Original Article

Anxiety and Early Maladaptive Schemas in Patients with Temporomandibular Disorders: A Case-Control Study

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ABSTRACT

Background: Temporomandibular disorders (TMD) are a group of clinical issues affecting the masticatory system. While psychological factors like anxiety are recognized contributors, the role of deeper cognitive patterns, specifically early maladaptive schemas (EMS), is less understood.

Purpose: This study aimed to compare the levels of anxiety and the prevalence of EMS in patients with TMD against a healthy control group, and to investigate the associations between these variables in an Iranian population.

Materials and Method: We conducted a case-control study at the Faculty of Dentistry, Qom University of Medical Sciences, Qom, Iran, during 2024. The sample consisted of 67 patients diagnosed with TMD and 67 healthy controls. Participants completed the Beck Anxiety Inventory (BAI) and the Young Schema Questionnaire-Short Form (YSQ-SF), which assesses 15 schemas: Emotional Deprivation, Abandonment/Instability, Mistrust/ Abuse, Social Isolation/Alienation, Defectiveness/Shame, Failure, Dependence/ Incompetence, Vulnerability to Harm, Enmeshment/Undeveloped Self, Subjugation, Self-Sacrifice, Emotional Inhibition, Unrelenting Standards, Entitlement/Grandiosity, and Insufficient Self-Control. Data were analyzed using descriptive statistics, independent t-tests, chi-square tests, and Fisher's exact tests. A p Value of less than 0.05 was considered statistically significant for all tests.

Results: Anxiety levels were significantly higher in the TMD group (p Value< 0.001), where 62.7% of patients reported anxiety compared to 26.9% of controls. The "Mistrust/ Abuse" ($p= 0.036$) and "Enmeshment/Undeveloped Self" ($p= 0.009$) schemas were also significantly more common in the patient group. Furthermore, within the TMD patient group, eight specific schemas were significantly linked to moderate and severe anxiety levels ($p< 0.05$).

Conclusion: Unadjusted analyses suggested a preliminary association between the "Mistrust/Abuse" and "Enmeshment/Undeveloped Self" schemas and the presence of TMD. However, the findings must be interpreted with significant caution because the study did not employ multivariate logistic regression to control for potential confounding variables, such as the observed significant difference in educational attainment between the two groups. Therefore, no firm conclusions regarding an independent or causal association can be drawn. These preliminary data suggest a need for rigorous future investigation using multivariate models.

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Introduction

The term temporomandibular disorders (TMD) describes a cluster of clinical problems that involve the masticatory muscles, the temporomandibular joint (TMJ) itself, and the adjacent structures [1].These disorders manifest through symptoms such as pain in the joint or muscles, restricted mouth opening, jaw deviation, and joint sounds like clicking or crepitus [2]. TMD prevalence is notable, impacting both the physical and psychological well-being of individuals [3]. Although many people may experience at least one symptom, only a small fraction ultimately seeks treatment [4].

The etiology of TMD is understood to be multifactorial, involving a mix of functional, structural, psychological, and behavioral components [5]. Among the prominent risk factors are stress and parafunctional habits [6]. The influence of psycho-personality factors, including stress, anxiety, and depression, has been widely observed in patients with TMD [7]. Anxiety, as an emotional reaction to stress, may either trigger or worsen TMD symptoms by elevating masticatory muscle tone or prompting parafunctional habits [8].

Deeper cognitive structures, known as early maladaptive schemas (EMS), were first described by Jeffrey Young [9] as profound and persistent emotional and cognitive patterns stemming from adverse childhood experiences. These schemas, which include concepts like "Mistrust/Abuse" or "Emotional Deprivation," influence how individuals perceive themselves and their surroundings, potentially impacting their mental health and behavior [10]. Previous studies have suggested a connection between EMS and conditions such as chronic pain and irritable bowel syndrome [11]. Recognizing the significance of psychological factors in TMD and the potential interplay between maladaptive schemas, anxiety, and physical ailments, we designed this study to probe these relationships in greater detail. Our primary goal was to determine the anxiety levels and the prevalence of various EMS in patients diagnosed with TMD and to compare them to a healthy control group [12].

