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Association between Temporomandibular Dysfunction, Burnout, and Somatic Symptoms: Evidence of an Integrated Biopsychosocial Approach in Orofacial Health

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Abstract

This correlational study investigated the association between Temporomandibular Disorders (TMD), burnout, and somatic symptoms in a sample of Portuguese adults (n=576), aiming to deepen the understanding of TMD as a biopsychosocial condition. A cross-sectional design was employed, comparing a clinical group diagnosed with TMD (n=217) and a community group (n=359), using the Burnout Assessment Tool-12 (BAT-12) and the Patient Health Questionnaire-15: Somatic Symptoms (PHQ-15). The results demonstrate a significant link between TMD and psychological well-being. Individuals diagnosed with TMD presented significantly higher levels of burnout and somatization compared to the group without TMD. Additionally, a positive correlation was found between TMD pain intensity and burnout and somatization levels. Linear regression analysis suggests that higher levels of burnout are associated with greater TMD severity, as are higher levels of somatization. These findings reinforce the role of psychological factors in the etiology and maintenance of TMD, highlighting the need for an interdisciplinary assessment and management that integrates somatic and psychosocial dimensions within the context of Stomatology.

Highlights

- Temporomandibular Disorders (TMD) are significantly associated with high levels of burnout and somatic symptoms in Portuguese adults, highlighting the biopsychosocial nature of the condition.
- Patients with TMD present significantly higher burnout ($p < .001$) and somatization ($p < .001$) scores compared to individuals without TMD, with a prevalence 3 times higher in women.
- Linear regression analysis revealed that somatization ($\beta = 0.45$) and burnout ($\beta = 0.31$) are independent predictors of TMD severity, explaining 38% of the variance in symptoms.
- The positive correlation between pain intensity in TMD and levels of burnout ($rs = 0.35$) and somatization ($rs = 0.51$) reinforces the need for an integrated approach that combines stomatological and psychological assessment.
- The results support the implementation of routine screening for burnout and somatization in stomatology consultations, using validated tools such as BAT-12 and PHQ-15 to optimize clinical management and reduce the burden of chronic orofacial suffering.

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1. Introduction

Temporomandibular Disorders (TMD) represent a significant public health challenge and are currently recognized as the leading cause of non-dental orofacial pain worldwide [1]. This heterogeneous group of musculoskeletal and neuromuscular conditions affects the temporomandibular joint (TMJ), the masticatory muscles, and the associated structures. The clinical presentation is typically characterized by a complex cluster of symptoms, most notably joint sounds (such as clicking or crepitus), functional limitation or deviation during mandibular movements, and persistent pain localized to the preauricular region and muscles of mastication based on established diagnostic criteria [2].

Historically, the understanding of TMD etiology has been dominated by a biomedical and mechanistic paradigm. For decades, both research and clinical practice focused almost exclusively on anatomical abnormalities, trauma, or occlusal disharmonies as the primary causative factors [3]. Consequently, diagnostic protocols were heavily reliant on physical examination findings. However, as recent evidence has highlighted, relying solely on mechanical benchmarks can be misleading. For instance, significant gender differences in maximum mouth opening exist, and failing to account for these physiological baselines can lead to diagnostic errors and over-medicalization [4].

In line with this traditional view, therapeutic interventions have historically focused on correcting the "mechanical fault." These interventions range from conservative occlusal splint therapy to invasive surgical procedures [5]. It is important to acknowledge that modern maxillofacial surgery has achieved remarkable standards of precision and efficacy. Recent multicentric prospective studies have demonstrated that bilateral arthroscopy is a highly effective procedure for managing internal derangement of the TMJ, significantly reducing pain and restoring function [6]. Similarly, advancements in orthognathic and reconstructive surgery, such as slice functional condylectomy, have provided definitive solutions for skeletal asymmetries caused by condylar hyperplasia [7].

However, despite these technical successes, a significant subset of patients continues to experience persistent pain and dysfunction even after anatomically successful interventions. The relationship between dental occlusion and TMD, which was once considered linear and causal, is now understood to be far more complex. While recent cross-sectional studies have confirmed an association between specific malocclusion traits and the presence of TMD, occlusal factors alone often fail to explain the variability in symptom severity and treatment resistance observed in clinical practice [8]. This persistence of symptoms suggests that the "mechanistic" approach, while necessary, is often insufficient to fully address the pathology [9].

