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Comorbid conditions associated with Painful Temporomandibular Disorders in adolescents from Brazil, Canada, and France

Comorbidities associated with adolescent TMD

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ABSTRACT

Background: Painful Temporomandibular Disorders (TMD) are common among adolescents. Presence of painful comorbidities may worsen painful TMD and impact treatment effectiveness.

Objective: The aim of this study was to assess the association between painful and non-painful comorbidities with painful TMD among adolescents.

Methodology: In this cross-sectional study, adolescents were recruited from various schools in Montreal (Canada), Nice (France), and Arceburgo (Brazil). Reliable screening instruments previously used by experts were used to asess TMD and a previously used research-based questionnaire was used to assess painful comorbidities. Multivariable logistic and linear regression analyses were conducted assessing the association between painful and non-painful comorbidities with painful TMD.

Results: The prevalence of self-reported painful TMD within is estimated at 32.73%; Arceburgo (37.0%), Montreal (23.4%) and Nice (31.8%). Girls were more likely to present painful TMD than boys (74.6%), regardless of their city: Arceburgo (79.1%), Nice (68.4%), or Montreal (71.8%). Painful TMD was associated with higher number of comorbidities than those without (OR = 1.79, 95%CI: 1.64-1.95); Arceburgo (OR = 1.90, 95%CI: 1.68-2.16), Montreal (OR = 1.79, 95%CI: 1.41-2.78) and Nice (OR = 1.71, 95%CI: 1.48-1.99). A stronger association was found with headaches and a weaker one with stomach pain. Allergy was also related to painful TMD (OR = 1.54, 95%CI: 1.20-1.91).

Conclusion: Painful and non-painful comorbidities increase the likelihood of painful TMD, regardless of age, gender and characteristics of the study sample; our findings show that this occurs in a dose-responsive manner.

Keywords: Temporomandibular joint disorders; pain; orofacial pain; comorbidities; adolescents; Epidemiology

INTRODUCTION

Temporomandibular Disorders (TMDs) are common among adults and adolescents. The prevalence of TMD among adolescents ranges from 4% to 35%: Sweden (4.2%[1], 5.1%[2], 7%[3]), USA[4, 5] Norway (7%),[6] Germany (13.9%),[7] China (14.8%[2] to 14.9%[7]), Brazil (25.2%[8] to 34.9%[9]).

It has been demonstrated that adolescents with painful TMD often report painful comorbid conditions.[3, 10-14] Comorbidity is defined as a "concurrent existence and occurrence of two or more medically diagnosed diseases in the same individual" [15]. Headache, neck, back, limb, and abdominal pain are common among adolescents with painful TMD. Prospective studies have demonstrated that mental illness comorbidities predict the onset of pain and vice versa. Prospective cohort TMD studies also found the increased risk of TMD among adults[16] and adolescents.[17] This increased risk is not specific to the onset of TMD, as it also contributes to the persistence.[18,19] Comorbidities may explain why 50% of those seeking care for TMD pain still report pain five years later and 20% experience long-term disability.[20, 21]

Therefore, to account for sociodemographic variations, we performed this cross-sectional study in different cities to assess if painful and non-painful comorbidities increases the likelihood of painful TMD in comparison to those without. Thus, we evaluated if this association was modified by sex and cities from different countries: Ascerburgo (Brazil), Montreal (Canada) and Nice (France).

METHODS

Study design and study population

Ethics approval was granted by the Jewish General Hospital Research Ethics Committee and the English school board from Montreal (Canada), the CHUN (*Centre hospitalier universitaire de Nice)* Delegation of Clinical Research and Innovation and the rectorate of the Nice Academy (France), and the *Comitê de Ética e Pesquisa do Centro de Pós-Graduação São Leopoldo Mandic Campinas-SP/Brasil (Brasil).*

This cross-sectional study recruited adolescents attending public and private schools in the city of Montreal (Quebec, Canada), Nice (France) and Arceburgo (Brazil). The methodology for data collection varied slightly between countries due to feasibility constraints and in accordance with local ethics board approvals.

