Clinical, Psychological and Comorbid Characteristics in Patients with Acute and Chronic Painful Temporomandibular Disorders: A Baseline Analysis of Acute to Chronic Transition Project

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DEDICATION

I would like to dedicate my thesis to my parents Dr. Moufak Sabsoob and Mrs. Nawal Kalam for their support, patience and love throughout my Masters' program

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LIST OF ABBREVIATIONS

TMD	Temporomandibular Disorders
ACTION	Acute Chronic Transition
RDC/TMD	Research Diagnostic Criteria for Temporomandibular Disorders
DC/TMD	Diagnostic Criteria for Temporomandibular Disorders
M and F	Males and Females
B and G	Boys and Girls
(α)	Cronbach's
(ICC)	Intraclass Correlation Coefficient
(k)	Reliability
(AV)	Ana Velly
(MG)	Mervyn Gornitsky
(ZD)	Zovinar Der Khatchadourian
OS/SE/MA	Omar Sabsoob/Sherif Elsaraj/Mohamed Amhmed
JGH	Jewish General Hospital
OD	Oral Diagnosis
OFP	Orofacial Pain
BDI	Beck Depression Inventory
MPS	Median Particle Size
GCPS	Graded Chronic Pain Scale
CPI	Characteristic Pain Intensity
NRS	Numerical Rating Scale
VAS	Visual Analogue Scale
RCT	Randomized Controlled Trial

IASP	International Association for the Study of Pain
Sens / Spec	Sensitivity / Specificity
PHQ-8	Patients Health Questionnaire-8
GAD-7	Generalized Anxiety Disorders-7
OR and 95%CI	Odds Ratio and 95% Confidence Interval

ABSTRACT

Although most cases of Temporomandibular Disorders (TMD) are mild and self-limiting, about one third of these patients will continue to suffer from moderate to severe levels of pain, disability, psychological distress and lower quality of life, independent of the treatment received. Thus, it is crucial to prevent painful TMD from becoming chronic, which is more difficult to manage. However, as stated by the National Institutes of Health (NIH) "we do not fully understand how acute progresses to chronic pain at any level, from molecular to behavioral". Our systematic review is in agreement with this previous NIH statement. The aim of this cross-sectional analysis was to identify the clinical, psychological, and comorbid factors among acute and chronic painful TMD. One hundred and eleven participants were recruited for this study. TMD diagnosis was established according to the RDC/TMD or DC/TMD; 22 and 89 where classified as acute and chronic painful TMD respectively. Our results showed that participants with chronic painful TMD were more likely to report headache located behind the eyes or inside the head (Odds ratio [OR] = 4.14, $P = 0.02$), pain in the legs (OR= 9.05, $P = 0.04$) or neck (OR = 3.10, $P = 0.03$) than the acute cases. Participants presenting at least one painful comorbidity (OR = 3.35, $P = 0.02$), or those with more than one (OR = 1.49, 95%CI = 1.01-2.20, $P = 0.04$) were more likely to have chronic painful TMD. A borderline association was noted with worst pain intensity ($P = 0.09$). Psychological factors were not different between groups. Results indicate that headache and comorbidities should be considered as important risk factors implicated in the transition from acute to chronic painful TMD.

RÉSUMÉ

Malgré le fait que la plupart des cas de Dysfonction de l'Articulation Temporo-mandibulaire (DATM) restent tolérables, environ un tiers des patients atteints continuent de souffrir de douleurs intenses, d'infirmité, de détresse psychologique et d'une qualité de vie inférieure, indépendamment du traitement reçu. Il est donc important de prévenir la progression de cette maladie, car la DATM chronique douloureuse est un cas beaucoup plus difficile à gérer. Par contre, tel qu'il est énoncé par le National Institutes of Health (NIH), « nous ne comprenons pas entièrement comment la douleur aiguë devient chronique à tous les niveaux, du niveau moléculaire au niveau comportemental » et notre revue systématique est en accord avec celle-ci. Le but de cette analyse analyse transversale est d'identifier les facteurs cliniques et psychologiques, ainsi que la comorbidité parmi les cas de DATM douloureuses aiguës et chroniques. Cent-onze participants ont été recrutés pour l'étude. Le diagnostic de la DATM a été basé en fonction du RDC/TMD ou du DC/TMD; 22 et 89 ont été classés comme étant atteints de DATM aiguë et chronique respectivement. Nos résultats démontrent que les participants atteints de DATM chronique étaient plus susceptibles à déclarer des maux de tête situés derrière les yeux ou à l'intérieur la tête (Odds ratio [OR] = 4.14, $P = 0.02$), douleur dans les jambes (OR= 9.05, $P = 0.04$) ou dans le cou (OR = 3.10, $P = 0.03$) comparé aux cas de DATM aiguës. Les participants présentant au moins une comorbidité douloureuse (OR = 3.35, $P = 0.02$) ou plusieurs (OR = 1.49, 95%CI = 1.01-2.20, $P = 0.04$) étaient plus susceptibles à avoir un cas de DATM chronique douloureuse. Une association borderline a été notée avec la douleur la plus intense ($P= 0.09$). Les facteurs psychologiques n'ont pas différé entre les groupes. Les résultats indiquent que les maux de têtes et les comorbidités devraient être considérés comme étant des facteurs de risque importants dans la transition de la DATM aiguë à chronique.

PREFACE

This thesis has followed a manuscript based thesis style. As per McGill University standards, the manuscripts included in thesis should be logically-coherent and should have a unified theme. The manuscript in this thesis discusses a novel project on the factors differentiating acute and chronic painful temporomandibular disorders. Following a concise introduction of the topic in the first chapter, the second chapter provides previous and current knowledge in the field of painful temporomandibular disorders. Chapter three proposes the objectives of the study based on knowledge provided by the literature. Following a comprehensive discussion of the methodology in chapter four, manuscripts are presented in chapter five. Finally, the last chapter discusses the methodological considerations and conclusion of the study.

Multiple authors have contributed in the thesis' work; explicit appreciation of each author's contribution is mentioned in the following section.

CONTRIBUTION OF AUTHORS

Manuscripts:

1) Clinical and Psychological Characteristics in Patients with Acute and Chronic Painful Temporomandibular Disorders: A Systematic Review

2) Clinical, Psychological and Comorbid Characteristics in Patients with Acute and Chronic Painful Temporomandibular Disorders: A Baseline Analysis of Acute to Chronic Transition Project

Omar Sabsoob, BDS, M.Sc. Candidate: Contributed to the development of the project, carried out the statistical analysis, wrote the manuscripts, and recruited and followed-up with patients.

Mervyn Gornitsky, Professor Emeritus, McGill University, has clinical and research experience in orofacial pain and saliva studies and he supported this project by advising on the saliva analysis.

Richard Hovey, BEd, MA, PhD, Associate Professor in the Division of Oral Health and Society, Faculty of Dentistry, McGill University brings his expertise as a qualitative researcher investigating patient experiences living with chronic pain.

Zovinar der Khatchadourian, is a Faculty Lecturer at the Faculty of Dentistry at McGill University. She collaborated by performing the clinical examination of the patients.

Ana Miriam Velly, Associate professor, Faculty of Dentistry McGill University, Montreal, Quebec, Canada: She has a DDS degree, an MS in Neurological Sciences, a PhD degree in Epidemiology, as well as post-doctoral training from the Randomized Clinical Trial Unit in the

Dept. of Epidemiology at McGill University. She conceived this investigation, designed and supervised this study, carried out the statistical analysis, and contributed to manuscript writing.

1. CHAPTER 1. INTRODUCTION

Temporomandibular disorder (TMD) is a term used to describe a group of musculoskeletal conditions characterized by pain in the muscles of mastication and/or the temporomandibular joint (1). TMD is considered to be the second most common musculoskeletal disorder after chronic back pain (2). Patients with painful TMD symptoms typically experience pain in the face, jaw, temple, and/or ear, and maybe altered by jaw function. The most common signs include tenderness on palpation on the muscles of mastication, and limitation of the mandibular opening (3). The prevalence of painful TMD ranges from 5% to 12% (2, 4-6), and is more common in females than in males (7, 8).

Many studies have identified harmful factors implicated in the risk of chronic painful TMD, including oral behaviors (e.g. clenching only or clenching-grinding) (9-11), trauma (9, 10, 12, 13), psychological factors (e.g. depression, anxiety, somatization) (10, 12, 14-16) and comorbidities (10, 17, 18). In addition, some of these factors, such as psychological (9, 14, 19, 20) and comorbidities (9, 14, 19, 20) contribute to the persistence of painful TMD.

Treatment of TMD often varies among clinicians, ranging from appliances, occlusal therapy, physical medicine modalities, pharmacologic therapy, cognitive-behavioral and psychological therapy and temporomandibular joint surgery. The major goal of these treatments are to improve pain management by preventing these risk factors (e.g. oral behaviors, stress). However, about one third of these patients will continue to suffer from moderate to severe levels of pain, disability, psychological distress and lower quality of life, independent of the treatment received (12, 21-24). Thus, it is crucial to prevent painful TMD from becoming chronic, which is more difficult to manage.

However, as stated by the National Institutes of Health (NIH) “we do not fully understand how acute progresses to chronic pain at any level, from molecular to behavioral” (25). One possible reason for this uncertainty is that most studies have focused on assessing factors associated with chronic painful TMD including participants enduring pain for many years. Our systematic review is in agreement with this previous statement from the NIH. Our review only found eight articles that compare acute with chronic painful TMD, or that assessed the risk factors related to this transition. Multivariable logistic regression analyses demonstrated that muscle disorders and pain intensity contributed to the transition from acute to chronic pain. However, major weaknesses found in these studies preclude any definitive conclusion of the risk factors implicated in the transition from acute to chronic painful TMD.

Therefore, we initiated the Acute to Chronic TMD Transition (ACTION) project in 2014 with the overall goal to identify the risk factors in the transition from acute to chronic painful TMD, as well as its persistence.

This current cross-section study is the first step of this ACTION project. The aim of this cross-sectional analysis is to compare the baseline characteristics between acute and chronic painful TMD participants. More specifically, the primary aim is to identify the clinical, psychological, and comorbid factors among acute and chronic painful TMD.

2. CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

Temporomandibular Disorders (TMDs) are musculoskeletal conditions which affect the muscles of mastication and/or the temporomandibular joint (1). Approximately half to two-thirds of TMD patients will seek professional care from dentists or physicians, and about one third of these patients will continue to suffer from moderate to severe levels of pain, disability, psychological distress and lower quality of life, independent of the treatment received (12, 22, 26, 27).

This section provides an overview of the epidemiology of TMD, screening, diagnosis, comorbidities, and reviews the relationship between acute and chronic TMD.

2.2 Epidemiology of Temporomandibular Disorders

2.2.1 Prevalence of painful temporomandibular disorders

Prevalence measures the frequency of an existing event that occurs over a period of time (28, 29). There are three different types of prevalence: period prevalence, point prevalence and lifetime prevalence. Period prevalence represents the number of cases that have the disease or the condition within a population at any point during a specified period of time. Point prevalence is the status of the disease in a population at a point in time. Lifetime prevalence is a general term which measures the cumulative frequency of an outcome at any time during the individual's past (28, 29).

Table 2.2.1 summarizes studies that assessed the prevalence of TMD. An OPPERA cohort study done by Slade *et al*. (2011), recruited individuals from 4 US locations (The University of Maryland, The University of Buffalo, The University of North Carolina and The University of Florida) between 2007 and 2009. A total of 3,263 patients were enrolled by a telephone interview,

which were followed by a clinical examination using the RDC/TMD questionnaire. The highest prevalence of facial pain in the jaw muscles or the joint in front of the ear during the past 3 months was 7.1% for women aged 35-44, but was 3.5% for women aged 75 years or more. It was noted that the authors did not report the overall prevalence for the entire population (30).

A population-based survey in the US based on self-reported survey from the National Health Institute Survey (NHIS) estimated a prevalence of facial pain in the jaw muscles or the joint in front of the ear during the past 3 months equal to 4.6%. This population-based survey included 30,978 participants (56.5% females and 43.5% males) and females reported a higher prevalence of TMD pain (6.3%) compared to males (2.8%) (4).

When looking at females and facial pain, another survey recruited 19,586 women between 18 and 75 years old in the New York metropolitan area via telephone assessing the presence of current facial pain. The participation rate in this study was 60%, and the prevalence of pain in the face or in front of the jaw was 10.5% during the last 6 months. From the same survey, 782 recruited individuals received a clinical exam in accordance with the Research Diagnostic Criteria (RCD)/TMD criteria. The participation rate was 39% of which 11% reported pain in the jaw and face. In this study, the clinical examination did not completely coincide with the survey results (low sensitivity = 42.7%).

Von Korff *et al.,* via a telephone interview and self-administrated questionnaire recruited 1,016 individuals (80.3% response rate) from the Health Maintenance Organization in Seattle, USA. Females were more prominent in seeking treatment for painful TMD (58.4%) as compared to males (41.6%), most of the participants were between 25 and 44 years old. The prevalence of facial pain in the last 6 months was 12% (5).

Table 2.1.1. Prevalence of Painful Temporomandibular Disorders							
Authors, Year	**Study Design**	**Gender**	**Age**	**Sample Size**	**Prevalence (%)**	**Condition**	**Assessment**
Slade *et al.*, 2011	Cohort	M and F	18 - 44	3,263	5.1 (F, 18-24) 7.1 (F, 35-44) 3.5 (F, ≥75)	TMD pain	Telephone Interview/ Clinical Examination/ RDC/TMD
Isong *et al.*, 2008	Survey	M and F	≥ 18	30,987	4.6	TMD pain	TMJMD-type Pain Instrument
Janal *et al.*, 2008	Survey	F	18 - 75	782	10.5	Myofascial TMD	RDC/TMD/ Telephone Survey/ Clinical Examination
Von Korff *et al.*, 1988	Survey	M and F	≥ 18	1,016	12	Facial Pain	Symptom Checklist
Locker *et al.*, 1988	Survey	M and F	≥ 18	677	7.3	TMJ pain while chewing	Telephone Survey/ Questionnaire
Goulet *et al.*, 1995	Survey	M and F	≥ 18	897	30	TMD jaw pain	Telephone Survey/ Questionnaire
M = Males, F = Females RDC/TMD = Research Diagnostic Criteria for Temporomandibular Disorders							

Two telephone surveys were performed in Canada to estimate the prevalence of TMD. The first one randomly contacted 1002 subjects in Ontario. Out of these, 677 random adults (67.7% response rate) presented a prevalence of pain of 5.5% in the TMJ while opening and a 7.3% prevalence while chewing (31): 9.5% in women and 5.0 in men. The second survey in Quebec estimated a 30% prevalence of pain in the muscles of mastication and jaw joints among 897 individuals with a participation rate of 64% (32).

2.2.2 Incidence of painful temporomandibular disorders

Incidence is defined as the proportion of occurrence of a new disease in a population during a specific period of time (28, 33). Incidence is divided into two types; 1) cumulative incidence and 2) incidence rate or density. Cumulative incidence is an estimation of the probability (or risk) that individuals will develop a disease in a specific period of time (28). Incidence rate is the number of new cases with disease in the population divided by the total persons-time at risk (28). Table 2.2.2 summarizes some studies that assessed the incidence of painful TMD.

Table 2.2.2. Incidence of Painful Temporomandibular Disorders

Authors, Year	Study Design	Gender	Age	Sample Size	Condition	Annual Incidence (%)	Assessment
Slade *et al.*, 2013	Cohort	M and F	18-44	2737	Painful TMD	3.9	Telephone interview/ Clinical Examination/ RDC/TMD
Nilsson *et al.*, 2007	Cohort	B and G	12-19	2255	Painful TMD	2.9	Questionnaire/ Clinical Examination
Von Korff *et al.*, 1993	Cohort	M and F	18+	1016	Painful TMD	2.2	Questionnaire

Note: M = Males, F = Females, B = Boys, G = Girls
RDC/TMD = Research Diagnostic Criteria for Temporomandibular Disorders

A cohort study conducted by Slade *et al.*, reported an annual incidence of painful TMD equal to 3.9% among 2,737 individuals. This annual incidence was higher among individuals between 35-44 years old (4.5%) compared to 18-24 years old (2.5%) (34).

Another cohort study carried out by Nilsson *et al.*, reported 2.9% annual incidence of painful TMD among 2,255 Swedish adolescents aged 12 to 19 over three years. It was also noted that the

annual incidence was higher in girls (4.5%) as compared to boys (1.3%) (35). A cohort study by Von Korff *et al.,* included 1,016 individuals from the Health Maintenance Organization aged between 18-65 years old demonstrated an annual incidence of approximately 2.2% (36).

2.3 Temporomandibular Disorders Evaluation

2.3.1 Temporomandibular disorders pain screening instrument

Many screeners have been developed for the TMD pain screening such as Nilsson *et al.* (2006) (37), Gerstner *et al.* (1994) (38) and Nielsen and Terp. (1990) (39).

Table 2.3.1a. Temporomandibular pain disorder screening instrument

1. In the last 30 days, on average, how long did any pain in your jaw or temple area on either side last?	a. No pain
	b. From very brief to more than a week, but it does stop
	c. Continuous
2. In the last 30 days, have you had pain or stiffness in your jaw on awakening?	a. No
	b. Yes
3. In the last 30 days, did the following activities change any pain (that is, make it better or make it worse) in your jaw or temple area on either side?	A. Chewing hard or tough food a. No b. Yes
	B. Opening your mouth or moving your jaw forward or to the side a. No b. Yes
	C. Jaw habits such as holding teeth together, clenching, grinding or chewing gum a. No b. Yes
	D. Other jaw activities such as talking, kissing or yawning a. No b. Yes

Note: Items 1 through 3A constitute the short version of the screening instrument, and Items 1 through 3D constitute the long version. An “a” response 0 points, a “b” response 1 point and a “c” response 2 points.

Recently, a new TMD pain screening instrument was developed by Gonzalez *et al.* (2011) (40). It consists of two versions; a long (six-item) and a short (three-item) version (Table 2.3.1a), assessing two core symptoms: (i) pain frequency and (ii) pain by function. Both versions present an excellent sensitivity (99%), specificity (97%) and reliability (Table 2.3.1b).

Table 2.3.1b. Difference between three-item and six-item

	3-item	6-item
Cronbach's (α)	0.87	0.93
Intraclass Correlation Coefficient (ICC)	0.83	0.79
Reliability (k)	from 0.52 to 0.78	
Sensitivity	99	
Specificity	97	

2.3.2 Temporomandibular disorders diagnosis

Various diagnostic protocols have been developed for the diagnosis of TMD such as the Helkimo's index (41-44), Craniomandibular Index (CMI) (45, 46), Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (47) and Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) (48).

2.3.2.1 Research diagnostic criteria and diagnostic criteria for temporomandibular disorders

Currently, the commonly used diagnostic protocol for TMD research is the RDC/TMD (47). This classification system comprised two axes: (i) Axis I, physical assessment to provide a

physical diagnosis (49) and (ii) Axis II, psychological assessment and pain-related disability to identify characteristics that could affect pain management (e.g., depression, pain intensity) (50).

The Axis I includes three subgroups; Group I (muscle disorders), Group II (disc displacements) and Group III (joint diseases) (47, 49). Group I, muscle disorders, is divided into two groups; 1) myofascial pain and 2) myofascial pain with limited mouth opening. Group II refers to disc displacements and is classified into three groups; 1) disc displacement with reduction, 2) disc displacement without reduction with limited opening; and 3) disc displacement without reduction without limited opening. Group III represents joint disorders categorized into three groups; 1) arthralgia; 2) osteoarthritis; and 3) osteoarthrosis. More details about the RDC/TMD protocol are described elsewhere (47, 49, 50).

For the DC/TMD Axis I includes: 1) muscle pain diagnosis is categorized into four major subclasses: myalgia (local myalgia, myofascial pain and myofascial pain with referral), 2) arthralgia, 3) headache attributed to TMD, and 4) intra-articular TMD (48).

2.3.2.2 Reliability and validity of research diagnostic criteria and diagnostic criteria for temporomandibular disorders

Validity represents the degree to which the results of measurement correspond to the true state of results being measured (33). Reliability or reproducibility refers to the degree of consistency to which the study can be reproduced over time and by different observers (33).

In a study including 230 individuals recruited from 10 clinical centers (San Francisco, Portland, USA; Singapore; Sydney, Australia; Amsterdam, The Netherlands; Heidelberg, Germany; Zurich, Switzerland; Naples, Italy; and Linkoping - Malmo, Sweden), a fair to good reliability assessed with the Interclass Correlation Coefficient (ICC) for myofascial pain with or

without limited opening (ICC = 0.51 and 0.60) were found. The ICCs for disc displacement with reduction and arthralgia were 0.61 and 0.47 respectively (51).

In addition, in a validation RDC study, which included 705 participants (614 TMD cases and 91 controls) (52), the target sensitivity and specificity (≥ 0.70 and ≥ 0.95, respectively) were not observed in any of the eight RDC/TMD diagnoses. Myofascial pain and myofascial pain with limited opening had high validity (52) (Table 2.3.2).

Table 2.3.2. Sensitivity and Specificity of RDC/TMD and DC/TMD

Diagnosis	Original RDC/TMD‡		Revised RDC/TMD¥		DC/TMD§	
	Sens	**Spec**	**Sens**	**Spec**	**Sens**	**Spec**
Myofascial pain or Myalgia***	0.87*****	0.98*****	0.82*****	0.98*****	0.90******	0.99******
With limitation	0.65*****	0.92*****	0.75*****	0.97*****	-	-
Without limitation	0.79*****	0.92*****	0.83*****	0.99*****	-	-
Myofascial pain with referral	-	-	-	-	0.86	0.98
Arthralgia	0.53	0.86	0.38	0.90	0.89	0.98
Disc displacement	0.36	0.94	0.35	0.96	-	-
With reduction	0.38	0.88	0.42	0.92	0.34	0.92
With reduction, with locking	-	-	-	-	0.38	0.98
Without reduction, with limitation	0.22	0.99	0.26	1.00	0.80	0.97
Without reduction, without limitation	0.03	0.99	0.05	0.99	0.54	0.79
Osteoarthrosis	0.15	0.99	0.13	1.00	-	-
Osteoarthritis	0.10	0.99	0.12	0.99	-	-
Degenerative joint disease	-	-	-	-	0.55	0.61
Subluxation	-	-	-	-	0.98	1.00

Note: "-" not included, ‡ Truelove et al., (2010), ¥ Schiffman et al., (2010), § Schiffman et al., (2014).
Abbreviations: Sens = Sensitivity, Spec = Specificity

Since the sensitivity and specificity target of the original RDC/TMD were not obtained, an attempt was made modifying the original RDC/TMD. Comparing to the revised RDC/TMD, the sensitivity and specificity improved overall, especially for myofascial pain and myofascial pain with limited opening (Table 2.3.2) (53).

