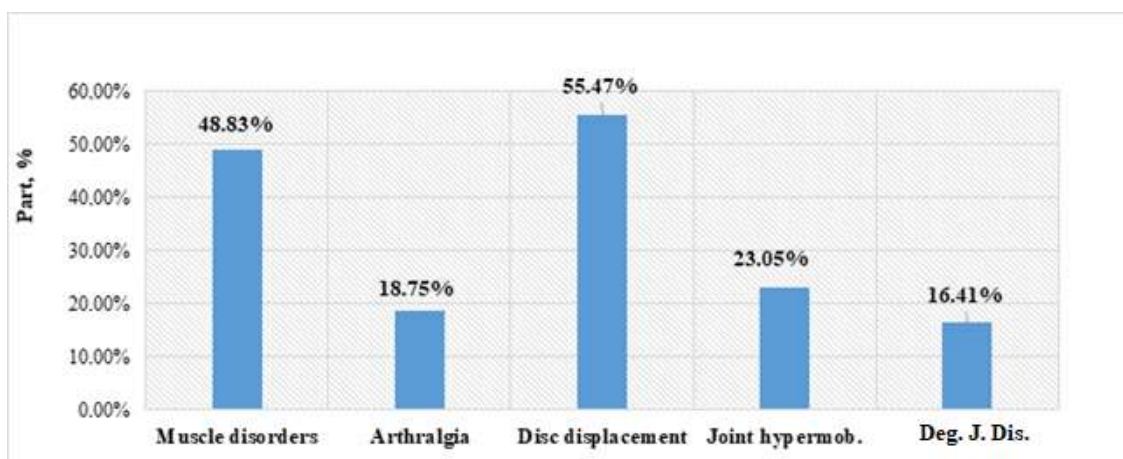
Figure 2. Main TMD groups depending on manifestations



Figures 3, 4, 5 show the distribution of TMD by major clinical diagnosis, age and sex. *Pain syndrome TMD* was caused by:

1. *Muscle disorders (MD)* – myalgia and myofascial pain syndrome in 48.83% (125) of patients with the m/a of 43.26 ± 14.56 years, including m – 20.8% (26) with the m/a of 40.62 ± 15.53 , w – 79.20% (99) with the m/a of 43.95 ± 14.30 ; ratio of m:w – 1: 3.8;
2. *Arthralgia* caused by *Intraarticular Joint Disorders* and *Degenerative Joint Diseases* in 18.75% (48) of patients with the m/a of 38.21 ± 14.81 years, including 27.08% (13) with the m/a of 34.62 ± 14.22 years; w – 72.92% (35) with the m/a of 39.54 ± 15.00 ; ratio of m:w – 1:2.7.
3. *Intraarticular Joint Disorders* in patients with TMD were most commonly diagnosed as:
 - any type of *Disc Displacement (DD)* in 55.47% (142) of patients with the m/a of 34.93 ± 11.98 years: m – 20.42% (29) with the m/a of 31.52 ± 9.89 , w – 79.58% (113) with the m/a of 35.81 ± 12.35 years; ratio of m:w – 1:3.7;
 - *Joint hypermobility - Subluxation (SUBLUX)* in 23.05% (59) of patients with the m/a of 35.92 ± 13.30 years: m – 2.81% (17) with the m/a of 33.41 ± 11.97 years, w – 71.11% (42) with the m/a of 36.93 ± 13.81 years; ratio of m:w – 1:2.5.

Figure 3. Prevalence of major clinical diagnoses of TMD according to the DC/TMD, Axis I



Degenerative Joint diseases and osteoarthritis (DEG.J.DIS.) were diagnosed in 16.41% (42) of patients with the m/a of 48.88 ± 15.83 years, including m – 14.29% (6) with the m/a of 45.67 ± 16.94 years; w – 85.71% (36) with the m/a of 49.42 ± 15.82 ; ratio of m:w – 1:5.9.

