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**PSYCHOSOCIAL IMPAIRMENT IN
TEMPOROMANDIBULAR DISORDERS
PATIENTS. RDC/TMD AXIS II
FINDINGS FROM A MULTICENTER
STUDY**

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Abstract

Objectives The relationship between the rate of chronic pain-related disability and depression and somatization levels as well as the influence of pain duration on Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) axis II findings were assessed in a three-center investigation.

Methods The study sample (N=1149; F:M 4.1:1, m.a. 38.6 years) consisted of patients seeking for TMD treatment and undergoing RDC/TMD axis II psychosocial assessment to be rated in chronic pain-related disability (Graded Chronic Pain Scale, GCPS), depression (Symptoms Checklist-90[SCL-90] scale for depression, DEP) and somatization levels (SCL-90 scale for non-specific physical symptoms, SOM). The null hypotheses to be tested were that 1. no correlation existed between GCPS categories and DEP and SOM scores, and 2. no differences emerged between patients with pain from more or less than six months as for the prevalence of the different degrees of pain-related impairment, depression, and somatization.

Results In the overall sample, the prevalence of high pain-related disability (GCPS grade III or IV), severe depression and somatization was 16.9%, 21.4%, and 28.5% respectively. A correlation was shown between GCPS and both DEP and SOM categories (Spearman's correlation test, $p < 0.001$). A significant association between pain lasting from more than six months and high GCPS scores was shown (chi-square, $p < 0.001$), while no association was found between DEP and SOM scores and pain duration in the overall sample (chi-square, $p = 0.742$ and $p = 0.364$, respectively).

Conclusions Pain-related disability was found to be strongly related with depression and somatization levels as well as associated with pain duration. Depression and somatization scores were not associated with pain duration.

Introduction

Several investigations have described high rates of psychosocial impairment in different populations of temporomandibular disorders (TMD) patients¹⁻⁴. The level of such impairment seems to have important implications at the therapeutic level due to its influence on treatment outcomes^{5,6}. Consequently, psychosocial impairment has been the subject of detailed descriptive TMD-related papers and guidelines^{7,8} and it has been suggested to be associated with the presence of chronic pain⁹.

At present, the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) axis II for psychosocial assessment is the only available instrument that enables clinicians to assess the severity of chronic pain and the levels of depression and somatization¹⁰, and its usefulness has been shown in the clinical setting¹¹. Nonetheless, few studies have been published on the prevalence of pain-related impairment, depression, and somatization levels, and little is known about the relationship between scores of pain-related impairment and those of depression and somatization. Such information should be useful to deepen our insight into the complex interaction between patients' disability, viz., the impact of chronic pain in daily activities, and psychological impairment, viz., the presence of psychological disturbance. Besides, in the light of the upcoming update of the RDC/TMD guidelines^{12,13}, it seems to be useful to discuss data gathered over the years by the use of the RDC/TMD version 1.0. Indeed, the new version is likely to update it in a completely different instrument, to be used not only for research but also for clinical purposes, and it might be interesting to have version 1.0 multicenter data collected to be compared with findings from future investigations.

To this aim, a comparison of data from different TMD clinics may be helpful to get a deeper insight into the psychosocial features which characterize TMD patients attending specialized centers. In the present paper, findings obtained with the use of the RDC/TMD axis II instrument at three highly-specialized university-based clinics (Padova, Italy; Tel Aviv, Israel; Amsterdam, The Netherlands) are presented in terms of prevalence of the different ratings of chronic pain severity, depression, and somatization. The relationship between the rate of chronic pain-related disability and depression and somatization levels was assessed, to test if the different components of axis II assessment are related with each

other. Also, the influence of pain duration on pain-related impairment, depression, and somatization levels was assessed in order to search for associations between pain chronicity and psychosocial impairment. Data are discussed in terms of overall findings as well as presented for each center involved in the study, to assess the presence of differences in the psychosocial impairment between patients attending the three clinics.

Materials and methods

Study population

The study sample consisted of three adult patient populations recruited from the TMD Clinic, University of Padova, Italy (N=284; 78% females, 22% males; mean age 39.5 ± 13.8 , range 18-81) during the period from January 1st to December 31st, 2008; from the TMD and Orofacial Pain Clinic, University of Tel Aviv, Israel (N=430; 79% females, 21% males; mean age 36.3 ± 15.1 , range 18-84) during the period from January 1st, 2001 to December 31st, 2004; and from the Department of Oral Kinesiology, Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, The Netherlands (N=435; 83% females, 17% males; mean age 40.4 ± 13 , range 18-82) during the period from January 1st, 2000 to December 31st, 2002.