2.4. Factors Differentiating Acute and Chronic Painful TMD

Table 2.4.1 shows a list of studies that assessed differences between acute and chronic TMD. Gatchel *et al*. (1996) conducted a case-control study including 101 painful TMD participants, 51 acute and 50 chronic participants (54). These participants were referred by dentists and oral surgeons in Dallas-Fort Worth area to the Division of Psychology in University of Texas Medical Center to participate in the study. Patients were considered chronic TMD participants if they experienced pain for at least 6 months, and acute participants if they had pain for less than six months. The diagnosis of acute and chronic painful TMD participants was based on the RDC/TMD (47). The mean duration of pain was 2.4 and 104.2 months for the acute and chronic participants, respectively. In this study, acute TMD participants demonstrated more frequent anxiety disorders (47.1%, $P < 0.001$), while somatoform disorders (50%, $P < 0.001$) and affective disorders (34%, $P < 0.001$) were more common among the chronic TMD participants. These psychological disorders were assessed based on the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R).

A cross-sectional study by Kafas and Leeson (2006) was carried out to identify clinical and psychological factors that could aid in the classification of acute and chronic TMD (55). TMD participants included in this study should present pain in the temporomandibular joint (TMJ) area. Muscle pain, limited mouth opening and clicking were not inclusion criteria. A sum of 22 painful TMD participants, 14 with chronic and 8 with acute painful TMD, were recruited in the pain clinic

at the Eastman Dental Institute. All patients were referred by the Department of Oral and Maxillofacial Surgery at Eastman Dental Institute. Chronic painful TMD implied patients who suffered from pain for at least three months, whereas acute painful TMD participants experienced pain for less than three months. A TMD pain assessment questionnaire was used for clinical examination. This instrument assessed the history of pain, pain locations (muscle of mastication, TMJ), sounds, deviation, and range of motion. Hospital Anxiety and Depression (HAD) instrument was used to assess anxiety and depression, and Pain Catastrophizing was used to evaluate catastrophizing. This study showed that patients who suffered from chronic painful TMD had significantly more frequent muscle tenderness in the TMJ area (85.7%, $P < 0.05$), constant pain (85.7%, $P < 0.05$) and dull ache (78.6%, $P < 0.05$) compared to patients with acute painful TMD. Psychological factors were also more common among chronic participants compared to acute. However, no statistically significance was found between-group.

Salmos-Brito *et al*. (2013) conducted a randomized controlled trial (RCT) to investigate the effects of low level laser therapy (LLLT) on pain intensity and maximal mouth opening (56). Individuals representing acute (n = 32) and chronic (n = 26) painful TMD participants were diagnosed with myofascial pain in accordance to the RDC/TMD classification criteria (47). Acute TMD patients were classified as patients who revealed pain for less than six months, while chronic TMD patients revealed pain for at least six months. All individuals were referred from the Pain Control Center of the University of Pernambuco from 2009 to 2010. The results of this study shows that the LLLT significantly reduced the intensity of pain using a 0-10 Visual Analogue Scale (VAS) ($P = 0.002$), and improved maximal mouth opening ($P < 0.001$) in acute patients more than the chronic.

Table 2.4.1. Factors Differentiating Acute and Chronic Painful TMD								
Study	**Design**	**Location**	**Groups Size**	**Participation Groups**	**Factors Measured**	**Percentage**	**Results‡‡**	***P* Value**
Gatchel *et al.*, (1996) (54)	Case-control	University of Texas	A (n=51)	A: Acute TMD (A < 6 months)	Somatoform	A = 5.9, C = 50.0	C > A	*P* < 0.001
					Affective disorders	A = 11.8, C= 34.0		
					Anxiety disorders	A = 47.1, C = 12.0	A > C	*P* < 0.001
			C (n=50)	C: Chronic TMD (C ≥ 6 months)	Substance abuse	A = 2.0, C = 4.0	A = C	Not provided
					Eating disorders	A = 2.0, C = 0		
					Adjustment disorders	A = 3.9, C = 2.0		
Kafas and Leeson (2006) (55)	Cross-sectional	Dental institute and hospital	A (n=8)	A: Acute TMD (A < 3 months)	Dull	A = 0, C = 78.6	C > A	*P* < 0.05
					Sharp	A = 50, C = 14.3	A > C	*P* < 0.05
					Constant	A = 25, C = 85.7	C > A	*P* < 0.05
			C (n=14)	C: Chronic TMD (C ≥ 3 months)	TMJ tenderness	A = 62.5, C = 14.3	A > C	*P* < 0.05
					Muscular ± TMJ tenderness	A = 37.5, C = 85.7	C > A	*P* < 0.05
					Depression§	A = 12.5, C = 42.9	A = C	Not provided

					Anxiety[§]	A = 25, C = 57.2	A = C	Not provided
					Coping	A = 25, C = 64.3	A = C	Not provided
					Catastrophizing	A = 12.5, C = 78.6	A = C	Not provided
Salmos-Brito *et al.*, (2013)* (56)	RCT	Pain control center	A (n=32)	A: Acute TMD (A < 6 months)	Pain intensity	No details provided	A > C	*P* = 0.002
			C (n=26)	C: Chronic TMD (C ≥ 6 months)	Maximal mouth opening	No details provided	A > C	*P* < 0.001
Jasim *et al.*, (2014)* (57)	Case-control	Undergrad dental clinic	AOP (n=24)	A: AOP (AOP <10 days)	Pain intensity	No details provided	A = C	Not provided
		OP clinic	C (n=27)	C: COP (C ≥ 6 months)	Stress	No details provided	C > A = CT	*P* < 0.05
					Somatization	No details provided		*P* < 0.001
					Depression	No details provided		*P* < 0.001
		Undergrad dental clinic	CT (n=27)	CT: Pain-free controls	Salivary cortisol level	No details provided	C = A = CT	Not provided

***** RDC/TMD was used. A = Acute TMD. C = Chronic TMD, CT = Controls, RCT = Randomized Control Trials, AOP = Acute orofacial pain. COP = Chronic orofacial pain. OP = Orofacial pain.

‡‡ Results measured between groups, A > C means that group A was more significant than group C, A = C means no statistically significant difference between groups. § No difference because of a small sample size.

A recent case-control study conducted by Jasim *et al.* (2014) compared psychological factors and salivary cortisol levels between women with acute and chronic orofacial pain, and women with no pain (controls) (57). Acute orofacial pain (n = 24) and controls participants (n = 27) were recruited from both undergrad dental clinic, while chronic orofacial pain participants (n = 27) were recruited from orofacial pain clinic. Chronic orofacial pain participants should receive the diagnosis of myofascial pain established according to the RDC/TMD (47). Acute pain was defined as a short-lasting pain which considers a disease or injury symptom (58). Furthermore, acute orofacial pain included individuals with orofacial pain, not TMD, for less than ten days, whereas chronic orofacial pain participants presented pain for at least six months. Pain duration among acute participants was on average 5 days (SD = 2.6 days) while the average among chronic participants was on average 5.54 years (SD = 8.0 years). Pain intensity and analgesic consumption were not significantly different between pain groups. Chronic orofacial pain participants presented significantly higher levels of depression ($P < 0.001$), somatization ($P < 0.001$) and perceived stress ($P < 0.05$) than both acute and controls participants. These psychological factors were assessed using Beck Depression Inventory (BDI), (DSM-IV) and Multidimensional Pain Inventory (MPI), respectively. No statistically significant differences were noted between controls and acute participants in psychological factors' scores. Also, no significant differences were found in salivary cortisol levels between groups.

2.5 Factors Associated with the Transition from Acute to Chronic Painful TMD

The studies that evaluated the risk factors implicated in the transition from acute to chronic painful TMD are described in Tables 2.4.2 to 2.4.4. In a 6-month prospective cohort study conducted by Garofalo *et al*. (1998) out of 164 acute painful TMD participants, 87 developed chronic TMD and 66 developed nonchronic TMD at the 6-month follow-up period (26). Eleven

participants (7%) dropped out of the study during follow-up. All participants were diagnosed by members of a research team as having painful TMD on the basis of the RDC/TMD criteria (47). Participants were referred by dentists or oral surgeons to the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas. Newspaper advertisement or university campus fliers were used to recruit the participants. Participants with acute TMD were those who had never sought treatment or who sought treatment within 6 months of first evaluation. A telephone interview was conducted at 3 and 6-month follow-ups, involving questions based on Graded Chronic Pain Scale (GCPS) (59), assessing pain intensity and disability. At 6-month follow-up, participants with a Characteristic Pain Intensity (CPI) score of less than 15 were classified as nonchronic painful TMD participants; those with a score of 15 or more were considered to have chronic TMD. CPI is the average of pain intensity; current, worst, and average multiplied by ten (59). The crude analysis pointed out that female participants ($P < 0.04$), participants with higher pain intensity ($P \approx 0.00$), RDC Group I ($P < 0.0001$), RDC Group III ($P < 0.003$), higher GCPS ($P < 0.0001$), depression ($P < 0.007$) and somatization ($P < 0.0002$) at baseline, were more likely to develop chronic painful TMD at 6-month follow-up than participants without being exposed to these putative risk factors. Furthermore, the multivariable logistic regression analysis including 153 participants showed that CPI ($\beta = 0.03$, $P = 0.02$) and Group I ($\beta = 1.43$, $P = 0.03$) at baseline contributed to the transition from CPI < 15 at baseline to CPI ≥ 15 at 6-month follow-up. A borderline association was noted with GCPS ($\beta = 2.00$, $P = 0.09$), but no association was found in Symptom Checklist-90-Revised (SCL-90-R) Nonspecific Symptoms Scale score ($\beta = 0.47$, $P = 0.15$). The CPI was defined as possible scores range from 1 to 100, with 1 = no pain while the GCPS especially 3 or 4 suggested that the person is experiencing a significant amount of limitation and disability related to the TMD regardless of the CPI score. The score of

SCL-90-R must fall at or below the 70th percentile of the general population or be less than 0.5 to be normal; between the 70th and 90th percentiles or between 0.5 and 1. To be moderate range and above the 90th percentile or greater than 1.0 to be severe.

Epker *et al*. (1999) conducted a 6-month cohort study to identify factors that contributed to the transition from acute to chronic painful TMD (60). At baseline, 204 acute TMD participants were recruited from the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas. RDC/TMD was used to established the TMD diagnosis (47). Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months within the study recruitment were classified as having acute TMD. At the 6-month follow up, 144 developed chronic TMD and 60 nonchronic TMD. At this time, subjects with CPI scores of less than 15 were considered to have nonchronic TMD, while subjects whose CPI score was 15 or above were considered to have chronic TMD. A telephone interview assessment was conducted at three and six-month follow-up, and the baseline assessment was done in-person. In a multivariable forward stepwise logistic regression analysis, including 175 participants demonstrated that CPI ($\beta = -0.06$, $P < .001$) and myofascial pain ($\beta = 0.78$, $P = 0.003$) measured at the baseline contributed to the transition to chronic pain status, reported pain at 6 months of follow-up with CPI > 15. The authors explained that participants with high pain intensity (CPI) and myofascial pain were more likely to develop chronic painful TMD. However, the CPI result is inconclusive since the CPI was negatively associated with chronic pain ($\beta = -0.06$). Furthermore, the authors mentioned that chronic participants were more likely to have reported at baseline, higher levels of GCPS, depression, nonspecific physical symptoms, limitations and pain intensity than the nonchronic group. The authors, however, did not provide any of these results. In this study, the CPI was calculated as the mean of the patient's report of current pain, worst pain in the last three months

and mean pain in the last three months, multiplied by 100. The nonspecific physical symptoms instrument was used as a measured of the patient's report of physical complaints in a variety of body areas. The GCPS was described as an index that combines the patient's report of pain severity and pain-related impairment.

Phillips *et al*. (2001) conducted a 6-month prospective cohort study to assess the risk factors implicated in the transition from acute to chronic painful TMD, among 161 women and 72 men (61). Participants were recruited from the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas. If they had never been diagnosed with TMD or had been diagnosed within less than 6 months of the initial evaluation, they were classified as acute subjects. The diagnosis was based on the RDC/TMD (47). At 6-month follow-up, subjects with CPI scores of less than 15 were considered to have nonchronic TMD, while subjects whose CPI score was 15 or above were considered to have chronic TMD. This study found that women and men who developed chronic TMD present statistically significant differences from those who do not develop chronic from their acute state. More specially, the crude analysis indicated from the women acute cohort, muscle disorders, mean limitations, CPI, GCPS moderate, depression, nonspecific physical symptoms noted at baseline were all more common among chronic than nonchronic participants at the 6 months of follow-up. From the men cohort, chronic TMD participants more frequently presented joint disorders, severe GCPS, higher mean limitations, and CPI than those with nonchronic pain at the 6-month follow-up. The CPI was measured the severity of pain by averaging a patient's report of current pain, worst pain and average pain in the last three months. While the GCPS combined the patient's report of pain severity and pain-related impairment. Depression was assessed by using the BDI instrument.

Gatchel *et al*. (2006) conducted a 12-month cohort study where 63 individuals with acute painful TMD were recruited from the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas (62). These participants were part of an ongoing RCT study assessing the treatment effectiveness of an early intervention for participants with acute painful TMD (63). The TMD diagnosis was established in accordance to the RDC/TMD criteria (47). Acute TMD subjects reported pain that lasted less than 6 months. BDI scores at baseline, 32 acute participants were classified as depressed and 31 as non-depressed. The phone-interview was performed at 3, 6, 9 and 12 months after baseline, and the clinical examination was performed at 12 months. The means of CPI ($P < 0.001$) and masticatory function score evaluated with Median Particle Size (MPS) ($P < 0.02$) at 12-month follow-up were significantly lower than those at baseline, regardless of the study group as depressed or nondepressed. Only BDI at baseline increased the odds of persistent depression (Odds ratio [OR] = 1.1, P = 0.03). Also, the BDI significantly decreased for both groups from pre-intake to 12-month follow-up.

Table 2.4.2. Cohort studies assessing the effect of the demographics in the transition from acute to chronic TMD							
Study	**Follow-up**	**Location**	**Acute pain sample (Baseline)**	**Study outcomes at follow-up**	**Factors Measured**	**Results**	***P* Value**
Garofalo *et al.*, (1998)* (26)	3 and 6-month	University of Texas	n = 164 §	NC (n = 66) ¶ C (n = 87) ¶¶	Females (%)	NC = 59.1, C = 74.1	$P < 0.04$
					Age in yrs. Mean (SD)	NC = 33.7 (10.4), C = 36.0 (9.4)	$P > 0.05$
					Education in yrs. Mean (SD)	NC = 15 (2.5), C = 14.8 (2.3)	$P > 0.05$
					White race (%)	NC = 75.8, C =75.9	$P > 0.05$
					Married status (%)	NC = 50.0, C = 54.0	$P > 0.05$
Epker *et al.*, (1999)* (60)	3 and 6-month cohort	University of Texas	n = 204 §	NC (n = 60) ¶ C (n = 144) ¶¶	Age in yrs. Mean (SD)	34.80 (-)	Not provided
					Females (%)	71.57	Not provided
Phillips *et al.*, (2001)* (61)	3 and 6-month cohort	University of Texas	n = 161 Women n = 72 Men £	NC = 80 (55 women, 25 men) ¶ C = 153 (106 women, 47 men) ¶¶	Age in yrs. Mean (SD)	Not provided	
					Females (%)	69.09	Not provided
Gatchel *et al.*, (2006)* (62)	3, 6, 9 and 12-month cohort	University of Texas	Acute TMD ¥ DEP (n = 32) NDEP (n = 31)	Chronic TMD DEP (n = 32) NDEP (n = 31)	Age in yrs. Mean (SD)	DEP = 36 (11.3) NDEP = 37.6 (11.4)	$P = 0.58$
					Females (%)	DEP = 87.5 NDEP = 71	$P = 0.09$

Abbreviations: * = RDC/TMD was used. C = Chronic TMD, NC = Nonchronic TMD. GCPS = Graded Chronic Pain Score. CPI = Characteristic Pain Intensity, DEP = depressed, NDEP = non depressed.

Note: Acute pain definitions: § Never sought treatment or sought treatment within 6 months of initial treatment, £ Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months before study recruitment. ¥ Pain for less than six months.

Definition of pain at 6-month follow-up: ¶ Nonchronic TMD = CPI score was less than 15 (that is, their TMD had resolved). ¶¶ Chronic TMD = CPI ≥ 15.

Table 2.4.3. Cohort studies assessing the effect of the clinical characteristics at baseline in the transition from acute to chronic TMD							
Study	**Follow-up**	**Location**	**Acute pain sample (Baseline)**	**Study outcomes at follow-up**	**Factors Measured**	**Results**	***P* Value**
Garofalo *et al.*, (1998)* (26)	3 and 6-month	University of Texas	n = 164 §	NC (n = 66) ¶ C (n = 87) ¶¶	Mean CPI (SD)	NC = 37.1 (22.6), C = 59.4 (18.6)	$P \approx 0.000$
					GCPS (0) (%)	NC = 3.3, C = 0	$P < 0.0001$
					GCPS (I) (%)	NC = 62.1, C = 29.9	
					GCPS (II) (%)	NC = 27.3, C = 49.4	
					GCPS (III) (%)	NC = 1.5, C = 14.9	
					GCPS (IV) (%)	NC = 1.5, C = 5.7	
					Group I - RDC (%)	NC = 28.3, C = 61.8	$P < 0.0001$
					Group II - RDC (%)	NC = 25.0, C = 33.3	Not provided
					Group III - RDC (%)	NC = 33.3, C = 58.8	$P < 0.003$
Epker *et al.*, (1999)* (60)	3 and 6-month cohort	University of Texas	n = 204 §	NC (n = 60) ¶ C (n = 144) ¶¶	CPI	$\beta = -0.06$	$P < 0.001$
					Myofascial pain	$\beta = 0.78$	$P = 0.003$

Phillips *et al.*, (2001)* (61)	3 and 6-month cohort	University of Texas	n = 161 Women n = 72 Men [£]	NC = 80 (55 women, 25 men) [¶] C = 153 (106 women, 47 men) [¶¶]	Muscle disorders (%)	WCH =67.1, WNCH = 31.4	$P < 0.01$
						MCH = 41.3, MNCH = 25.0	$P > 0.05$
					Joint disorders (%)	WCH =34.1, WNCH = 23.5	$P > 0.05$
						MCH = 19.6, MNCH = 29.2	$P < 0.05$
					GCPS low (%)	WCH =34.9, WNCH = 70.9	$P < 0.001$
						MCH = 48.9, MNCH = 80.0	$P < 0.01$
					GCPS Moderate (%)	WCH =51.9, WNCH = 23.6	$P < 0.001$
						MCH = 36.2, MNCH = 20)	$P > 0.05$
					GCPS High (%)	WCH =13.2, WNCH = 5.5	$P > 0.05$
						MCH = 14.9, MNCH = 0	$P < 0.04$
					Mean CPI	WCH = 55.13, WNCH = 35.12	$P < 0.001$
						MCH =48.58, MNCH = 28.0	$P < 0.001$
					Mean limitations	WCH =0.34, WNCH = 0.26	$P < 0.02$
						MCH =0.27, MNCH = 0.13	$P < 0.002$

Gatchel *et al.*, (2006)* (62)	3, 6, 9 and 12-month cohort	University of Texas	Acute TMD ¥ DEP (n = 32) NDEP (n = 31)	Chronic TMD DEP (n = 32) NDEP (n = 31)	Characteristic Pain Intensity	DEP: AC = 56.84(13.41) CH = 22.77 (17.54)	*P* > 0.05
						NDEP: AC = 58.26 (10.97) CH = 24.94 (18.78)	
					Masticatory function	DEP: AC = 3.68 (1.23) CH = 3.54 (1.29)	
						NDEP: AC = 3.71 (1.28) CH = 3.87 (1.35)	

Abbreviations: * RDC/TMD was used. C = Chronic TMD. NC = Nonchronic TMD. AC = Acute TMD. GCPS = Graded Chronic Pain Score. CPI = Characteristic Pain Intensity. DEP = depressed, NDEP = non depressed. WCH = Chronic pain among women. WNCH = Nonchronic among women. MCH = Chronic pain among men. MNCH = Nonchronic among men.

Note: Acute pain definitions: § Never sought treatment or sought treatment within 6 months of initial treatment, £ Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months before study recruitment. ¥ Pain for less than six months.

Definition of pain at 6-month follow-up: ¶ Nonchronic TMD = CPI score was less than 15 (that is their TMD had resolved). ¶¶ Chronic TMD = CPI ≥ 15.

Table 2.4.4. Cohort studies assessing the effect of the psychological characteristics at baseline in the transition from acute to chronic TMD							
Study	**Follow-up**	**Location**	**Acute pain sample (Baseline)**	**Study outcomes at follow-up**	**Factors Measured**	**Results**	***P* Value**
Garofalo *et al.*, (1998)* (26)	3 and 6-month	University of Texas	n = 164 §	NC (n = 66) ¶ C (n = 87) ¶¶	Moderate Depression	C = 35.7, NC = 21.5	$P < 0.007$
					Severe Depression	C = 38.1, NC = 27.7	
					Moderate NSS	C = 27.7, NC = 23.1	$P < 0.0002$
					Severe NSS	C = 56.6, NC = 30.2	
Phillips *et al.*, (2001)* (61)	3 and 6-month cohort	University of Texas	n = 161 Women n = 72 Men £	NC = 80 (55 women, 25 men) ¶ C = 153 (106 women, 47 men) ¶¶	Anxiety	Women (C = 54.3 and NC = 34.5)	$P < 0.018$
					Depression	Women (C = 10.72 and NC = 6.67)	$P < 0.002$
						Men (C = 9.43 and Men NC = 5.67)	$P < 0.05$
					Distress	Men (C = 31.1, Men NC = 8.3)	$P < 0.03$
					Hypochondriasis	Women (C = 62.15, NC = 56.45)	$P < 0.008$
					Hysteria	Women (C = 62.29, NC = 54.51)	$P < 0.001$
Gatchel *et al.*, (2006)* (62)	3, 6, 9 and 12-month cohort	University of Texas	Acute TMD ¥ DEP (n = 32) NDEP (n = 31)	Chronic TMD DEP (n = 32) NDEP (n = 31)	Depression	DEP: AC = 11.97 (12.04)	$P < 0.03$
						NDEP: AC = 5.84 (4.91)	
						DEP: 12-month = 7.25 (8.60)	$P = 0.02$
						NDEP: 12-month = 2.87 (3.25)	

Abbreviations: * = RDC/TMD was used. C = Chronic TMD. NC = Nonchronic TMD. AC = Acute TMD. DEP = depressed, NDEP = non depressed. NSS = Non specific symptom

Note: Acute pain definitions: £ Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months before study recruitment. ¥ Pain for less than six months.