Materials and Method

This case-control study was carried out at the Faculty of Dentistry, Qom University of Medical Sciences, Qom, Iran, during 2024. It received full ethical approval from the university's Ethics Committee (Code: IR.MUQ. REC.1402.200). All procedures adhered to the ethical standards of the responsible committee on human experimentation and the principles of the *Helsinki Declaration* of 1975, as revised in 2000.

Participants were recruited from patients referred to the faculty of dentistry. To determine an adequate sample size, we used a formula for comparing the means of two populations, setting statistical power at 80% and the error level at 0.05. This calculation indicated a minimum requirement of sixty-seven participants for each group. Participants were enrolled via a convenience sampling method until the target sample size of 67 per group was reached.

After receiving a thorough explanation of the study, all volunteers provided written informed consent. The sole inclusion criterion was an age of eighteen years or older. We excluded individuals with systemic diseases that could influence the results, such as rheumatoid arthritis, as well as those with severe skeletal issues, a history of orthognathic surgery, recent facial trauma, use of removable prostheses, or severe dentofacial anomalies [13].

Data collection utilized three tools. First, a single, trained examiner used a checklist based on the Research Diagnostic Criteria for Temporomandibular Disorders to collect demographic data and record clinical signs for all participants [8]. This clinical assessment, performed by an unblinded trained final-year dental student from Qom University of Medical Sciences under the supervision of an oral and maxillofacial medicine specialist, determined whether an individual was assigned to the case or control group.

Second, participants completed the Beck Anxiety Inventory (BAI), a 21-item questionnaire designed to measure the severity of clinical anxiety. The Persian version of this instrument has demonstrated high reliability and validity in Iranian populations (Cronbach's alpha= 0.92) [14]. Scores are categorized as follows: 0-7 indicates minimal anxiety, 8-15 mild anxiety, 16-25 moderate anxiety, and 26-63 severe anxiety. Third, the 75-item Young Schema Questionnaire-Short Form (YSQ-SF) was administered to assess fifteen early maladaptive schemas. The questionnaires (BAI and YSQ-SF) were administered orally by the examiner and filled out by the examiner. It uses a six-point Likert scale, and a schema is considered clinically significant if its average score is above 2.5. The Persian version of the YSQ-

SF has shown excellent psychometric properties (Cronbach's alpha for the total scale= 0.96) [15].

All statistical analyses were performed using SPSS software, version 28. The Shapiro-Wilk test was used to confirm the normality of the data. For inferential statistics, we employed the independent t-test to compare quantitative variables between the groups and the chi-square test or Fisher's exact test for qualitative variables. A p-value of less than 0.05 was considered statistically significant for all tests.

Results

The study included a total of 134 individuals, evenly split with 67 in the case group and 67 in the control group. The two groups showed no significant differences in terms of mean age, gender, or marital status. The case group included 35 women (52.2%) and 32 men (47.8%), while the control group consisted of 33 women (49.3%) and 34 men (50.7%). The mean age was 32.27±8.36 years for the case group and 29.63± 9.87 years for the control group. Data on educational attainment was also collected. A significant difference was found between the groups (*p* Value= 0.019), with 95.5% (n=64) of the case group reporting a 'Diploma or below' level of education, compared to 83.6% (n=56) of the control group. Conversely, 14.9% (n=10) of the control group held bachelor or master degree, compared to only 3.0% (n=2) of the case group.

Notably, 46.3% of individuals in the case group described themselves as "sensitive and irritable," whereas 37.3% in the control group did so. Among patients in the case group, the most frequently reported subjective symptom was joint sounds (91.0%). This was confirmed during clinical examination in 91% of these patients, with clicking being the most prevalent type of sound (79.1%). Pain or tenderness upon palpation was most commonly felt in the TMJ area itself (17.9%) (Table 1).