Assessment instruments

All patients underwent an assessment in accordance to the RDC/TMD guidelines, and the present paper describes data gathered with the axis II questionnaire, which contains specific items for the appraisal of the chronic pain severity and levels of depression and somatization¹⁰. A culturally adapted Dutch version of the RDC/TMD was adopted for all the assessment procedures on patients included in the ACTA sample¹⁴, while Italian and Hebrew language versions of the RDC/TMD, as available on the RDC/TMD consortium website, were adopted in the Padova and Tel Aviv samples, respectively¹⁵.

The RDC/TMD axis II enables that the severity of chronic pain is rated by means of the Graded Chronic Pain Scale (GCPS), originally developed by Von Korff et al.^{16,17}. Its validity has been tested in a large population survey, and the prognostic value has been tested in a 3-year follow-up study in large samples of primary care pain patients, also

including TMD pain patients^{16,17}. The GCPS is composed of six items assessed on a 10-point scale, and one item on the number of disability days due to facial pain. These items are suitable for self-report use and, even though the characteristics of the scale enable measuring pain dysfunction as a continuous variable, the authors have provided hierarchical criteria to grade pain dysfunction into ordinal categories. The scoring criteria are simple to use, and allow categorizing pain patients into five levels of chronic pain grades (0, no disability; 1, low disability, low pain intensity; 2, low disability, high pain intensity; 3, high disability, moderately limiting; 4, high disability, severely limiting).

As for depression and somatization levels, the RDC/TMD axis II enables their assessment by means of the depression and somatization scales of the Symptom Checklist 90-R (SCL-90-R), an instrument originally developed by Derogatis¹⁸. The choice to include the SCL-90-R depression and somatization scales (SCL-DEP, SCL-SOM; briefly indicated as DEP and SOM scales in the text below) in the RDC/TMD axis for psychosocial assessment found its rationale in providing a contemporary evaluation of concurrent depressive and non-specific physical symptoms. A total of 31 items were included in the axis II, belonging either to the Depression and Vegetative Symptom Scale or to the Somatization Scale, which is here used to evaluate the presence of non-specific physical symptoms, plus seven additional items added to the Depression and Vegetative Symptom Scale. The mean scale score is calculated by summing up the score of the single items. This makes possible to rate patients as having normal, moderate or severe levels of impairment in the depression and non-specific physical symptoms scales. On the DEP scale, scores below 0.535 were considered normal, between 0.535 and 1.105 indicated moderate depression, and above 1.105 the presence of severe ongoing depressive disorder. On the SOM scale, including the pain items, scores lower than 0.5 were considered normal, values between 0.5 and 1 indicated moderate somatization, and above 1 severe somatization.

Statistical analysis

Baseline demographic and pain duration features were compared among samples by using chi-square test, analysis of variance (ANOVA) with Bonferroni's post-hoc test,

when needed. The frequencies of the different scores for GCPS, DEP, and SOM in the study population were described. Correlation between categories of patients identified by the GCPS items and the DEP and SOM scales was assessed by means of Spearman's correlation test. The null hypotheses were that no correlation existed between GCPS categories and DEP and SOM scores. Also, to test for the influence of pain duration on the degree of pain-related disability, and DEP/SOM levels, chi-square test was performed to compare the prevalence of the different GCPS, DEP, and SOM categories between patients with pain lasting from more or less than six months. Again, the null hypothesis was that no differences emerged between patients with pain from more or less than six months as for the prevalence of the different degrees of pain-related impairment, depression, and somatization.

Statistical significance was set at $p < 0.05$. All the statistical procedures were performed with the Statistical Package for the Social Sciences (SPSS 15.0, SPSS Inc., Chicago, USA).

Results

The study sample accounted for a total of 1149 patients (80% females, 20% males) with a mean age of 38.6 ± 14.1 years. The mean pain duration at the time of the assessment was 37.3 ± 56.5 months (range 0-600 months), and the percentage of patients with pain lasting for at least six months was 74.5%. The demographic features of the sample and those of the three constituent subsamples are shown in table 6.1.

