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Painful Sites In And Adjacent To The Masticatory System Increase With More Severe Somatization Scores In Temporomandibular Disorders And Tension-Type Headache Subjects.

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Abstract

Introduction: *Somatization is the displacement of psychic conflict into bodily complaints. Temporomandibular disorders have been frequently related to psychosomatic disorders. It is believed that multiple complaints also occur in and/or adjacent to the masticatory system. Such complaints may be related to somatization.*

Aim: *Compare differences in pain sites in and or adjacent to the masticatory system and evaluate a potential correlation between scores in somatization and scores in pain sites in a sample of subjects presenting with temporomandibular disorders and tension-type headache.*

Methods: *Clinical examination, history of the chief complaint, palpation of joints and muscles, use of psychological tests including the Rief and Hiller instrument for somatization, a questionnaire and clinical examination for bruxing behavior, determination of painful sites with or without palpation and assessment of the type of headache based clinical description were used to classify patients and controls as presenting signs and symptoms of temporomandibular disorders, tension-type headache and somatization. Following a comprehensive evaluation data from patients and controls were stored in a database for futures studies. Recently 146 and 183 clinical records from patients and controls respectively, were retrieved consecutively and retrospectively evaluated. Criteria for Temporomandibular disorders and tension-type headache were those used and published in the current literature. The Rief and Hiller instrument was used and subjects and controls were classified as presenting no, mild, moderate, severe and very severe somatization scores. Subgroups with temporomandibular disorders and tension-type headache and mild, moderate, severe and very severe somatization scores were compared with control subjects without temporomandibular disorders and no tension – type headache. To establish a better comparison in the temporomandibular and tension-type headache group versus the control one regarding painful sites, the control group was divided in three different subgroups: Those with no temporomandibular disorders and no tension-type headache (n=41), those with no temporomandibular disorders and with tension-type headache (n=40) and those with temporomandibular disorders and no tension-type headache (n=103). In the same way, subjects in the temporomandibular disorder and tension-type headache subgroup were classified by their scores in somatization. Data were analyzed using unpaired t-test with Welch´s correction, Fisher´s exact test, Kruskal-Wallis ANOVA and Spearman correlation coefficient. Statistical significance was accepted if $p<0.05$.*

Results: *Mean age in the temporomandibular disorder and tension-type headache group was about 31,1 (SD=11,8, range=11—66) as compared to 33,6 (SD=11,7, range=17—66) in the whole control group: Unpaired t-test with Welch´s correction p=0,67 indicating statistically nonsignificant difference. There were 138/146 females in the temporomandibular and tension-type headache subgroup and 150/184 in the control group: Fisher´s exact test p<0,0004, indicating that more females were present in the TMD + TTH group and the difference was statistically very significant.*

Mean in somatization in the whole group of 146 TMD and TTH subjects was about 10.6 (SD=5,5, range=1-24) as compared to 4,9 (SD=3,0, range 0-11) in the control group (n=184): Unpaired t-test with Welch´s correction p<0,0001, indicating a statistically and extremely significant difference between the experimental group (n=146 and the whole control group (n=184). Means, SD and range in somatization in 3 controls and 4 TMD and TTH groups are described as follows: ***TMD + TTH and 0—5****: 3,5, 1,4 and 0—5;* ***TMD and TTH 6-11****: 8,3, 1,6 and 6—11;* ***TMD + TTH and 12-16****: 13,9, 1,5 and 12—16;* ***TMD + TTH and 17 or higher*** *scores in somatization:*

19,4, 2,4 and 17—24. Kruskal-Wallis statistics with Dunn's p<0,0001, a statistically and extremely significant difference. ***No TMD No TTH: 4,14****, 3,3 and 0—16;* ***No TMD + TTH=7,7****, 3,6, 2—14;* ***TMD No TTH=6,8****, 4,8 and 0—19;*