Definition of pain at 6-month follow-up: ¶ Nonchronic TMD = CPI score was less than 15 (that is their TMD had resolved). ¶¶ Chronic TMD = CPI ≥ 15.

2.6 Painful Comorbidities and Temporomandibular Disorder Pain

Fibromyalgia, migraine headache, and neck and back pain are the most common comorbid pain conditions observed among TMD patients. The New Oxford American Dictionary defines comorbidities as “the simultaneous presence of two chronic diseases or conditions in a patient”. Current evidence suggests that painful TMD coexists with painful comorbid conditions. Many studies found that painful comorbidities frequently report painful conditions at sites other than the masticatory system (e.g., migraine, fibromyalgia, back pain and neck pain) (64-69). In this section each of these comorbid pain conditions in relation to TMD were described.

2.6.1 Headache

The International classification of headache disorders defines headache as recurrent headache disorder manifesting attacks that last 4 to 72 hours with at least two of five characteristics. Those are unilateral location, pulsating pain, moderate or severe intensity, aggravation by routine physical activity, and association with nausea and/or photophobia. Migraine affects 10-14% of the general population, with females’ predominance when compared to their male counterpart (70-72). Migraine headache is common among painful TMD patients (73-77). Migraine headache and TMD pain have been suggested to be comorbid conditions for several reasons. Migraine headache is reported to be common among TMD patients (12% to 69%) (74-78). The International Headache Society diagnostic criteria for migraine (79) and the RDC/TMD (47) also denote significant overlap between the two conditions, including head pain, peri-cranial tenderness, and chronicity. Painful TMD and migraine headache are trigeminal mediated and characterized by pain in the head or face as well as peri-cranial tenderness (70-72, 80, 81). Several cross-sectional and case-control studies have shown that individuals with painful TMD were almost 2 to 9 times more likely to have headache than controls (10, 82-86). Anderson *et al.* (2011) conducted a case-control study including 86 painful TMD participants, 309 painful TMD participants with headaches, and 149 participants without painful TMD or

headaches, demonstrated that painful TMD participants with headaches were more likely to have severe painful TMD. In this study ICDH-II tension-type headache criterion was used for the assessment of headaches (87).

Macfarlane *et al.* (2001) conducted a case-control study among 1981 participants found that young adults with headache once or twice a month (OR = 2.1, 95% CI: 1.2 – 3.7) or at least once a week (OR = 3.7, 95% CI: 1.6 – 8.4) had an increased risk of orofacial pain (88). In addition, a 2007 cohort study administered by LeResche *et al.* group including 1310 participants demonstrated that for adolescents with headache, the risk of developing painful TMD was 2.7 times (95% CI: 1.6 - 4.4) that of those without headaches. Children were asked if they ever had headaches in the past year (89) in this study. A nested case-control study using questionnaires to assess headaches among 280 participants found an increased odds of incidence of headaches among those who had painful TMD and spinal pain (OR = 5.2, 95% CI: 2.0 – 13.7) (90).

2.6.2. Fibromyalgia

Fibromyalgia is a chronic musculoskeletal pain condition, characterized by widespread pain and tenderness in the body as well as cognitive dysfunction and somatic symptoms (91, 92). The current diagnostic criteria for fibromyalgia focuses on two questionnaires: Widespread Pain Index (WPI) and Symptom Severity (SS). All of the following three conditions must co-exist: (1) WPI is ≥ 7 and SS is ≥ 5, or if the WPI is 3-6 with SS ≥ 9; (2) symptoms have been present at a similar level for at least 3 months; and (3) the patient does not have a disorder that would otherwise explain the pain (92, 93). Fibromyalgia usually affects young or middle aged females in comparison to males (94-96). In the general population, the prevalence of fibromyalgia ranges from 2-4% (94, 97, 98). Furthermore, many of the patients with fibromyalgia and widespread pain exhibit painful TMD (68, 99-101). A cohort study by LeResche *et al.* (2007) including 1310 adolescents (boys and girls) demonstrated that subjects with pain conditions elsewhere in the body had 2 times the risk of developing painful TMD within the

next 3 years (OR = 3.2, 95% CI: 1.7 – 6.1) compared to those without these pain conditions. In this study pain conditions elsewhere in the body were classified using questionnaires (89).

A cohort study conducted by Aggarwal *et al.* (2010) showed that widespread pain and fibromyalgia increased the risk of orofacial pain in 1735 subjects, where widespread pain predicted the onset of orofacial pain (RR = 4.0, 95% CI: 2.2 - 7.4) (102). Another cohort study by John *et al.* group (2003) in 397 participants showed that among women without dysfunctional painful TMD at baseline, widespread pain was a risk factor for development of painful TMD (OR = 1.9, 95%CI: 1.2 - 2.8, P = 0.003). In this study, graded chronic pain was used for the assessment of pain (99). Velly *et al.* (2003) conducted a cohort study in 2010 among 485 participants, demonstrating that baseline widespread pain (OR: 2.53, P = 0.04) was related to the onset of clinically significant painful TMD (68).

2.6.3. Neck and back pain

Painful TMD patients (16-68%) commonly report neck and back pain (10, 65, 82, 95, 103, 104). The pain is more likely to persist with those who experience additional comorbidities. This is due to higher pain amplification due to the presence of additional comorbidities which lowers the pain threshold (105, 106). Patients may report the pain persisting for longer period of time due to the presence of multiple comorbidities. Even though, the specific mechanism to explain the persistence of painful TMD is not clearly understood, some researchers suggest that it involves the central and peripheral nervous systems (105, 107).

Several cross-sectional and case-control studies demonstrated that subjects with painful TMD are 3 to 5 times more likely to have back pain compared to individuals without painful TMD (10, 82, 86). Moreover, participants with painful TMD are also more likely to report neck pain (OR = 4.0 - 7.9) (82, 86). A nested case-control study including 1981 participants found that adults with intermittent (OR= 3.6; 95%CI: 2.2-5.9) and frequent (OR= 5.3; 95%CI: 2.5-11.3) neck pain were more likely to have orofacial pain. Similarly, participants with back pain were also 3 times more likely to have

orofacial pain. In this study neck and back pain were assessed using questionnaires (88). A second nested case-control study that assessed back pain among 280 dental students using a questionnaire, demonstrated that students with spinal pain were at a greater risk of developing painful TMD compared to those without spinal pain (OR= 2.9; 95%CI: 1.3-6.2). It also showed that females with spinal pain were almost 5 times more likely to develop painful TMD (90). When looking at adolescents who were exposed to back pain had an increased likelihood of painful TMD compared to the unexposed group (OR = 3.9, 95% CI: 2.2–6.8) in a prospective-cohort study conducted among 1981 individuals (89). Furthermore, a matched case-control study, including 96 participants with long-term back pain and 192 controls found that back pain participants were 7 times more likely (95%CI: 3.9–13.7) to have TMD compared to controls (108).

2.7 Summary of the Systematic Review Results

The cohort studies demonstrated that muscle disorders and pain intensity contributed to the transition from acute to chronic painful TMD. Psychological factors were more common among chronic in comparison to acute participants, but these factors do not increase the transition risk. Due to the small number of cohort studies and their study methodology weaknesses, there is insufficient evidence of risk factors implicated in the transition from acute to chronic painful TMD.

3. CHAPTER 3. STUDY OBJECTIVES AND HYPOTHESES

Based on these considerations, it emerges that pain intensity, muscle pain and psychological factors may be potential risk factors for the transition from acute to chronic TMD. However, given the scarce number of studies that assessed the risk factors implicated in this transition (26, 60-62), and their limitations, particularly selection bias, small sample size and not adequate statistical analysis, the risk factors that contribute to this transition remain an enigma.

On these premises, we initiated the Acute to Chronic TMD Transition (ACTION) project in 2014 with the overall goal to identify the risk factors for the transition from acute to chronic pain, as well as its persistence.

This baseline cross-section analysis is the first step of the ACTION project. The aim of this analysis was to compare acute and chronic painful TMD. More specifically, the aim of this cross-sectional study was to assess clinical, psychological variables and comorbidities among acute and chronic painful TMD.

3.1. Specific study objectives and study hypotheses

More specifically, our aims and null hypotheses were:

1. To identify clinical characteristics among acute and chronic painful TMD cases.

   Hypothesis 1. Participants with chronic painful TMD are not more likely to present clinical characteristics (e.g. higher levels of pain intensity, muscle pain diagnosis) than those with acute painful TMD.

2. To identify headaches and other painful conditions among acute and chronic painful TMD cases.

   Hypothesis 2.1. Participants with chronic painful TMD are not more likely to present headaches in comparison to acute painful TMD patients.

   Hypothesis 2.2. Participants with chronic painful TMD are not more likely to present other painful conditions comorbidities (e.g. pain in arms, pain in back, pain in chest) in comparison to acute painful TMD patients.

3. To evaluate psychological characteristics among acute and chronic painful TMD cases.

   Hypothesis 3. Patients with chronic painful TMD are not more likely to present harmful psychological factors (e.g. anxiety or depression) in comparison to acute painful TMD participants.

4. CHAPTER 4. METHODOLOGY

This cross-sectional study is the first study from the ACTION program aimed to identify the phenotypes and biomarkers related to the transition from acute to chronic painful TMD. Specifically, in this chapter, the methodology of the current cross-sectional study is described, including the ethics, study design, study population, data collection, and statistical analyses.

4.1 Ethics

The ACTION project was approved by the McGill Institutional Review Board in Montreal, Canada (approval number: A12-M113-14A) and by the Dental Specialists Group in Ottawa, Ontario (approval number: 240-400). All participants agreed to participate in this study and signed the consent form.

4.2 Study Design and Study Population

All subjects included in this study were recruited between August 2015 and July 2016. Enrollment in this ACTION 6-month prospective cohort study will continue after July 2016 and the new data will be presented in future publications.

4.2.1 Eligibility and Recruitment

Eligible participants with acute or chronic painful TMD were recruited from the Jewish General Hospital (JGH) general dental clinic, the Faculty of Dentistry of McGill University oral diagnosis (OD) clinic and the Dental Specialists Group TMD-specialized clinic, between August 2015 and July 2016. Painful TMD participants were eligible for this study if they were between 18 and 80 years of age, and received a diagnosis of painful TMD (muscle and/or joint pain) in accordance with the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)

or Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). Participants who had another orofacial pain, no access to a telephone, and those who were unable to provide informed consent, or not capable to speak French or English were excluded.

A total of 137 patients were informed about the TMD study. From these, 4 refused to participate (lack of time and distress) and 22 were not eligible (pain other than TMD, language issue and over 80 years old). Because of ethical consideration, we were not able to collect more details from the patients who refused to participate.

All 111 possible participants were invited to complete a TMD pain screening instrument (40). These 111 participants had a positive screening, which confirmed the presence of their TMD pain. Afterwards, participants received a clinical examination by Drs. Mervyn Gornitsky (MG) (JGH), Ana Velly (AV) (JGH), Zovinar Der Khatchadourian (ZD) (McGill University) and Sherif Elsaraj (SE) (The Dental Specialists Group) to confirm the diagnosis of painful TMD. The TMD diagnosis was established according to the RDC/TMD (47) or DC/TMD (48).

Twenty-two participants (20%) were classified as acute painful TMD cases because they reported a history of pain for less than three months, while 89 (80%) were classified as chronic painful TMD cases since they reported to have painful TMD for at least 3 months. Our decision to classify acute and chronic painful TMD is supported by the International Association for the Study of Pain (IASP) which defined chronic pain as "pain without apparent biological value that has persisted beyond normal tissue healing time, which in the absence of other criteria, is taken to be 3 months" (109, 110). Croft *et al*. (2010), in reference to the 3-month period, confirmed that "this time reflects the most widely accepted time period" (111). Furthermore, we also decided to classify the chronic painful TMD participants in: (i) subchronic painful TMD cases if they presented pain

lasting at least 3 months but less than 6 months, and (ii) chronic cases if they presented pain lasting at least 6 months.

4.2.2 Assessment

The DC/TMD instrument was used to assess pain intensity and headache. We assessed the presence of comorbidities (e.g. chest pain, back pain) using both, a questionnaire and a pain diagram. The DC/TMD contained several instruments such as TMD Pain Screener (See 2.3.1), Generalized Anxiety Disorders (GAD-7) and Patient Health Questionnaire (PHQ-8). GAD-7 and PHQ-8 were used to measure anxiety and depression, respectively. GAD-7 (sensitivity/specificity = 0.89/0.82, Cronbach's (α) = 0.92) and PHQ-8 (sensitivity/specificity = 0.88/0.88, Cronbach's (α) = 0.86-0.89) have good validity and internal consistency (112-117).

The scoring cut-offs for the GAD-7 and PHQ-8 questionnaires assessing anxiety and depression respectively were: 0-4 indicates that a person is not anxious or depressed, 5-9 indicates mild, 10-14 moderate, 15–27 indicates severe anxious or depressed.

4.2.3 Confounder Variables

Confounding is a distortion of the exposure-outcome association due to its mutual association with another factor (118). This distortion can lead to either overestimation or underestimation of the true association between exposure and outcome. In our study, the possible confounders and effect modifiers were age and gender.

4.3 Statistical Analyses

Descriptive analyses were performed to assess the clinical characteristics, comorbidities, psychological factors and demographics of the study sample. Student’s t-test, and ANOVA were

used to compare the continuous variables (e.g., age, pain intensity, number of comorbidities) between study groups. Chi-square test was used to compare the categorical or binary variables between groups (e.g. gender, headache, type of headache).

For the primary analysis, the dependent variable was binary: acute painful TMD (painful TMD < 3 months) (0) versus chronic painful TMD (painful TMD ≥ 3 months) (1). Univariate and multivariable logistic regression analyses were used to assess the clinical characteristics, comorbidities, psychological factors more commonly noted in the chronic group in comparison to the acute cases. All analyses tested a null hypothesis of no statistical relationship between the independent and dependent variables of interest at α=0.05 significance. The odds ratio (OR) and 95% confidence intervals (CI) for each factor were estimated. All analyses were performed using the statistical software package SAS (version 9.4; SAS Institute Inc., Cary, NC, USA), with the significance level for type I error set at the 0.05 level.

The logistic regression equation used can be written as:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \sum_{i=1}^{k} \beta_i * X_i$$

Where,

p is the probability of Y = 1, or the probability of the outcome

X_i is the i^{th} predictor variable, i = 1,2,3…..k;

β_o is the log odds of probability of outcome when predictor variables have a value of zero

β_i is the regression parameter associated with the i^{th} predictor variables such that odds ratio associated with increase in one unit of the i^{th} variables, when other variables are constant, is

$$OR_i = e^{\beta}_i$$

We also performed a secondary analysis to evaluate the characteristics among acute, subchronic and persistent chronic painful TMD. For these secondary analyses, we created three dependent variables: (i) acute painful TMD (painful TMD < 3 months) (0) versus subchronic painful TMD ≥ 3 months and < 6 months (1), (ii) acute painful TMD (0) versus persistent chronic painful TMD (> 6 months) (1), and (iii) subchronic painful TMD (0) versus persistent chronic painful TMD (1). Univariate and multivariable logistic regression analyses were also applied to evaluate the odds of these characteristics among these groups. The ORs and their 95% CI were also calculated.

The effective sample size of 100 patients provide power of 80% to detect an odds ratio of 2.8 to 4. These odds ratios and prevalence were based on Gatchel *et al.* (1996) (54). For this estimation, we considered alpha equal to 5%.

5. CHAPTER 5. MANUSCRIPTS

5.1. Clinical and Psychological Characteristics in Patients with Acute and Chronic Painful Temporomandibular Disorders: A Systematic Review

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Abstract

Aim: The purposes of this systematic review were to: 1) present the results of case-control, cross-sectional and randomized clinical trial studies that evaluated the characteristics of acute and chronic painful TMD, 2) present the findings of the cohort studies that assessed the risk factors implicated in the transition from acute to chronic painful TMD, and 3) appraise the methodology of these studies.

Methods: Four different databases; MEDLINE, Embase, Web of Science and Cochrane Database of Systematic Reviews were used. The initial result of these databases were 384 articles. Eligible studies were required to: (i) include patients diagnosed with acute orofacial pain or acute TMD, and chronic TMD, (ii) be human studies and (iii) be published in English, French, Portuguese or Spanish.

Results: From the eight articles assessed, five were cohort studies, two were case-control studies and one was a cross-sectional study. Multivariable logistic regression analyses demonstrated that muscle disorders and pain intensity contributed to the transition from acute to chronic painful TMD. Psychological factors were higher among chronic than acute participants, but these factors do not increase the transition risk. Major weaknesses found in these studies preclude any definitive conclusion of the risk factors implicated in the transition from acute to chronic painful TMD.

Conclusions: Based on this review, muscle disorders and pain intensity contribute to the transition from acute to chronic painful TMD. However, due to the small number of cohort studies, and weaknesses, there is insufficient evidence of risk factors implicated in the transition from acute to chronic painful TMD.

Introduction

Temporomandibular Disorders (TMD) is a term used to describe a musculoskeletal conditions which affect the muscles of mastication and/or the temporomandibular joint (1). Painful TMD is considered the second most common musculoskeletal disorder after chronic lower-back pain, with prevalence ranging from 5% to 12% (2, 5, 6, 119).

Treatment of TMD varies among clinicians, ranging from appliances, physical medicine modalities, pharmacologic therapy, cognitive-behavioral and psychological therapy and temporomandibular joint surgery. The major goal of these treatments are to improve pain management by preventing the risk and prognostic factors associated with TMD including oral behaviors (e.g. clenching only or clenching-grinding) (9-11), psychological factors (e.g. depression, anxiety, somatization) (9, 10, 12, 14-16, 19, 20) and comorbidities (9, 10, 14, 17-20). However, about one third of these patients will continue to suffer from moderate to severe levels of pain, disability, psychological distress and lower quality of life, independent of the treatment received (21-23). Therefore, it is crucial to prevent acute TMD patients from becoming chronic, which is more challenging to manage.

However, as stated by the National Institutes of Health (NIH) “we do not fully understand how acute progresses to chronic pain at any level, from molecular to behavioral” (25). One possible reason for this uncertainty is that most studies have focused on assessing factors associated with chronic painful TMD including participants enduring pain for many years.

Therefore, we initiated the Acute to Chronic TMD Transition (ACTION) project in 2014 with the overall goal to identify the risk factors in the transition from acute to chronic painful TMD, as well as its persistence. Thus, the purposes of this systematic review were to: 1) present the results of case-control, cross-sectional and randomized clinical trial studies that evaluated the

characteristics of acute and chronic painful TMD, 2) present the findings of the cohort studies that assessed the risk factors implicated in the transition from acute to chronic painful TMD, and 3) appraise the methodology of these studies.

Methods

Literature Search

Four reviewers participated in selecting and reviewing the potential eligible articles pertaining to this systematic review (OS, HK, KK, AV). The search was made through four databases and found; 136 articles from MEDLINE, 157 articles from EMBASE, 89 articles from Web of Science and 2 articles from Cochrane Database of Systematic Reviews. The initial result of these databases were 384 articles. Table 5.1.1 illustrates the Medical Subject Heading (MeSh) terms, and keywords used in the search.

Table 5.1.1. Search Strategy

1. exp Craniomandibular Disorders/	8. (acute or acutely).tw.	15. exp Acute Disease/
2. exp Facial Pain/	9. 7 or 8	16. exp Chronic Disease/
3. (TMD or TMJD).tw.	10. 6 and 9	17. 7 or 8 or 15
4. ((temporomandibular* or craniomandibular*) adj3 disorder*).tw.	11. exp Chronic Pain/	18. 11 or 12 or 16
5. (facial* adj3 pain*).tw.	12. (chronic* or dull*).tw.	19. 6 and 17 and 18
6. or/1-5	13. 11 or 12	20. 1 or 3 or 4
7. exp Acute Pain/	14. 10 and 13	21. 17 and 18 and 20

The search strategy followed the Cochrane recommendation and was prepared in agreement with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (120), which presents a flow chart summarizing the search strategy and selection process for studies included in this systematic review (Fig. 5.1.1).

Eligibility Criteria

All types of studies, whether observational or randomized control trials that were related to acute and chronic TMD required to: (i) include participants with acute pain and chronic TMD, (ii) be human studies and (iii) be published in English, French, Portuguese or Spanish. Unpublished studies, reports, abstracts were excluded from this review. This decision of excluding was based on the study by Egger *et al*. (2003) (121) which showed that the methodology and quality of reviewed papers is better than including gray literature such as abstracts, which are usually of poorer quality.

Validity Assessments

A standardized method conforming to the Cochrane handbook for Systematic Review, and the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guidelines were taken into consideration to evaluate the quality of the eight eligible studies (122, 123). Therefore, we assessed: the title and abstract, introduction, methods, results, discussion and other information.

All eight articles were independently evaluated and scored by three reviewers (OS, HK, AV). A group discussion was achieved in case of any disagreement.

Data Abstraction and Management

The articles were abstracted from the databases by (OS) with the collaboration of Martin Morris, librarian at McGill University. Data extracted are included in Tables 5.1.2 and 5.1.5.