In both Montreal and Nice, two researchers were responsible for visiting randomly selected schools within the city. Thirteen schools from the English Montreal School Board were approached, and two provided approvals from their principal. Classrooms from these approved schools were randomly selected based on the age of students in the class. Nine classrooms with students aged 14 to 17 participated in this study. In Montreal, the study was explained to 350 students and offering voluntary participation. Three hundred twelve (89%) children accepted to participate. In Nice, seven schools were approached, and six accepeted. All classrooms with students aged 14 to 16 were selected to participate in this study. Students from the selected class were given a letter to hand over to their parents or legal guardians. The letter contained two parts: (i) a general presentation of the research aims and TMD; and (ii) an informed consent form to authorize the adolescent's participation in the study. The informed

consent form needed to be signed by parents or legal guardians and the adolescent. Of the 1864 invited adolescents, 597 (32.3%) of the children (and their family) receiving both the information document and questionnaire accepted to participate in this study.

In Arceburgo, a letter and consent form were sent to parents or guardians of 1571 adolescents (12 to 18 years old) identified by the data health system, inviting them to participate in the study. An agent from the Community Health Agency (ACS) then visited the potential participant's home. The rationale for this method is that dentists from the ACS already perform monthly home visits, making it both feasible and preferable to recruit the adolescents privately within their home instead of at school. From the 1571 adolescents invited, 805 (51.5%) accepted to participate.The exclusion criteria for all locations was the refusal to participate in this study and falling outside of the age brackets previously indicated.

Assessment

Temporomandibular Disorders screening

For painful TMD screening, the presence of self-reported TMD symptoms was established using the following two questions: (i) *Do you have pain in the temple, face, jaw joint or jaws once a week or more often*? (ii) *Do you have pain when you open your mouth wide or chew once a week or more often*? If participants answered "*yes*" to one or both questions, they were included in the painful TMD group. If participants answered "*no*" to both questions, they were included in the control group. Sensitivity and specificity of these questions were 0.98 (95% CI 0.90-1.0) and 0.90 (95% CI 0.81 - 0.95), [22, 23] respectively. The test-retest reliability of these questions was 0.83 (Kappa).

We performed a forward-backward translation of this questionnaire in Portuguese and French. The first step was to translate these two questions by the corresponding author (AV) whose native language is Portuguese and is fluent in English and French. A back-translation method was used to confirm the equivalence between the original English version to the translate Portuguese and French forms. Consequently, other bilingual individuals with native Portuguese or French languages conducted a reverse translation. Once these translations were accomplished, the original English version was compared with the back-translated Portuguese and French versions. Some minor modifications were make if necessary. The preliminary French and Portuguese versions were then submitted for pilot-testing. The participants were asked to complete the scale and express their opining on how easy/difficult it would be for Portuguese and French students to understand. Some modifications to wording were performed and the translation versions were checked another time. No more modifications were made after that. The French and Portuguese Cronbach's alpha were acceptable: 0.73 and 0.65, respectively.

Comorbid complaints

Each question, prepared by Nilsson et al. 2013,[10] assessed headache, neck and back pain, and was scored on a five-point scale: never, one to three times a month, once a week, several times a week, and daily. We also performed a forward-backward translation of this form in Portuguese and French. The French and Portuguese Cronbach's alpha were acceptable: 0.69 and 0.67, respectively.

To measure non-painful comorbidities we asked our participants about presence of allergies and asthma, evaluated with a yes or no response. If students answered “yes” to these questions, presence of non-painful comorbidities was registered. The French and Portuguese Cronbach's alpha were acceptable (α = 0.68, 0.65, respectively).

Analgesic consumption

This was recorded with a six-point rating scale and used to measure frequency of pain medication: (i) daily, (ii) three to four times a week, (iii) one to two times a week, (iv) every month, (v) almost never, or (vi) never. [3]

School absences

We assessed student absenteeism from school due to painful TMD by asking how many days in the last month he or she was home from school because of pain in the temples, face, jaws or jaw joints. [22]

Statistical analysis

Descriptive statistics were performed to determine the proportion of painful TMD. Chi-square and Student's t-test were used to test statistical differences between adolescents with and witout painful TMD. Univariate and multivariate unconditional logistic regression analyses were used to assess the odds ratio (OR), and their 95% confidence intervals (CI) assessing the association between painful TMD and comorbidities. In these analyses painful TMD was the dependent variable and

comorbidities the independent variables. Additionaly, we perform linear regression analysis assessing the linear association between number of comorbidities (dependent variable) and painful TMD (independent variable). The multivariable logistic and linear models also included gender, age. In addition, these analyses were stratified by sex and cities. Finaly, we performed Spearman correlation analysis to assess the correlation between number of comorbidities and screening painful TMD questions, missing schools and analgesic use variables. All analyses were performed using the statistical software package SAS (version 9.3), with the significance level for type I error set at 0.05.