Regarding scores in ***pain sites*** *in the temporomandibular disorder and tension-type headache subgroup they are described as follows:* ***2,2*** *(SD=1,12, range=0-5);* ***2,4*** *(SD=1,2, range=0—6);* ***3,1*** *(SD=1,5, range=1—7);* ***3,3*** *(SD=1,1, range=1—5) in the Temporomandibular disorder + Tension-type headache subgroup and somatization 0-5; in the temporomandibular disorder subgroup + Tension-type headache and somatization 6-11; in the temporomandibular disorder + Tension-type headache group and somatization 11—16 and in the temporomandibular disorder group + Tension-type headache and somatization 17 or higher, respectively.* ***Means in pain sites*** *in the control subgroups are described as follows:* ***0,65*** *(SD=0,97, range=0—4);* ***0,85*** *(SD=0,83, range=0—3) and* ***1,85*** *(SD=1,5, range=0—6= in the* ***No temporomandibular Disorder No Tension-type headache****,* ***No temporomandibular disorder with Tension-type headache*** *and* ***Temporomandibular disorder without Tension-type headache*** *subgroup respectively. Kruskal-Wallis nonparametric ANOVA: Temporomandibular disorders with no Tension-type headache versus no Temporomandibular Disorders and No Tension-type headache p<0,001 (statistically very significant); temporomandibular disorders + Tension-type headache and 0-5 scores in somatization versus No temporomandibular disorders No Tension-type headache p<0,001 (statistically very significant); temporomandibular disorders + Tension-type headache 6-11 scores in somatization versus No temporomandibular disorders No Tension-type headache p<0,001 (statistically very significant); temporomandibular disorders + tension-type headache and 12-16 scores in somatization versus No temporomandibular disorders No tension-type headache p<0,001 (a very significant difference); temporomandibular disorders + tension-type headache 17 or higher scores in somatization versus No temporomandibular Disorders and No Tension-type headache p<0,001 (statistically very significant); Temporomandibular disorders No tension-type headache versus No temporomandibular disorders + tension-type headache p<0,01 (statistically significant); temporomandibular disorders + tension-type headache and 0-5 scores in somatization versus No temporomandibular disorders + tension-type headache p<0,001 (statistically very significant); temporomandibular disorders + tension-type headache 6-11 scores in somatization versus No temporomandibular disorders + tension-type headache p<0,001 (very significant difference); temporomandibular disorders + tension-type headache and 12-16 scores in somatization versus No temporomandibular disorders + tension-type headache p<0,001 (statistically very significant); temporomandibular disorder + tension-type headache and 17 or higher scores in somatization versus No temporomandibular disorders + tension-type headache p<0,001 (statistically very significant); temporomandibular disorders + tension-type headache and 12-16 scores in somatization versus temporomandibular disorders No tension-type headache p<0,001 (statistically very significant); temporomandibular disorders + tension-type headache and 17 or higher scores in somatization versus temporomandibular disorders and No tension-type headache p<0,001 (statistically very significant).*

Conclusion: *When temporomandibular + tension-type subjects were classified in subgroups by their scores in somatization, the number of pain sites in and/or adjacent to the masticatory system increased with more severe somatization scores. Control subjects with temporomandibular disorders or with tension-type headache demonstrated higher number of pain sites as compared to control subjects with no temporomandibular disorders and no tension-type headache. Further studies are needed to compared findings in the current study.*

Keywords: *Temporomandibular disorders. Tension-type headache. Somatization. Pain sites.*

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I. Introduction

Temporomandibular Disorders or TMDs constitute a well-defined set of signs and symptoms of dysfunctional temporomandibular joints (TMJs) and/or masticatory muscles and include a complaint of muscle and/or joint pain, impairment of jaw movements, tenderness to palpation, joint noises and sometimes headache. Based in one investigation [1]. TMDs are also conceptualized as" umbrella terms that include not only pain in the TMJs but also functional disturbances of the jaws such as locking and clicking". TMDs occur frequently in the general population and about 10% of early TMDs subjects develop more severe chronic pain, about 20% of TMDs patients develop chronic and persistent signs and symptoms. Central modulatory processes combined with some comorbidities and psychiatric disorders play a central role facilitating the perpetuation of TMDs sign and symptoms [2]. TMDs are considered a form of "musculoskeletal disorders" in which muscle and joint disorders predominate and are closely influenced by the presence of anxiety, stress, depression and somatization [3].

Somatization is a psychiatric disorder characterized by the tendency to experience stress and anxiety in the form of multiple symptoms or bodily complaints usually associated with psychic conflicts of which the patient is unaware and is unable to provide or communicate information about the cause and related personal conflicts

[4]. Abbas, Lovas and Purdy [5] define somatization as "the translation of emotions into the development or worsening of somatic or bodily problems or complaints". Somatization is a very complex psychiatric disorder contributing to the development of multiple bodily symptoms, central sensitization, hyperalgesia, allodynia and recalcitrant chronic pain. Many patients reporting signs and symptoms of recurrent or persistent headache have somatization of emotions as a major component of their complaints [5]. Even though the whole dimension of psychic conflicts related to somatization, has not been determined, it is believed that internalization of anger or the difficulty to externalize it, constitutes one of the major conflicts closely related to somatization disorders, a phenomenon that has been labelled "internalization of anger or anger turned inward". Elevated levels of psychological distress including anxiety, depression and somatization may be observed frequently in patients presenting with TMD signs and symptoms [6].

