TUMI ORAL HEALTH
e-ISSN 3119-7701

TUMI Oral Health
Gamboa-Dominguez A. TUMI Oral Health.2026;1(1):e001
https://doi.org/10.64716/wgamhy18

ORIGINAL RESEARCH **OPEN ACCESS**

Association between anxiety and temporomandibular disorders assessed by Fonseca Index in Peruvian schoolchildren: a cross-sectional study.

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ABSTRACT

Background: Anxiety and temporomandibular disorders (TMD) are increasingly recognized as interrelated conditions, particularly in pediatric and adolescent populations, where psychosocial factors may influence musculoskeletal function. However, evidence on this association among school-aged populations remains limited in Peru. **Objective:** This study aimed to evaluate the association between anxiety and temporomandibular disorders assessed using the Fonseca Index in Peruvian secondary school students. **Methods:** A quantitative, observational, cross-sectional, non-experimental study with a correlational scope was conducted in a private educational institution. A non-probabilistic convenience sample of 92 students was selected from a total population of 120. Eligible participants were students enrolled in secondary education who provided assent and whose parents or legal guardians provided informed consent. Data were collected using the Fonseca Anamnestic Index and the Zung Self-Rating Anxiety Scale. Descriptive statistics were calculated, and the association between variables was analyzed using the chi-square test, with statistical significance set at $p < 0.05$. **Results:** Moderate anxiety was observed in 16.3% of participants, while mild TMD was identified in 40.2%. A statistically significant association was found between anxiety levels and TMD according to the Fonseca Index ($p < 0.05$). **Conclusions:** Anxiety was significantly associated with the presence of TMD in secondary school students. These findings support the incorporation of psychosocial assessment into preventive and clinical dental care for school-aged populations.

Keywords: Anxiety; Temporomandibular Joint Disorders; Adolescent; Cross-Sectional Studies

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Journal homepage: https://tumijournal.com/index.php/oral-health/en/index
https://doi.org/10.64716/wgamhy18

Editor-in-Chief: Jhair Alexander Leon-Rodriguez
Associate Editor: Maria Espinoza-Salcedo

Received: February 04, 2026
Revised: February 05, 2026
Accepted: February 13, 2026
Available online: February 14, 2026

Introduction

Temporomandibular disorders (TMD) constitute a heterogeneous group of conditions affecting the temporomandibular joint, masticatory muscles, and associated structures, often leading to pain, functional limitation, and reduced quality of life. These disorders are considered multifactorial in origin, involving biomechanical, neuromuscular, and psychosocial components. Epidemiological studies have reported a considerable prevalence of TMD across different age groups, including children and adolescents, with symptoms frequently manifesting as orofacial pain, joint sounds, restricted mandibular movement, and muscular tenderness. The chronic nature of these conditions and their impact on daily functions highlight their clinical relevance in dental and public health contexts [1-4].

Growing evidence suggests that psychological factors, particularly anxiety, play a significant role in the onset and progression of TMD. Anxiety has been associated with increased muscle tension, altered pain perception, and parafunctional habits, all of which may contribute to temporomandibular dysfunction. Previous studies conducted mainly in adolescent and university populations have demonstrated varying degrees of association between anxiety levels and TMD severity, commonly assessed using standardized instruments such as the Fonseca Anamnestic Index and the Zung Self-Rating Anxiety Scale. However, most available evidence originates from adult or dental student populations, limiting its generalizability to younger, school-aged groups [5-7].

Despite the recognized interaction between psychological and musculoskeletal factors, there remains a notable gap in epidemiological data regarding the relationship between anxiety and temporomandibular disorders in schoolchildren, particularly in Latin American and Peruvian settings. Existing studies in Peru have primarily focused on university students, leaving the school-aged population underrepresented. This lack of data restricts the development of early preventive strategies and limits the understanding of psychosocial influences on temporomandibular health during critical stages of growth and development [8-10].

The objective of this study was to evaluate the association between anxiety and temporomandibular disorders assessed by the Fonseca Index in Peruvian schoolchildren. This research is justified by its contribution to the clinical and epidemiological understanding of temporomandibular disorders in pediatric populations, as well as by its relevance for integrating psychosocial assessment into evidence-based dental practice and preventive oral health strategies.

Materials and methods

Study design and reporting guideline

A quantitative, observational, cross-sectional, and non-experimental study with a correlational scope was conducted [11]. The methodological reporting of this study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational research.