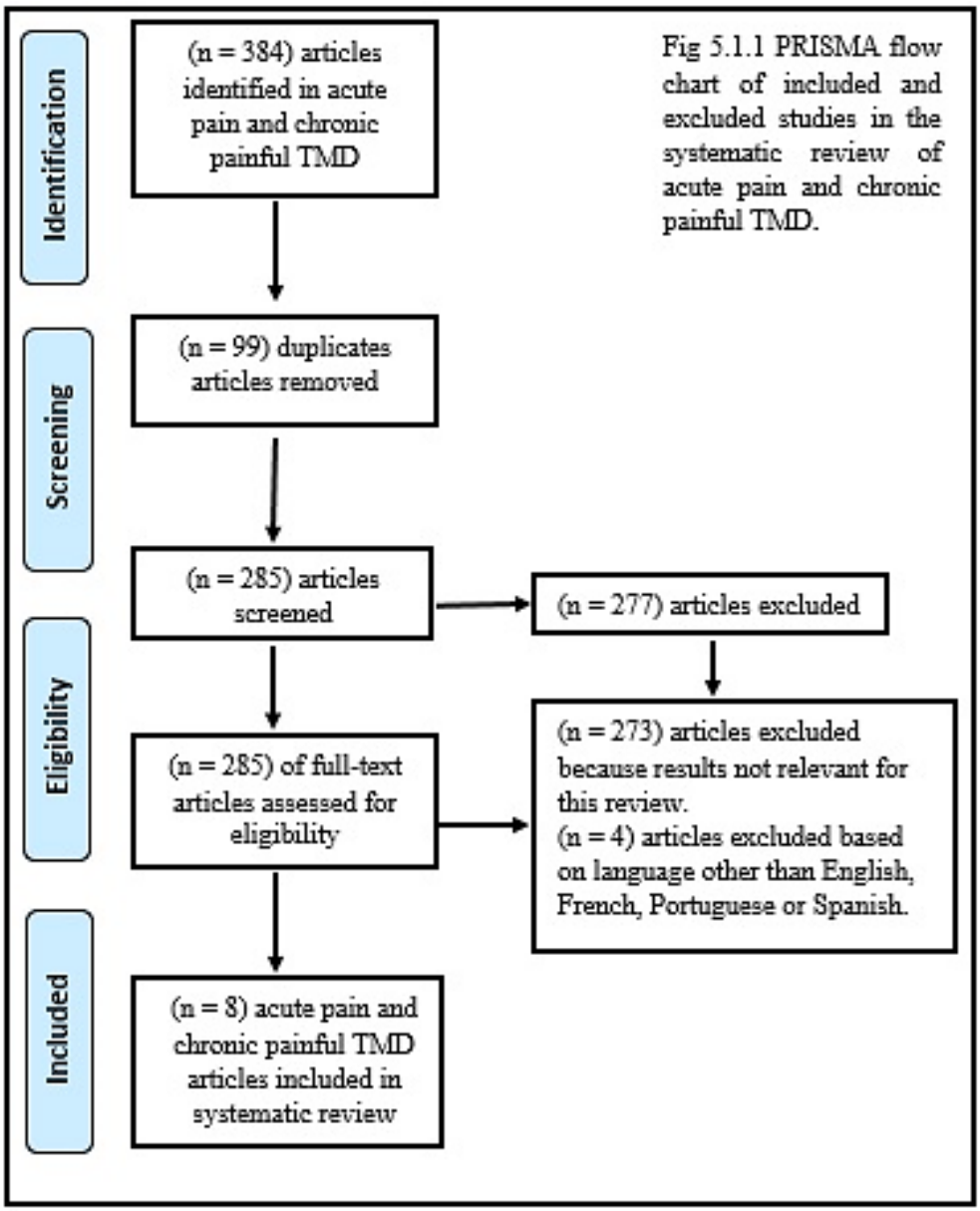

Fig 5.1.1 PRISMA flow chart of included and excluded studies in the systematic review of acute pain and chronic painful TMD.

Results

In this systematic review of literature published between 1996 and 2014, the initial search resulted in 384 publications.

Two-hundred and eighty-five publications were screened, and 8 were included in this review. From those, four were cohort studies (26, 60-62), two were case-control studies (54, 57), one was a cross-sectional study (55) and one was a randomized clinical trials (56). Tables 5.1.2 to 5.1.5 present the results of these studies.

Factors Differentiating Acute and Chronic Painful TMD

Table 5.1.2 shows a list of studies that assessed differences between acute and chronic TMD. Gatchel *et al*. (1996) conducted a case-control study including 101 painful TMD participants, 51 acute and 50 chronic participants (54). These participants were referred by dentists and oral surgeons in Dallas-Fort Worth area to the Division of Psychology in University of Texas Medical Center to participate in the study. Patients were considered chronic TMD participants if they experienced pain for at least 6 months, and acute participants if they had pain for less than six months. The diagnosis of acute and chronic painful TMD participants was based on the RDC/TMD (47). The mean duration of pain was 2.4 and 104.2 months for the acute and chronic participants, respectively. In this study, acute TMD participants demonstrated more frequent anxiety disorders (47.1%, $P < 0.001$), while somatoform disorders (50%, $P < 0.001$) and affective disorders (34%, $P < 0.001$) were more common among the chronic TMD participants. These psychological disorders were assessed based on the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R).

A cross-sectional study by Kafas and Leeson (2006) was carried out to identify clinical and psychological factors that could aid in the classification of acute and chronic TMD (55). TMD participants included in this study should present pain in the temporomandibular joint (TMJ) area. Muscle pain, limited mouth opening and clicking were not inclusion criteria. A sum of 22 painful TMD participants, 14 with chronic and 8 with acute painful TMD, were recruited in the pain clinic at the Eastman Dental Institute. All patients were referred by the Department of Oral and Maxillofacial Surgery at Eastman Dental Institute. Chronic painful TMD implied patients who suffered from pain for at least three months, whereas acute painful TMD participants experienced pain for less than three months. A TMD pain assessment questionnaire was used for clinical examination. This instrument assessed the history of pain, pain locations (muscle of mastication, TMJ), sounds, deviation, and range of motion. Hospital Anxiety and Depression (HAD) instrument was used to assess anxiety and depression, and Pain Catastrophizing was used to evaluate catastrophizing. This study showed that patients who suffered from chronic painful TMD had significantly more frequent muscle tenderness in the TMJ area (85.7%, $P < 0.05$), constant pain (85.7%, $P < 0.05$) and dull ache (78.6%, $P < 0.05$) compared to patients with acute painful TMD. Psychological factors were also more common among chronic participants compared to acute. However, no statistically significance was found between-group.

Salmos-Brito *et al*. (2013) conducted a randomized controlled trial (RCT) to investigate the effects of low level laser therapy (LLLT) on pain intensity and maximal mouth opening (56). Individuals representing acute (n = 32) and chronic (n = 26) painful TMD participants were diagnosed with myofascial pain in accordance to the RDC/TMD classification criteria (47). Acute TMD patients were classified as patients who revealed pain for less than six months, while chronic TMD patients revealed pain for at least six months. All individuals were referred from the Pain

Control Center of the University of Pernambuco from 2009 to 2010. The results of this study shows that the LLLT significantly reduced the intensity of pain using a 0-10 Visual Analogue Scale (VAS) ($P = 0.002$), and improved maximal mouth opening ($P < 0.001$) in acute patients more than the chronic.

A recent case-control study conducted by Jasim *et al.* (2014) compared psychological factors and salivary cortisol levels between women with acute and chronic orofacial pain, and women without pain (57). Acute orofacial pain (n = 24) and controls participants (n = 27) were recruited from both undergrad dental clinic, while chronic orofacial pain participants (n = 27) were recruited from orofacial pain clinic. Chronic orofacial pain participants should receive the diagnosis of myofascial pain established according to the RDC/TMD (47). Acute pain was defined as a short-lasting pain which considers a disease or injury symptom (58). Furthermore, acute orofacial pain included individuals with orofacial pain, not TMD, for less than ten days, whereas chronic orofacial pain participants presented pain for at least six months. Pain duration among acute participants was on average 5 days (SD = 2.6 days) while the average among chronic participants was on average 5.54 years (SD = 8.0 years). Pain intensity and analgesic consumption were not significantly different between pain groups. Chronic orofacial pain participants presented significantly higher levels of depression ($P < 0.001$), somatization ($P < 0.001$) and perceived stress ($P < 0.05$) than both acute and controls participants. These psychological factors were assessed using Beck Depression Inventory (BDI), (DSM-IV) and Multidimensional Pain Inventory (MPI), respectively. No statistically significant differences were noted between controls and acute participants in psychological factors' scores. Also, no significant differences were found in salivary cortisol levels between groups.

Table 5.1.2. Factors Differentiating Acute and Chronic Painful TMD								
Study	**Design**	**Location**	**Groups Size**	**Participation Groups**	**Factors Measured**	**Percentage**	**Results‡‡**	***P* Value**
Gatchel *et al.*, (1996) (54)	Case-control	Division of psychology, medical center	A (n=51)	A: Acute TMD (A < 6 months)	Somatoform	A = 5.9, C = 50.0	C > A	*P* < 0.001
					Affective disorders	A = 11.8, C= 34.0		
			C (n=50)	C: Chronic TMD (C ≥ 6 months)	Anxiety disorders	A = 47.1, C = 12.0	A > C	*P* < 0.001
					Substance abuse	A = 2.0, C = 4.0	A = C	Not provided
					Eating disorders	A = 2.0, C = 0		
					Adjustment disorders	A = 3.9, C = 2.0		
Kafas and Leeson (2006) (55)	Cross-sectional	Dental institute and hospital	A (n=8)	A: Acute TMD (A < 3 months)	Dull	A = 0, C = 78.6	C > A	*P* < 0.05
					Sharp	A = 50, C = 14.3	A > C	*P* < 0.05
			C (n=14)	C: Chronic TMD (C ≥ 3 months)	Constant	A = 25, C = 85.7	C > A	*P* < 0.05
					TMJ tenderness	A = 62.5, C = 14.3	A > C	*P* < 0.05
					Muscular ± TMJ tenderness	A = 37.5, C = 85.7	C > A	*P* < 0.05

					Depression[§]	A = 12.5, C = 42.9	A = C	Not provided
					Anxiety[§]	A = 25, C = 57.2	A = C	Not provided
					Coping	A = 25, C = 64.3	A = C	Not provided
					Catastrophizing	A = 12.5, C = 78.6	A = C	Not provided
Salmos-Brito *et al.*, (2013)* (56)	RCT	Pain control center	A (n=32)	A: Acute TMD (A < 6 months)	Pain intensity	No details provided	A > C	*P* = 0.002
			C (n=26)	C: Chronic TMD (C ≥ 6 months)	Maximal mouth opening	No details provided	A > C	*P* < 0.001
Jasim *et al.*, (2014)* (57)	Case-control	Undergrad dental clinic	AOP (n=24)	A: AOP (AOP <10 days)	Pain intensity	No details provided	A = C	Not provided
		OP clinic	C (n=27)	C: COP (C ≥ 6 months)	Stress	No details provided	C > A = CT	*P* < 0.05
					Somatization	No details provided		*P* < 0.001
					Depression	No details provided		*P* < 0.001
		Undergrad dental clinic	CT (n=27)	CT: Pain-free controls	Salivary cortisol level	No details provided	C = A = CT	Not provided

***** RDC/TMD was used. A = Acute TMD. C = Chronic TMD, CT = Controls, RCT = Randomized Control Trials, AOP = Acute orofacial pain. COP = Chronic orofacial pain. OP = Orofacial pain.

‡‡ Results measured between groups, A > C means that group A was more significant than group C, A = C means no statistically significant difference between groups. § No difference because of a small sample size.

Table 5.1.3. Cohort studies assessing the effect of the demographics in the transition from acute to chronic TMD							
Study	**Follow-up**	**Location**	**Acute pain sample (Baseline)**	**Study outcomes at follow-up**	**Factors Measured**	**Results**	***P* Value**
Garofalo *et al.*, (1998)* (26)	3 and 6-month	University of Texas	n = 164 §	NC (n = 66) ¶ C (n = 87) ¶¶	Females (%)	NC = 59.1, C = 74.1	$P < 0.04$
					Age in yrs. Mean (SD)	NC = 33.7 (10.4), C = 36.0 (9.4)	$P > 0.05$
					Education in yrs. Mean (SD)	NC = 15 (2.5), C = 14.8 (2.3)	$P > 0.05$
					White race (%)	NC = 75.8, C =75.9	$P > 0.05$
					Married status (%)	NC = 50.0, C = 54.0	$P > 0.05$
Epker *et al.*, (1999)* (60)	3 and 6-month cohort	University of Texas	n = 204 §	NC (n = 60) ¶ C (n = 144) ¶¶	Age in yrs. Mean (SD)	34.80 (-)	Not provided
					Females (%)	71.57	Not provided
Phillips *et al.*, (2001)* (61)	3 and 6-month cohort	University of Texas	n = 161 Women n = 72 Men £	NC = 80 (55 women, 25 men) ¶ C = 153 (106 women, 47 men) ¶¶	Age in yrs. Mean (SD)	Not provided	
					Females (%)	69.09	Not provided
Gatchel *et al.*, (2006)* (62)	3, 6, 9 and 12-month cohort	University of Texas	Acute TMD ¥ DEP (n = 32) NDEP (n = 31)	Chronic TMD DEP (n = 32) NDEP (n = 31)	Age in yrs. Mean (SD)	DEP = 36 (11.3) NDEP = 37.6 (11.4)	$P = 0.58$
					Females (%)	DEP = 87.5 NDEP = 71	$P = 0.09$

Abbreviations: * = RDC/TMD was used. C = Chronic TMD, NC = Nonchronic TMD. GCPS = Graded Chronic Pain Score. CPI = Characteristic Pain Intensity, DEP = depressed, NDEP = non depressed.

Note: Acute pain definitions: § Never sought treatment or sought treatment within 6 months of initial treatment, £ Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months before study recruitment. ¥ Pain for less than six months.

Definition of pain at 6-month follow-up: ¶ Nonchronic TMD = CPI score was less than 15 (that is, their TMD had resolved). ¶¶ Chronic TMD = CPI ≥ 15.

Table 5.1.4. Cohort studies assessing the effect of the clinical characteristics at baseline in the transition from acute to chronic TMD							
Study	**Follow-up**	**Location**	**Acute pain sample (Baseline)**	**Study outcomes at follow-up**	**Factors Measured**	**Results**	***P* Value**
Garofalo *et al.*, (1998)* (26)	3 and 6-month	University of Texas	n = 164 §	NC (n = 66) ¶ C (n = 87) ¶¶	Mean CPI (SD)	NC = 37.1 (22.6), C = 59.4 (18.6)	$P \approx 0.000$
					GCPS (0) (%)	NC = 3.3, C = 0	$P < 0.0001$
					GCPS (I) (%)	NC = 62.1, C = 29.9	
					GCPS (II) (%)	NC = 27.3, C = 49.4	
					GCPS (III) (%)	NC = 1.5, C = 14.9	
					GCPS (IV) (%)	NC = 1.5, C = 5.7	
					Group I - RDC (%)	NC = 28.3, C = 61.8	$P < 0.0001$
					Group II - RDC (%)	NC = 25.0, C = 33.3	Not provided
					Group III - RDC (%)	NC = 33.3, C = 58.8	$P < 0.003$
Epker *et al.*, (1999)* (60)	3 and 6-month cohort	University of Texas	n = 204 §	NC (n = 60) ¶ C (n = 144) ¶¶	CPI	$\beta = -0.06$	$P < 0.001$
					Myofascial pain	$\beta = 0.78$	$P = 0.003$

Phillips *et al.*, (2001)* (61)	3 and 6-month cohort	University of Texas	n = 161 Women n = 72 Men [£]	NC = 80 (55 women, 25 men) [¶] C = 153 (106 women, 47 men) [¶¶]	Muscle disorders (%)	WCH =67.1, WNCH = 31.4	$P < 0.01$
						MCH = 41.3, MNCH = 25.0	$P > 0.05$
					Joint disorders (%)	WCH =34.1, WNCH = 23.5	$P > 0.05$
						MCH = 19.6, MNCH = 29.2	$P < 0.05$
					GCPS low (%)	WCH =34.9, WNCH = 70.9	$P < 0.001$
						MCH = 48.9, MNCH = 80.0	$P < 0.01$
					GCPS Moderate (%)	WCH =51.9, WNCH = 23.6	$P < 0.001$
						MCH = 36.2, MNCH = 20)	$P > 0.05$
					GCPS High (%)	WCH =13.2, WNCH = 5.5	$P > 0.05$
						MCH = 14.9, MNCH = 0	$P < 0.04$
					Mean CPI	WCH = 55.13, WNCH = 35.12	$P < 0.001$
						MCH =48.58, MNCH = 28.0	$P < 0.001$
					Mean limitations	WCH =0.34, WNCH = 0.26	$P < 0.02$
						MCH =0.27, MNCH = 0.13	$P < 0.002$

Gatchel *et al.*, (2006)* (62)	3, 6, 9 and 12-month cohort	University of Texas	Acute TMD ¥ DEP (n = 32) NDEP (n = 31)	Chronic TMD DEP (n = 32) NDEP (n = 31)	Characteristic Pain Intensity	DEP: AC = 56.84(13.41) CH = 22.77 (17.54)	*P* > 0.05
						NDEP: AC = 58.26 (10.97) CH = 24.94 (18.78)	
					Masticatory function	DEP: AC = 3.68 (1.23) CH = 3.54 (1.29)	
						NDEP: AC = 3.71 (1.28) CH = 3.87 (1.35)	

Abbreviations: * RDC/TMD was used. C = Chronic TMD. NC = Nonchronic TMD. AC = Acute TMD. GCPS = Graded Chronic Pain Score. CPI = Characteristic Pain Intensity. DEP = depressed, NDEP = non depressed. WCH = Chronic pain among women. WNCH = Nonchronic among women. MCH = Chronic pain among men. MNCH = Nonchronic among men.

Note: Acute pain definitions: § Never sought treatment or sought treatment within 6 months of initial treatment, £ Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months before study recruitment. ¥ Pain for less than six months.

Definition of pain at 6-month follow-up: ¶ Nonchronic TMD = CPI score was less than 15 (that is their TMD had resolved). ¶¶ Chronic TMD = CPI ≥ 15.

Table 5.1.5. Cohort studies assessing the effect of the psychological characteristics at baseline in the transition from acute to chronic TMD							
Study	**Follow-up**	**Location**	**Acute pain sample (Baseline)**	**Study outcomes at follow-up**	**Factors Measured**	**Results**	***P* Value**
Garofalo *et al.*, (1998)* (26)	3 and 6-month	University of Texas	n = 164 §	NC (n = 66) ¶ C (n = 87) ¶¶	Moderate Depression	C = 35.7, NC = 21.5	$P < 0.007$
					Severe Depression	C = 38.1, NC = 27.7	
					Moderate NSS	C = 27.7, NC = 23.1	$P < 0.0002$
					Severe NSS	C = 56.6, NC = 30.2	
Phillips *et al.*, (2001)* (61)	3 and 6-month cohort	University of Texas	n = 161 Women n = 72 Men £	NC = 80 (55 women, 25 men) ¶ C = 153 (106 women, 47 men) ¶¶	Anxiety	Women (C = 54.3 and NC = 34.5)	$P < 0.018$
					Depression	Women (C = 10.72 and NC = 6.67)	$P < 0.002$
						Men (C = 9.43 and Men NC = 5.67)	$P < 0.05$
					Distress	Men (C = 31.1, Men NC = 8.3)	$P < 0.03$
					Hypochondriasis	Women (C = 62.15, NC = 56.45)	$P < 0.008$
					Hysteria	Women (C = 62.29, NC = 54.51)	$P < 0.001$
Gatchel *et al.*, (2006)* (62)	3, 6, 9 and 12-month cohort	University of Texas	Acute TMD ¥ DEP (n = 32) NDEP (n = 31)	Chronic TMD DEP (n = 32) NDEP (n = 31)	Depression	DEP: AC = 11.97 (12.04)	$P < 0.03$
						NDEP: AC = 5.84 (4.91)	
						DEP: 12-month = 7.25 (8.60)	$P = 0.02$
						NDEP: 12-month = 2.87 (3.25)	

Abbreviations: * = RDC/TMD was used. C = Chronic TMD. NC = Nonchronic TMD. AC = Acute TMD. DEP = depressed, NDEP = non depressed. NSS = Non specific symptom

Note: Acute pain definitions: £ Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months before study recruitment. ¥ Pain for less than six months.

Definition of pain at 6-month follow-up: ¶ Nonchronic TMD = CPI score was less than 15 (that is their TMD had resolved). ¶¶ Chronic TMD = CPI ≥ 15.

Factors Associated with the Transition from Acute to Chronic Painful TMD

The studies that evaluated the risk factors implicated in the transition from acute to chronic painful TMD are described in Tables 5.1.3 to 5.1.5. In a 6-month prospective cohort study conducted by Garofalo *et al*. (1998) out of 164 acute painful TMD participants, 87 developed chronic TMD and 66 developed nonchronic TMD at the 6-month follow-up period (26). Eleven participants (7%) dropped out of the study during follow-up. All participants were diagnosed by members of a research team as having painful TMD on the basis of the RDC/TMD criteria (47). Participants were referred by dentists or oral surgeons to the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas. Newspaper advertisement or university campus fliers were used to recruit the participants. Participants with acute TMD were those who had never sought treatment or who sought treatment within 6 months of first evaluation. A telephone interview was conducted at 3 and 6-month follow-ups, involving questions based on Graded Chronic Pain Scale (GCPS) (59), assessing pain intensity and disability. At 6-month follow-up, participants with a Characteristic Pain Intensity (CPI) score of less than 15 were classified as nonchronic painful TMD participants; those with a score of 15 or more were considered to have chronic TMD. CPI is the average of pain intensity; current, worst, and average multiplied by ten (59). The crude analysis pointed out that female participants ($P < 0.04$), participants with higher pain intensity ($P \approx 0.00$), RDC Group I ($P < 0.0001$), RDC Group III ($P < 0.003$), higher GCPS ($P < 0.0001$), depression ($P < 0.007$) and somatization ($P < 0.0002$) at baseline, were more likely to develop chronic painful TMD at 6-month follow-up than participants without being exposed to these putative risk factors. Furthermore, the multivariable logistic regression analysis including 153 participants showed that CPI ($\beta = 0.03$, $P = 0.02$) and Group I ($\beta = 1.43$, $P = 0.03$) at baseline contributed to the transition from CPI < 15 at baseline to CPI ≥ 15 at 6-month follow-up. A borderline association was noted with GCPS ($\beta = 2.00$, $P = 0.09$), but no

association was found in Symptom Checklist-90-Revised (SCL-90-R) Nonspecific Symptoms Scale score ($\beta = 0.47$, $P = 0.15$). The CPI was defined as possible scores range from 1 to 100, with 1 = no pain while the GCPS especially 3 or 4 suggested that the person is experiencing a significant amount of limitation and disability related to the TMD regardless of the CPI score. The score of SCL-90-R must fall at or below the 70th percentile of the general population or be less than 0.5 to be normal; between the 70th and 90th percentiles or between 0.5 and 1. To be moderate range and above the 90th percentile or greater than 1.0 to be severe.