Widespread pain in adjacent anatomic structures including the neck, cervical, shoulders and upper back region may also be associated with dysfunctional TMJs. Pain in the lower back, stomach, the shoulder and other joints in general are reported frequently in TMD patients. The terms "widespread pain" was proposed recently to refer to persistent pain in other body parts and the association of TMDs with pain in distant anatomic locations in patients with TMDs [7]. Widespread pain is closely associated with somatization, more chronic musculoskeletal pain and with a neurophysiological process known as "central sensitization, allodynia and hyperalgesia [7]. The concept of widespread pain has gained enormous clinical and theoretical importance as it has been identified with a risk factor in the onset and maintenance of chronic pain [8]. Thus, widespread pain can contribute to both longer duration and increased pain intensity of TMDs patients. Some TMDs patients report pain from both adjacent and distant anatomic regions as well as some somatic symptoms including body fatigue and dizziness [6], Such widespread pain combined with high levels of anxiety, depression and somatization facilitates the transformation of acute into more chronic pain [6]

Even though an enormous body of both clinical and scientific research has emerged in the last three decades amplifying our understanding about the role of psychological factors in the development of chronic TMDs, our understanding about the relationship between multiple pain sites adjacent and distant to the masticatory system and somatization is still very rudimentary. Thus, this investigation was carried out to:

1.Evaluate scores in somatization in a large sample of subjects with TMDs and TTH (n=146) and compare such scores with subgroups of subjects with no TMDs and no TTH (n=41), with no TMDs and with TTH (n=40) and with TMDs and no TTH (n=103).

2.Compare the frequency of pain sites in subgroups of TMD + TTH classified by the severity of somatization with control subgroups

3.Assess the strength of association between scores in somatization and scores in painful sites in and adjacent to the masticatory system in experimental and control subjects.

II. Methods

The method to carry out the current study was designed in two stages. In stage 1 subjects referred consecutively to a university-based facility were comprehensively evaluated assessing the history of the chief complaint, palpating their muscles and joints, examining the presence of trigger points, using questionnaires and biomechanical test to assess types of TMJ-IDs and using questionnaire and clinical examination to evaluate diurnal, nocturnal or mixed bruxing behavior, type of headache, for instance, tension-type headache migraine and combination headache. The severity of anxiety, depression and somatization was evaluated using the Taylor Manifest Anxiety Scale (TMAS), the Beck Depression Inventory (BDI) and the Rief and Hiller instrument, respectively. The presence of pain sites in and/or adjacent to the masticatory system was evaluated using a simple questionnaire complemented by the use of additional questions, for example, description of the pain, pattern of referral and the role of stress, anxiety and weather conditions. At the end of the evaluation process, the principal examinator, classified the patient as a TMD or a control, the headache was classified according to patient´s description into various types including TTH, migraine, combination headache, occipital neuralgia and headache from myofascial trigger points. Subjects presenting with both TMDs and TTH and controls ones were invited to respond to the Rief and Hiller questionnaire for somatization [9,10]. Experimental subjects were allocated to subgroups with 0-5 (no or mild), 6-11 (moderate), 12-16 (severe) and 17 or higher (very severe) scores in somatization. Once the comprehensive evaluation was completed, the clinical records were stored in a database for future investigations in many areas of TMDs and Orofacial Pain. One major objective of this procedure from the outset was to collect precise, complete and accurate data based on criteria published in the current literature, for instance use of current criteria for TMDs, TTH, somatization and bruxing behavior.

The second stage of this investigation consisted in the retrospective evaluation of clinical records. In this case all records were alphabetically evaluated and retrieved consecutively according to the goals of the study. All those clinical records having information about TMDs, TTH, somatization and painful sites were retrieved to establish the experimental group. All subjects (n=146) in the experimental group were allocated to a large group with sign and symptoms of TMD, TTH and information about somatization and painful sites. Based on their

scores in somatization, experimental subjects were again allocated to subgroups as follows: TMD + TTH with 0-5 (no or mild somatization), 6-11 (moderate somatization), 12-16 (severe somatization) and 17 or higher scores (very severe somatization). Controls were those subjects without combined signs of symptoms of TMDs + TTH and were allocated to three different subgroups: Those with no TMDs and no TTH (n=41), those with no TMDs and with TTH (n=40) and those with TMDs and without TTH (n=103). Thus, the control group was formed by 184 subjects retrospectively evaluated. We did so in order to evaluate means in somatization and pain sites in experimental subjects and controls, compare means in different experimental and control subgroups and finally, assess correlations between painful sites and somatization in experimental and control subjects.

Criteria for TMDs: Seeking treatment for signs or symptoms of TMD, a complaint of pain, joint noises, tenderness to palpation, difficulties to perform jaw movements.
Criteria for TTH: Bilateral pain in the temporal and frontal region, pain described as pressure, tightness, compression or constriction lasting hours or days, occasional nausea and rarely vomiting, dull, aching and constant in quality, a feeling of tightness or stiffness in the cervical region.
Criteria for somatization: Using the Rief and Hiller questionnaire [9,10], those with 0-2, 3-5, 6-11, 12-16 and 17 or higher were allocate to subgroups as follows: no, mild, moderate, severe and very severe somatization, respectively.
Criteria for pain sites: Pain sites were those reported in the face, lower jaw, ear, cervical, shoulders, back, vertex, muscle pain referred to the teeth, TMJ, head, stomach and joints. Some signs and symptoms including ear stuffiness, hearing difficulties, throat infections and others no musculoskeletal disorders in nature, were not included as "pain sites".
Exclusion criteria: Experimental and control subjects with cognitive difficulties, communication disorders, motor alterations, psychiatric and psychological difficulties were not included had their clinical records filed in a separate section and were not included in this investigation. Experimental and control subjects with neuropathic, neurogenic or psychogenic orofacial pain were also excluded from participating in this investigation.