Participants

The study population consisted of 120 schoolchildren enrolled in secondary education at the selected institution. A non-probabilistic convenience sampling approach was used, and all eligible students were invited to participate. Of the total population, 92 schoolchildren were included, representing those who met the inclusion criteria and completed the study procedures. The remaining 28 students were excluded due to the following reasons: lack of parental or legal guardian informed consent, absence of student assent, or failure to meet the eligibility criteria, including previous treatment for temporomandibular joint disorders or enrollment in primary education levels. Therefore, the final sample size reflects the number of available and consenting participants during the data collection period, corresponding to a census of accessible and eligible students within the study setting.

Procedures

Data collection was carried out in a classroom setting after institutional authorization was obtained. Parents or legal guardians were informed about the objectives and procedures of the study and provided informed consent, while participating schoolchildren provided assent prior to data collection. The questionnaires were administered in person, following standardized instructions, and confidentiality and anonymity were ensured. The estimated duration for completing the instruments ranged from 20 to 30 minutes, during which the researcher remained present to clarify any questions.

Measurement instruments, validity, and reliability

Temporomandibular disorders were assessed using the Fonseca Anamnestic Index, a validated screening

instrument consisting of ten items addressing pain, functional limitation, joint sounds, parafunctional habits, and stress perception. The Spanish-language version of the questionnaire was used, which has been previously applied in adolescent and Spanish-speaking populations. Responses ("yes", "sometimes", "no") were scored as 10, 5, and 0 points, respectively, allowing classification into four severity levels: no TMD (0–15), mild (20–40), moderate (45–65), and severe (70–100) [12]. Although the instrument was originally developed for adult populations, its simplicity and clinical applicability support its use as a screening tool in school-aged populations.

Anxiety levels were evaluated using the Zung Self-Rating Anxiety Scale, Spanish version, composed of 20 items with four response options reflecting symptom frequency. Total scores were classified according to conventional cut-off points: null anxiety (≤45), moderate anxiety (46–59), severe anxiety (60–74), and grave anxiety (≥75) [13]. This scale has been widely used in adolescents and Spanish-speaking populations, supporting its applicability in the present study. Content validity of both instruments was assessed through expert judgment by three specialists. Internal consistency reliability was evaluated through a pilot test, yielding Cronbach's alpha values of 0.828 for the Fonseca Index and 0.964 for the Zung Scale, indicating high internal consistency.

Statistical analysis

Data were processed using SPSS version 25 and Microsoft Excel. Descriptive statistics were calculated using absolute and relative frequencies, which were presented

in tables and figures. Inferential analysis was performed using the chi-square test to assess the association between anxiety levels and temporomandibular disorders. A significance level of $p < 0.05$ was considered statistically significant.

Ethical considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the institutional ethics committee of the corresponding academic institution. Written informed consent was obtained from parents or legal guardians, and assent was obtained from all participating schoolchildren prior to data collection.

Results

A statistically significant association was observed between anxiety levels and temporomandibular disorders ($\chi^2 = 92.743$, df = 4, $p < 0.001$). The strength of association, measured using Cramér's V, was 0.58, indicating a large effect size (Table 1). Mild anxiety was the most frequent category (81.5%) (Figure 1), and mild temporomandibular disorder was the most prevalent TMD classification (40.2%) (Figure 2). Higher anxiety levels were proportionally more frequent among students presenting temporomandibular disorders compared to those without dysfunction.

Table 1. Association between anxiety levels and temporomandibular disorders in secondary school students

Temporomandibular disorders	Anxiety									
	Mild		Moderate		Severe		Serious		Total	
	f	%	f	%	f	%	f	%	f	%
No TMD	28	30,4	6	6,5	2	2,2	0	0,0	36	39,1
Mild	32	34,8	5	5,4	0	0,0	0	0,0	37	40,2
Moderate	15	16,3	4	4,4	0	0,0	0	0,0	19	20,7
Severe	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
Total	75	81,5	15	16,3	2	2,2	0	0,0	92	100,0

Note. A statistically significant association was observed between anxiety levels and temporomandibular disorders ($\chi^2 = 92.743$, df = 4, $p < 0.001$), with a large effect size (Cramér's V = 0.58). Higher levels of anxiety were associated with increased severity of temporomandibular disorders.

Discussion

The present study demonstrated a statistically significant association between anxiety levels and temporomandibular disorders assessed by the Fonseca Index in schoolchildren. This finding supports existing evidence indicating that psychological factors are related to the presence and severity of temporomandibular disorders during school age. The observed relationship highlights the coexistence of emotional and musculoskeletal conditions in pediatric populations, without implying a causal direction, and reinforces the multifactorial nature of temporomandibular disorders.