RESULTS

A total of 1714 adolescents were enrolled in this study; 805 (60.2% girls, 39.8% boys from Arceburgo, 312 (54.2% girls and 45.8% boys) from Montreal and 597 (59.3% girls and 40.7% boys) from Nice.

The prevalence of self-reported painful TMD within the whole study sample is estimated at 32.73% (n=561). Painful TMD was more common among study samples from Arceburgo (37.0%) than Montreal (23.4%, $P<0.0001$) and Nice (31.8%, $P=0.04$). A higher prevalence was also noted in Nice when compared to Montreal ($P=0.008$). Girls were more likely to present painful TMD than boys (74.6%), regardless of their city: Arceburgo (79.1%), Nice (68.4%), or Montreal (71.8%). The mean age of participants with painful TMD was 15.30 (SD = 1.48 yrs) and 15.1(SD = 1.35 yrs) for those without. These mean estimates were similar across cities ($P \geq 0.12$).

Having pain in the temple, face or jaw once a week or more was more common among adolescents with painful TMD (n = 497, 88.75%) than pain when opening (n = 299, 53.49%, P<0.0001). These higher percentages of pain in the temple, face, jaw joint and jaw once a week or more often were similar in all three cities, Arceburgo, Nice and Montreal: 275 (92.6%), 58 (79.5%), and 165 (86.4%). Pain when opening was also common, but less frequent: 140 (47.3%), 38 (52.1%), 121 (63.4%).

One in five adolescents with painful TMD reported missing school because of their pain; 108 (19.39%) reported missing fewer than seven days, and five (0.90%) reported missing seven or more days. The proportion of students who missed school was higher in Arceburgo (26.01%, P=0.001) than in Montreal (11.27%) and Nice (12.11%). Seventy-six (13.60%, 76/559) adolescents with painful TMD were more likely to use analgesics at least one to two times per month than those without.

Painful TMD participants were more likely to present a higher number of comorbidities than those without (OR = 1.79, 95%CI: 1.64-1.95), regardless of their age and sex. This higher odds among painful TMD participants was similar in the three sample cities: Arceburgo (OR = 1.90, 95%CI: 1.68-2.16), Montreal (OR = 1.79, 95%CI: 1.41-2.78) and Nice (OR = 1.71, 95%CI: 1.48-1.99). Furthemore, moderate to strong ORs were found when comparing adolescents with one, two, three, and four painful comorbidities to those without (Table 1). A linear association was found in Arceburgo (β =1.22, P<0.0001), Nice (β = 0.92, P<0.0001) and Montreal (β = 0.92, P<0.0001). Similar results were noted with inclusion of non-painful comorbidities (results not presented).

Looking at specific comorbidities, Table 2 shows that headaches, neck pain, back pain, stomach pain and allergies were associated with painful TMD. A stronger association was found with headaches and a weaker one with stomach pain.

This strong association between headaches and painful TMD was also noted among females (Table 3). Among males, stronger likelihoods were noted with both headaches and neck pain. Likelihood of painful TMD among those reporting stomach pain was specific to females.

Table 4 shows the ORs for each city. Headaches once a week or more was associated with painful TMD in all cities. Neck pain was related to painful TMD among Arceburgo and Nice samples, and back pain among samples from Arceburgo and Montreal. A significant association between stomach pain and painful TMD was only found in Arceburgo.

Number of comorbidities was moderately correlated with missing schools ($n = 0.40$, $P<.0001$), but not with the study sample where data was collected ($r = -0.03$, $P = 0.21$). Strong correlations were found between the number of comorbidities and either screening: “Having pain in the temple, face or jaw once a week” ($r = 0.89$, $P < 0.0001$) and “pain when opening” ($r = 0.84$, $P < 0.0001$).

Discussion

This cross-sectional study confirms the results of several previous studies, with some new additions, including the stronger association association of allergies with paiful TMD. Adding to the growing evidence in the literature, we confirm that adolescents with a greater number of comorbidities were more likely to present painful

TMD than those without. We also found that the ORs of presenting with painful TMD strengthen with increasing numbers of comorbidities (Table 1) suggesting a dose-response phenomenon.