Figure 4. Age distribution of TMD clinical diagnoses according to the DC/TMD, Axis I

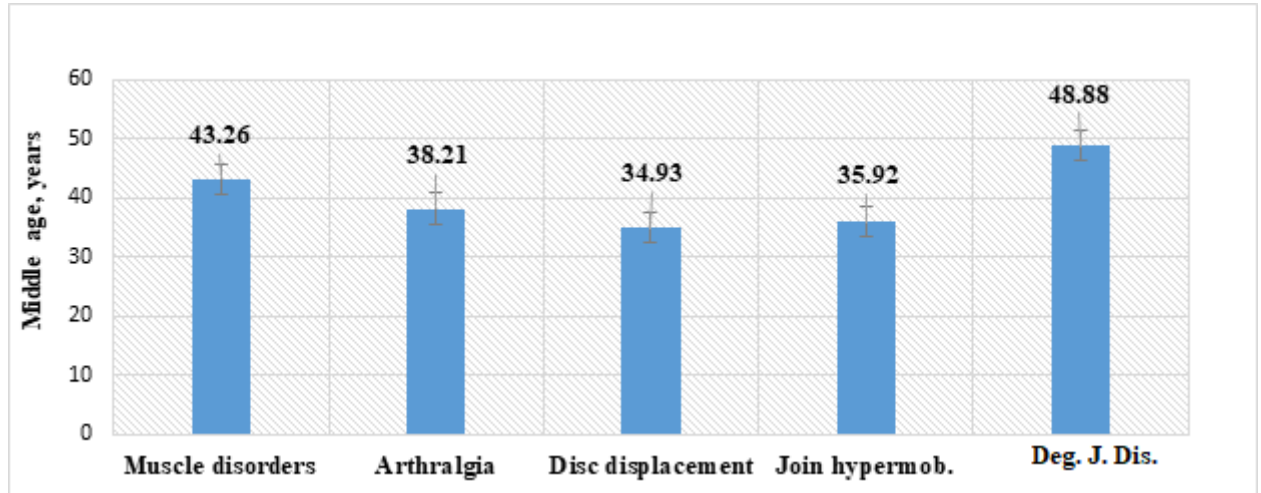


Figure 5. Gender distribution of major clinical diagnoses according to the DC/TMD, Axis I