GCPS scores allowed to detect high disability, severely limiting pain-related impairment, viz., grade IV, in 5.7% of patients, and high disability, moderately limiting impairment, viz., grade III, in 11.2% of patients. The percentage of patients with high disability (grade III or IV) was higher in the Dutch sample (21.6%) with respect to that of the Italian and Israeli samples (13.7% and 13.2%, respectively) (chi-square, $p < 0.001$). Also, the Dutch sample reported the lowest prevalence of patients with no disability at all (4.4%; $p < 0.001$). Severe depression was shown in 21.4% of the overall sample. The Italian sample endorsed the highest levels of depression, with 52.8% of patients showing moderate or severe depression, significantly higher than those reported in the Israeli and Dutch samples

(48.6% and 37.5%, respectively) (chi-square, $p<0.001$). The prevalence of severe somatization symptoms in the overall sample was 28.5%. The Italian sample showed the highest prevalence of either moderate or severe somatization levels (71.8%), significantly higher than that recorded in the Israeli and Dutch samples (61.8% and 41%, respectively) (chi-square, $p<0.001$) (Table 6.2).

Data recorded in the overall sample showed a strong correlation between pain-related disability (GCPS categories) and both depression and somatization (DEP and SOM categories) (Spearman's correlation test, $p<0.001$). The prevalence of severe depression increased with the rate of pain-related impairment, ranging from 16.7% in patients with no disability to 53.8% in patients with high disability, severely limiting impairment. The same happens in the three subsamples, even though in the Italian sample the correlation is only close to significance ($p=0.06$). Absolute prevalence values of severe depression in patients with GCPS grade IV impairment were higher in the Italian and Israeli samples (71.4%) with respect to the Dutch one (40.6%). (Table 6.3). Also, the prevalence of severe somatization increased with high levels of pain-related impairment both in the overall (47.7% vs. 15.3% of patients with no disability) and in the three subsamples. Again, the Italian (71.4%) and Israeli (64.3%) populations showed higher prevalence of severe somatization in GCPS grade IV patients with respect to the Dutch sample (32.4%) (Table 6.4).

In the overall sample as well as in all three subsamples, a significant association between pain lasting from more than six months and high levels of pain-related disability was shown (chi-square, $p<0.001$). In the overall sample, a 2.6:1 ratio was described in the GCPS grade IV group for patients with pain from more than six months vs. those with pain from six months or less, with peaks in the Israeli sample (4:0 ratio) and lows in the Dutch one (1.2:1 ratio) (Table 6.5).

No association was found between depression and somatization scores and pain duration in the overall sample (chi-square, $p=0.742$ and $p=0.364$, respectively). The prevalence of different depression levels was quite similar in the two pain groups, both in the overall sample as well as in the three subsamples (Table 6.6). The only significant association was found in the Israeli sample, which showed a positive association also

between somatization levels and pain duration, but findings that emerged from the Italian and Dutch samples were not supportive of such association (Table 6.7).

Table 6.1. Demographic features and mean pain duration of the overall sample and its constituent subsamples.

	Overall sample	Padova	Tel Aviv	Amsterdam
Size	1149	284	430	435
Female:male ratio	924:225 (4.1:1)	222:62 (3.6:1)	339:91 (3.7:1)	363:72 (5:1)
Mean age (±s.d.)	38.6±14.1	39.5±13.8	36.3±15.1	40.4±13
Pain duration (mths)	37.3±56.5	16.7±37.5	35.8±50.5	50.3±65.8
Pain > 6 mths (%)	74.5	58.3	74.7	83.5

Table 6.2. Percentage of patients with different ratings of pain-related disability (GCPS), depression (DEP) and somatization (SOM) levels.

	Ratings	Overall sample (N=1149)	Padova (N=284)	Tel Aviv (N=430)	Amsterdam (N=435)
GCPS	0	12.6	13.7	20.0	4.4
	1	31.7	43.3	25.8	30.0
	2	38.8	29.2	40.0	44.0
	3	11.2	8.8	10.9	13.0
	4	5.7	4.9	3.3	8.6
DEP	<i>Normal</i>	54.5	47.2	51.4	62.5
	<i>Moderate</i>	24.1	21.1	25.1	24.9
	<i>Severe</i>	21.4	31.7	23.5	12.6
SOM	<i>Normal</i>	43.5	28.2	38.1	59.0
	<i>Moderate</i>	27.9	29.5	26.7	28.0
	<i>Severe</i>	28.5	42.3	35.1	13.0

Table 6.3. Percentage of patients with normal (0), moderate (1), or severe (2) depression within the different categories of pain-related impairment.