Closer examination of specific painful comorbidities revealed additional corroboration of previous findings wherein adolescents with headaches have a greater ikelihood to present painful TMD, regardless of the other comorbidities.[10-13, 24] The magnitude of the OR estimated in the current study (OR = 4.10, Table 2) is close to that found by Franco *et al*. (OR=4.94),[12] and smaller than that presented by Nilsson *et al*. (OR = 6.59),[10] suggesting that the association in our study is not overestimated. These increased odds are also found among adults with painful TMD.[25]

Our study and Nilsson *et al*.[10] also found that frequent neck and back pain are related to painful TMD. The magnitude of the association for both comorbidities (OR = 2.10 and 1.55, Table 2) were again lower than that found by Nilsson *et al*. [10] (OR for neck pain= 4.0, OR for back pain = 2.6))[10] suggesting that our results are not overstimated.

Nilsson *et al*. found that the positive association between stomach pain and painful TMD did not remain in the multivariable model adjusted by other painful and psychological comorbidities.[10] We also found that this association was not modified by the presence of other comorbidities since the magnitude of the association almost did not change, but it was modified by sex (Table 2); it remained only among girls (Table 3). This association specifically among girls was also found by LeResche *et al*..[5]

As previously mentioned, another interesting finding from our study was that allergies were associated with painful TMD (Table 2) in both male and female adolescents (Table 3).

It is intriguing to find, however, that the associations were not consistent across the different cities. In Arceburgo, Montreal and Nice, painful TMD participants presented a greater likelihood for headaches (Table 4), however, a significant association between neck pain and painful TMD was noted only in Arceburgo and Nice. A positive association between back pain and painful TMD was found in Arceburgo and Montreal. One possible reason for this variation may be the smaller sample size from Montreal; thus weakening the statistical power. This variation could also potentially be related to differing habits in different countries, modifying the odds to present painful TMD.

Moreover, this study confirms previous findings wherein self-reported painful TMD was common among adolescents, regardless of their city. Additionally, this study replicated previous studies that found an increased likelihood of painful TMD among females in comparison to males.[6] This may be related to neuropsychological and physiological factors.[17]

Limitations of this study should be noted. First, the relationship between painful TMD and comorbidities may be biased by confounding variables not assessed (e.g. psycholological variables). Secondly, due to the study design, we could not establish whether comorbidity increased the risk for the painful TMD, or vice-versa. Third, a misclassification on the self-report of comorbidity and painful TMD may be considered. However, it is important to note that data from the questionnaire may serve as a valid tool to assess comorbidities in schoolchildren.[26] In addition, Graue et al. [6] noted that the

the estimated prevalence of painful TMD was lower when using self-reported screening questionnairess than when using DC/TMD criteria, suggesting that use of self-reported questionnaires may provide a conservative estimate of painful TMD prevalence. As such, the results of our study may be underestimating both the prevalence of and the association between comorbidities and painful TMD. Fourth, our study heavily relied on the cooperation of schools to recruit adolescent participants. Unfortunately, some schools, particularly in Montreal, had other ongoing research projects or could not accommodate our request due to examination schedules and various other reasons. This resulted in a smaller sample size in Montreal, which may decrease the external validity.

Strengths of this study include the use of a reliable and validated screening tool to detect painful TMD which helps to reduce misclassification bias.[1] We also used questionnaire to assess painful comorbidities as it was used by other experts in the field.[10] In addition, a sample including three different cities enhances the external validity of our study and helps to account for cross-cultural factors that may exist.

In summary, we have demonstrated that presence of both painful and non-painful comorbidities increases the likelihood of painful TMD, regardless of age, gender and characteristics of the study sample; our findings show that this occurs in a dose-responsive manner. Our results add to the growing evidence that self-reported painful TMD is common among adolescents, particularly females. Findings from this study and others provide important knowledge to healthcare professionals as they denote the necessity of properly identifying any comorbidities in painful TMD patients in order to provide proper therapy, as well as the commonality of painful TMD among adolescents.

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Tables

Table 1. Logistic regression analyses assessing the association between number of comorbidities and painful TMD

Number of painful comorbidities	All sample n = 1709		Girls n = 1005		Boys n = 704	
	OR	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
1 vs 0	5.87*	2.57-13.39	6.92*	2.34-20.45	3.89*	1.04-14.40
2 vs 0	12.41*	5.66-27.22	11.33*	4.00-32.09	13.67*	4.11-45.46
3 vs 0	17.86*	8.18-38.99	15.35*	5.46-43.12	22.44*	6.80-74.42
4 vs 0	30.17*	13.82-65.86	26.11*	9.32-73.19	38.56*	11.57-128.52

Note: Multivariable model adjusted by age and gender. * P<0.05, multiple comparisons demonstrates each group (1, 2, 3, 4) of painful comorbidities was significantly different from all others (P<0.01). Missing data ≤ 0.002.