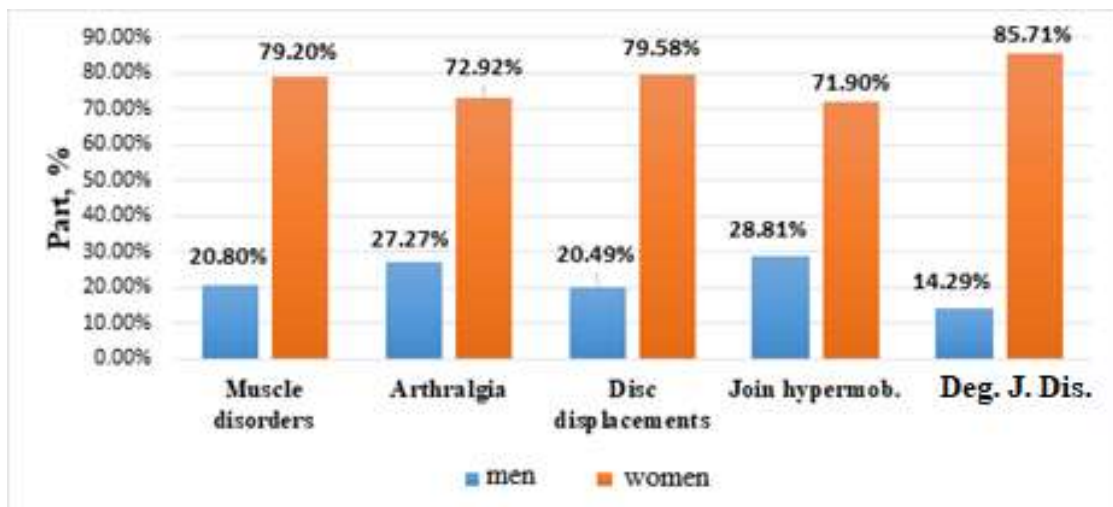


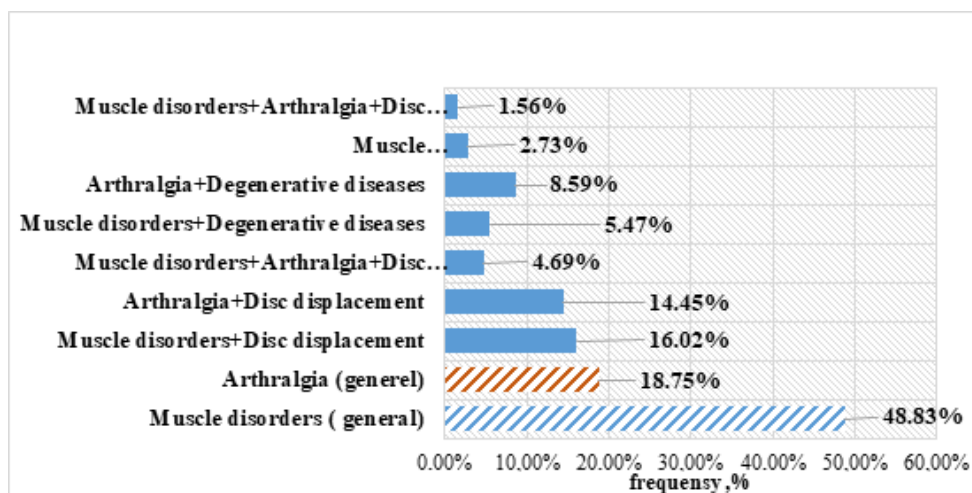
Figure 6. Combined TMD diagnoses (DC/TMD, Axis I) associated with Pain Syndrome

Figure 6 shows the distribution of combined diagnoses associated with pain syndrome in the form of muscular disorders (MD) and/or arthralgia. In particular, MD (total 48.83% (125) patients) was combined with:

- DD in 16.02% (41) patients with the m/a of 35.20 ± 12.99 years: m – 17.07% (7) with the m/a of 30.43 ± 13.75 ; w – 82.93% (34) with the m/a of 36.18 ± 12.82 years, ratio of m:w – 1:4.8;

- DEG.J.DIS. – in 5.47% (14) patients with the m/a of 48.71 ± 13.39 years, w – 100%;

MD in combination with arthralgia was accompanied by:

- DD in 4.69% (12) patients with the m/a of 32.17 ± 13.16 years: m – 16.67% (2) with the m/a of 34.50 ± 23.30 years; w – 83.33% (10) patients with the m/a of 31.70 ± 12.24 years; ratio of m:w – 1:5.

- DEG.J.DIS in 2.73% (7) patients with the m/a of 44.43 ± 14.01 years: w – 100.0% (7).

- DEG.J.DIS in combination with DD in 1.56% (4) patients with the m/a of 38.50 ± 16.66 years: w – 100.0% (4).

MD as a single diagnosis was established in 17.9% patients with the m/a of 44.32 ± 14.53 years: m – 27.7% with the m/a of 42.75 ± 17.28 years; w – 72.73% with the m/a of 44.91 ± 13.63 years; ratio of m:w – 1:2.7.

Arthralgia (a total proportion of 18.75% (48)) was diagnosed with:

- DD in 14.45% (37) patients with the m/a of 34.30 ± 13.0 years; m – 27.03% (10) with the m/a of 31.50 ± 11.15 years; w – 72.97% (27) with the m/a of 35.33 ± 13.67 years; ratio of m:w – 1:2.7;

- DEG.J.DIS in 8.59% (22) patients with the m/a of 41.86 ± 15.12 years: m – 18.18% (4) patients with the m/a of 41.25 ± 18.77 years, w – 81.82% (18) patients with the m/a of 42.00 ± 14.83 years;

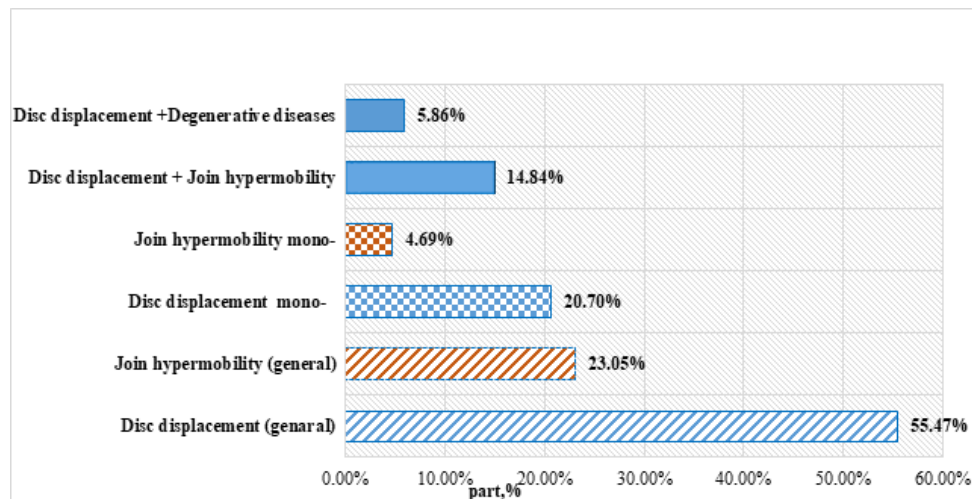
- in combination with MD and DD in 4.69% (12) of patients with the m/a of 32.17 ± 13.16 years: m – 16.67% (2) of patients with the m/a of 34.50 ± 23.30 years; w – 83.33% (10) of patients with the m/a of 31.70 ± 12.24 years; ratio of m:w – 1:5.