Epker *et al*. (1999) conducted a 6-month cohort study to identify factors that contributed to the transition from acute to chronic painful TMD (60). At baseline, 204 acute TMD participants were recruited from the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas. RDC/TMD was used to established the TMD diagnosis (47). Participants who had never been diagnosed as having TMD or had been diagnosed less than 6 months within the study recruitment were classified as having acute TMD. At the 6-month follow up, 144 developed chronic TMD and 60 nonchronic TMD. At this time, subjects with CPI scores of less than 15 were considered to have nonchronic TMD, while subjects whose CPI score was 15 or above were considered to have chronic TMD. A telephone interview assessment was conducted at three and six-month follow-up, and the baseline assessment was done in-person. In a multivariable forward stepwise logistic regression analysis, including 175 participants demonstrated that CPI ($\beta = - 0.06$, $P < .001$) and myofascial pain ($\beta = 0.78$, $P = 0.003$) measured at the baseline contributed to the transition to chronic pain status, reported pain at 6 months of follow-up with CPI > 15. The authors explained that participants with high pain intensity (CPI) and myofascial pain were more likely to develop chronic painful TMD. However, the CPI result is inconclusive since the CPI was negatively associated with chronic pain ($\beta = - 0.06$). Furthermore, the authors mentioned that

chronic participants were more likely to have reported at baseline, higher levels of GCPS, depression, nonspecific physical symptoms, limitations and pain intensity than the nonchronic group. The authors, however, did not provide any of these results. In this study, the CPI was calculated as the mean of the patient's report of current pain, worst pain in the last three months and mean pain in the last three months, multiplied by 100. The nonspecific physical symptoms instrument was used as a measured of the patient's report of physical complaints in a variety of body areas. The GCPS was described as an index that combines the patient's report of pain severity and pain-related impairment.

Phillips *et al*. (2001) conducted a 6-month prospective cohort study to assess the risk factors implicated in the transition from acute to chronic painful TMD, among 161 women and 72 men (61). Participants were recruited from the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas. If they had never been diagnosed with TMD or had been diagnosed within less than 6 months of the initial evaluation, they were classified as acute subjects. The diagnosis was based on the RDC/TMD (47). At 6-month follow-up, subjects with CPI scores of less than 15 were considered to have nonchronic TMD, while subjects whose CPI score was 15 or above were considered to have chronic TMD. This study found that women and men who developed chronic TMD present statistically significant differences from those who do not develop chronic from their acute state. More specially, the crude analysis indicated from the women acute cohort, muscle disorders, mean limitations, CPI, GCPS moderate, depression, nonspecific physical symptoms noted at baseline were all more common among chronic than nonchronic participants at the 6 months of follow-up. From the men cohort, chronic TMD participants more frequently presented joint disorders, severe GCPS, higher mean limitations, and CPI than those with nonchronic pain at the 6-month follow-up. The CPI was measured the severity

of pain by averaging a patient's report of current pain, worst pain and average pain in the last three months. While the GCPS combined the patient's report of pain severity and pain-related impairment. Depression was assessed by using the BDI instrument.

Gatchel *et al*. (2006) conducted a 12-month cohort study where 63 individuals with acute painful TMD were recruited from the TMD Clinical Treatment Program at the University of Texas Southwestern Medical Center in Dallas (62). These participants were part of an ongoing RCT study assessing the treatment effectiveness of an early intervention for participants with acute painful TMD (63). The TMD diagnosis was established in accordance to the RDC/TMD criteria (47). Acute TMD subjects reported pain that lasted less than 6 months. BDI scores at baseline, 32 acute participants were classified as depressed and 31 as non-depressed. The phone-interview was performed at 3, 6, 9 and 12 months after baseline, and the clinical examination was performed at 12 months. The means of CPI ($P < 0.001$) and masticatory function score evaluated with Median Particle Size (MPS) ($P < 0.02$) at 12-month follow-up were significantly lower than those at baseline, regardless of the study group as depressed or nondepressed. Only BDI at baseline increased the odds of persistent depression (Odds ratio [OR] = 1.1, P = 0.03). Also, the BDI significantly decreased for both groups from pre-intake to 12-month follow-up.

Discussion

This systematic review assessed eight publications evaluating clinical, psychological and demographic characteristics among acute orofacial pain or acute TMD and chronic painful TMD, as well as the contribution of these factors to the transition from acute for chronic painful TMD. Based on these studies, the following conclusions can be made.

The implication of psychological factors in the increased risk for the transition from acute to chronic painful TMD has not yet been well established. The cohort studies showed in their crude

analysis that participants who developed chronic pain had higher mean scores of psychological status than those who did not (26, 60, 61). However, these studies did not find in the multivariable logistic regression analysis that psychological status predicted this transition (26, 60) after 6 months of follow-up. This does not agree with the cohort studies that also demonstrated that psychological status increases the risk of chronic painful TMD (10, 12, 14-16), as well as contribute to its persistence (9). A probable reason for this inconsistency may be differences in study population, TMD groups, and chronic pain definition. For example, we found that in this systematic review that high psychological status was more common among chronic myofascial pain (57) and chronic TMJ (55).

This review also appraised clinical characteristics that could contribute to the transition of the differences between acute and chronic painful TMD. Two cohort (26, 60) demonstrated that pain intensity (CPI) and myofascial pain contributed to increase the risk for the transition from acute to chronic painful TMD after a 6-month follow-up, regardless of GCPS and psychological factors. In these studies, chronic pain was defined as having a CPI greater or equal to 15. However, it was interesting to find current pain intensity did not differ between acute orofacial pain and chronic myofascial pain (57).

Methodological issues and biases in the review process

In this review, languages other than English, French, Spanish and Portuguese were not eligible, which may affect the validity of our results (121). Although a protocol has been implemented to identify the studies; some may have been inadvertently missed. Furthermore, like many reviews, a positive results bias - a type of publication bias - could also exist when authors are more likely to submit, or editors accept, positive rather than null (negative or inconclusive) results.

We noted major weaknesses in these studies reviewed that prevent any definitive conclusions on the factors implicated in the increase risk for the transition from acute to chronic painful TMD. None of these studies met all level I criteria. The percentage of STROBE criteria met among the eight studies included in Tables 5.1.2 to 5.1.5 was low with a percentage equal to 60%. The major potential problems influencing study results were: (i) recruiting patients from a center expert in the risk factor assessed (psychological center) may result in a selection bias, (ii) not appropriate statistical analysis used with adjusting for relevant confounders, (iii) poorly-described statistical analysis, and (iv) absence of sample size calculation. Certainly, these discrepancies may result because of the way of defining acute and chronic painful TMD.

Future Research

The new analytic studies need to follow the STROBE and CONSORT guidelines recommendations (120, 124). The methodological issues and inconsistencies indicate that more research is required to determine factors are involved in the transition from acute to chronic painful TMD, as well as its persistence. These studies will provide valid evidence for procedures intent to prevent this transition.

Conclusion

This systematic review appraised eight papers (two case-controls, one cross-sectional, one RCT and four prospective cohort studies). A qualitative review of the literature found insufficient evidence for the effect of demographic, clinical characteristics and psychological factors as primary risk factors implicated in the transition from acute to chronic painful TMD.

Acknowledgment

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5.2. Clinical, Psychological and Comorbid Characteristics in Patients with Acute and Chronic Painful Temporomandibular Disorders:

A Baseline Analysis of Acute to Chronic Transition Project

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Abstract

Although most cases of Temporomandibular Disorders (TMD) are mild and self-limiting, about one third of these patients will continue to suffer from moderate to severe levels of pain, disability, psychological distress and lower quality of life, independent of the treatment received. Thus, it is crucial to prevent painful TMD from becoming chronic, which is more difficult to manage. However, as stated by the National Institutes of Health (NIH) "we do not fully understand how acute progresses to chronic pain at any level, from molecular to behavioral". Our systematic review is in agreement with this previous NIH statement. The aim of this cross-sectional analysis was to identify the clinical, psychological, and comorbid factors among acute and chronic painful TMD. One hundred and eleven participants were recruited for this study. TMD diagnosis was established according to the RDC/TMD or DC/TMD; 22 and 89 where classified as acute and chronic painful TMD respectively. Our results showed that participants with chronic painful TMD were more likely to report headache located behind the eyes or inside the head (Odds ratio [OR] = 4.14, $P = 0.02$), pain in the legs (OR= 9.05, $P = 0.04$) or neck (OR = 3.10, $P = 0.03$) than the acute cases. Participants presenting at least one painful comorbidity (OR = 3.35, $P = 0.02$), or those with more than one (OR = 1.49, 95%CI = 1.01-2.20, $P = 0.04$) were more likely to have chronic painful TMD. A borderline association was noted with worst pain intensity ($P = 0.09$). Psychological factors were not different between groups. Results indicate that headache and comorbidities should be considered as important risk factors implicated in the transition from acute to chronic painful TMD.

Keywords:

TMD, acute pain, chronic pain.

Introduction

Temporomandibular disorder (TMD) is a term used to describe musculoskeletal conditions characterized by pain in the muscles of mastication and/or the temporomandibular joint (1). Approximately half to two-thirds of painful TMD patients seek professional care from dentists or physicians, but on average one third of these patients will continue to suffer from moderate to severe levels of pain, disability, psychological distress and lower quality of life, independent of the treatment received (12, 21-23, 27).

Thus, it is crucial to prevent painful TMD from becoming chronic, which is more difficult to manage. However, as stated by the National Institutes of Health (NIH) "we do not fully understand how acute progresses to chronic pain at any level, from molecular to behavioral" (25). Therefore, it is of great urgency to identify the risk factors of the transition and persistence of painful TMD, and hence develop strategies to prevent this transition.

Many risk factors have been suggested to contribute to the onset and persistence of painful TMD; psychological factors, oral habits and comorbidities (9, 12, 18, 90). From the many psychological factors, anxiety appears to be more often associated with acute painful TMD (54), whereas stress and depression, with chronic painful TMD (57). Others, and us (9, 10, 12, 13, 18, 125-127), have demonstrated that trauma and comorbidities are associated with chronic painful TMD.

Our systematic review is in agreement with this previous statement from the NIH. Our review only found eight articles that compare acute with chronic painful TMD, or that assessed the risk factors related to this transition. Multivariable logistic regression analyses demonstrated that muscle disorders and pain intensity contributed to the transition from acute to chronic pain.

Major weaknesses found in these studies preclude any definitive conclusion of the risk factors implicated in the transition from acute to chronic painful TMD.

Therefore, we initiated the Acute to Chronic TMD Transition (ACTION) project in 2014 with the overall goal to identify the risk factors in the transition from acute to chronic painful TMD, as well as its persistence. Thus, the purposes of this cross-sectional analysis were to compare the baseline characteristics between acute and chronic painful TMD participants. More specifically, the primary aim is to identify the clinical, psychological, and comorbid factors among acute and chronic painful TMD.

Methods

Study population

This clinically based cross-sectional study is the first part of an ongoing 6-month prospective cohort study and was approved by the McGill Institutional Review Board in Montreal, Canada (approval number: A12-M113-14A) and by the Dental Specialists Group in Ottawa, Ontario (approval number: 240-400).

Eligible participants with acute or chronic painful TMD were recruited from the Jewish General Hospital (JGH) general dental clinic, the Faculty of Dentistry of McGill University oral diagnosis (OD) clinic and the Dental Specialists Group TMD-specialized clinic, between August 2015 and July 2016. Painful TMD participants were eligible for this study if they were between 18 and 80 years of age, and received a diagnosis of painful TMD (muscle and/or joint pain) in accordance with the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) or Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). Participants who had another orofacial pain, no access to a telephone, and those who were unable to provide informed consent, or not capable speak French or English were excluded.

A total of 137 patients were informed about the TMD study. From these, 4 refused to participate (lack of time and distress) and 22 were not eligible (pain other than TMD, language issue and over 80 years old). Because of ethical consideration, we were not able to collect more details from the patients who refused to participate.

All 111 possible participants were invited to complete a TMD pain screening instrument (40). These 111 participants had a positive screening which confirmed the presence of their TMD pain. Afterwards, participants received a clinical examination by Drs. Mervyn Gornitsky (MG) (JGH), Ana Velly (AV) (JGH), Zovinar Der Khatchadourian (ZK) (McGill University) and Sherif Elsaraj (SE) (The Dental Specialists Group) to confirm the diagnosis of painful TMD. The TMD diagnosis was established according to the RDC/TMD (47) or DC/TMD (48).

Twenty-two participants (20%) were classified as acute painful TMD cases because they reported a history of pain for less than three months, while 89 (80%) were classified as chronic painful TMD cases since they reported to have painful TMD for at least 3 months. Our decision to classify acute and chronic painful TMD is supported by the International Association for the Study of Pain (IASP) which defined chronic pain as "pain without apparent biological value that has persisted beyond normal tissue healing time, which in the absence of other criteria, is taken to be 3 months" (109, 110). Croft *et al*. (2010), in reference to the 3-month period, confirmed that "this time reflects the most widely accepted time period" (111).

Furthermore, we also decided to classify the chronic painful TMD participants in: (i) subchronic painful TMD cases if they presented pain lasting at least 3 months but less than 6 months, and (ii) chronic cases if they presented pain lasting at least 6 months.

Assessment

The DC/TMD instrument was used to assess pain intensity and headache. We assessed the presence of comorbidities (e.g. chest pain, back pain) using both, a questionnaire and a pain diagram. The DC/TMD contained several instruments such as TMD Pain Screener, Generalized Anxiety Disorders (GAD-7) and Patient Health Questionnaire (PHQ-8).

TMD pain screening instrument

In this study, we evaluated the presence of TMD pain among the acute and chronic painful TMD cases by using a TMD screening instrument. This instrument was developed by Gonzalez *et al.* (2011) (40) and reported an excellent sensitivity (99%) and specificity (97%).

Headache and painful comorbidities

We assessed headache using the DC instrument and six painful comorbidities using a questionnaire and a pain diagram: pain in arms, legs, chest, neck, back and abdomen.

Psychological variables

Psychological variables assessed were anxiety and depression. GAD-7 and PHQ-8 were used to measure anxiety and depression, respectively. GAD-7 (sensitivity/specificity= 0.89/0.82, Cronbach's (α) = 0.92) and PHQ-8 (sensitivity/specificity= 0.88/0.88, Cronbach's (α) = 0.86-0.89) have a good validity and internal consistency (112-117). The scoring cut-offs for the GAD-7 and PHQ-8 questionnaires assessing anxiety and depression respectively were: 0-4 indicates that a person is not anxious or depressed, 5-9 indicates mild, 10-14 moderate, 15–27 indicates severe anxious or depressed.

Sociodemographic status

The two sociodemographic factors that were investigated in this study were: age and gender.

Statistical analyses

Descriptive analyses were performed to assess the clinical characteristics, comorbidities, psychological factors and demographics of the study sample. Student's t-test, and ANOVA were used to compare the continuous variables (e.g., age, pain intensity, number of comorbidities) between study groups. Chi-square test was used to compare the categorical or binary variables between groups (e.g. gender, headache, type of headache).

For the primary analysis, the dependent variable was binary: (0) acute painful TMD (painful TMD < 3 months) versus (1) chronic painful (painful TMD ≥ 3 months). Univariate and multivariable logistic regression analyses were used to assess the clinical characteristics, comorbidities, psychological factors more commonly noted in the chronic group in comparison to the acute cases. All analyses tested a null hypothesis of no statistical relationship between the independent and dependent variables of interest at $\alpha = 0.05$ significance. The odds ratio (OR) and 95% confidence intervals (CI) for each factor were estimated. All analyses were performed using the statistical software package SAS (version 9.4; SAS Institute Inc., Cary, NC, USA), with the significance level for type I error set at the 0.05 level.

We also performed a secondary analysis to evaluate the characteristics among acute, subchronic and persistent chronic painful TMD. For these secondary analyses, we created three dependent variables: (i) acute painful TMD (painful TMD < 3 months) (0) versus subchronic painful TMD ≥ 3 months and < 6 months (1), (ii) acute painful TMD (0) versus persistent chronic painful TMD (> 6 months) (1), and (iii) subchronic painful TMD (0) versus persistent chronic

painful TMD (1). Univariate and multivariable logistic regression analyses were also applied to evaluate the odds of these characteristics among these groups. The ORs and their 95% CI were also calculated.

Our sample size calculation was based on Gatchel *et al.* (1996) study (54). Based on the prevalence of the risk factors between the study groups noted in this study, a sample size of 100 patients will be sufficient to provide a power of 80%. For this estimation, we considered alpha equal to 5%.

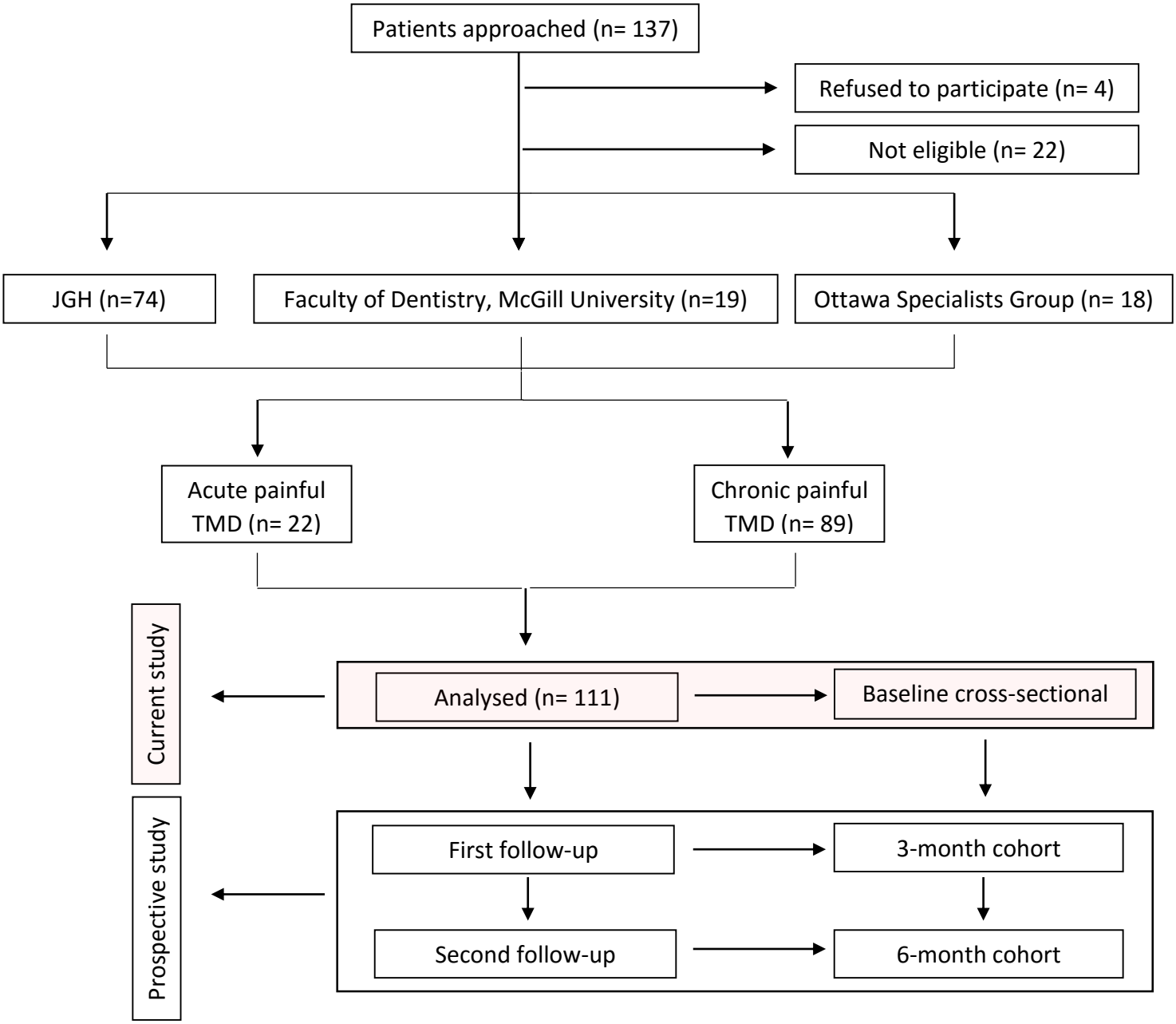
Results

Description of population

A total of 137 patients presenting with painful TMD were invited to participate and 4 refused to participate (97% participation rate). The main reasons given for non-participation were due to the lack of time and distress. Of the 133 patients, 16 were excluded because they had orofacial pain other than TMD (eg. pain of dental origin), 3 were over 80-year-old and 3 were not able to communicate in English or French. From the 111 participants, 22 had acute painful TMD for less than 3 months. Eighty-nine presented with a painful condition for at least 3 months and were classified as chronic cases. Amongst these 89 participants, 19 were classified in the subchronic painful TMD group (TMD pain ≥ 3 months and < 6 months) and 70 had persistent chronic painful TMD group (TMD pain ≥ 6 months). The mean duration of painful TMD among acute participants was 1.13 months (0.25 to 2 months), while the corresponding duration for chronic participants was 59.75 months (3 to 600 months). Most of the 111 participants from the acute (77.3%) or chronic painful TMD groups (79.8%, $P = 0.80$) were females, with a mean age of 43.68 (SD = 18.33) and 44.44 (SD = 15.89, $P = 0.85$), respectively. All participants received a primary diagnosis of muscle pain (e.g. myalgia or myofascial pain). The most common treatment used by participants was

analgesics prescription (acute = 36.4%, chronic = 49.4%, P = 0.27), followed by splint therapy (acute = 9.1%, chronic = 20.22%, P = 0.35).

Figure 5.2.1. Patients' enrolment flowchart



Headache

Table 5.2.1 shows the distribution and odds of headache among acute and chronic painful TMD participants. Headache was more common among participants experiencing chronic painful TMD (71.9 %) compared to acute painful TMD (54.6 %). Our regression analysis showed that chronic painful TMD participants were more likely to present headache than the acute TMD group, but the odds ratio was not significant (OR = 2.13, 95%CI = 0.82-5.56, *P* = 0.12). As the confidence intervals suggested that chronic painful TMD participants present a greater likelihood to present a headache, we decided to evaluate if the odds were modified by any type of a specific headache site assessed by the DC/TMD instrument.

Table 5.2.1. Crude and adjusted OR and 95% CI assessing headache questions in acute and chronic painful TMD

Questions		**Acute n (%)**	**Chronic n (%)**	**OR (95% CI)**	
				Crude [a]	**Multivariable** [b]
Headache in temple area	No	14 (63.64%)	44 (49.44%)	1 (reference)	1 (reference)
	Yes	8 (36.36%)	45 (50.56%)	1.79 (0.68-4.69)	1.79 (0.68-4.73)
Headache in front of the head	No	17 (77.27%)	54 (60.67%)	1 (reference)	1 (reference)
	Yes	5 (22.73%)	35 (39.33%)	2.20 (0.75-6.52)	2.27 (0.78-6.78)
Headache on top of the head	No	19 (86.39%)	69 (77.53%)	1 (reference)	1 (reference)
	Yes	3 (13.64%)	20 (22.47%)	1.84 (0.49-6.84)	1.85 (0.50-6.93)
Headache on back of the head	No	22 (100%)	62 (69.66%)	*Not included*	
	Yes	0 (0%)	27 (30.34%)		
Headache behind eyes or inside the head	No	18 (81.82%)	48 (53.93%)	1 (reference)	1 (reference)
	Yes	4 (18.18%)	41 (46.07%)	3.84 (1.20-12.27) *	4.14 (1.26-13.57) *

Abbreviations: OR = Odds Ratio, CI = Confidence Interval.
Note: [a] Simple logistic regression analysis, [b] Multivariable logistic regression analysis including age and gender.
* *P* = 0.02

Our results showed that participants with chronic painful TMD were more likely to report headache located behind the eyes or inside the head (OR = 3.84, *P* = 0.03) than the acute cases. This association was strong and remained significant when the model was adjusted by age and

gender (OR = 4.14, *P* = 0.02). When we performed the secondary analysis, the magnitude of the odds ratio for headache behind the eyes or inside the head was similar for persistent chronic (OR = 4.32, *P* = 0.02) and subchronic painful TMD (OR = 3.77, *P* = 0.10) groups. The magnitude of the latter odds ratio remained moderate, but not significant.