Table 2. Logistic regression analyses assessing the association between each comorbidity and painful TMD						
Comorbidities & demographics	**Category**	**Controls/ cases**	**Crude n = 1709**		**Multivariable n = 1689**	
			OR	**95%CI**	**OR**	**95%CI**
Headaches	No	348/28	1	reference	1	reference
	≥ once a week	801/533	6.64*	5.29-8.32	4.09*	3.19-5.24
Neck pain	No	774/215	1	reference	1	reference
	≥ once a week	371/336	4.10*	3.15-5.34	2.06*	1.51-2.82
Back pain	No	538/118	1	reference	1	reference
	≥ once a week	609/435	3.19*	2.57-3.96	1.55*	1.19-2.01
Stomach pain	No	656/178	1	reference	1	reference
	≥ once a week	493/378	2.86*	2.22-3.67	1.39*	1.03-1.86
Asthma	No	1063/511	1	reference	1	reference
	Yes	90/50	1.16	0.81-1.66	1.15	0.75-1.76
Allergies	No	769/310	1	reference	1	reference
	Yes	384/251	1.62*	1.32-1.99	1.62*	1.27-2.06
Sex	Boys	567/142	1	reference	1	reference
	Girls	598/417	2.78*	2.23-3.48	1.95*	1.52-2.51
Age	Mean	15.19/15.30	1.06	0.98-1.34	1.02	0.94-1.11
Note: * P<0.05, missing data ≤ 0.015						

Table 3. Multivariable logistic regression analyses assessing the association between comorbidities and painful TMD across sex

Comorbidities	**Category**	**Girls n = 1005**		**Boys n = 704**	
		OR	**95%CI**	**OR**	**95%CI**
Headaches	No	1	reference	1	reference
	≥ once a week	4.34*	3.24-5.81	3.45*	2.13-5.58
Neck pain	No	1	reference	1	reference
	≥ once a week	1.79*	1.23-2.61	2.85*	1.62-4.99
Back pain	No	1	reference	1	reference
	≥ once a week	1.45*	1.06-1.99	1.78*	1.11-2.87
Stomach pain	No	1	reference	1	reference
	≥ once a week	1.50*	1.06-2.13	1.17	0.66-2.05
Asthma	No	1	reference	1	reference
	Yes	0.94	0.55-1.61	0.76	0.37-1.57
Allergies	No	1	reference	1	reference
	Yes	1.53*	1.14-2.06	1.86*	1.23-2.81

Note: * P<0.05, missing data ≤ 0.002.

Table 4. Multivariable logistic regression analyses assessing the association between comorbidities and painful TMD across cities

Comorbidities	Category	Arceburgo n = 803		Montreal n = 308		Nice n = 597	
		OR	95%CI	OR	95%CI	OR	95%CI
Headaches	No	1	reference	1	reference	1	reference
	≥ once a week	5.79*	3.99-8.40	2.88*	1.47-5.65	3.29*	2.17-4.98
Neck pain	No	1	reference	1	reference	1	reference
	≥ once a week	2.31*	1.39-3.83	1.75	0.82-3.74	2.47*	1.49-4.08
Back pain	No	1	reference	1	reference	1	reference
	≥ once a week	1.79*	1.20-3.18	2.00*	1.00-4.06	1.15	0.75-1.77
Stomach pain	No	1	reference	1	reference	1	reference
	≥ once a week	2.02*	1.29-3.18	1.19	0.58-2.45	1.17	0.69-1.97
Asthma	No	1	reference	1	reference	1	reference
	Yes	1.79	0.78-4.12	1.59	0.78-1.42	1.29	0.66-2.52
Allergies	No	1	reference	1	reference	1	reference
	Yes	1.20	0.85-1.69	1.69	0.87-3.43	1.23	0.79-1.87

Note: * P<0.05, Missing data ≤ 0.01.