Anxiety Levels

A statistically significant difference in anxiety levels was found between the groups ($p< 0.001$), as determined by the BAI. The prevalence of mild, moderate, and severe anxiety was considerably higher in the case group. Specifically, 38.8% of patients with TMD reported mild anxiety, 16.4% moderate, and 7.5% severe anxiety. In stark contrast, while 26.9% of the control group had mild anxiety, none experienced moderate or severe anxiety.

Table 1: Frequency of research diagnostic criteria for temporomandibular disorders criteria in the case group (n=67). n= number of participants

Criterion	Present n(%)	Absent n (%)
Pain in jaw, temporal region, face, in or around the ear	16 (23.9)	51 (76.1)
Unassisted mandibular opening< 40mm	12 (17.9)	55 (82.1)
Assisted mandibular opening <45mm	10 (14.9)	57 (85.1)
Clicking sound on vertical opening and closing*	53 (79.1)	14 (20.9)
Clicking sound on lateral/protrusive movements*	21 (31.3)	46 (68.7)
History of jaw locking or catching	6 (9.0)	61 (91.0)
Lateral movement < 7 mm	6 (9.0)	61 (91.0)
Uncorrected deviation	0 (0)	67 (100)
In 2 of 3 trials		

This finding points to a strong association between having TMD and experiencing higher anxiety levels.

Early Maladaptive Schemas

When comparing the prevalence of the fifteen EMS measured by the YSQ-SF, two showed a significant difference between the groups. The "Mistrust/Abuse" schema was significantly more prevalent among cases (37.3%) than controls (20.9%) ($p= 0.036$). Similarly, the "Enmeshment/Undeveloped Self" schema was found more frequently in the case group (23.9%) compared to the control group (7.5%) ($p= 0.009$). For the remaining thirteen schemas, no significant differences were observed (Table 2).

Association between Schemas and Anxiety

Further analysis within the TMD case group revealed that the presence of eight specific schemas was signifi-

Table 2: Comparison of schema prevalence in the case and control groups. n = number of participants

Schema	Case Group n (%)	Control Group n (%)	*p* Value
Emotional Deprivation	20(29.9)	15(22.4)	0.325
Abandonment/Instability	23(34.3)	14(20.9)	0.082
Mistrust/Abuse	25(37.3)	14(20.9)	0.036
Social Isolation/ Alienation	18(26.9)	13(19.4)	0.306
Defectiveness/Shame	7 (10.4)	6(9.0)	0.770
Failure	13(19.4)	6(9.0)	0.083
Dependence/ Incompetence	8(11.9)	3(4.5%)	0.116
Vulnerability to Harm	13(19.4)	7(10.4)	0.146
Enmeshment/ Undeveloped Self	16(23.9)	5(7.5)	0.009
Subjugation	16(23.9)	8(11.9)	0.071
Self-Sacrifice	47(70.1)	45(67.2)	0.710
Emotional Inhibition	26(38.8)	17(25.4)	0.096
Unrelenting Standards	48(71.6)	54(80.6)	0.224
Entitlement/Grandiosity	44(65.7)	38(56.7)	0.287
Insufficient Self-Control	26(38.8)	25 (37.3)	0.859

cantly associated with moderate to severe anxiety levels ($p< 0.05$). This was determined through chi-square analysis, which showed that individuals with these schemas were significantly more likely to fall into the moderate and severe anxiety categories**.** These schemas were "Emotional Deprivation," "Abandonment/ Instability," "Mistrust/Abuse," "Social Isolation/Alienation," "Defectiveness/Shame," "Dependence/Incompetence," "Vulnerability to Harm," and "Subjugation."

Discussion

This study sheds light on the deep psychological underpinnings of TMD by examining its relationship with anxiety and EMS. Our results offer a tripartite perspective on this complex disorder.

