"Association between Anxiety Levels and Temporomandibular Disorders in Clinical Dental Students: A Cross-Sectional Study"

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Abstract

Background: Temporomandibular disorders (TMDs) comprise an extensive spectrum of conditions that originate from diverse complex components of the temporomandibular joint. It is generally acknowledged that the biopsychosocial model is the preeminent framework for understanding the etiology of TMDs. Anxiety, depression, and tension are among the psychological disorders that are commonly observed in dental students. The current research probed the propinquity of anxiety and temporomandibular disorder (TMD) among clinical dental undergraduates residing in the Aseer region of Saudi Arabia, with a specific emphasis on the functional implications for their overall well-being.

Methods: This research included 89 clinical dentistry students who completed online questionnaires. The PROMIS (Patient-Reported Outcomes Measurement Information System) and OHIP-TMD (Oral Health Impact Profile for Temporomandibular Disorders) were used in these surveys. The trait-related attributes of TMD impacting the oral health profile were assessed using principal component analysis. Demographic factors for anxiety and TMD were examined using linear regression. The psychosocial and functional variables of the OHIP-TMD were compared with those of anxiety in the general regression system.

Results: The mean value for OHIP was 0.60, or 0.61, with a standard deviation of 0.61; this indicates that a large proportion of respondents reported having no or infrequent impacts on their oral health profile. The variables that significantly predicted OHIP were the respondents' marital status and gender ($P<0.05$). In regard to the OHIP, married respondents reported higher scores than did their female counterparts. The average PROMIS score was 11.12, and the standard deviation was 3.84. The results from the PROMIS regression analysis on demographic variables showed an R2 value of 0.092, $F(4,78) = 5.691$, and significance at $P<0.05$. Sex emerged as the most significant predictor of the PROMIS ($P<0.05$). On the PROMIS, females reported higher scores. According to an analysis using a general linear

model, there was a significant correlation between heightened anxiety levels and an increase in both psychosocial problems and physical function.

Conclusion: In female and married clinical dentistry students at the College of Dentistry in Aseer Province, Kingdom of Saudi Arabia, anxiety was linked to psychological distress and oral physical function impairment. In addition to dental health, anxiety affects pupils' academic performance and involvement. Strategies to lower student anxiety are beneficial.

Keywords: Temporomandibular Joint Disorders; Anxiety; Dental Students; OHIP; PROMIS; OHRQoL

Background

A broad category, temporomandibular joint dysfunction, encompasses various circumstances in which the masticatory muscles, the temporomandibular joint, and other associated structures are involved [1]. TMDs are often classified into subgroups based on their origin: either articular or muscular. In the first situation, symptoms are specifically related to the temporomandibular joint (TMJ); in contrast to the subsequent case, symptoms are specifically linked to the stomatognathic anatomy [2].

The etiology of TMD is difficult to recognize, although it results from a combination of psychological, physiological, structural (occlusion and trauma), and postural variables (parafunctional habits) and genetic components. These situations have the potential to disturb the equilibrium of the stomatognathic system, leading to the emergence of symptoms and issues associated with temporomandibular disorders (TMDs) [3].

According to a recent investigation, the prevalence of TMDs was found to be approximately 31% in adults and elderly individuals and approximately 11% in children and adolescents. A reduction in disc displacement was the most common subtype of TMD, occurring in close to 26% of the aged individuals and 7.5% of the juveniles. Commonly reported symptoms include pain in the TMJ, auricles, champing musculature, faculty of sight, and countenance; emotional stress; limited physical function; joint noises or locking; and restricted jaw movements [4, 5].

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Prior research has underscored the influential role of psychosocial factors in the development of TMD, demonstrating a higher occurrence among TMD patients compared to healthy individuals. TMJ disorders are often associated with anxiety, which can impact pain perception and muscle over activity. This can be classified as state anxiety, which results from a particular stressor, or trait anxiety, which is a lasting behavioral characteristic [6-8].