- in combination with MD and DEG.J.DIS in 2.73% (7) of patients with the m/a of 44.43 ± 14.01 years, w – 100.0% (7).

A combination of DD with *SUBLUX* (total 55.47% (142) and 23.05% (59), respectively) was diagnosed in 14.84% (38) of patients with the m/a of 31.89 ± 10.65 years: m – 28.95% (11) patients with the m/a of 29.36 ± 9.62 years, w – 71.05% (27) patients with the m/a of 32.93 ± 11.04 years, ratio of m:w – 1:2.5. A combination of DD and DEG.J.DIS was observed in 5.86% (15) patients with the m/a of 36.93 ± 14.32 years: m – 6.67% (1) patients with the m/a of 30.00 ± 0.0 years; w – 93.33% (14) patients with the m/a of 37.43 ± 14.73 years; ratio of m:w – 1:14. As a single diagnosis, DD

was diagnosed in 20.7% (53) of patients with the m/a of 34.34 ± 10.97 years: m – 16.98% (9) patients with the m/a of 31.67 ± 10.38 years; w – 83.02% (44) patients with the m/a of 34.89 ± 11.2 years; ratio of h:w – 1:4.9. *SUBLUX* was observed in 4.69% (12) patients with the m/a of 41.50 ± 15.40 years; m – 25.00% with the m/a of 43.33 ± 15.01 years, w – 75.0% with the m/a of 40.89 ± 16.37 years, ratio of m:w – 1:3 (Fig. 7).

Figure 7. Combined diagnoses of Intraarticular Joint Disorders (DC/TMD, Axis I)

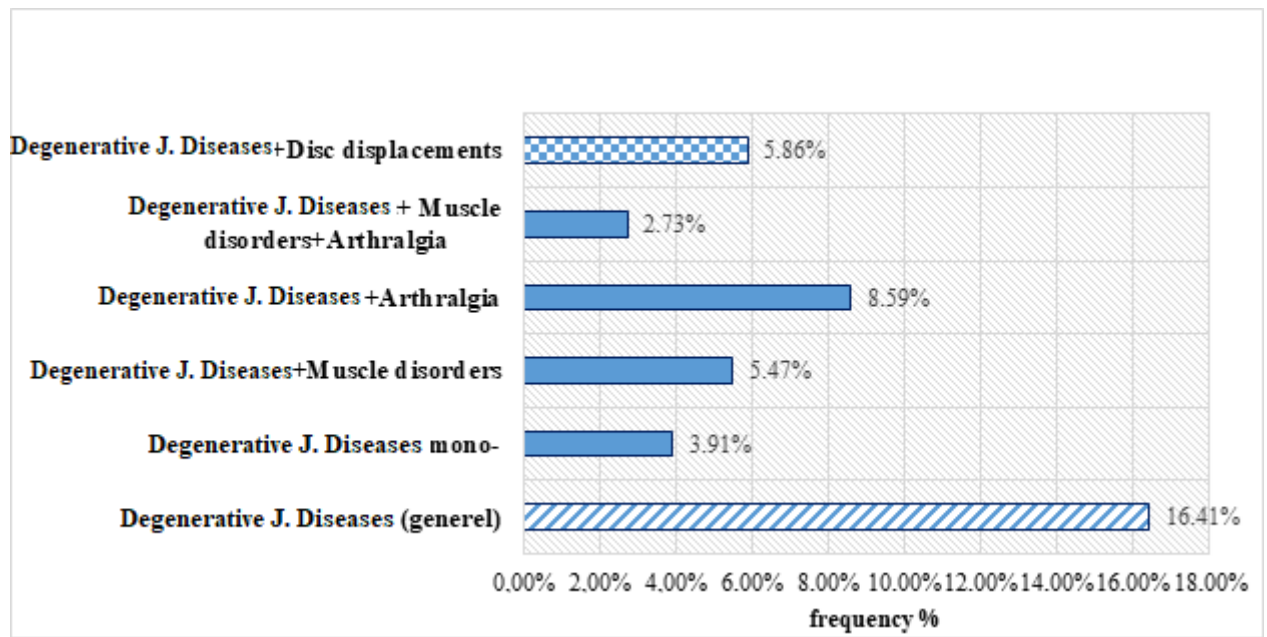


Degenerative Joint diseases, osteoarthritis (DEG.J.DIS) – was diagnosed in 16.41% (42) patients with the m/a of 48.88 ± 15.83 years: m – 14.29% (6) with the m/a of 45.67 ± 16.94 years; w – 85.71% (36) with the m/a of 49.42 ± 15.82 years, ratio of m:w – 1:5.9. *DEG.J.DIS* associated with pain in the form of (Fig. 8):