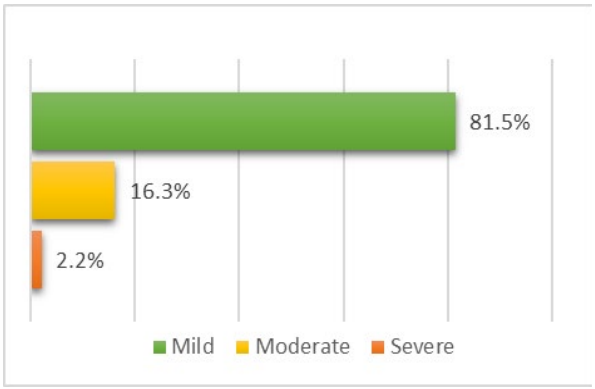

Figure 1. Anxiety level

These findings are consistent with previous studies that have reported associations between anxiety and temporomandibular disorders in adolescents and young populations. Al-Khotani et al. (2021) [14] described higher frequencies of temporomandibular disorders among individuals with elevated anxiety levels, suggesting that psychological distress commonly co-occurs with temporomandibular symptoms. Anxiety-related behaviors such as bruxism and clenching have been frequently reported in the literature as concomitant factors in individuals with temporomandibular disorders, supporting the biological plausibility of this association.

Regarding anxiety levels, most schoolchildren in the present study exhibited mild anxiety. This finding aligns with the results reported by Nilsson et al. (2023) [15], who observed predominantly low anxiety levels in school populations. This pattern suggests that anxiety in this age group is commonly associated with routine academic and social demands rather than severe psychopathology. Nevertheless, even mild anxiety has been reported in previous studies as being associated with musculoskeletal complaints, including temporomandibular disorders. In contrast, Navarro et al. (2019) [16] reported higher frequencies of moderate to severe anxiety, which may be attributed to differences in sociocultural context, educational environment, or methodological approaches.

With respect to temporomandibular disorders, mild TMD was the most Afrequently observed condition among participants. Similar prevalence distributions have been reported by Khotani et al. (2021) [14] and Mehdiopur et al. (2022) [17], who also identified mild temporomandibular disorders as the predominant category in school and adolescent populations. This pattern is clinically relevant, as mild forms are commonly detected during early stages and may benefit from preventive and conservative approaches. Conversely, Karibe et al. (2015) [18] reported a higher prevalence of moderate temporomandibular disorders; in turn, studies by Minervini et al. (2023) [19] and Castillo et al. (2018) [20] indicate that contextual, behavioral, or developmental factors may influence the distribution of severity among populations.

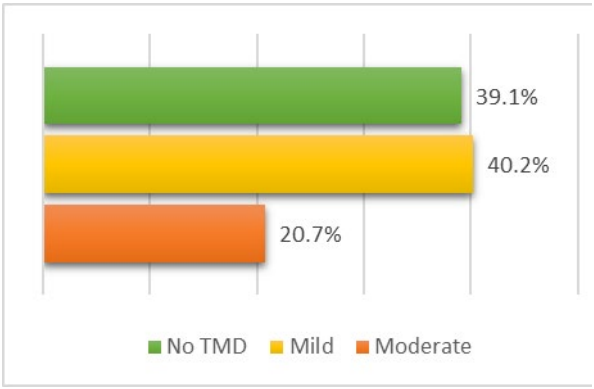

Figure 2. Level of temporomandibular disorders

From a clinical and public health perspective, these findings emphasize the importance of considering psychosocial factors during dental evaluations of schoolchildren. The strengths of this study include the use of standardized and validated instruments and the focus on an understudied school-aged population. However, limitations must be acknowledged, including the cross-sectional design, which does not allow causal inference, and the use of non-probabilistic sampling, which may limit external validity. Future studies employing longitudinal designs and representative samples are needed to better characterize the temporal relationship between anxiety and temporomandibular disorders and to inform preventive strategies integrating psychological and dental health.

Conclusions

A significant association was observed between anxiety levels and temporomandibular disorders assessed by the Fonseca Index in schoolchildren. Higher anxiety levels were associated with a greater presence of temporomandibular disorders, with mild forms being the most frequently identified. These findings support the relevance of considering psychological factors when evaluating temporomandibular health in school-aged populations.

Author Contributions Statement (CrediT)

AGD: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing – Original Draft, Supervision**. JDL:** Resources, Project administration, Writing – Review & Editing.

Acknowledgments

The authors would like to thank the authorities of the educational institution for granting permission to conduct the study, as well as the schoolchildren and their parents or legal guardians for their voluntary participation and cooperation. We also acknowledge the institutional and administrative support provided during the data collection process.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare no financial, institutional, or personal conflicts of interest that could have influenced the conduct or publication of this study.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to confidentiality and ethical restrictions but are available from the corresponding author upon reasonable request.

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