Other pain conditions

Table 5.2.2 shows the crude and adjusted analysis assessing the association between painful comorbidities and painful TMD. Our crude (OR = 3.15, 95%CI = 1.20-8.22, *P* = 0.02) and multivariable logistic model adjusted by age and gender showed that participants presenting at least one painful comorbidity were more likely to have chronic painful TMD than acute (OR = 3.35, 95%CI = 1.23-9.13, *P* = 0.02). In addition, number of comorbidities increased the chance to have chronic painful TMD (OR = 1.46, 95%CI = 1.00-2.13, *P* = 0.048) when compared to acute cases. This result remained significant regardless of participants age and gender (OR = 1.49, 95%CI = 1.01-2.20, *P* = 0.04). Among the painful comorbidities, participants with pain in the legs (OR = 8.33, *P* = 0.02) or neck (OR = 3.06, *P* = 0.03) had a greater likelihood to have chronic painful than the acute cases. These associations remained significantly associated with chronic painful TMD, independent of participants age and gender (OR_{legs} 9.05, *P* = 0.04; OR_{neck} = 3.10, *P* = 0.03). Furthermore, we found that pain in the legs was strongly related to persistent chronic painful TMD (n = 20, 29%, OR = 10.89, 95%CI: 1.30-91.42, *P* = 0.03). The odds ratio assessing the association with neck pain (n = 38, 55.1%, OR = 3.45, 95%CI: 1.18-10.06, *P* = 0.02) was similar to the previous odds ratio including all participants with chronic painful TMD. Furthermore, subchronic painful TMD participants have higher odds of pain in the neck (n = 9, 47.37%, OR = 2.22, 9%CI: 0.59-8.32, *P* > 0.05) and legs (n = 5, 26.3%, OR = 6.72, 95%CI: 0.69-65.25, *P* > 0.05) when compared to acute participants. However, this statement may need

additional investigation to further support our claim since these results are not statistically significant and the sample size was very small.

Table 5.2.2. Crude and adjusted OR and 95% CI assessing painful comorbidities in acute and chronic painful TMD

Painful comorbidities		Acute n (%)	Chronic n (%)	OR (95% CI)	
				Crude [a]	Multivariable [b]
Pain in arms	No	20 (90.91)	73 (82.02%)	1 (reference)	1 (reference)
	Yes	2 (9.09%)	16 (17.98%)	2.19 (0.46-10.34)	2.23 (0.46-10.80)
Pain in legs	No	21 (95.45%)	63 (71.59%)	1 (reference)	1 (reference)
	Yes	1 (4.55%)	25 (28.41%)	8.33 (1.06-65.31) *	9.05 (1.12-72.94) **
Pain in chest	No	21 (95.45%)	82 (92.13%)	1 (reference)	1 (reference)
	Yes	1 (4.55%)	7 (7.87%)	1.79 (0.21-15.38)	1.77 (0.20-15.49)
Pain in neck	No	16 (72.73%)	41 (46.59%)	1 (reference)	1 (reference)
	Yes	6 (27.27%)	47 (53.41%)	3.06 (1.09-8.54) ***	3.10 (1.10-8.78) ***
Pain in back	No	16 (72.73%)	46 (52.27%)	1 (reference)	1 (reference)
	Yes	6 (27.27%)	42 (47.73%)	2.43 (0.87-6.80)	2.44 (0.87-6.88)
Pain in abdomen	No	19 (86.36%)	74 (84.09%)	1 (reference)	1 (reference)
	Yes	3 (13.64%)	14 (15.91%)	1.20 (0.31-4.60)	1.22 (0.31-4.79)

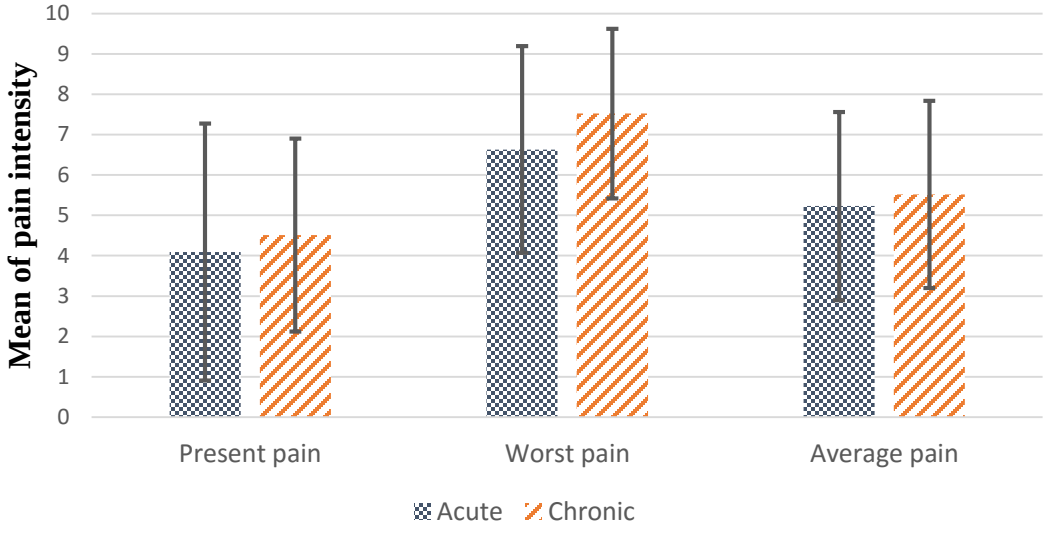
[a] Simple logistic regression analysis, [b] Multivariable model including age and gender
OR = Odds Ratio, CI = Confidence Interval
* P = 0.02, ** P = 0.04, *** P = 0.03

Pain intensity

The characteristic pain intensity of acute participants was 53.18 (SD = 20.84), and chronic cases was 58.35 (SD = 19.77, P = 0.28). Furthermore, figure 5.2.2 illustrates the different classifications of pain intensity between groups (acute and chronic painful TMD). These are present, worst and average pain. A borderline difference was found between the mean of worst pain intensity in chronic compared to acute; (between groups difference = 0.89, 95%CI = 0.14-1.93, P = 0.09). Interestingly, in the three groups analysis, the mean of the worst pain intensity (0-10 NRS) was only significantly higher in the subchronic painful TMD group (mean = 8.15, 95%CI

= 7.16-9.15) than the acute group (P = 0.03). Participants with persistent chronic cases (mean = 7.36, 95%CI = 6.83-7.87) presented a less severe pain intensity than the subchronic group, and no statistically significant difference was observed (P = 0.16).

Figure 5.2.2. Pain intensity (0-10 NRS) in acute and chronic painful TMD



Psychological variables

Figures 5.2.3 and 5.2.4, show the distribution of anxiety and depression between participants, respectively. Participants with chronic painful TMD did not present a greater likelihood of mild (OR = 0.93, 95%CI = 0.30-2.88), moderate (OR = 1.05, 95%CI = 0.20-5.61, P = 1) or severe anxiety (OR = 0.76, 95%CI = 0.20-2.82, P = 0.73), in comparison to the acute participants. Due to the similarity of these odds, we combined the mild, moderate and severe categories together. As expected, a similar distribution on mild to severe anxiety was noted between participants with chronic pain (n = 46, 51.7%) and acute participants (n = 12, 54.6%, P = 0.81) (Table 5.2.3).

Figure 5.2.3. Anxiety disorder among acute and chronic painful TMD cases

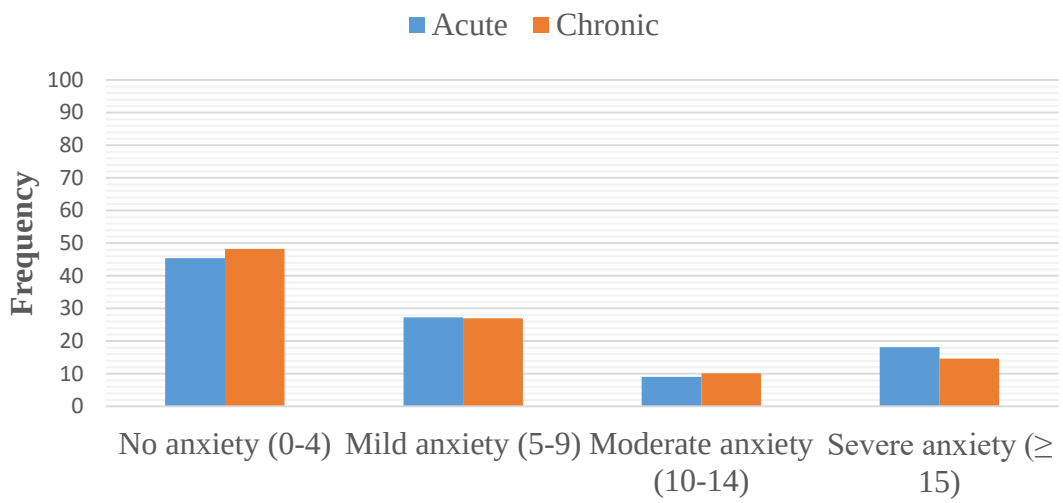


Figure 5.2.4. Depression disorder among acute and chronic painful TMD cases

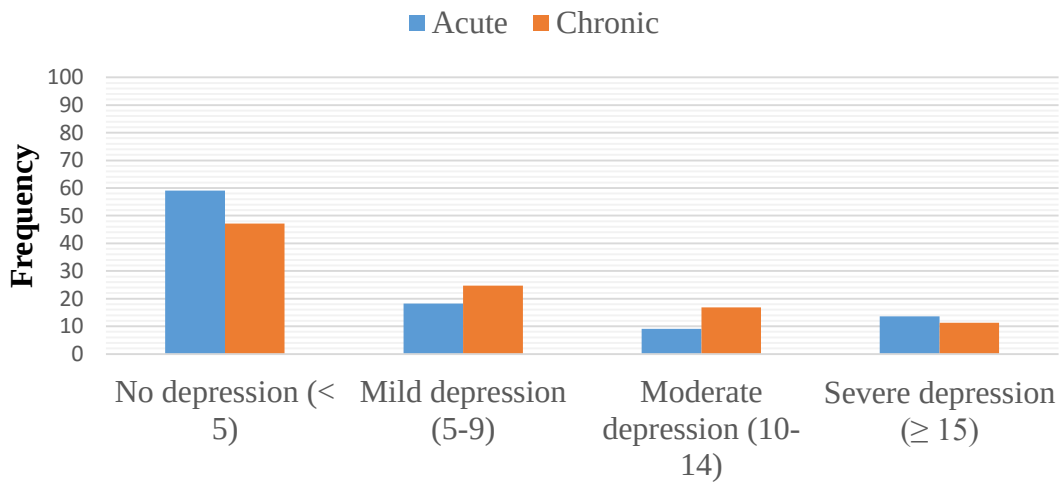


Table 5.2.3. Crude and adjusted OR and 95% CI assessing psychological variables in acute and chronic painful TMD

Questions		Level	Acute n (%)	Chronic n (%)	OR (95% CI)	
					Crude [a]	Multivariable [b]
Anxiety	No	< 5	10 (45.45%)	43 (48.31%)	1 (reference)	1 (reference)
	Mild - severe	≥ 5	12 (54.55%)	46 (51.69%)	0.89 (0.35-2.27)	0.89 (0.35-2.26)
Depression	No	< 5	13 (59.09%)	42 (47.19%)	1 (reference)	1 (reference)
	Mild - Moderate	≥ 5 – < 15	6 (27.27%)	37 (41.57%)	1.91 (0.66-5.53)	1.93 (0.66-5.60)
	Severe	≥ 15	3 (13.64%)	10 (11.24%)	1.03 (0.25-4.32)	1.04 (0.24-4.46)

[a] Simple logistic regression analysis, [b] Multivariable model including age and gender
OR = Odds Ratio, CI = Confidence Interval

Figure 5.2.4 shows that participants with acute or chronic painful TMD more frequently reported no depression or mild-moderate depression. The crude logistic regression analyses showed that mild (OR = 1.70, 95%CI = 0.50-5.85, *P* = 0.71), moderate depression (OR = 2.32, 95%CI = 0.47-11.51, *P* = 0.42), and severe depression (OR = 1.03, 95%CI = 0.25-4.32, *P* = 0.56), were not associated with chronic painful TMD. Based on the magnitude of the OR, we combined the mild and moderate categories together. As expected, these logistic regression analyses showed again that depression was not related to chronic painful TMD when compared to acute cases (Table 5.2.3).

Screening items

The likelihood to respond to TMD pain screening questionnaire (40) was similar between study groups (Table 5.2.4). Greater differences were found on the frequency of jaw habits and jaw activities, even though none of these analyses were statistically significant. Acute cases (72.7%) reported more frequent pain related to jaw activities such as talking, kissing or yawning than the

chronic cases (56.2%, $P = 0.16$). Jaw habits such as holding teeth together or chewing gum were more frequently reported in chronic cases (69.3%) compared to acute (54.6%, $P = 0.18$). Similar magnitude of effect was found in the clinical variables (Table 5.2.4) after adjusting them by age and gender.

Table 5.2.4. Crude and adjusted OR and 95% CI assessing screening questions in acute and chronic painful TMD

Questions*		Acute n (%)	Chronic n (%)	OR (95% CI)	
				Crude [a]	Multivariable [b]
How long	Inter	10 (45.45%)	31 (34.83%)	1 (reference)	1 (reference)
	Cont	12 (54.55%)	58 (65.17%)	1.56 (0.61-4.02)	1.56 (0.61-4.02)
Stiffness	No	6 (27.27%)	17 (19.10%)	1 (reference)	1 (reference)
	Yes	16 (72.73%)	72 (80.90%)	1.59 (0.54-4.66)	1.64 (0.55-4.87)
Chewing	No	6 (27.27%)	29 (32.58%)	1 (reference)	1 (reference)
	Yes	16 (72.73%)	60 (67.42%)	0.78 (0.28-2.19)	0.78 (0.28-2.22)
Open mouth	No	5 (22.73%)	27 (30.68%)	1 (reference)	1 (reference)
	Yes	17 (77.27%)	61 (69.32%)	0.67 (0.22-1.98)	0.68 (0.22-2.05)
Jaw habits	No	10 (45.45%)	27 (30.68%)	1 (reference)	1 (reference)
	Yes	12 (54.55%)	61 (69.32%)	1.88 (0.73-4.89)	1.90 (0.73-4.95)
Jaw activities	No	6 (27.27%)	39 (43.82%)	1 (reference)	1 (reference)
	Yes	16 (72.73%)	50 (56.18%)	0.48 (0.17-1.34)	0.48 (0.17-1.34)

*The questions are described in Gonzalez *el al.,* (2011) (40), Inter = intermittent, Cont = Continuous.
[a] Simple logistic regression analysis, [b] Multivariable model including age and gender.
OR = Odds Ratio, CI = Confidence Interval.

Discussion

Results of this baseline cross-sectional study showed that participants with chronic painful TMD were more likely to have headaches and painful comorbidities than the acute participants. The odds ratios remained significant regardless of participants' age or gender. These results suggest that these factors increase the risk of transition from acute to chronic painful TMD.

In our previous study, comorbidities were associated with the onset of chronic pain, defined as the onset of clinically significant pain (19, 68). In the current study, chronic painful TMD participants were also more likely to have a larger number of painful comorbidities, pain in legs and neck. Likewise, several studies (9, 88) also found that individuals with chronic painful TMD had an increased risk of comorbidities (82).

A borderline statistically significant difference, however, was found between the worst pain intensity and study groups. This result in part, is in agreement with our previous study that also showed that worst pain intensity was related to the onset and persistence of more severe pain (19).

Depression and anxiety were not significantly associated with acute and chronic painful TMD. This is not in agreement with Gatchel *et al.* (1996) and Phillips *et al.* (2001) who showed that the distribution of psychological factors was statistically significant different between acute and chronic painful TMD.

Using the TMD pain screening instrument, we observed notable differences in chronic painful TMD participants experiencing jaw habits such clenching or chewing gum compared to the acute cases. Our results show that the acute painful TMD participants reported more frequent pain related to jaw activities such as talking, kissing or yawning than the chronic cases. This finding has a similar trend with previous works (9, 13) which showed a statically significant association between clenching only and chronic myofascial pain patients. A possible reason as to why our results were not as significant, was due to a low sample size.

The findings of this study should be interpreted in the context of its limitations. First, the classification of acute and chronic TMD was based on participants' memory about the duration of pain condition. In order to avoid the information (misclassification) bias, we followed the IASP to classify chronic pain, which suggested 3-month or more (109, 110). Second, in this study, to

collect the information from participants; we used a self-report method. This method may have some disadvantages such as exaggeration; respondents may be too embarrassed to reveal private details or may also forget pertinent details. Third, the sample size was not large enough to assess all factors. The power analysis (80%) for the current study was based on Gatchel *et al.* (1996) (54). However, our results found a lower difference in the risk factors prevalence than that noted by Gatchel *et al.* (1996) (54), which decreased the power of the current study. However, this current cross-section study is only the first analysis of the ACTION project. This is an ongoing project and more participants have been enrolled in the study, since these analyses were performed.

We followed the definition of chronic pain "3-month" that is stated by the IASP in order to classify our chronic TMD subjects. Based on the IASP chronic pain has been classified as "pain without apparent biological value that has persisted beyond normal tissue healing time, which in the absence of other criteria, is taken to be 3 months" (109, 110). The magnitude of the odds ratio from persistent (≥ 6 months) and subchronic painful TMD (≥ 3 months and < 6 months) analyses were close, suggesting that our decision to follow IASP recommendation of the cut-off at 3-months is appropriate. Furthermore, our secondary analysis suggests that by including participants with less than 6 months in the acute painful TMD group may underestimate the effect assessed, since subchronic participants appear to be more similar to the persistent chronic participants than those in the acute (< 3 months). However, a large sample size is necessary to appropriately perform the subchronic and persistent painful TMD analyses.

To summarize, our study consisted of 20% acute and 80% chronic painful TMD patients. Headache behind the eyes or inside the head, pain in the legs, and pain in the neck were more significantly associated with chronic painful TMD than acute. Understanding the relationship between acute and chronic painful TMD using a prospective cohort study design will provide a

better insight to broaden the knowledge of the risk factors implicated in the transition from acute to chronic painful TMD.

CHAPTER 6. DICUSSION

This section will discuss, some methodological considerations, strengths and limitations of this project. The overall aim of this cross-sectional study was to investigate the factors that can be used to differentiate acute and chronic painful TMD. More specifically, we aimed to investigate the clinical, psychological and comorbidities that are associated with acute and chronic painful TMD.

6.1 Summary of the systematic review results

The cohort studies demonstrated that muscle disorders and pain intensity contributed to the transition from acute to chronic painful TMD. Psychological factors were more common among chronic in comparison to acute participants, but these factors do not increase the transition risk. Due to the small number of cohort studies and their study methodology weaknesses, there is insufficient evidence of risk factors implicated in the transition from acute to chronic painful TMD.

6.2 Summary of the project results

In this cross-sectional study we approached 137 patients presenting with painful TMD. Of them, 4 refused to participate (97% participation rate). The main reasons given for non-participation were due to the lack of time and distress. Of the 133 patients, 16 were excluded because they had orofacial pain other than TMD (e.g. pain of dental origin), 3 were over 80-year-old and 3 were not able to communicate in English or French.

From the 111 participants, 22 had acute painful TMD for less than 3 months. Eighty-nine presented with a painful condition for at least 3 months and were classified as chronic cases. Amongst these 89 participants, 19 were classified in the subchronic painful TMD group (TMD

pain ≥ 3 months and < 6 months) and 70 had persistent chronic painful TMD group (TMD pain ≥ 6 months).

Most of the 111 participants from the acute (77.3%) or chronic painful TMD groups (79.8%, $P = 0.80$) were females, with a mean age of 43.68 (SD = 18.33) and 44.44 (SD = 15.89, $P = 0.85$), respectively. All participants received a primary diagnosis of muscle pain (e.g. myalgia or myofascial pain). The most common treatment used by participants was analgesics prescription (acute = 36.4%, chronic = 49.4%, $P = 0.27$), followed by splint therapy (acute = 9.1%, chronic = 20.22%, $P = 0.35$).

6.2.1 Clinical variables and pain intensity associated with acute and chronic painful TMD

This baseline cross-sectional study assessed a wide range of variables among recruited participants. The screening instruments used in our study were designed to identify patients suffering from painful TMD. Therefore, we did not expect to find a significant difference between acute and chronic painful TMD groups. However, we observed notable differences in chronic painful TMD patients experiencing jaw habit such clenching or chewing gum compared to the acute group. Our results show that the acute painful TMD participants reported more frequent pain related to jaw activities such as talking, kissing or yawning than the chronic cases. This finding has a similar trend with our previous work by Velly *et al.*, (2003) which showed a statically significant association between clenching only and chronic myofascial pain patients. A possible reason as to why our results were not as significant, was due to a low sample size.

Headache was more common among participants experiencing chronic painful TMD (71.9 %) compared to acute painful TMD (54.6 %). Our regression analysis showed that chronic painful TMD participants were more likely to present headache than the acute TMD group, but the odds ratio was not significant. Our results showed that participants with chronic painful TMD were

more likely to report headache located behind the eyes or inside the head than the acute cases. This association was strong and remained significant when the model was adjusted by age and gender.

6.2.2 Psychological factors associated with painful TMD

Depression and anxiety were not significantly associated with acute and chronic painful TMD. This is in agreement with another study (55) which did not find an association with neither depression nor anxiety. The limitation of the referenced study was that the sample size recruited was too small (n = 22) which could not help to present a power of analysis. On the other hands, Phillips *et al*. (2001) showed in their study that chronic TMD patients had significantly more anxiety compared to nonchronic TMD patients. Perhaps having a larger sample size may cause a different trend to be observed.