III. Statistical Analysis

Basic statistics including means, standard deviation and range were used to gather information about age, proportion of females and males, somatization and pain sites scores. Unpaired t-test was used to compared mean and age differences in experimental and control subjects. Fisher´s exact test was utilized in the comparison of proportion of females and males. Unpaired t-test was used to compare somatization scores in the whole groups of experimental and control subjects. Kruskal-Wallis statistics with Dunn´s test was used to contrast experimental and control groups regarding means in somatization and pain sites. Spearman rho statistics was used to evaluate linear correlations between scores in somatization and scores in pain sites in both experimental and control groups. Significance was accepted if $p<0,05$.

IV. Outcome

This investigation retrospectively evaluated a group of TMD subjects presenting with signs and symptoms of **TMDs + TTH** (n=146), that responded to a self-reported questionnaire about somatization and to a simple question about pain sites in and adjacent to the masticatory system. **Controls** (n=184) were subjects evaluated consecutively in the same period of time that were allocated to different subgroups as follows: those with no TMDs and no TTH (n=41), those with no TMDs and with TTH (n=40) and those with TMDs without TTH (n=103=. Mean age in the experimental group was about 31,1 (SD=11,8, range=11-66) compared to 33,6 (SD=11,7, range 17-66) in the control group: Unpaired t-test with Welch´s correction p=0,67, a nonsignificant statistically difference. There were 138 females (138/146=94,5%) and 8/146=5,5% males in the experimental group and 150/184=81,5% females and 34/184=18,5% males in the control group: Fisher´s exact test $p<0,0004$. There were more females in the TMD + TTH group as compared to the control one and the difference was extremely and statistically significant. See Table 1 for further details.

Means, SD and range in somatization in the TMDs + TTH subgroups are described as follows: The whole group of 146 TMD and TTH subjects mean=10,6, SD=5,5, Range=1—24 as compared to 4,9, SD=3,0, range=0-11 in the control group. Unpaired t-test with Welch´s correction $p<0,0001$, a statistically extremely significant difference. Means in somatization in different subgroups of TMDs + TTH subjects are described as follows: TMDs + TTH and 0-5 scores in somatization (3,5, 1,4 and 1-5); TMDs + TTH and 6-11 scores in somatization (8,3, 1,6 and 6-11); TMDs + TTH and 12-16 scores in somatization (13,9, 1,5 and 12-16); TMDs + TTH and 17 or higher scores in somatization (19,4, 2,4 and 17-24). Means, SD and range in somatization the **control groups** are described as follows: No TMD No TTH subgroup (4,14, 3,3 and 0-16); No TMD + TTH subgroup (7,7, 3,6 and 2-14) and TMD No TTH subgroup (6,8, 4,8 and 0-19). Kruskal and Wallis nonparametric ANOVA with Dunn´s test $p<0,0001$, an extremely and statistically significant difference in the contrast of experimental and control subgroups: See Table 2 for additional details.