		SCL-DEP											
		Overall sample (N=1149)			Padova (N=284)			Tel Aviv (N=430)			Amsterdam (N=435)		
		0	1	2	0	1	2	0	1	2	0	1	2
GCPS	0	65.3	18.0	16.7	56.4	20.5	23.1	69.8	15.1	15.1	63.1	26.4	10.5
	1	57.5	25.3	17.2	46.4	24.3	29.3	55.8	26.2	18.0	69.8	25.4	4.8
	2	57.7	24.0	18.3	49.4	18.1	32.5	50.0	30.2	19.8	68.5	20.8	10.7
	3	38.6	27.5	33.9	44.0	24.0	32.0	21.3	27.6	51.1	50.9	29.1	20.0
	4	23.1	23.1	53.8	21.4	7.2	71.4	21.4	7.2	71.4	24.3	35.1	40.6
Sig. (correlation)		<0.001			0.063			<0.001			<0.001		

Table 6.4. Percentage of patients with normal (0), moderate (1), or severe (2) somatization within the different categories of pain-related impairment.

		SCL-SOM											
		Overall sample (N=1149)			Padova (N=284)			Tel Aviv (N=430)			Amsterdam (N=435)		
		0	1	2	0	1	2	0	1	2	0	1	2
GCPS	0	54.2	30.5	15.3	30.8	51.3	17.9	59.3	24.4	16.3	79.0	15.8	5.2
	1	52.1	26.9	21.0	32.5	30.9	36.6	48.6	30.7	20.7	74.0	19.7	6.3
	2	42.0	27.3	30.7	27.7	25.3	47.0	29.6	25.6	44.8	59.6	29.8	10.6
	3	22.6	29.8	47.6	12.0	12.0	76.0	12.8	27.6	59.6	35.7	39.3	25.0
	4	23.1	29.2	47.7	14.3	14.3	71.4	14.3	21.4	64.3	29.8	37.8	32.4
Sig. (correlation)		<0.001			<0.001			<0.001			<0.001		

Table 6.5. Association between pain-related impairment and pain duration.

		Overall sample (N=1149)		Padova (N=284)		Tel Aviv (N=430)		Amsterdam (N=435)	
		Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)
GCPS	0	17.2	3.7	16.0	8.5	28.4	3.3	4.6	2.0
	1	40.2	30.9	53.0	41.4	24.7	29.7	40.0	27.5
	2	32.1	44.4	25.0	32.1	34.6	48.1	40.0	46.7
	3	7.7	13.7	4.0	13.6	12.3	14.3	7.7	14.6
	4	2.8	7.3	2.0	7.1	0	4.6	7.7	9.1
Sig. (chi-square)		<0.001		.018		<0.001		.133	

Table 6.6. Association between depression levels and pain duration.

		Overall sample (N=1149)		Padova (N=284)		Tel Aviv (N=430)		Amsterdam (N=435)	
		Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)
SCL-DEP	0	55.0	52.3	50.0	44.3	53.0	42.3	65.1	62.5
	1	23.1	25.1	21.0	20.7	24.7	28.8	24.2	24.2
	2	21.9	22.6	29.0	35.0	22.3	28.9	10.7	13.3
Sig. (chi-square)		.742		.590		.230		.834	

Table 6.7. Association between somatization levels and pain duration.

		Overall sample (N=1149)		Padova (N=284)		Tel Aviv (N=430)		Amsterdam (N=435)	
		Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)	Pain ≤ 6 mths (%)	Pain > 6 mths (%)
SCL-SOM	0	47.4	42.2	33.0	26.4	50.6	28.0	64.7	58.3
	1	25.3	28.1	28.0	29.3	21.0	28.0	26.5	27.6
	2	27.3	29.7	39.0	44.3	28.4	44.0	8.8	14.1
Sig. (chi-square)		.364		.526		<0.001		.448	

Discussion

Since the time of early suggestions of an association between TMD symptoms and a number of psychological factors¹⁹, a growing interest was put in the study of such aspects, to the point that demonstrations of the social impact of pain in terms of quality of life, disability in daily activities, among others, led to the adoption of classification systems based on a multi-axial assessment of both the physical and psychosocial impairment^{10,20}. The term “psychosocial” was mostly used to describe all those psychological (e.g., stress, anxiety and mood disturbances, temperamental traits, and emotions) and social (e.g., workplace satisfaction, marital status, cultural and economic conditions, social behaviors, and expectations) factors that may affect an individual’s health²¹. Over the years, evidence grew that the psychosocial aspects of TMD assessment are important for predicting treatment outcome^{5,6,22,23}, thus lending support to the need for a thorough psychosocial assessment of TMD patients.