6.2.3 Comorbidities associated with painful TMD

Our current cross-sectional study demonstrated that patients with comorbidities presented in the chronic group more than the acute. Among different comorbidities assessed, pain in legs and pain in neck were significantly associated with acute and chronic painful TMD. The ORs of these two aforementioned comorbidities increased after adjusting them by age and gender (OR = 9.05 and OR = 3.10, respectively). Likewise, a case-control study also found a significant association between neck pain and painful TMD, with an OR estimate equal to 8.0 (82). This is consistent with our findings.

6.3 Methodological Considerations

6.3.1 Bias

Bias is any systematic error in any epidemiological study, which can result in incorrect estimation of association between the exposure and the disease. In order to maintain the validity investigators should keep in mind the selection of participants, measurement of variables, outcome and statistical analyses. Types of biases expected to occur in a cross-sectional study are detailed below:

6.3.1.1 Selection bias

Selection bias refers to any error that arises in the process of identifying the study populations (28). In this cross-sectional study participants were identified from three different locations in order to decrease the chance of selection bias.

6.3.1.2 Information bias

Information bias is a systematic error in the measurement or classification of participants in a study (28). To control information bias in our cross-sectional study, information on factors and health conditions (outcomes), is often obtained at the same time-point using validated questionnaires. Adopting standardised and validated methods and using objective measures can help avoid information inaccuracies or biases.

We followed the definition of chronic pain "3-month" that is stated by the IASP in order to classify our chronic TMD subjects. Based on the IASP chronic pain has been classified as "pain without apparent biological value that has persisted beyond normal tissue healing time, which in the absence of other criteria, is taken to be 3 months" (109, 110). The magnitude of the odds ratio from persistent (≥ 6 months) and subchronic painful TMD (≥ 3 months and < 6 months) analyses

were close, suggesting that our decision to follow IASP recommendation of the cut-off at 3-months is appropriate. Furthermore, our secondary analysis suggests that by including participants with less than 6 months in the acute painful TMD group may underestimate the effect assessed, since subchronic participants appear to be more similar to the persistent chronic participants than those in the acute (< 3 months). However, a large sample size is necessary to appropriately perform the subchronic and persistent painful TMD analyses.

6.3.1.3 Bias due to confounding

A situation in which a measure of association or relationship between exposure and outcome is distorted by the presence of another variable. Positive confounding (when the observed association is biased away from the null) and negative confounding (when the observed association is biased toward the null) both occur. In our study both age and gender are considered to be confounders. Different methods can be used to control confounding such as selecting participants of similar age group, gender or others. Also, it can be controlled in the analytic stage of the study by adjusting cofounders.

6.4 Strengths

Overall, this cross-sectional study has many strengths: (1) All instruments used in the study were validated, (2) Calibrated examiners recruited all participants, which reduced the chance of information bias, (3) Participants received a full clinical examination and treatment for their TMD pain by a TMD specialist, (4) We performed a series of multivariable analyses adjusting for potential confounders, and lastly (5) This project was the first step of a large prospective cohort study.

6.5 Limitations

The findings of this study should be interpreted in the context of its limitations. First, the classification of acute and chronic painful TMD has been used differently among researchers. In order to avoid the information (misclassification) bias, we followed the IASP to classify chronic pain, which suggested 3-month or more. Second, in this study, to collect the information from participants; we used a self-report method. This method may have some disadvantages such as exaggeration; respondents may be too embarrassed to reveal private details or may also forget pertinent details. Third, the sample size was not large enough to assess all factors. The power analysis (80%) for the current study was based on Gatchel *et al.* (1996) (54). However, our results found a lower difference in the risk factors prevalence than that noted by Gatchel *et al.* (1996) (54), which decreased the power of the current study. However, this current cross-section study is only the first analysis of the ACTION project. This is an ongoing project and more participants have been enrolled in the study, since these analyses were performed.

7. CHAPTER 7. CONCLUSION

The following conclusions can be drawn from the results of our thesis:

1) Our review only found eight articles that compare acute with chronic painful TMD, or that assessed the risk factors related to this transition. Multivariable logistic regression analyses demonstrated that muscle disorders and pain intensity contributed to the transition from acute to chronic pain. However, major weaknesses found in these studies preclude any definitive conclusion of the risk factors implicated in the transition from acute to chronic painful TMD, which is in agreement with the NIH statement (25).

2) It was alarming to find that 80% presented painful TMD for more than 6 months. As expected females were more prevalent than males in the study sample.

3) Our results showed that participants with headache behind the eyes or inside the head, pain in the legs, or pain in the neck were more likely to present chronic painful TMD than acute. These associations were not modified by participant's age or gender. These results suggest that these factors are relevant risk factors implicated in the transition from acute to chronic painful TMD.

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9. CHAPTER 9. APPENDIX

(Questionnaires and Consent Forms)

ACTION Program

Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

Please answer the following questions:

1. How old are you? _____ Years old.

2. Do you have pain in temple, face, jaw joint, or jaws once a week or more often?

Yes ☐ No ☐

3. Do you have pain when you open your month wide or chew, once a week or more often?

Yes ☐ No ☐

4. Do you have pain in the temples once a week or more often? Yes ☐ No ☐

5. In the last 30 days, on average, how long did any pain in your jaw or temple area on either side last?

☐ No pain
☐ From very brief to more than a week, but it does stop
☐ Continuous

6. In the last 30 days, did you have pain or stiffness in your jaw on wakening?

Yes ☐ No ☐

7. In the last 30 days, did the following activities change any pain (that is, make it better or make it worse) in your jaw, temple, in the ear, or in front of the ear on either side?

	Yes	No
A. Chewing hard or tough food.	☐	☐
B. Opening your mouth, or moving your jaw forward or to the side.	☐	☐
C. Jaw habits such as holding teeth together or chewing gum.	☐	☐
D. Other jaw activities such as talking, kissing, or yawning.	☐	☐

ACTION Program

Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

8. Have you ever had pain in your jaw, temple, in the ear, or in front of the ear on either side?

Yes ☐ No ☐

9. How many years or months ago did your pain in the jaw, temple, in the ear, or in front of the ear first begin?

Year(s) ☐ Month(s) ☐

10. How would you rate your facial pain right now? Please rate your pain by circling the number that tells how much pain you have right now.

No pain — Pain as bad as could be

0 1 2 3 4 5 6 7 8 9 10

11. In the last 30 days, how would you rate your worst facial pain? Use the same scale, where 0 is "no pain" and 10 is "pain as bad as could be".

No pain — Pain as bad as could be

0 1 2 3 4 5 6 7 8 9 10

12. In the last 30 days, on average, how would you rate your facial pain? Use the same scale, where 0 is "no pain" and 10 is "pain as bad as could be". (That is, your usual pain at times you were in pain)

No pain — Pain as bad as could be

0 1 2 3 4 5 6 7 8 9 10

13. In the last 30 days, how many days did your facial pain keep you from doing your usual activities like work, school, or housework? (every day = 30 days) _____ Days

14. In the last 30 days, how much has facial pain interfered with your daily activities? Use a scale where 0 is "no interference" and 10 is "unable to carry on any activities".

No interference — Unable to carry on any activities

0 1 2 3 4 5 6 7 8 9 10

ACTION Program

Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

15. In the last 30 days, how much has facial pain interfered with your recreational, social and family activities? Use the same scale where 0 is "no interference" and 10 is "unable to carry on any activities".

No interference — Unable to carry on any activities

0 1 2 3 4 5 6 7 8 9 10

16. In the last 30 days, how much has facial pain interfered with your ability to work, including housework? Use the same scale where 0 is "no interference" and 10 is "unable to carry on any activities".

No interference — Unable to carry on any activities

0 1 2 3 4 5 6 7 8 9 10

17. How would you describe the duration of this pain in your jaw, temple, ear, or in front of the ear since it first began? (Select ONE response)

☐ Persistent – continuous pain since initial onset
☐ Recurrent – more than one bout of pain, with periods of no pain
☐ One time – a prior episode of pain that has ended

18. In the last 30 days, which of the following best describes any pain in your jaw, temple, in the ear, or in front of the ear on either side? (Select ONE response)

☐ No pain
☐ Pain comes and goes
☐ Pain is always present

19. In the last 30 days, how many days per month have you had this pain in your jaw, temple, in the ear, or in front of the ear? (Select ONE response)

☐ Less than 1 day
☐ 1 day or more, but less than 15 days
☐ 15 days or more, but not continuous
☐ Continuous

ACTION Program

Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

20. On average, how long does a single episode of this pain in your jaw, temple, in the ear, or in front of the ear last? (Select ONE response)

- ☐ Less than 30 minutes per episode
- ☐ 30 minutes to less than 2 hours per episode
- ☐ 2 hours to less than 4 hours per episode
- ☐ 4 hours to 72 hours (3 days) per episode
- ☐ More than 3 days to 7 days per episode
- ☐ More than 7 days to continuous pain per episode

21. In the last 30 days, have you had any headaches? Yes ☐ No ☐

If you answered NO to question 21, skip to Question 25.

22. How many years or months ago did your headache first begin?

Year(s) ☐ Month(s) ☐

23. In the last 30 days, rate the intensity, on average, of your headache? (Select ONE response)

- ☐ Mild to moderate
- ☐ Moderate to severe

24. Where is the headache located? (Mark ALL that apply)

- ☐ Temple
- ☐ Front of head
- ☐ Top of head
- ☐ Back of head
- ☐ Behind the eyes or inside the head

25. In the last 30 days, have you had any jaw joint noise(s) when you moved or used your jaw? Yes ☐ No ☐

26. Have you ever had your jaw lock or catch, even for a moment, so that it would not open ALL THE WAY? Yes ☐ No ☐

If you answered NO to question 26, skip to question 30.

27. Was your jaw locked or catch severe enough to limit your jaw opening and interfere with your ability to eat? Yes ☐ No ☐

ACTION Program

Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

28. Is your jaw currently locked or limited so that your jaw will not open ALL THE WAY?
Yes ☐ No ☐

29. At any time in your life, when you opened your mouth wide, did your jaw lock or catch even for a moment such that you could not close it from this wide open position?
Yes ☐ No ☐

30. What treatments did you receive for your pain?

_____

_____

☐ Dental extraction ☐ Orthodontics treatment

31. Do you have:

Condition	Yes	No	Medication for condition
a- Diabetes	( )	( )	
b- Allergies (Penicillin/Medication)	( )	( )	
c- Thyroid problem	( )	( )	
d- Rheumatic fever	( )	( )	
e- High blood pressure	( )	( )	
f- Low blood pressure	( )	( )	
g- Smoking (per day)	( )	( )	
h- Asthma	( )	( )	
i- Heart problems	( )	( )	
j- Pain in arms	( )	( )	
k- Pain in legs	( )	( )	
l- Pain in chest	( )	( )	
m- Pain in neck	( )	( )	
n- Pain in back	( )	( )	
o- Pain in abdomen	( )	( )	

ACTION Program

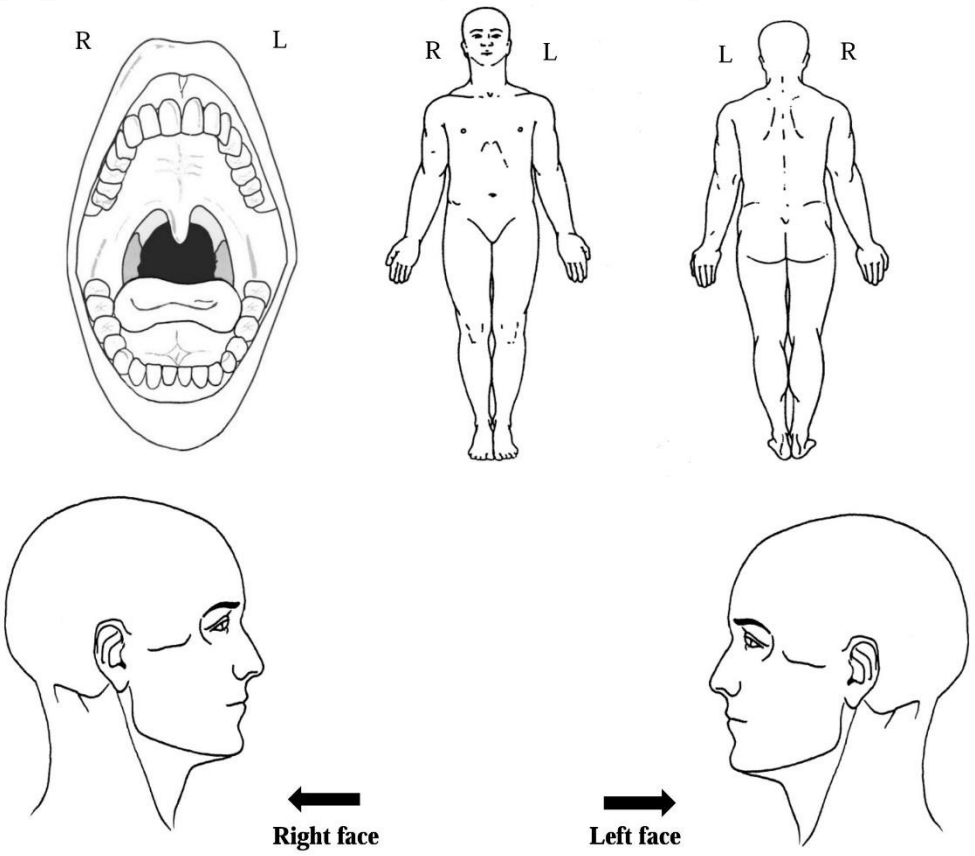
Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

32. Pain Diagram

Indicate the location of ALL of your different pains by shading in the area, using the diagrams that are most relevant. If there is an exact spot where the pain is located, indicate the pain with a solid dot (●). If yourpain moves from one location to another, use arrows to show the path.



33. On which side of the face is the pain more severe?

☐ Left side ☐ Right side ☐ Both sides equally

ACTION Program

Centre no. | Patient no. | Initials

Day | Month | Year | Hospital ☐ | Home ☐

Period: Baseline ☐

34. Using the scale below, please indicate the degree to which you have these feelings.

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
A. Feeling nervous, anxious or on edge.	0	1	2	3
B. Not being able to stop or control worrying.	0	1	2	3
C. Worrying too much about different things.	0	1	2	3
D. Trouble relaxing.	0	1	2	3
E. Being so restless that it is hard to sit still.	0	1	2	3
F. Becoming easily annoyed or irritable.	0	1	2	3
G. Feeling afraid as if something might happen.	0	1	2	3

ACTION Program

Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

35. Using the scale below, please indicate the degree to which you have these feelings.

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
A. Little interest or pleasure in doing things.	0	1	2	3
B. Feeling down, depressed, or hopeless.	0	1	2	3
C. Trouble falling or staying asleep, or sleeping too much.	0	1	2	3
D. Feeling tired or having little energy.	0	1	2	3
E. Poor appetite or overeating.	0	1	2	3
F. Feeling bad about yourself – or that you are a failure or have let yourself or your family down.	0	1	2	3
G. Trouble concentrating on things, such as reading the newspaper or watching television.	0	1	2	3
H. Moving or speaking so slowly that other people could have noticed or the opposite - being so fidgety or restless that you have been moving around a lot more than usual.	0	1	2	3

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
☐	☐	☐	☐

ACTION Program

Centre no. ☐☐☐ Patient no. ☐☐☐☐☐☐ Initials ☐☐☐

Day ☐☐ Month ☐☐ Year ☐☐☐☐ Hospital ☐ Home ☐

Period: Baseline ☐

36. Please answer the following questions about yourself by indicating the extent of your agreement:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
A. In uncertain times, I usually expect the best.					
B. It's easy for me to relax.					
C. If something can go wrong for me, it will.					
D. I'm always optimistic about my future.					
E. I enjoy my friends a lot.					
F. It's important for me to keep busy.					
G. I hardly ever expect things to go my way.					
H. I don't get upset too easily.					
I. I rarely count on good things happening to me.					
J. Overall, I expect more good things to happen to me than bad.					

37. Have you received any tooth extraction? No ☐ Yes ☐
- ☐ Because of pain
- ☐ Do not remember
- ☐ Not because of pain

38. Have you received any orthodontics treatment? No ☐ Yes ☐
- ☐ Because of pain
- ☐ Do not remember
- ☐ Not because of pain

Programme ACTION

No. Centre ☐☐☐ No. Patient ☐☐☐☐☐☐ Initiales ☐☐☐

Jour ☐☐ Mois ☐☐ Année ☐☐☐☐ Hôpital ☐ Résidence ☐

Période: référence ☐

S'il vous plaît répondre aux questions suivantes:

1. Quel âge avez-vous? _____ ans.

2. Avez-vous mal à la temple, au visage, aux mâchoires, ou aux articulations des mâchoires, une fois par semaine ou plus souvent? Oui ☐ Non ☐

3. Avez-vous des douleurs lorsque vous ouvrez votre bouche ou mâcher, une fois par semaine ou plus souvent? Oui ☐ Non ☐

4. Avez-vous des douleurs dans les temples une fois par semaine ou plus souvent Oui ☐ Non ☐

5. Au cours des 30 derniers jours, la douleur que vous avez peut être ressentie dans la (ou les) mâchoire(s) ou au niveau de la (ou des) tempes a eu une durée?
   - ☐ Pas de douleur
   - ☐ De très brève a plus d'une semaine, sans arrêt
   - ☐ Ou continue

6. Ces 30 derniers jours, avez-vous douleur ou rigidité dans votre mâchoire sur réveil? Oui ☐ Non ☐

7. Ces 30 derniers jours, est-ce-que les activités suivantes ont changé la douleur (c'est-à-dire, s'est améliorée, s'est empirée) à la mâchoire, à la tempe, à l'oreille, ou devant l'oreille des deux côtes?

	Oui	Non
A. Mâcher de la nourriture dure.	☐	☐
B. Ouvrir la bouche, ou bouger la mâchoire en avant en avant ou sur le côté.	☐	☐
C. Des habitudes fonction telles que maintenir les dents serrées, ou mâcher de la gomme.	☐	☐
D. D'autres activités telles que parler, embrasser ou bailler	☐	☐

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Période: référence ☐

8. Avez-vous déjà eu de la douleur à la mâchoire, la tempe, dans l'oreille ou en avant de l'oreille d'un côté ou de l'autre? Oui ☐ Non ☐

9. Il y a combien d'années ou de mois qu'a débuté, pour la première fois, votre douleur à la mâchoire, tempe, dans l'oreille, ou en avant de l'oreille? Année(s) ☐ Mois ☐

10. Veuillez encercler le numéro qui décrit le mieux le niveau de douleur faciale que vous ressentez en ce moment. Utilisez une échelle de 0 à 10, où 0 indique « aucune douleur » et 10 indique « la pire douleur possible ».

Aucune douleur — La pire douleur possible

0 1 2 3 4 5 6 7 8 9 10

11. Quel est le chiffre qui décrit la plus forte douleur faciale que vous avez ressentie au cours des 30 derniers jours. Utilisez la même échelle, où 0 indique « aucune douleur » et 10 indique « la pire douleur possible ».

Aucune douleur — La pire douleur possible

0 1 2 3 4 5 6 7 8 9 10

12. Quel est le chiffre qui décrit le niveau de douleur faciale que vous avez ressenti en général au cours des 30 derniers jours. Utilisez la même échelle, où 0 indique « aucune douleur » et 10 indique « la pire douleur possible ».

Aucune douleur — La pire douleur possible

0 1 2 3 4 5 6 7 8 9 10

13. Environ combien de jour au cours des 30 derniers jours avez-vous été empêché par votre douleur faciale de faire vos activités habituelles tel que emploi, école/cours, ou travaux ménagers? (tous les jours = 30 jours) _____ Jours

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Période: référence

14. Jusqu'à quel point votre douleur faciale a interféré avec vos activités quotidiennes des 30 derniers jours. Utilisez une échelle de 0 à 10, où 0 indique « aucune interférence » et 10 indique « incapable d'exécuter les activités quotidiennes ».

Aucune interférence — Incapable d'exécuter les activités quotidiennes

0 1 2 3 4 5 6 7 8 9 10

15. Jusqu'à quel point votre douleur faciale vous a empêché de prendre part à desactivités sociales, familiales et récréatives au cours des 30 derniers jours. Utilisez la même échelle, où 0 indique « aucune interférence » et 10 indique « incapable d'exécuter les activités quotidiennes ».

Aucune interférence — Incapable d'exécuter les activités quotidiennes

0 1 2 3 4 5 6 7 8 9 10

16. Jusqu'à quel point votre douleur faciale vous a empêché de faire votre travail au cours des 30 derniers jours (incluant les taches domestique)? Utilisez la même échelle de 0 à 10, où 0 indique « aucune interférence » et 10 indique « incapable d'exécuter les activités quotidiennes».

Aucune interférence — Incapable d'exécuter les activités quotidiennes

0 1 2 3 4 5 6 7 8 9 10

17. Quel énoncé s'applique à la durée de cette douleur à la mâchoire, tempe, oreille, ou en avant de l'oreille depuis on apparition? (Choisir une seule réponse)
- ☐ Persistante - une douleur continue depuis le début
- ☐ Récurrente - plus d'un épisode de douleur, avec des périodes sans douleur
- ☐ Une fois - un épisode de douleur qui s'est terminé

18. Au cours des 30 derniers jours, laquelle des propositions suivantes décrit le mieux votre douleur à la mâchoire, tempe, dans l'oreille, ou en avant de l'oreille d'un côté ou de l'autre? (Choisir une seule réponse)
- ☐ Aucune douleur
- ☐ La douleur qui vient et disparaît
- ☐ La douleur est toujours présente

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Période: référence ☐

19. Au cours des 30 derniers jours, combien de jours avez-vous eu votre douleur à la mâchoire, tempe, dans l'oreille ou en avant de l'oreille? (Choisir une seule réponse)
    - ☐ Moins de 1 jour
    - ☐ Un jour et plus, mais moins de 15 jours
    - ☐ 15 jours et plus, mais pas continuellement
    - ☐ Continuellement

20. En moyenne, combien de temps dure un seul épisode de votre douleur à la mâchoire, tempe, dans l'oreille, ou en avant de l'oreille ? (Choisir une seule réponse)
    - ☐ Moins de 30 minutes par épisode
    - ☐ 30 minutes à moins de 2 heures par épisode
    - ☐ 2 heures à moins de 4 heures par épisode
    - ☐ 4 heures à 72 heures (3 jours) par épisode
    - ☐ Plus de 3 jours à 7 jours par épisode
    - ☐ Plus de 7 jours à la douleur continue par épisode

21. Au cours des 30 derniers jours, avez-vous eu des maux de tête? Oui ☐ Non ☐

Si vous avez répondu NON à la question 21, passez à la question 25.