No CMDs + TTH versus no TMDs no TTH p<0,01 (statistically significant)
TMDs No TTH versus no TMD no TTH p< 0,05) statistically significant)
TMD + TTH 6-11 somatization scores versus no TMD no TTH p<0,001 (statistically very significant.
TMD + TTH 12-16 somatization scores versus no TMDs no TTH p<0,001 (statistically very significant).
TMD + TTH and 17 or higher somatization scores versus no TMD no TTH p<0,001 (statistically very significant).
TMD + TTH 0-5 somatization scores versus no TMDs + TTH p<0,001) statistically very significant)
TMD + TTH 12-16 somatization scores versus no TMDs + TTH p<0,001 (statistically very significant)
TMD + TTH 17 or higher somatization scores versus no TMD + TTH p<0,001 (statistically very significant)
TMD + TTH o-5 somatization scores versus TMDs no TTH p<0,01 (statistically significant)
TMD + TTH 12-16 somatization scores versus TMD no TTH p<0,001, (statistically very significant)
TMD + TTH 17 or higher somatization scores versus TMD no TTH p<0,001 (statistically very significant).
TMD + TTH 6-11 versus TMD + TTH 0-5 somatization scores p<0,001 (statistically very significant)
TMD + TTH 12-16 versus TMD + TTH 0-5 somatization scores p<0,001 (statistically very significant).
TMD + TTH 17 or higher versus TMD + TTH 0-5 somatization scores p<0,001 (statistically very significant).
TMD + TTH 12-16 versus TMD + TTH 6-11 somatization scores p<0,001 (statistically very significant.
TMD + TTH 17 or higher versus TMD + TTH 6-11 somatization scores p<0,001 (statistically very significant).
See Table 2 for additional details.
Means, standard deviation and range in pain sites in the groups No TMD No TTH, No TMD + TTH, TMD No TTH, TMD + TTH and 0—5, TMD + TTH and 6—11, TMD + TTH and 12—16 and TMD + TTH and 17 or higher scores in somatization were as follows: 0,65, 0,97 and 0—4; 0,85, 0,83 and 0—3; 1,85, 1,5 and 0—6; 2,2, 1,12 and 0—5; 2,4, 1,2 and 0—6; 3,1, 1,5 and 1—7 and 3,3, 1,1 and 1—5, respectively: Kruskal-Wallis non parametric ANOVA with Dunn´s test p<0,0001, an extremely and statistically significant difference. See Table 2 for further details:
***TMD No TTH versus No TMD No TTH p<0,001, statistically very significant
TMD + TTH 0—5 versus No TMD No TTH p<0,001, statistically very significant
TMD + TTH 6—11 versus No TMD No TTH p<0,001, statistically very significant
TMD + TTH 12-16 versus No TMD No TTH p<0,001, statistically very significant
TMD + TTH 17 or higher versus No TMD No TTH p<0,001, statistically very significant
TMD No TTH versus No TMD + TTH p<0,01, statistically significant
TMD + TTH 0—5 versus No TMD + TTH p<0,001, statistically very significant
TMD + TTH 6—11 versus No TMD + TTH p<0,001, statistically very significant
TMD + TTH 12—16 versus No TMD + TTH p<0,001, statistically very significant
TMD + TTH 17 or higher versus No TMD + TTH p<0,001, statistically very significant
TMD + TTH 12—16 versus TMD No TTH p<0,001, statistically very significant
TMD + TTH 17 or higher versus TMD No TTH p<0,001, statistically very significant.

Spearman correlation coefficient was used to test the **strength of association between scores in somatization** and painful sites both in the experimental group and in the control one. Because Spearman r=0,32 and p<0,0001 (experimental group) and Spearman r=0,20 and p<0,009 in the control group it can be stated that there was a positive and significant association between scores in somatization and painful sites in both the experimental and control groups. Nonetheless, the association between scores in somatization and number of pain sites was stronger in the TMD and TTH group (n=146).

V. Discussion

Higher scores in somatization were found in the TMDs and TTH subgroup (n=146) as compared to the combined control group of those with no TMDs No TTH, no TMDs + TTH and TMDs No TTH (n=184).

Psychological and/or psychiatric disorders are currently considered as major characteristics in some subgroups of TMDs subjects with or without headache. It has been accepted that many groups of such subjects usually demonstrate higher scores in anxiety, depression and somatization. This is so as somatization is a complex psychiatric construct occurring together with high levels of anxiety and depression. Most TMD an TTH subjects in the current investigation were diurnal, nocturnal or mixed bruxers and bruxism usually occur in combination with other oral jaw behaviors. Thus, these findings and considerations are in line with one investigation [11] asserting that such behaviors occurring in combination with TMDs sign and symptoms and headache can be enhanced by higher psychological distress, indicating that such psychological or psychiatric disorders including somatization, anxiety and depression co-occur in subjects with TMDs, headaches and oral jaw behaviors. In the current study, moderate, severe and very severe scores in somatization were found in subjects with TMDs and TTH. Psychiatric disorders including anxiety, depression and somatization, are frequently observed in patients complaining of signs and symptoms of craniofacial pain including in those with TMDs and TTH [12]. Individuals

presenting with signs and symptoms of diffuse musculoskeletal pan in the craniofacial structures usually demonstrate spontaneous pain and pain on palpation of muscles and joints.

These considerations are echoed by one investigation [12] reporting that "there is a positive and significant relationship between muscle tenderness and psychiatric disorders in patients with TMDs and migraine and in those with TMDs and TTH. The influence of psychological and social factors was demonstrated in a recent investigation in patients presenting with TMDs and headaches. Researchers reported that pain- related disability was strongly associated with depression in TMD-pain patients with TTH and with somatization in patients with headache attributed to TMDs [13]. Because of chronic and frequent nociceptive firing to the central nervous system and other neurophysiological phenomena, chronic pain is expected to be more severe and incapacitating. These considerations are echoed by one investigation [14] in females with chronic headache. Even though researchers did not report the frequency of TMD and/type of headache, they found that chronic headache, severe disability and high somatic symptom severity were associated with higher scores in depression. Chronic daily headache is pathological and behavioral disorder may occur together with signs and symptoms of migraine, TTH and medication overuse. Associated somatic symptoms are more frequently observed in patients with chronic migraine and chronic daily headache with more frequent severe headaches and with associated anxiety or depression [15].