This realization has catalyzed a shift towards the "biopsychosocial model," initially proposed by Engel, which posits that biological factors interact dynamically with psychological and social variables to modulate the patient's pain perception and illness behavior [10]. Within this framework, psychological distress is not merely a secondary reaction to chronic pain but can be a primary driver of the condition. Two psychological constructs are particularly relevant: Burnout and Somatization.

Burnout is defined as a work-related state of exhaustion, characterized by extreme tiredness, reduced ability to regulate cognitive and emotional processes, and mental distancing [11]. It leads to a chronic dysregulation of the body's stress response systems, particularly the hypothalamic-pituitary-adrenal (HPA) axis. Somatization, on the other hand, refers to the tendency to experience and communicate psychological distress in the form of somatic symptoms. This phenomenon is closely linked to central sensitization, a state where the central nervous system becomes hyperexcitable, lowering the pain threshold and amplifying sensory inputs [12]. Validated instruments such as the Burnout Assessment Tool (BAT-12) and the Patient Health Questionnaire (PHQ-15) have been developed to quantify these constructs in clinical research [11, 13].

The objective of this study was to analyze the interplay between TMD, burnout, and somatic symptoms in an adult population. It is hypothesized that high levels of burnout and somatization are distinguishing features of the TMD patient profile, validating the need for a holistic diagnostic algorithm that integrates stomatological and psychological evaluation.

2. Materials and Methods

2.1. Study Design and Ethical Considerations

A quantitative, observational, cross-sectional study was designed and implemented to evaluate the correlation between temporomandibular dysfunction and specific psychological variables. The study was conducted in Portugal, adhering strictly to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines . Ethical approval was obtained from the institutional review board, and all procedures were performed in accordance with the Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study.

2.2. Sampling Strategy and Eligibility

A purposive sampling strategy was employed to recruit adult participants. The recruitment process targeted two distinct populations to allow for valid group comparisons:

Clinical Group: This group comprised patients presenting to university dental clinics and private practices with complaints of orofacial pain or jaw dysfunction. Inclusion required a formal diagnosis of TMD based on the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) Axis I.

Control Group: This group consisted of individuals recruited from the general community who reported no history of orofacial pain, joint sounds, or limitation of mandibular movement in the preceding six months.

Strict exclusion criteria were applied to both groups to minimize confounding variables. Participants were excluded if they had a history of acute facial trauma within the last three months (unrelated to chronic TMD), were undergoing active oncological treatment, or had a history of radiation therapy to the head and neck region, as these conditions introduce distinct physiological alterations that differ from idiopathic TMD.

2.3. Instruments

Data collection utilized a structured sociodemographic questionnaire and two validated psychometric scales:

Burnout Assessment Tool (BAT-12): This is a shortened, self-report instrument designed to measure the core symptoms of burnout. It assesses four key dimensions: exhaustion, mental distance, cognitive impairment, and emotional impairment. Responses are rated on a Likert scale, with higher cumulative scores indicating a higher risk of clinical burnout.

Patient Health Questionnaire-15 (PHQ-15): This instrument is widely used to screen for somatization and monitor somatic symptom severity. It asks participants to rate the severity of 15 common physical symptoms (e.g., stomach pain, back pain, headaches, dizziness) experienced over the last four weeks. Scores are categorized into minimal, low, medium, and high somatic symptom severity, serving as a proxy for central sensitization and somatic amplification.

2.4. Statistical Analysis

Data were processed using IBM SPSS Statistics. Descriptive statistics (mean, standard deviation, frequencies) were calculated to characterize the sample. The normality of the distribution for continuous variables was assessed using the Kolmogorov-Smirnov test. Since the psychometric scores (BAT-12 and PHQ-15) did not follow a normal distribution, non-parametric tests were employed. The Mann-Whitney U test was used to assess differences in mean ranks between the Clinical and Control groups. Spearman's rank correlation coefficient (rs) was calculated to explore the strength and direction of associations between TMD pain intensity (measured on a Visual Analog Scale), burnout scores, and somatization scores. Finally, a multivariate linear regression analysis was performed to determine the predictive value of Burnout and Somatization on the presence and severity of TMD, controlling for potential confounders such as age and gender. A p-value of $< .05$ was considered statistically significant.

3. Results

3.1. Demographic Characteristics

A total of 576 adult participants were included in the final analysis. Based on the inclusion criteria, the sample was distributed as follows, Table 1:

Table 1. Sociodemographic Characteristics of the Sample

Variable	Category	Clinical Group (TMD) (n=217)	Control Group (n=359)	Total (N=576)
Age	Mean (SD)	34.6 (±12.4)	34.6 (±12.4)*	34.6 (±12.4)
Gender	Female	162 (74.7%)	185 (51.5%)	347 (60.2%)
	Male	55 (25.3%)	174 (48.5%)	229 (39.8%)

Note: Groups were matched for age range.