First, our findings confirm that patients with TMD experience significantly higher levels of anxiety than their healthy counterparts. This aligns with a body of previous work, including several systematic reviews, that establishes a strong link between TMD and anxiety [7, 16-17]. It is plausible that this heightened psychological distress contributes to the worsening of TMD symptoms by increasing muscle tension and promoting parafunctional habits. It is worth noting that some older studies did not find such a link, a discrepancy that could be due to differences in study design or participant populations [18-19].

Second, we identified a significant association between several EMS and higher anxiety levels within the patient group. Specifically, eight schemas, mostly from the "Disconnection and Rejection" and "Impaired Autonomy" domains, were linked to moderate and severe anxiety. This result is consistent with extensive research and recent meta-analyses which indicate that EMSs are key precursors to anxiety symptoms [20-21]. It suggests that these fundamental negative beliefs may foster a vulnerability to developing significant anxiety, which in turn could manifest through physical conditions like TMD.

Third, and a novel finding of this study, is the direct association between specific schemas and a clinical TMD diagnosis**.** Our study found a significant link between the "Mistrust/Abuse" and "Enmeshment/ Undeveloped Self" schemas and the presence of TMD. The "Mistrust/Abuse" schema involves the core belief that others will intentionally cause harm or take advantage, while the "Enmeshment/Undeveloped Self" schema is characterized by excessive emotional involvement with significant others at the expense of one's own identity. While this is a less-traveled area of research for TMD, studies in related fields offer valuable context. For instance, research has connected EMS to symptom severity in irritable bowel syndrome and multiple sclerosis [11, 23]. Our findings imply that these deep-seated beliefs may be specific risk factors for developing TMD, conceivably by manifesting physically as chronic hypervigilance and muscular tension in the jaw region.

This study has several significant limitations. First, the case-control design precludes any conclusions about causality. Second, its reliance on self-report questionnaires introduces potential for bias.

Most importantly, the findings are based on bivariate (unadjusted) statistical tests. A primary limitation of this study is the lack of a multivariate logistic regression analysis to control for the effects of potential confounding variables. This is a critical point, as our analysis of the demographic data revealed a significant difference in educational attainment between the case and control groups, with the patient group having a significantly lower level of education. This variable, a common proxy for socioeconomic status, as well as other demographic factors like age or gender, were not controlled for in our analysis. Therefore, the significant associations reported between specific schemas (such as 'Mistrust/Abuse' and 'Enmeshment') and a TMD diagnosis may be confounded by these other factors.

Finally, the sample was a non-probabilistic convenience sample recruited from a single university dental clinic in Qom, Iran. This limits the generalizability of the findings to broader populations. Future longitudinal research, using larger and more representative samples, is necessary to confirm these preliminary associations and to delineate the complex mechanisms connecting these psychological and sociodemographic factors to TMD using appropriate multivariate models

From a clinical perspective, these findings suggest that screening for anxiety and specific maladaptive schemas could be beneficial in managing TMD patients. Identifying these underlying psychological factors may open the door for targeted interventions, such as schema therapy, which could complement traditional physical treatments and potentially lead to more effective and lo-

ng-lasting symptom relief.

Conclusion

In conclusion, this case-control study, conducted on a convenience sample of 134 adults (mean age ~31 years) from a university dental clinic in Qom, Iran. The findings must be interpreted with significant caution, as they are based on unadjusted bivariate analyses. The study did not control for the effects of potential confounding variables, most notably the significant difference in educational attainment observed between the case and control groups.

Therefore, no firm conclusions regarding a causal link or an independent association can be drawn. Given these critical limitations, the preliminary data merely suggests a potential topic for future research. The unadjusted analysis showed higher anxiety levels in the TMD group and a potential, though unconfirmed, link to the 'Mistrust/Abuse' and 'Enmeshment/Undeveloped Self' schemas. These preliminary findings require rigorous investigation using multivariate regression models to determine if any true association exists.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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