The frequency of pain sites in and adjacent to the masticatory system was higher in the TMDs and TTH group as compared to the combined group of no TMDs no TTH and TMDs without TTH.

Even though studies have demonstrated that somatization usually co-occur with anxiety and depression, it is somatization that operating through different neurochemical and neurophysiological mechanism is correlated with greater number of painful sites both adjacent and distant to the masticatory system. The development of painful sites may also be influenced by greater chronicity and more severe pain complaints. Further, a combination of TMDs and TTH is more likely to be associated with higher scores in somatization, greater disability, severe pain disorders, hyperalgesia and allodynia in the masticatory system and in other body sites. Findings and considerations in the current investigation are in line with one study [16] that did not evaluate TTH in TMDs subjects. Notwithstanding this, researchers reported a higher number of comorbid conditions including pain, reduced pain thresholds in both cranial and extracranial regions and increased somatic symptoms as compared to controls. TMDs and TTH subjects with higher scores in somatization are expected to demonstrate a greater number of comorbidities and poor general health and welfare including widespread pain. These considerations are congruent with one investigation [17] in which researchers did not evaluate the presence and characteristics of TTH. Nonetheless, they found higher scores in the General Health Questionnaire instrument and widespread pain associated with multiple anatomic sites which correlated with TMDs pain symptoms. Findings in the current investigation are also supported by another investigation [17] in TMDs subjects in adolescents in which even though researchers did not evaluate the presence of TTH signs and symptoms, they reported that painful TMDs was associated with a higher number of body pain sites in the last twelve months [18]. Bruxing behavior can be found frequently in TMDs subjects with or without headache and constitutes a "silent" expression of somatization. Sleep bruxism is a direct manifestation of more severe somatization. Because more severe forms of sleep bruxism can be found in some subgroups of TMDs with or without headache, this nocturnal behavior may cause more severe damage in many anatomic areas adjacent and distant to the masticatory system. These observations are in line with one study in bruxers and TMDs individuals [19] reporting that "more severe bruxing behavior may be observed frequently in subgroup of TMDs subjects and may cause clinical symptoms in a more widespread area including in the head, neck and back". More widespread pain can be observed in subgroups of subjects presenting with TMDs [20]. Widespread pain can be both an expression or a risk factor for the onset of signs and symptoms of TMD in females and local painful symptoms can be triggered by lowered pain thresholds [8]. Even adolescents with painful TMDs may present with higher number of trigger points which may or may not cause local or more diffuse pain associated with TMDs [7]. Pain dispersion indicating a greater number of pain sites may be associated with both more intense somatization and greater chronicity of pain [21]. Pain in more musculoskeletal anatomic areas distant to the masticatory system including cervical, shoulder and upper back regions were observed with some frequency in the current investigation. Thus, findings in the current investigation are consonant with those of Correia and associates [22] in TMD subjects reporting that the cervical, shoulder and low back, were the most frequent painful anatomic areas in such individuals. Recent evidence points to a close association between the clinical diagnosis of TTH and TMDs coexisting with chronic TMD pain, depression and somatization [23].

The number of pain sites in and adjacent to the masticatory system increased from the two subgroups without TTH to those with TMDs, TTH and higher scores in somatization.

Subjects with no TTH or no TMDs demonstrated the lowest scores in painful sites. However, the number of painful sites increased from the subgroup of TMDs + TTH with the lowest scores to those with higher scores in somatization., indicating that painful sites in the masticatory system are highly influenced by somatization.

Findings in the current study indicate that greater number of pain sites are paralleled by highest scores in somatization. Such findings indicate to a certain extent that "in subjects with TMDs, TTH and higher scores in somatization, there is a strong unconscious need to produce signs and symptoms in the musculoskeletal structures". It may be that TMD and TTH patients have a strong predisposition to affect a chain or a set of skeletal muscles in the corresponding anatomic area. If such muscles are not treated, they may develop chronic trigger points that further complicate and modify pain. For instance, other adjacent anatomic areas may become sensitized and develop additional trigger points that produce pain and dysfunction, thus resulting in pain in multiple sites even in a restricted anatomic area, for instance face and cervical structures. This point of view is echoed by one investigation [22] indicating that TMDs patients may have several comorbidities such as fibromyalgia, sleep disorders, and myofascial pain associated with trigger points and thus with pain in multiple sites. If TMD and headache, for instance, TTH coexist with fibromyalgia or a form of generalized muscle pain, both disorders facilitate the development of diffuse pain [22].