22. Il y a combien d'années ou de mois que votre mal de tête débuté pour la première fois?

    Année(s) ☐ Mois ☐

23. Au cours des 30 derniers jours, évaluez l'intensité en moyenne de votre mal de tête à la tempe. (Choisir une seule réponse)
    - ☐ Légère à modérée
    - ☐ Modérée à sévère

24. Où est le mal de tête situé? (Cochez TOUT ce qui s'applique)
    - ☐ Tempe
    - ☐ Front
    - ☐ Dessus de la tête
    - ☐ Arrière de la tête
    - ☐ Derrière les yeux ou à l'intérieur de la tête

25. Au cours des 30 derniers jours, avez-vous eu des bruits d'articulation de la mâchoire lorsque vous avez bougé ou utilisé votre mâchoire?

    Oui ☐ Non ☐

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Période: référence ☐

26. Avez-vous déjàeu la mâchoire bloquée ou coincée au point de ne pouvoir l'ouvrir complètement?

Oui ☐ Non ☐

Si vous avez répondu NON à la question 26, passez à la question 30.

27. Est-ce-que le blocage ou coincement de votre mâchoire était suffisamment sévère pour limiter son ouverture et interférer avec votre capacité à manger?

Oui ☐ Non ☐

28. Est-ce que votre mâchoire est actuellement bloquée ou limitée au point de ne pouvoirouvrir COMPLÈTEMENT?

Oui ☐ Non ☐

29. A n'importe quel moment de votre vie lorsque vous avez ouvert la bouche grande, avez-vous déjà eu la mâchoire bloquée ou coincée, même pour un instant, au point de nepouvoir la fermer de cette position grande ouverte? Oui ☐ Non ☐

30. Quels médicaments prenez-vous contre la douleur?

_____

_____

☐ Extraction dentaire ☐ Traitement orthodontique

31. Avez-vous une autre douleur en:

Condition	Yes	No	Médicament pour la condition
a- Diabète	( )	( )	
b- Allergies (Pénicilline/Médicaments)	( )	( )	
c- Problème de thyroïde	( )	( )	
d- Fièvre rhumatismale	( )	( )	
e- Haute pression sanguine	( )	( )	
f- Basse pression sanguine	( )	( )	
g- Fumez-vous (par jour)	( )	( )	
h- Asthme	( )	( )	
i- Problème cardiaque	( )	( )	
j- Douleur bras	( )	( )	
k- Douleur jambes	( )	( )	
l- Douleur poitrine	( )	( )	
m- Douleur cou	( )	( )	
n- Douleur dos	( )	( )	
o- Douleur abdomen	( )	( )	

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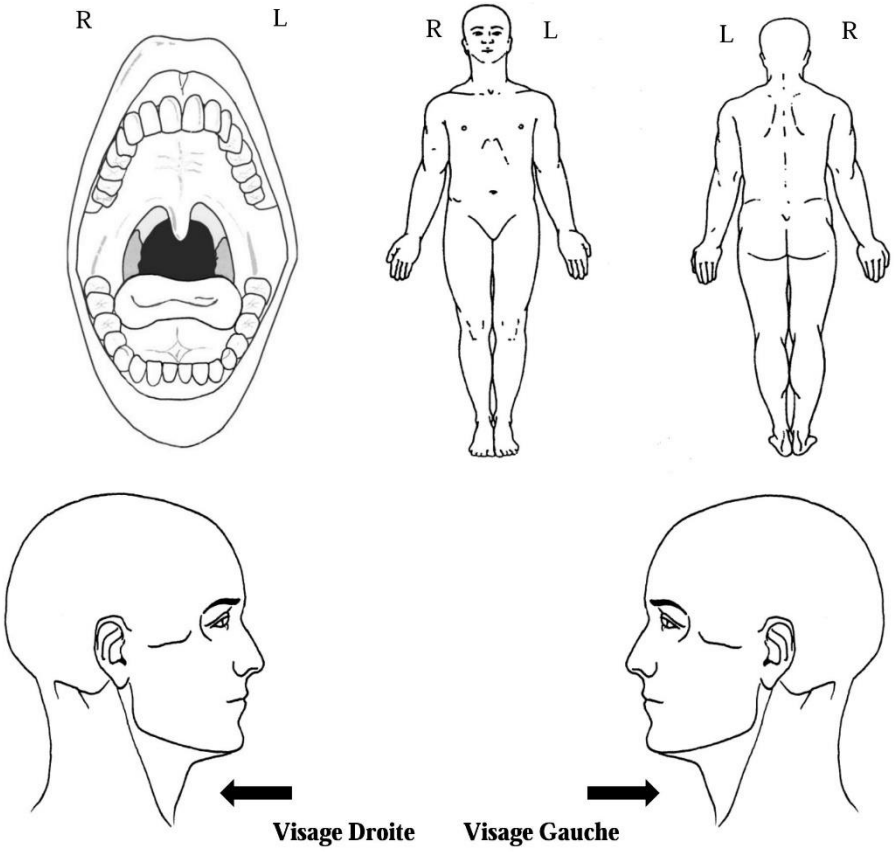
32. Diagramme de douleur

Indiquez l'emplacement de TOUTES vos douleurs différentes en colorant la zone, sur les illustrations appropriés. S'il ya un endroit précis où la douleur est localisée, indiquer la douleur avec un point solide (●). Si votre douleur bouge d'un endroit à un autre, utilisez des flèches pour indiquer le trajectoire.



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Période: référence ☐

33. De quel côté de la face est la douleur plus sévère?
☐ Côté gauche ☐ Côté droite ☐ Les deux côtés également

34. En utilisant l'échelle ci-dessous, s'il vous plaît indiquer la mesure dans laquelle vous avez ces sentiments.

Au cours des 14 derniers jours, à quelle fréquence avez-vous été dérange par les problèmes suivants?	Jamais	Plusieurs jours	Plus de la moitié des jours	Presque tous les jours
A. Sentiment de nervosité, d'anxiété ou de tension.	0	1	2	3
B. Incapable d'arrêter de vous inquiéter ou de contrôler vos inquiétudes.	0	1	2	3
C. Inquiétudes excessive à propos de tout et de rien.	0	1	2	3
D. Difficulté à se détendre.	0	1	2	3
E. Agitation telle qu'il est difficile de rester tranquille.	0	1	2	3
F. Devenir facilement Contrarie(e) ou irritable.	0	1	2	3
G. Avoir peur que quelque chose d'épouvantable puisse arriver.	0	1	2	3

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35. En utilisant l'échelle ci-dessous, s'il vous plaît indiquer la mesure dans laquelle vous avez ces sentiments.

Au cours des 2 dernières semaines, à quelle fréquence avez-vous été dérangée par les problèmes ou les états suivants :	jamais	Plusieurs jours	Plus de 7 jours	Presque tous les jours
A. Peu d'intérêt ou de plaisir à faire des choses.	0	1	2	3
B. Se sentir triste, déprimé(e) ou désespère (e).	0	1	2	3
C. Difficultés à s'endormir ou à rester endormi(e), ou trop dormir.	0	1	2	3
D. Se sentir fatigue(e) ou avoir peu d'énergie.	0	1	2	3
E. Peu d'appétit ou trop manger.	0	1	2	3
F. Mauvaise perception de vous-même – ou vous pensez que vous êtes un perdant ou que vous n'avez pas satisfait vos propres attentes ou celles de votre famille.	0	1	2	3
G. Difficultés à se concentrer sur des choses elles que lire le journal ou regarder la télévision.	0	1	2	3
H. Vous bougez ou parlez si lentement que les autres personnes ont pu le remarquer. Ou au contraire – vous êtes si agite que vous bougez beaucoup plus que d'habitude.	0	1	2	3

Si vous cochez au moins un des problèmes nommes dans ce questionnaire, répondez a la question suivante : dans quelle mesure ce (s) problème (s) va-t-il (ont-ils) rendu difficile(s) votre travail, vos taches à la maison ou votre capacité a bien vous entendre avec les autre?

Pas du tout difficile ☐ Plutôt difficile ☐ Très difficile ☐ Extrêmement difficile ☐

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Période: référence ☐

36. S'il vous plaît répondre aux questions suivantes sur vous-même en indiquant la mesure de votre accord:

	Totalement en désaccord	Plutôt en désaccord	Neutre	Plutôt d'accord	Totalement d'accord
A. Dans les moments d'incertitude, je m'attends habituellement au mieux.					
B. J'ai de la facilite a relaxer.					
C. S'il y a des chances que ça aille mal pour moi, ça ira mal.					
D. Je suis toujours optimiste face à mon avenir.					
E. J'apprécie beaucoup mes amis(es).					
F. C'est important pour moi de me tenir occupe.					
G. Je ne m'attends presque jamais à ce que les choses aillent comme je le souhaite.					
H. Je ne me fâche pas très facilement.					
I. Je m'attends rarement à ce que de bonnes choses m'arrivent.					
J. Dans l'ensemble, je m'attends à ce qu'il m'arrive plus de bonnes choses que de mauvaises.					

37. Avez-vous déjà subi une extraction dentaire? Non ☐ Oui ☐

- ☐ Parce que j'avais mal
- ☐ Je ne me souviens pas
- ☐ Pas à cause de la douleur

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Jewish General Hospital

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Consent Form

Transition from acute to chronic painful temporomandibular disorders:
A prospective cohort study

You are being invited to participate in a study regarding transition from acute to chronic Temporomandibular Disorder 'called TMD', a type of facial pain. You have been selected as we are interested in understanding what may predict health wellbeing associated with facial pain. You have the right to know about the purposes and procedures that are be used in this study and to be informed about its potential benefits, risks and any discomfort that may occur. There is no compensation for your participation. Before you agree to take part in this study, it is important that you read the information in this consent form. You should ask as many questions as you need to in order to understand what you will be asked to do. Your participation is voluntary.

Purpose of this study:
The purpose of this study is to identify the possibilities of having a TMD-related pain and determine the factors associated with this facial pain.

Procedures:
If you agree to participate in our study, you will be asked to do the following:

- You will be invited to complete a questionnaire on the day of your dental appointment (today), and at 3 and 6 months after this first interview. If you cannot do so, we will ask you to complete it at a later time and mail it back to us in a postage-paid envelope that will be provided to you. If you cannot return this questionnaire, a telephone interview will then be conducted by the research assistant. The completion of the questionnaire may take on average 10 to 20 minutes.
- Allow us to collect saliva (5-10 ml) on the day of the first interview. To collect the saliva, the research assistant will ask you to spit into a sterilized centrifuge tube. No hospitalization is required for this purpose. The duration of saliva collection will take a maximum of 10 minutes. Saliva samples will be used to assess if the composition of the saliva is related to TMD-related pain.
- The research team will ask you about your general health using a brief questionnaire. We will see if you have high blood pressure, diabetes, thyroid problem, allergy, and asthma. We will do that to see if these factors may predict health wellbeing associated with facial pain.
- The questions which are going to be asked in the study will help to identify the individuals with TMD, as well as to measure the level of pain and disability related to this condition. Other questions will evaluate the level of general health and psychological characteristics (e.g., anxiety and depression).

Risks, Disadvantages and Side-Effects:
You will be interviewed by the research assistant. If you feel uncomfortable to answer any of the questions, you are free to stop or skip that question and move on to the next one. This interview will take a maximum of 20 minutes of your time.

Benefits:
There is no direct benefit to participate in this study. However, this study will provide the medical and dental community with more definitive evidence of factors that may increase the chance of this type of facial pain. The results of this study may contribute to the development of personalized programs to improve TMD pain management.

Voluntary participation / withdrawal:
Your participation in this study is voluntary. Whether you accept or decline to participate in this study, your future dental care and your patient-doctor relationship will not be affected in any way. You may choose to participate now and decide to stop your participation at any time. If you decide to withdraw from the study, all information obtained about you up to the point of your withdrawal will be kept to preserve the scientific integrity of the study. Upon your withdrawal, you can request to have your saliva samples destroyed.

Confidentiality:
While you take part in this research study, the researcher in charge and study staff will collect and store personal identifiable information about you in a file for the purpose of the research study. Only information necessary for the research study will be collected.

All information and saliva sample obtained about you during this study will be treated confidentially within the limits of the law. Thus, to protect your identity, your name and identifying information will be replaced with a code (numbers). The link between the code and your identity as well as the study file will be kept under the responsibility of Dr. Velly and will be held in a locked drawer in Dr. Velly's office at the Dental Department of the Jewish General Hospital. No information that discloses your identity will be allowed to leave the institution.

The saliva sample will be stored in the saliva freezer at the Lady Davis Institute of the Jewish General Hospital under the responsibility of Drs. Gornitsky, Schipper and Velly. Your sample will be stored until the saliva is used for study analysis. The remaining saliva sample will be destroyed in the laboratory of Dr. Hyman Schipper at the Lady Davis Institute, 10 years after the completion of the study. The sample will only be used for the purposes described in this consent form. The Lady Davis Institute requires a pass for entry, the door to the lab is locked and the results of the samples will be kept in a locked drawer with information being codified. Computer information is restricted by a password.

The result of the analysis will be kept confidential and will not be placed anywhere in your file. Also, you will not be identified in any published report. A copy of this consent form will not be placed in your medical record file and a copy will be given to you.

For the purpose of monitoring this research, your research study file as well as your medical records identifying you could be checked by a person authorized by the Research Ethics Committee of the Jewish General Hospital or the Institutional Review Board of McGill University. This person is obliged to respect your privacy.

For safety purposes, and in order to communicate information that is required in order to protect your well-being, Dr. Velly, the principal researcher of this study will keep your personal information including your name, contact information, the date when your participation in the study began and when it ended separate from the research documents.

You have the right to look at your study file in order to check the information gathered about you and to correct it, if necessary, as long as the study researcher or the institution keeps this information.

Contact information:

If you have any question about this study, please contact Dr. Ana Velly: 514-340-8222 ext 2932, 3755 Cote St. Catherine Road, room A-017, Montreal, Quebec H3T 1E2. For any question regarding your rights as a research participant, please contact Rosemary Steinberg (Jewish General Hospital), local commissioner of complaints and quality of service, at 514-340-8222 ext. 5833 or Pascale Valois (Montreal General Hospital), local commissioner of complaints and quality of service, at 514-934-1934 ext. 44285

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Statement of Consent:

I have read the previous information and my questions were answered to my satisfaction. A copy of this signed consent form will be given to me. My participation is voluntary and I can withdraw from the study at any time without giving reasons. It will not affect my dental care now or later. I do not give up any of my legal rights by participating in this study. I understand that I will be contacted by the research assistant at the first appointment and after three and six months.

I agree to participate in this study.

_____

Printed name of participant

_____ _____

Signature of Subject Date

_____

Printed name of person obtaining consent

_____ _____

Signature of Person Obtaining Consent Date

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Formulaire de consentement

Transition de la douleur aiguë à la douleur chronique liée aux désordres temporomandibulaires: Une étude de cohorte prospective

Vous êtes invité à participer à une étude concernant la transition de la douleur aigue à la douleur chronique liée aux désordres temporomandibulaires, nommés « DAM », un type de douleur au visage. Vous avez été sélectionné car nous sommes intéressés à comprendre ce qui peut prédire le bien-être en santé lié à la douleur faciale. Vous avez le droit de connaître le but et les procédures de cette étude, et d'être informé sur ses potentiels avantages et risques, ainsi que tout inconfort qui peuvent être encourus. Il n'y a aucune rémunération pour participer à cette étude.

Avant d'accepter de prendre part à cette étude, il est important que vous lisiez l'information dans ce formulaire de consentement. Vous devriez poser autant de questions nécessaires afin de comprendre ce que vous serez invité à faire. Votre participation est volontaire.

But de l'étude:

L'objectif de cette étude est de déterminer les possibilités d'avoir de la douleur liée aux désordres temporomandibulaires et de déterminer les facteurs associés à cette douleur au visage.

Procédures:

Si vous acceptez de participer à notre étude, vous serez demandé de faire ce qui suit:

- Vous serez invité à compléter un questionnaire le jour de votre rendez-vous (aujourd'hui), 3 et 6 mois après ce premier entretien. Si vous ne pouvez pas le compléter, nous vous demanderons de le faire ultérieurement et de nous renvoyer le questionnaire dans une enveloppe prépayée que nous vous fournirons. Si vous ne pouvez pas nous retourner ce questionnaire, une entrevue téléphonique sera alors effectuée par l'assistant de recherche. L'achèvement du questionnaire peut prendre en moyenne de 10 à 20 minutes.
- Permettez-nous de recueillir de la salive (5-10 ml) le jour de la première entrevue. Afin de collecter la salive, l'assistant de recherche vous demandera de cracher dans une éprouvette stérilisée. Aucune hospitalisation ne sera nécessaire à ces fins. La durée de la collecte de salive prendra un maximum de 10 minutes. Les échantillons de salive seront utilisés afin d'évaluer si la composition de la salive est liée à cette douleur.
- L'équipe de recherché vous posera des questions sur vos la santé en général en utilisant un bref questionnaire. Nous vérifierons si vous avez de l'hypertension, le diabète, des problèmes de thyroïde, des allergies ou de l'asthme. Nous ferons cela afin de voir si ces facteurs peuvent prédire le bien-être en santé associé à la douleur au visage.
- Les questions qui seront posées lors de cette étude aideront à l'identification des individus atteints de DAM, ainsi que de mesurer le niveau de douleur et d'incapacité lié à cette condition. D'autres questions évalueront le niveau de la santé en général et les caractéristiques psychologiques (ex. anxiété et dépression).

Les risques, inconforts et effets secondaires:
Vous aurez des entrevues avec l'assistant de recherche. Si vous n'êtes pas confortable à répondre à certaines questions en particulier, vous êtes libres d'arrêter ou de sauter la question et de passer à la suivante. Cette entrevue prendra un maximum de 20 minutes de votre temps.

Avantages:
Il n'y a aucun avantage direct à participer à cette étude. Cependant, cette étude fournira à la communauté médicale et dentaire des preuves plus définitives sur les facteurs qui peuvent augmenter les chances de cette douleur au visage. Ces résultats peuvent contribuer au développement de programmes personnalisés pour améliorer la gestion de la douleur liée aux désordres temporomandibulaires.

Participation volontaire / retrait:
Votre participation à cette étude est volontaire. Indépendamment de si vous accepter ou refuser de participer à cette étude, vos futurs soins dentaire et votre relation dentiste-patient ne seront affectés en aucune façon. Vous pouvez choisir de participer maintenant et d'arrêter à tout moment. Si vous décidez de vous retirer de cette étude, toutes informations recueillies jusqu'au moment de votre retrait seront gardées afin de protéger l'intégrité scientifique de l'étude. Après votre retrait, vous pouvez demander à ce que vos échantillons de salive soient détruits.

Confidentialité:
Durant votre participation à cette étude, le chercheur responsable et le personnel impliqué dans l'étude collecteront et conserveront des informations personnelles pouvant vous identifier dans un dossier aux fins de l'étude. Seules les informations nécessaires à l'étude de recherche seront recueillies.

Toutes les informations et échantillons de salive obtenus de vous au cours de cette étude seront traités confidentiellement dans les limites de la loi. Ainsi, afin de protéger votre identité, votre nom et informations d'identification seront remplacés par un code (chiffres). Le lien entre le code et votre identité ainsi que le dossier d'étude seront maintenus sous la responsabilité du Dr. Velly, et seront conservés dans un tiroir verrouillé dans le bureau du Dr. Velly au département dentaire de l'Hôpital général juif. Aucune information révélant votre identité ne sera autorisé à quitter l'établissement.

L'échantillon de salive sera conservé dans un congélateur contenant des échantillons de salive à l'Institut Lady Davis de l'Hôpital général juif, sous la responsabilité des Drs. Gornitsky, Schipper et Velly. Votre échantillon sera conservé jusqu'à ce que la salive soit utilisée pour des analyses. Le reste de l'échantillon de salive sera détruit dans le laboratoire du Dr. Hyman Schipper à l'Institut Lady Davis, 10 ans après la fin de l'étude. L'échantillon de salive sera utilisé uniquement aux fins des objectifs décrits dans ce formulaire de consentement. L'Institut Lady Davis nécessite un laissez-passer pour y accéder, la porte du laboratoire est verrouillée, et les résultats des échantillons seront conservés dans un tiroir fermé à clé avec les informations codifiées. Les informations sur l'ordinateur sont limitées par un mot de passe.

Le résultat de l'analyse sera maintenu confidentiel et ne sera pas placé dans votre dossier. En outre, vous ne serez identifié dans aucun rapport publié. Une copie de ce formulaire de consentement ne sera pas placée dans votre dossier médical, et un exemplaire vous sera remis.

Aux fins de surveillance de cette étude, votre dossier de recherche ainsi que vos dossiers médicaux vous identifiant peuvent être vérifiés par une personne autorisée par le comité d'éthique de l'Hôpital général juif ou le comité d'examen institutionnel de l'Université McGill. Cette personne est tenue de respecter votre vie privée.

Pour des raisons de sécurité, et afin de communiquer des informations qui sont nécessaires pour protéger vos données, Dr. Velly, chercheur principal de cette étude, gardera vos informations personnelles, y compris votre nom, vos coordonnées, les dates auxquelles votre participation à l'étude a commencé et a fini séparées des documents de recherche.

Vous avez le droit de consulter votre dossier d'étude afin de vérifier les informations recueillies sur vous et de les corrigées, si nécessaire, tant que le chercheur ou l'institution conserve ces renseignements.

Contacts :

Si vous avez des questions au sujet de cette étude, s'il vous plaît contacter Dr. Ana Velly: 514-340-8222 poste 2932, 3755 Côte Ste. Catherine Road, room A 017, Montréal, Québec H3T 1E2. Pour toute information concernant vos droits à titre de participant à une étude de recherche, veuillez contacter Rosemary Steinberg (Hôpital général juif), commissaire locale aux plaintes et à la qualité du service, au 514-340-8222 poste 5833 ou Pascale Valois (Hôpital général de Montréal), commissaire locale aux plaintes et à la qualité du service, au 514-934-1934 poste 44285.

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Hôpital général juif | Jewish General Hospital

McGill

Déclaration de consentement:

J'ai lu les informations et mes questions ont été répondues à ma satisfaction. Une copie de ce formulaire de consentement signé me sera remise. Ma participation est volontaire et je peux me retirer de l'étude à tout moment sans donner de raisons, sans que cela affecte mes soins médicaux maintenant ou plus tard. Je ne renonce à aucun de mes droits légaux en participant à cette étude. Je comprends que je serai contacté par l'assistante de recherche au premier rendez-vous et après trois et six mois.

Je suis d'accord pour participer à cette étude.

_____

Nom du participant

_____ _____

Signature du participant Date

_____

Nom de la personne obtenant le consentement

_____ _____

Signature de la personne obtenant le consentement Date