The overall mean age of the sample was 34.6 years (SD = 12.4). In terms of gender distribution, the Clinical Group exhibited a distinct female preponderance with a ratio of approximately 3:1. This distribution is consistent with the known global epidemiology of Temporomandibular Disorders, where women are significantly more likely to seek treatment for orofacial pain. The Control Group was matched for age range but naturally exhibited a more balanced gender ratio.

3.2. Psychological Assessment Scores

The statistical analysis revealed highly distinct psychological profiles for the two groups, Table 2. The Clinical Group reported statistically significantly higher mean scores across all dimensions of the assessed constructs compared to the Control Group.

Burnout (BAT-12): The Mann-Whitney U test confirmed significant differences ($p < .001$). Patients with TMD exhibited elevated levels of exhaustion and mental distance compared to the asymptomatic controls. This suggests that the clinical population is operating under a higher baseline of chronic stress and psychological fatigue.

Somatization (PHQ-15): The difference was even more pronounced for somatic symptoms ($p < .001$). A substantial proportion of TMD patients fell into the "medium" (score 10-14) to "high" (score >15) severity categories of the PHQ-15, whereas the Control Group predominantly scored in the "minimal" range. This indicates that these patients suffer from a multiplicity of physical complaints beyond the orofacial region.

3.3. Correlation Analysis

Spearman correlation analysis demonstrated significant positive associations between the variables, Table 3:

TMD and Burnout: A moderate positive correlation was observed ($rs = 0.42$, $p < .001$), indicating that as burnout levels rise, so does the prevalence of TMD.

TMD and Somatization: A strong positive correlation was identified ($rs = 0.58$, $p < .001$), suggesting a robust

Table 2. Comparison of Psychometric Scores (Mann–Whitney U Test)

Instrumen	Domain	Clinical Group Mean (Rank)	Control Group Mean (Rank)	p-value
BAT-12	Total Burnout	346.2	251.4	< .001
	Exhaustion	351.5	248.1	< .001
	Mental Distance	338.9	256.3	< .001
PHQ-15	Total Somatization	389.1	225.3	< .001
	Medium/High Severity	68.2%	12.5%	< .001

link between generalized somatic distress and localized orofacial pain.

Pain Intensity: Within the Clinical Group, self-reported pain intensity (VAS) was positively correlated with both Burnout (rs = 0.35) and Somatization (rs = 0.51), reinforcing the link between psychological burden and pain perception.

Table 3. Spearman's Rank Correlations (r_s) Among Variables

Variables	1. TMD Presence	2. Pain Intensity (VAS)	3. Burnout (BAT-12)	4. Somatization (PHQ-15)
1. TMD Presence	1.00	–	.42**	.58**
2. Pain Intensity	–	1.00	.35**	.51**
3. Burnout	.42**	.35**	1.00	.48**
4. Somatization	.58**	.51**	.48**	1.00

**Correlation is significant at the 0.01 level (2-tailed).

3.4. Regression Analysis

The multivariate linear regression model confirmed that both psychological constructs are independent predictors of TMD severity, Table 4. Somatization emerged as the strongest predictor (beta = 0.45), followed by Burnout (beta = 0.31). Together, these variables explained a significant proportion of the variance in TMD symptomatology (R^2 = .38), even after adjusting for age and gender.

4. Discussion

The results of this study provide robust empirical evidence supporting the biopsychosocial nature of Temporomandibular Disorders. The finding that patients with TMD exhibit significantly higher levels of burnout and somatization compared to healthy controls challenges the traditional, joint-centric view of the pathology. These findings align with the core principles of the biopsychosocial model, suggesting that the "host response"—mediated by psychological resilience or vulnerability—is as critical as the physical insult itself [10, 14].

Table 4. Multiple Linear Regression Analysis (Predictors of TMD Severity)

Independent Variable	B	Std. Error	β	t	Sig. (p)
(Constant)	1.24	0.31	–	4.02	< .001
Somatization (PHQ-15)	0.52	0.04	0.45	12.8	< .001
Burnout (BAT-12)	0.28	0.05	0.31	6.15	< .001
Age	0.01	0.01	0.05	1.20	.231 (ns)
Gender	-0.15	0.09	-0.08	-1.65	.102 (ns)

Model R^2 = .38 (psychological factors explain 38% of the variance in TMD severity).