This information subtly suggests that TMDs and TTH subjects with localized multiple muscle pains and trigger points are more likely to suffer of muscle disorders in other parts of the body. A common body site reported as painful in TMD and TTH subjects in the current investigation was the cervical region. Thus, this observation is congruent with one investigation [22] in TMD and myofascial pain subjects indicating that cervical pain was reported very frequently by TMD subjects in the study. Because most TMD and TTH subjects in this investigation demonstrated higher scores in somatization paralleled by a greater number of masticatory sites with pain, one is induced to believe that "somatization contributes with the diffuseness of body or masticatory pain". More diffuse muscle pain as shown by a greater frequency of reported painful sites in and adjacent masticatory sites may indicate "widespread sensitivity" [7] Local factors including a set of oral jaw habits may also contribute with more diffuse pain. Most TMD and TTH subjects in the current investigation were diagnosed as diurnal, nocturnal or mixed bruxers according to a clinical protocol developed by the first author of this investigation. Strong neuromuscular loading to muscles and joints contributes to pain and inflammation and even to the development of localized trigger points. Supporting this point of view, one investigation [8] asserts that bruxing behavior is a comorbid factor in subjects with chronic pain in other parts of the body as bruxing behavior may be related to somatization and generalized hyperalgesia. A pain disorder may in some way be related to somatization and with the development of more painful areas, or alternatively, a higher level of somatization may facilitate the development and/or maintenance of painful anatomic sites. This reasoning makes sense when we observe that the presence of painful sites was very low in no TMDs and no TTH subjects, but practically doubled in the no TMD and TTH subgroup and again increased in those with signs and symptoms of TMDs and TTH.

There was a strong and positive association between scores in somatization and scores in pain sites in and adjacent to the masticatory system in the group presenting with signs and symptoms of TMDs and TTH according to the outcome of appropriate correlation statistical tests.

Diurnal, nocturnal and mixed bruxing behavior are considered as motor disorders and manifestation of somatization. More severe bruxism is associated with higher scores in somatization and consequently with greater number of painful sites adjacent and distant from the masticatory system. There is a strong association between more severe bruxism, more severe somatization and greater number of painful sites. These considerations are in line with one investigation [24] in TMDs and bruxers reporting a higher number of pain sites in the group of moderate and severe bruxers as compared to the subgroups of mild and control subjects. Further, a recent investigation [17] in TMD subjects did not evaluate the prevalence of TTH. Notwithstanding this, researchers reported that there was a positive association between symptoms of TMDs, widespread pain, self-reported bruxism as a manifestation of somatization and psychological distress. Pain in multiple sites in subjects with TMDs indicating "widespread or diffuse pain" is associated to comorbid conditions including somatization indicating sharing of common pathophysiological pathways [16].

There is a significant overlap or association between TMDs, headache and oral jaw behaviors as a manifestation of somatization. Somatization may increase the intensity of pain and facilitate the development of trigger points that contribute to the formation of "painful anatomic areas". This reasoning is echoed by the investigation carried out by Glaros and associates [25] in TMD subjects with and without headache, reporting a significantly higher muscle tension in the face, jaw and head, more frequent stress and more intense tooth contact. Stress, tooth contact and oral jaw habits produce strong neuromuscular forces that favor the development of anatomic areas with pain, tenderness and dysfunction. van der Meer and associates [13] analyzed the association between headaches and TMDs and bruxing behavior. They asserted that there is a central working mechanism overlapping TMDs and headache. The clinical and scientific evidence points out that such association is significantly influenced by the presence of somatization. TMDs and headache predominate in females, headache is positively associated with several musculoskeletal disorders, bruxing behavior, stress, depression and somatization [13]. As stated before, diurnal, nocturnal or mixed bruxing behavior are considered by many as manifestations of psychosomatic disorders. Thus, it seems sound to expect higher levels of somatization in TMD

subjects with severe bruxism and consequently a higher number of painful sites. These considerations are echoed by one investigation [4] in TMD subjects. Even though researchers did not report the frequency of TTH in the sample of those with TMDs and bruxism, they indicated that a higher frequency of painful sites on awakening in the morning was found in sleep bruxers with TMDs as compared to controls no TMDs and no bruxing behavior.

VI. Conclusion

Based on data from the current investigation backed by the review of the literature, some conclusions can be drawn from this study:

1.The level of somatization was higher and significant in the TMD + TTH subgroup even when there was a group with TTH or with TMDs was included in the control group.

2. Various levels of somatization can be found in subjects with TMDs and TTH including severe and very severe somatization.

3.The number of painful sites increased from the control subgroup to those subjects with TMDs, TTH and higher scores in somatization.

4.The correlation between levels of somatization and number of pain sites was positive and statistically significant in the TMDs + TTH subgroup and in the Control group. However, it was stronger positive and s in the TMD and TTH group.

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Table 1: Social and demographic data in the group of TMDs and TTH subjects (n=145) and in the pooled group of those with no TMDs no TTH + TMDs with no TTH (n=144).

	TMDs + TTH=146	Controls=184
AGE		
Mean	31,1	33,6*
SD	11,8	11,7
Range	11—66	17—66
GENRE		
Females	138=94,5%	150=81.5%**
Males	8 =5,5%	34 =18,5%
Totals	146=100%	184=100%

*Unpaired t-test with Welch correction p=0,67 (a statistically nonsignificant difference).
**Fisher´s exact test p=0,0004, an extremely and statistically significant difference. More females are present in the TMD + TTH group.