At present, the instruments included in the RDC/TMD axis II represent the standard of reference on this issue^{11,24}. Notwithstanding, the amount of data on the prevalence of the levels of pain-related impairment, depression, and somatization, as diagnosed with the RDC/TMD axis II instruments, was limited, with few published works^{4, 25-30}. Thus, the present multicenter investigation, involving three highly-specialized centers for the treatment of TMD and orofacial pain and researchers who took part in several past studies adopting the RDC/TMD, was an attempt to collect and discuss as many data as possible on the RDC/TMD axis II version 1.0.¹⁰

The prevalence of depression and somatization was 45.6% and 56.4%, respectively, with 21.4% showing severe depression and 28.5% severe somatization. Some differences emerged between the three subsamples. Patients attending the Amsterdam clinic endorsed the lowest prevalence of depression and somatization, while patients recruited at Padova showed the highest prevalence for both disorders, with less than one-third scoring normal values on the SOM scale and less than half on the DEP scale. The Israeli patients were in the mid-range. Such findings are in line with data recorded in previously recruited samples^{4,29,30,31}, thus suggesting that the enlargement of the samples did not provide changes with respect to results published by the three research groups on smaller-size

samples. The findings are hard to compare with those from the literature due to the non-homogeneous inclusion criteria adopted in the different studies. Notwithstanding, it seems that the prevalence of depression in the present investigation was quite similar to that reported in other studies, which ranged from about 39-44%²⁶⁻²⁷ to about 50-65%^{32,33}. Also the prevalence of somatization was in line with literature findings, showing a 45%²⁶ to 66%²⁷ prevalence, with peaks of 85% in a biracial population of young women³³.

High disability pain-related impairment, as diagnosed with the GCPS, was recorded in 16.9% of the overall sample. Again, some differences between groups were described, with the Dutch sample showing significantly higher levels of pain-related impairment with respect to the other two centers. Quite surprisingly, little information is available in the TMD literature on this issue. Early studies using the GCPS, replicated on totally independent samples in large population-based studies several years apart, indicated that of those reporting chronic TMD pain, about 35-40% are grade I, 35-40% are grade II, 15-18% are grade III, 3-6% are grade IV¹⁶, and some more recent papers reported a 3-8% prevalence of high intensity, severely limiting pain³⁴⁻³⁶. All those findings are in line with results from the present multicenter investigation. In consideration of that, the view can be supported that only a small portion of TMD patients developed disabling pain with negative influences on their daily activities, and that only about 3-8% of them felt severely limited by the presence of pain.

Despite the amount of available information on the psychosocial aspects of TMD pain, very few information was published on the relationship of depression and somatization levels with pain-related impairment. The datasets of patients on which the axis II instruments were tested provided hierarchical results, with positive relationship between the three main instruments (GCPS, DEP, and SOM), viz., patients with the highest pain-related disability were those with the highest levels of depression and somatization¹¹. Nonetheless, a recent paper supported only in part the view that all components of the integrated axis II assessment are related with each other, showing that GCPS scores had a strong relationship with somatization but are only weakly related with depression levels³¹. The authors of this paper suggested that studies on more representative samples were needed to increase the external validity of their findings, which were limited to patients

with long-lasting pain recruited at a single TMD center. The attempt to get deeper into this issue was among the main purposes of the present multicenter study. Findings on the overall sample suggested that both DEP and SOM scores have a significant relationship with GCPS ratings, thus supporting the early view that the three main components of the RDC/TMD axis II are related with each other¹¹. Some minor differences emerged between the three university samples (e.g., the relationship between DEP and GCPS scores in Padova patients was weak; the percentage of patients with severe depression in the subgroup of GCPS grade IV was lower in the Dutch than in the other two samples), but it seems that the external validity of the RDC/TMD axis II as a well-integrated instrument for a thorough psychosocial assessment of TMD patients can be supported. Thus, findings from the present investigation allow rejecting the null hypothesis that no correlation existed between pain-related impairment and depression/somatization levels.