The association between burnout and TMD can be explained through well-documented physiological mechanisms. Burnout acts as a chronic stressor that leads to the dysregulation of the autonomic nervous system [12]. This dysregulation typically manifests as sustained sympathetic activation and an increase in resting muscle tone, particularly in the jaw elevator muscles [15]. This physiological state creates a fertile ground for parafunctional habits such as bruxism. While mechanical factors such as malocclusion are relevant contributors to the disease process, as demonstrated in recent cross-sectional studies [8], the patient's adaptive capacity is likely modulated by their stress levels. A patient with high burnout levels may lack the physiological resilience to tolerate minor occlusal interferences that a healthy individual would ignore, reinforcing the concept that occlusion is often a co-factor rather than the sole etiology [8, 9].

Furthermore, the strong correlation with somatization suggests a mechanism of central sensitization [13]. Patients with TMD often present with comorbidities such as chronic headache, back pain, or gastrointestinal distress, indicating a generalized hypersensitivity [16]. This generalized somatic focus lowers the pain threshold, making patients more susceptible to developing chronic pain states from minor peripheral inputs [17]. This complicates the clinical picture significantly, as it becomes crucial for the clinician to differentiate between localized structural pathology and widespread somatic distress [18]. This distinction is vital because physiological baselines, such as maximum mouth opening, already vary significantly by gender, as shown by Angelo et al. [4]. When high somatization is superimposed on these physiological differences, the risk of diagnostic error and subsequent over-treatment increases dramatically.

From a clinical perspective, these findings imply that the management of TMD cannot be purely mechanical [19]. While surgical interventions, such as bilateral arthroscopy, have been proven to be highly effective for treating internal derangements [6], and advanced techniques like

slice functional condylectomy are necessary for correcting skeletal asymmetries [7], the long-term functional success of these procedures may be compromised by untreated psychological distress. In complex cases, such as those requiring alloplastic joint replacement due to radiation-induced damage, the patient's psychological state becomes an even more critical determinant of quality of life [20]. If somatization is the primary driver of the patient's complaints, invasive procedures may not yield the expected relief and could potentially exacerbate the central sensitization process [21].

Therefore, we propose that screening for burnout and somatization using valid and rapid tools like the BAT-12 and PHQ-15 should become a routine part of the stomatological examination [11, 13]. Identifying these risk factors early in the diagnostic process allows for the implementation of a multidisciplinary treatment plan. This might include stress management strategies, cognitive-behavioral therapy, or biobehavioral interventions alongside conventional dental or surgical care [22]. Addressing the "person" behind the "joint" is not merely an adjunctive measure but a fundamental requirement for therapeutic success in modern oral and maxillofacial medicine [23, 24].

4.1. Study Limitations and Future Research

While this study provides compelling evidence for the biopsychosocial nature of Temporomandibular Disorders (TMD), several limitations must be acknowledged. First, the cross-sectional design of this research limits the ability to establish a definitive causal relationship between burnout, somatization, and TMD. While a significant correlation exists, it remains unclear whether psychological distress functions as a primary etiological driver or if the burden of chronic orofacial pain secondarily induces states of burnout and somatic amplification.

Furthermore, although the study identifies burnout and somatization as key predictors of TMD severity, the current data does not allow for an assessment of how these psychological profiles impact the prognosis or success rates of current therapeutic modalities. Traditional "mechanistic" interventions—ranging from occlusal splint therapy to advanced surgical procedures like bilateral arthroscopy or functional condylectomy—have proven efficacy in addressing structural derangements. However, this study did not track whether patients with high baseline scores in the BAT-12 or PHQ-15 experience higher rates of treatment failure or clinical relapse.

Future research should prioritize longitudinal cohorts to evaluate the predictive value of psychosocial screening on long-term surgical and conservative outcomes. Specifically, investigation is needed into whether patients with high somatization scores benefit more from an integrated protocol involving Central Nervous System (CNS) modulators or cognitive-behavioral interventions alongside standard stomatological care. Determining the "threshold" at which psychological distress necessitates a shift from purely mechanical to multidisciplinary treatment will be essential for optimizing patient care and reducing the global burden of chronic TMD.

5. Conclusion

Temporomandibular Disorders are deeply embedded in the patient's biopsychosocial context. This study confirms that burnout and somatization are highly prevalent in TMD patients and are key predictors of disease severity. Consequently, an integrated treatment model that combines conventional stomatological care with psychological evaluation is essential. By acknowledging and treating the psychological dimensions of the condition, clinicians can optimize outcomes and reduce the burden of chronic orofacial pain [25].

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