- MD in 5.47% (14) patients with the m/a of 48.71 ± 13.39 years: w – 100% (14);
- Arthralgia in 8.59% (22) patients with the m/a of 41.86 ± 15.12 years: m – 18.18% (4) with the m/a of 41.25 ± 18.77 years, w – 81.82% (18) with the m/a of 42.00 ± 14.83 years; ratio of m:w – 1:4.5;
- combination of MD and Arthralgia in 2.73% (7) of patients with the m/a of 44.43 ± 14.01 years: w – 100%.

DEG.J.DIS was also combined with *DD* in 5.86% (15) patients with the m/a of 36.93 ± 14.32 years: m – 6.67% (1) with the m/a of 30.00 ± 0.0 years; w – 93.33% (14) with the m/a of 37.43 ± 14.73 years; ratio of m: w – 1:14.

Figure 8. Combined diagnoses of Degenerative Joint Diseases according to the DC/TMD, Axis I



IV. Discussion

The analysis showed that among the patients with TMD manifestations who sought medical advice, the largest proportion, 63.67% (163), had IAD in the form of DD – 55.47% (142), SUBLUX – 23.05% (59); 62.11% of patients (159) suffered from TMD pain syndrome caused by MD in 48.83% (125) patients, arthralgia – 18.75% (48) patients (Fig. 2-3). Analyzing in more detail the clinical diagnoses of TMD using the DC/TMD, Axis I, which are most common in the practice of a dentist, it should be noted that the DD group, 55.47% (142) of patients with the m/a of 34.93 ± 11.98 years was the most numerous and the youngest (according to the WHO 2014 age classification, these are young people). The smallest and at the same time the oldest group included the patients with *DEG.J.DIS.*; 16.41% of the patients in the group had the m/a of 48.88 ± 15.83 (middle age according to the WHO 2014 age classification).

MD (different types of myalgia) made up the second largest group – 48.83% of patients (Fig. 3). The ratio of men to women with myalgia was 1:3.8, meaning that the number of women was almost 4-fold higher. The mean age of the patients in this category was 43.26 ± 14.56 years (Fig. 4). According to the World Health Organization age classification, this age is within young (25-44 years) and middle (44-60 years) working age group. It is known that pain syndrome caused by MD can have negative psycho-emotional consequences and cause a patient's disability and even invalidity.⁷

In all clinical groups, women prevailed; their number was 2.5-6 times higher, depending on the clinical diagnosis. Thus, the ratio of men to women in each group was: MD – 1:3.8; arthralgia – 1:2.7; DD – 1:3.7; SUBLUX – 1:2.5; *DEG.J.DIS* – 1:5.9. *DEG.J.DIS* was the group where the number of women was almost 6 times higher than that of men (Fig. 5). Analyzing the combination of TMD diagnoses with pain syndrome, it should be noted that MD with 16.02% (41) prevailed over arthralgia with 14.45% (37) in DD. Compared to MD, arthralgia was more common in the patients with *DEG.J.DIS* and was 8.59% (22) and 5.47% (14) respectively. The percentage of cases of combination and arthralgia was higher in DD – 4.69% (12); in *DEG.J.DIS* it was 2.73% (7) (Fig. 6).

Among combined diagnoses of intra-articular disorders, DD was most often combined with SUBLUX (subluxation of one or more joints) (14.84%) (38). This was the youngest age group with a population of 31.89 ± 10.65

years of age and the smallest gender gap between men and women – 1:2.5. DD and SUBLUX in the form of a single diagnosis is of interest. Thus, with the total DD percentage of 55.47% (142) with the m/a of 34.93 ± 11.98 years, the proportion of DD as a single diagnosis was almost $\frac{1}{2}$ – 20.7% (53) with the mean age of 34.34 ± 10.97 . The proportion of SUBLUX as a single diagnosis was 4.69% (12) with the m/a of 41.50 ± 15.40 years, with a total proportion of SUBLUX of 23.05% (59) with the m/a of 35.92 ± 13.30 years. In the patients with DD, the signs of degenerative changes in the intra-articular elements were observed in 5.86% (15) of the patients of young age, at 36.93 ± 14.32 years of age (Fig. 7).