According to a recent analysis, people with myofascial pain experience increased levels of anxiety and depression. When evaluating patients with TMD, it is essential to consider the biopsychosocial components separately [9].

Oral health-related quality of life (OHRQoL) involves evaluating a patient's functional abilities (such as munching, napping, and withering), sagacity, and delectation with oral health care [10, 11]. Comprehending a patient's OHRQoL enables a more individualized approach to their care beyond mere medical-dental interventions. Research has shown that people with TMD have more difficulties with their oral health-related quality of life (OHRQoL) than do the silent majority. The presence of symptoms such as periarticular pain and restricted jaw movement significantly influences the socioeconomic status of patients. [12, 13].

Several studies have shown that anxiety augments the risk of developing TMD. Given the high levels of anxiety experienced by students during their university studies, it is logical to anticipate an increased susceptibility to developing TMD as a result of this anxiety link [14-16].

Previous research has shown that dental students often face significant stress, which may increase their risk of developing TMD [17-20]. Investigating the impact of TMD corollaries on the wellbeing of dental students and how anxiety plays a role could lead to the development of intercessions to grapple with these quandaries. Nevertheless, there is a scarcity of studies regarding anxiety and TMD among dental students in Aseer Province in the Kingdom of Saudi Arabia. This dissertation seeks to explore the intersectionality between anxiety and TMD among clinical dentistry students in the Aseer province of the Kingdom of Saudi Arabia, using Patient-Reported Outcomes Measurement Information System (PROMIS) and Oral Health Impact Profile for Temporomandibular Disorders (OHRQoL) questionnaires.

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Materials and Methods

As part of the research, a cross-sectional survey was used. The Institutional Review Board of King Khalid University's College of Dentistry granted ethical approval (IRB/KKUCOD/ETH/2022-23/017), and written informed consent was obtained from all participants.

Participants

This study focused on undergraduate dentistry students at the College of Dentistry, King Khalid University in Aseer Province, Saudi Arabia. The sample size needed to obtain a 95% confidence level with a margin of error of 0.06, assuming a 50% prevalence of TMD in the community, was determined to be 83 individuals. The data were gathered between December 2022 and June 2023 with the voluntary involvement of the study participants. Staff disseminated the study details via vocal announcements in lectures and weekly emails during a one-month timeframe. Both the missives and webmails included a hyperlink to a virtual questionnaire. Upon entering the survey (Survey Monkey, San Mateo, CA), scholars had to peruse a note explaining that partaking was discretional and would not influence their academic tallies or accord with quants. Survey results were collected anonymously, and individuals agreed to participate by completing the survey.

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Survey Instruments

The Oral Health Impact Profile (OHIP) for TMDs was used to gather data on TMD symptoms. It consists of 22 questions that evaluate functional constraints, bodily twinge and infirmity, mental comfortlessness and frailty, social impairment, and handicap. The rating for each question is on a 5-point scale ranging from 0 to 4. The overall score is obtained by adding together all the replies and dividing by the total number of items. Higher scores indicate a worse quality of life. The psychometric features of the tool have been confirmed in prior validation studies [21, 22].

The Patient-Reported Outcomes Measurement Information System (PROMIS) has designed a range of available assessments for adults that target bodily, intellectual, and congenial well-being. A worksheet was used to document signs of anxiety. This questionnaire has proven to be a reliable tool for assessing inner consistency, test-retest veracity, and concept viability. Four items were included to assess self-reported levels of fear, anxious-worry, and hyperarousal. Responses are evaluated using a 5-point scale ranging from never to always, with scores ranging from 1 to 5. Adding up the responses gives the total score, with higher scores indicating higher levels of anxiety [23].

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Statistical analysis

Demographic information was gathered using eight questions that inquired about age, gender, academic year, employment status, living situation, parental status, relationship status, and recent facial or jaw trauma within the past month.