Table 2: Means in somatization scores and pain sites in subgroups of TMD and TTH subjects with different severities of somatization (n=146) and in control ones (n=184).

Somatization	TMD + TTH n=146	Controls n=184	No TMD No TTH	No TMD + TTH	TMD No TTH	TMD + TTH 0--5	TMD + TTH 6--11	TMD + TTH 12-16	TMD + TTH 17 or higher
Mean	10,6	4,9*	4,14	7,7	6,8	3,5	8,3	13,9	19,4**
SD	5,5,	3,0	3,3	3,6	4,8	1,4	1,6	1,5	2,4
Range	1—24	0—11	0--16	2--14	0—19	1--5	6--11	12-16	17-24
Pain Sites									
Mean			0,65	0,85	1,85	2,2	2,4	3,1	3,3***
SD			0,97	0,83	1,5	1,12	1,2	1,5	1,1
Range			0—4	0--3	0—6	0--5	0--6	1--7	1—5

*Unpaired t-test with Welch´s correction p<0,0001, a statistically very significant difference in somatization scores between the experimental group (n=146) and the control one (n=184).
**Kruskal-Wallis statistics with Dunn´s test p<0,0001 an extremely statistically significant difference in the comparison of scores in somatization in the 4 subgroups of subjects with TMD and TTH and the 3 control subgroups (No TMD No TTH, No TMD + TTH and TMD No TTH):
No TMD + TTH versus No TMD No TTH p<0,01
TMD No TTH versus No TMD No TTH p<0,05
TMD + TTH 6-11 somatization scores versus No TMD No TTH p<0,001
TMD + TTH 12-16 versus No TMD No TTH p<0,001
TMD + TTH 17 or higher somatization scores versus No TMD No TTH p<0,001
TMD + TTH 0-5 somatization scores versus No TMD + TTH p<0,001
TMD * TTH 12-16 somatization scores versus No TMD + TTH p<0,001
TMD + TTH 17 or higher somatization scores versus No TMD+ TTH p<0,001
TMD + TTH 0-5 somatization scores versus TMD No TTH p<0,01
TMD + TTH 12-16 somatization scores versus TMD No TTH p<0,001
TMD + TTH 17 or higher somatization scores versus TMD No TTH p<0,001
TMD + TTH 6-11 somatization scores versus TMDs + TTH0-5 p<0,001
TMD + TTH 12-16 somatization scores versus TMDs + TTH 0-5 p<0,001
TMD + TTH 17 or higher somatization scores versus TMD + TTH 0—5 p<0,001
TMD + TTH 12-16 somatization scores versus TMD + TTH 6-11 p<0,001
TMD + TTH 17 or higher somatization scores versus TMD + TTH 6-11 p<0,001.
***Kruskal-Wallis statistics with Dunn´s test p<0,0001, an extremely and statistically significant difference in the frequency of painful sites between the 4 TMD and TTH subgroups and the 3 control subgroups (No TMDs No TTH, No TMD + TTH and TMD No TTH):
TMD No TTH versus No TMD No TTH p<0,001
TMD + TTH 0-5 somatization scores versus No TMD No TTH p<0,001
TMD + TTH 6-11 somatization scores versus No TMD No TTH p<0,001
TMD + TTH 12-16 somatization scores versus No TMD No TTH p<0,001
TMD + TTH 17 or higher somatization scores versus No TMD No TTH p<0,00
TMD No TTH versus No DTM + TTH p<0,01
TMD + TTH 0-5 somatization scores versus No TMD + TTH p<0,001
TMD + TTH 6-11 somatization scores versus No TMD + TTH p<0,001
TMD + TTH 12-16 somatization scores versus No TMD + TTH p<0,001
TMD + TTH 17 or higher somatization scores versus No TMD + TTH p<0,001

TMD + TTH 12-16 somatization scores versus TMD no TTH p<0,001
TMD + TTH 17 or higher somatization scores versus TMD no TTH p<0,001

Table 3: Correlation coefficients between somatization scores and painful sites in and adjacent to the masticatory system in those with TMDs and TTH with scores in somatization (n=146) and in control group of 184 subjects (No TMDs No TTH, No TMDs + TTH and +TMD No TTH).

Linear correlation	No TMD No TTH TMD + TTH=146	+ TMD No TTH=184
Test	Spearman r	Spearman r
n=	146	184
Spearman rho	0,32	0,20
p value	p<0,0001	p<0,009 *****
Significant?	Extremely significant	Extremely significant

***** Even though Spearman r demonstrated that the correlation between somatization scores and number of pain sites in the masticatory system was positive and significant in both the experimental and control groups, the strongest correlation was observed in the group of 146 subjects with both TMDs and TTH.