DEG.J.DIS (osteoarthritis) was diagnosed in 16.41% (42) of patients with the m/a 4.88 ± 15.83 years. This is the oldest group, which had the highest number of women – the ratio of m:w was 1:5.9. In 8.59% of the patients, *DEG.J.DIS* was associated with arthralgia, 2.73% had arthralgia and MD and 5.47% had MD. *DEG.J.DIS* without pain syndrome was observed in 3.91% of the patients (Fig. 8). In this case, it is interesting to compare the manifestations of pain syndrome between the age groups. Thus, degenerative changes in the joint with arthralgia were observed at a younger age, the m/a of 41.86 ± 15.12 years; *DEG.J.DIS* with arthralgia in combination with MD was observed at the m/a of 44.43 ± 14.01 years, the mean age in the group of *DEG.J.DIS* and MD was 48.71 ± 13.39 years and the m/a in the group of *DEG.J.DIS* without any pain syndrome was 63.30 ± 9.38 years. Pain syndrome TMD is a marker of the intensity of pathological structural and functional changes in the joint and muscles. The age-related patterns of its manifestations may indicate some stages in structural and functional pathological changes in TMJ and chewing muscles in the *DEG.J.DIS*.

V. Conclusions

The use of unified TMD diagnostic tools, such as The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), can increase the consistency between the studies of the prevalence of clinical TMD diagnoses. The use of the DC/TMD allowed the obtaining and comparison of our own TMD prevalence data and independent, identical studies conducted in different countries.

According to our own data, in the structure of TMD, the most common are Disc disorders in the form of various types of the articular disc displacement – 55.47%, the second most common disorders are muscular disorders in the form of myalgia and myofascial pain syndrome – 48.83%, and the third is SUBLUX in the form of subluxations of the joint head – 23.05%. *DEG.J.DIS* and arthralgia were fourth and fifth, respectively, with 18.75% and 16.41%. The DD group was the youngest age group with the m/a of 34.93 ± 11.98 years, the oldest was the group of *DEG.J.DIS* with the m/a of 48.88 ± 15.83 years. Women prevailed in all groups: 2.5-6 times higher numbers compared to men, depending on the group.

References

- [1] Ohrbach R., Gonzalez Y., List T., Michelotti A., Schiffman E. Diagnostic criteria for temporomandibular disorders (DC/TMD). *Clinical Examination Protocol Version*, 6, 2014. <http://www.rdc-tmdinternational.org>.
- [2] Blanco-Hungría A., Blanco-Aguilera A., Blanco-Aguilera E., Serrano-del-Rosal R., Biedma-Velázquez L., Rodríguez-Torronteras A., Segura-Saint-Gerons R. Prevalence of the different Axis I clinical subtypes in a sample of patients with orofacial pain and temporomandibular disorders in the Andalusian Healthcare Service. *Med Oral Patol Oral Cir Bucal*, 2016, 21(2): 169-77. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4788795>
- [3] Manfredini D., Piccotti F., Ferronato G., Guarda-Nardini L. Age peaks of different RDC/TMD diagnoses in a patient population. *Journal of Dentistry*, 38(5): 392-399. <https://www.researchgate.net/publication/41138851>.

- [4] Osiewicz M., Lobbezoo F., Loster B., Loster J., Manfredini D. Frequency of temporomandibular disorders diagnoses based on RDC/TMD in a Polish patient population. *The Journal of Craniomandibular and Sleep Practice*, 36(5): 304-310. <https://www.researchgate.net/publication/319019177>.
- [5] Celic R., Dworkin S., Jerolimov V., Maver-Bižanin M., Milica J. Frequency of diagnoses of temporomandibular dysfunction and psychological status in Croatian patients. *Acta Stomatol Croat*, 2019, 38(4): 323-332. <https://www.researchgate.net/publication/27188314>.
- [6] Ribert Y. A comprehensive approach in the diagnosis and treatment of patients with temporomandibular disorders with functional occlusion disorders. Lviv: LNMU, 2017.
- [7] Schiffman E, Ohrbach R, Truelove E. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: Recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. *Oral Facial Pain Headache*, 2014, 28: 6-27.