The collected data from respondents were subjected to statistical treatment using appropriate statistical techniques. The means, SDs, frequencies, and percentages were used as descriptive statistics for summarizing the raw data. Principal component analysis (PCA) is a multidimensional analytical method primarily used for condensing a large number of variables into a few meaningful components without sacrificing much information contained in the original variables of the OHIP questionnaire. PCA attempts to identify the hidden new dimensions in the original variables of OHIP. Before starting PCA, the OHIP data were normalized to reduce the intervariability among variables. A correlation matrix is then generated using the variables, and then the normalized eigenvectors (principal components) are generated. Eigen values greater than or equal to one were retained as the main components that provided the maximum amount of information contained in the original data. The next step involved was to determine the correlation between the principal components and the original variables, which was called factor loading. The popularly known

oblique rotation has been used for calculating factor loadings. Factor loadings exceeding 0.4 were used to combine variables to uncover underlying dimensions within the dataset. The subsequent line of evaluation consisted of forging distinctive linear regression models for anxiety and TMD manifestations to measure the linkage among every concept and cohort variable. Finally, a general linear model was applied to evaluate the juxtaposition of anxiety and the psychosocial and functional scales that were included in the principal component analysis of the OHIP-TMD questionnaire. We have assessed the crucial assumptions to be satisfied to perform simple linear modeling and generalized linear modeling. In all the inferential analyses, a calculated P value less than 0.05 was considered to indicate statistical significance. All the analyses were carried out with the help of the software SPPS v23.0 for Windows.

Factor 1 (items 19-22) related to a construct reflecting psychosocial issues regarding OHRQoL

Factor 2 (items 2-5 and item 7) was related to a construct reflecting physical function issues related to TMD

Factor 3 (items 14-16 and items 12 and 17) related to the construct reflecting social disability

Factor 4 related to a construct reflecting dental issues

Factor 5: related to a construct reflecting eating handicap

Results

Table 1 presents the loadings of each item for the respective factors. The items were categorized into scales based on their factor loadings. The homogeneity and internal consistency of the scales were assessed using corrected item-total correlations and Cronbach's alpha, respectively. The corrected item-total correlations ranged from 0.308 to 0.779, as did the Cronbach's alpha values for psychosocial issues, physical function, and social disability.

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Dental issues, and eating handicap scales were 0.791, 0.853, 0.921, 0.881 and 0.821, respectively, which indicated acceptable internal consistency.

The following step in the analysis was to create individual linear regression models for anxiety and TMD symptoms, aiming to investigate the correlation between each variable and demographic factors. All independent variables were simultaneously included in the regression using standard practice. Demographic factors such as age (continuous values), sex (female = 0; male= 1), year of the program (3rd year, 4th year, 5th year), and marital status (0=single; 1=unmarried) were entered into the models. Throughout the analysis process, assumptions for regression were evaluated. The Durbin-Watson statistic produced values of 1.999 and 1.998 to check for independence of observations utilizing residuals, while normality of residuals was confirmed with a P-P plot. Additionally, homoscedasticity was validated through a scatter plot of unstandardized residuals, and multicollinearity was assessed by checking variance inflation factor values below 10.

Finally, a general linear model was employed to examine the link between anxiety and the psychosocial and functional scales derived from the principal component analysis of the OHIP-TMD questionnaire. This approach included all factors in the analysis, allowing for adjustment of covariance between dependent variables. It was chosen based on our prior assumption that there would be some level of correlation among the psychosocial and physical function dependent variables.

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Table 2 shows that in the third (66%) and fourth (61.9%) years, the majority of respondents were males, while in the fifth year, the majority were females (86.7%). The majority of respondents in the third (100%), fourth (100%) and fifth (86.7%) years were unmarried. The average ages of the respondents in the third, fourth, and fifth years were 21.66 ±0.29, 22.51± 0.34, and 23.47 ±0.44, respectively.