Interesting findings emerged for the association between psychosocial factors and pain duration. A common suggestion in the musculoskeletal pain literature as well as in the TMD literature is that chronic pain patients are more disabled in their activities and more impaired from a psychosocial viewpoint than subjects with non-chronic pain³⁷⁻⁴⁰. The present multicenter study supported the existence of differences between patients with long-lasting pain, viz., more than six months, and those with pain lasting for less than six months, thus allowing to reject the null hypothesis that no differences existed between pain groups for the prevalence of pain-related degrees of impairment. These differences were related to the pain-related impairment; not to the presence of increased depression and somatization scores, so that the null hypothesis of no differences between pain groups for the prevalence of SOM/DEP levels could not be rejected. GCPS scores were significantly higher in the group of patients complaining of long-lasting pain in all samples, with the exception of the Dutch one, but increased scores in DEP and SOM scales were detected only in the Israeli sample as for the somatization scale. The fact that this investigation did not fully support the suggestion of a “chronic” pain-psychosocial factors association may be explained with the differences in referral habits between the three centers and with the “chronic” pain definition with respect to other studies in the literature. Also, the existence of cultural differences which may influence the cognitive aspects related with the pain

experience cannot be excluded. It appears that much more research is needed to achieve a comprehensible definition of chronic pain. The temporal criterion, viz., pain lasting from more than three or six months, which was used in the present investigation as well as in many others, is likely to be the most suitable selection criterion for large-scale studies, but it is not the most accurate definition. In view of this consideration, future researches are strongly recommended to reconsider the very definition of chronic pain to include features of chronic pain quality (i.e. persistency, intensity, fluctuation) and states (i.e. emotional distress, disabling effects), as also suggested by Palla⁴¹. A better qualitative description of chronic pain may also allow increasing the external validity of literature studies, thanks to the reduction of potential bias, such as for example treatment seeking behaviour, which is inherently related with the individual qualitative perception of pain and is poorly controlled with the adoption of a simple pain duration criterion to select studies' populations. Such definition would be very useful in the clinical setting, and could help researchers getting a deeper insight into different aspects of the pain experience.

The present multicenter investigation, along with its intrinsic strengths, such as the largest sample size ever recruited so far for an axis II study and the involvement of three centers specialized in the treatment of TMD and orofacial pain to increase the external validity of the findings, has some potential shortcomings, the first of which being represented by the different target population of the three clinics. Despite being all highly-specialized tertiary clinics, the three university centers are a TMD clinic within a maxillofacial surgery department (Padova), a specialized orofacial pain unit (Tel Aviv), and a TMD/orofacial pain clinic that also specializes in dental sleep disorders and tooth wear (Amsterdam). So, it cannot be excluded that the pathway for patient referral to such clinics may be different, as may be suggested by the significant differences in the prevalence of patients with long-lasting pain as well as in the mean age between the three samples. Also, it cannot be excluded that some cultural, racial, social, or economic factors underlie the differences in the depression and somatization levels between samples recruited at the three centers. To avoid this, future community studies on the prevalence of such psychosocial disorders are highly recommended to adjust findings on TMD populations. Besides, some statistical considerations on the sample size should be done, since the choice to enlarge the

overall sample up to more than one thousands subjects, which was needed to increase representativeness of the sample and to increase the number of subjects in the low prevalence cells, may have increased the risk for type-I error, viz., detection of statistical, not clinical, significance.

In view of these considerations, findings from the present investigation and their potential clinical usefulness need to be confirmed with future studies, with special attention on the complexity of pain experience for a better definition of chronic pain. In any case, it can be suggested that the instruments adopted in the RDC/TMD axis II version 1.0 correlate with each other and, especially the GCPS rating, might be indicators of the pain experience to be included for screening of TMD pain patients.

Conclusions

In a sample of 1149 TMD patients, recruited at three tertiary centers (Padova, Tel Aviv, Amsterdam), a severely limiting pain-related impairment (GCPS grade IV) was detected in 5.7% of the study population, thus suggesting that the portion of TMD patients developing high disability is limited. Severe depression and somatization were shown in 21.4% and 28.5% of the overall sample, respectively, with some differences between the clinics, the reasons of which are likely to be found in socio-cultural factors to be addressed with future studies. The relationship between depression and somatization levels with the rate of pain-related disability seems to be strong, thus suggesting the good internal construct of the RDC/TMD axis II assessment, with all components related with each other. Interestingly, differences between patients with pain from more or less than six months are limited to the levels of pain-related impairment (GCPS scores), while no differences emerged as for depression and somatization levels. Therefore, a need to redefine research criteria for chronic pain, taking into account also qualitative criteria and not only the duration criteria, are recommended to get deeper into this issue. The clinical implications of the present findings are to be addressed with outcome studies assessing the psychosocial component as well as the physical component of TMD pain.

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