Table Legends

Table 1. Logistic regression analyses assessing the association between number of comorbidities and painful TMD

Table 2. Logistic regression analyses assessing the association between each comorbidity and painful TMD

Table 3. Multivariable logistic regression analyses assessing the association between comorbidities and painful TMD across sex

Table 4. Multivariable logistic regression analyses assessing the association between comorbidities and painful TMD across cities

Appendix

Table A1. Association between Comorbidities and painful TMD						
Comorbidities	**Category**	**Controls/cases**	**Crude**		**Multivariable**	
			OR	**95%CI**	**OR**	**95%CI**
Headaches	No	348/28	1	reference	1	Reference
	Yes	801/533	8.27	5.54-12.34	4.15	2.72-6.34
Neck pain	No	774/215	1	reference	1	Reference
	Yes	371/336	3.26	2.64-4.03	2.00	1.58-2.54
Back pain	No	538/118	1	reference	1	Reference
	Yes	609/435	3.26	2.58-4.12	1.57	1.20-2.06
Stomach pain	No	656/178	1	reference		
	Yes	493/378	2.83	2.28-3.50	1.41	1.11-1.80
Asthma	No	1063/511	1	reference	1	Reference
	Yes	90/50	1.16	0.81-1.66	1.11	0.74-1.66
Allergies	No	769/310	1	reference	1	Reference
	Yes	384/251	1.62	1.32-1.99	1.54	1.20-1.91
Sex	Male	567/142	1	reference	1	Reference
	Female	598/417	2.78	2.23-3.48	2.03	1.60-2.59
Age	Mean	15.19/15.30	1.06	0.98-1.34	1.03	0.95-1.21

Table A2. Association between Comorbidities and painful TMD						
Comorbidities	**Arceburgo n = 803**		**Montreal n = 308**		**Nice n = 597**	
	OR	95%CI	OR	95%CI	OR	95%CI
Headaches	1	reference	1	reference	1	Reference
	10.85	4.88-24.13	2.12	0.74-6.05	2.13	1.14-3.96
Neck pain	1	reference	1	reference	1	Reference
	1.80	1.26-2.58	1.57	0.81-3.03	2.91	1.96-4.34
Back pain	1	reference	1	reference	1	Reference
	1.36	0.93-1.99	2.86	1.27-6.43	1.84	1.13-2.98
Stomach pain	1	reference	1	reference	1	Reference
	2.30	1.60-3.38	1.19	0.57-2.48	1.00	0.67-1.49
Asthma	1	reference	1	reference	1	Reference
	1.79	0.78-4.12	1.59	0.78-1.42	1.29	0.66-2.52
Allergies	1	reference	1	reference	1	Reference
	1.20	0.85-1.69	1.69	0.87-3.43	1.23	0.79-1.87
Note: Multivariable logistic regression model adjusted by age and gender.						

Table A3. Logistic regression analyses assessing the association between number of comorbidities and painful TMD		
Number of comorbidities	**All sample n = 1709**	
	OR	**95%CI**
1 vs 0	6.84*	2.03-23.0
2 vs 0	17.87*	5.55-57.54
3 vs 0	28.58*	8.95-91.31
4 vs 0	39.32*	12.32-125.452
5 vs 0	74.91*	22.28-238.55
Note: Multivariable model adjusted by age and gender. * P<0.05, multiple comparisons demonstrates each group (1, 2, 3, 4) of painful comorbidities was significantly different from all others (P<0.01).		

Table A4. Logistic regression analyses assessing the association between number of comorbidities and painful TMD					
Number of painful comorbidities	**Number of comorbidities**				
	0	**1**	**2**	**3**	**4**
1	0.16*	-	2.27*	3.43*	6.0*
2	0.07*	0.44*	-	1.51*	2.65*
3	0.05*	0.29*	0.66*	-	1.75*
4	0.03*	0.17*	0.38*	0.57*	-
Note: Multivariable model adjusted by age and gender, * = P<0.02.					

Table A5. Logistic regression analyses assessing the association between number of comorbidities and painful TMD by city						
Number of comorbidities	**Arceburgo n = 803**		**Montreal n = 308**		**Nice n = 597**	
	OR	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
1 vs 0	11.07*	2.55-48.06	0.94	0.12-7.15	5.43*	1.50-19.62
2 vs 0	29.77*	7.10-124.87	3.63	0.76-17.43	8.36*	2.48-28.21
3 vs 0	43.68*	10.43-182.83	4.38	0.93-20.59	12.94*	3.88-43.08
4 vs 0	77.97*	18.48-328.98	9.25*	2.08-41.06	24.03*	7.19-80.34
Note: Multivariable model adjusted by age and gender. * P<0.05, multiple comparisons demonstrates each group (1, 2, 3, 4) of painful comorbidities was significantly different from all others in Nice and Arceburgo (P<0.01).						