From Table 3, the mean value for OHIP was 0.60, with an SD of 0.61, indicating that the majority reported never/hardly ever OHIP. The main psychosocial issues were a less satisfied life and difficulty doing their usual jobs. In terms of physical function, the main factors were painful aching of the mouth and sore jaw. The main components of social disability were difficulty relaxing and being upset. Among the dental issues were dental issues and self-concern. Chewing food is a main issue in eating handicaps.

The regression analysis of OHIP on demographic variables reported R2=0.200, F(4,78)=4.847 P=0.002*, *:P<0.05. The significant predictors of OHIP were the gender and marital status of the respondents (P<0.05). Females reported higher OHIP scores, while married respondents reported higher OHIP scores.

The mean PROMIS score was 11.12, with an SD of 3.84. The regression analysis of the PROMIS score on demographic variables yielded R2=0.092, F(4,78)=5.691, *P<0.05. The significant predictor of PROMIS was sex (P<0.05). Females reported higher scores on the PROMIS.

A general linear model analysis revealed that an increase in anxiety was significantly associated with an increase in psychosocial issues and physical function.

Discussion

It is believed that the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) is the most accurate approach for TMD diagnosis [24]. A number of research organizations are currently investigating the diagnostic criteria for temporomandibular disorders (DC/TMD) and have discovered that women and younger individuals have a greater prevalence of TMD. The prevalence of TMD has been found to be greater among university students, specifically those pursuing medical and dental disciplines, as evidenced by these studies [25-28].

In a recent study conducted by Srivastava et al., the prevalence of TMDs was assessed among dental students in Saudi Arabia using a DC/TMD diagnostic tool. The study revealed that

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dental students, particularly those at clinical levels, were shown to have a greater likelihood of developing TMD [17]. Our study appears to be the only study carried out in the Kingdom of Saudi Arabia utilizing statistical techniques to explore the OHIP-TMD structure. Through these instruments, it was determined that physical and psychosocial difficulties were associated with anxiety among female and married dental students. According to the instrument creators, the questionnaire was thought to include 7 areas. Our research revealed that the OHIP-TMD comprises 5 variables, as illustrated in Table 1. Of all the variables identified, only 2 had enough elements to create dependable scales. Additional research is needed to improve the psychometric properties of the OHIP-TMD.

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According to the information supplied by clinical dental students in our study, the average value that was reported for OHIP-TMDs was 0.60. This indicates that the majority of dental students reported having OHIP-TMDs seldom or never. Individuals who have been diagnosed with TMD, on the other hand, often encounter 15 to 30 oral health consequences that have an effect on their quality of life [29]. The difference in oral health impacts between individuals with TMD and the population that we studied suggests that TMD is not a substantial issue for clinical dentistry students in the province of Aseer for the reasons that we have found.

Previous studies in the general population have also indicated a link between high anxiety levels and TMD. Boscato and colleagues emphasized that anxiety plays a crucial role in temporomandibular disorders (TMDs) and can act as a factor that triggers or worsens the condition [30]. Individuals experiencing anxiety tend to report increased pain intensity during medical evaluations. deOliveira et al. highlighted that trait anxiety plays a causal role, while anxiety has a more psychosomatic impact on the severity of TMD [31]. Monteiro and colleagues validated two key principles from the literature that help explain this relationship: individuals with neuroticism tend to be anxious, and those who are anxious may intensify their attention to pain, resulting in a heightened perception of its intensity [32]. According to

Reissmann et al., anxiety is a key factor in temporomandibular disorder (TMD), suggesting that a person's likelihood of experiencing anxiety could be considered a risk factor for TMD pain [13]. According to Staniszewski et al., psychological factors could cause a sustained increase in HPA axis activity, leading to increased levels of salivary cortisol released by the adrenal cortex over time [33]. The results of the present study validate the data that support a significant connection between psychosocial variables and the initiation of TMD. According to normative norms, the respondents showed slight impairment in their anxiety levels.

Furthermore, the results of this study revealed that married women experienced significantly greater levels of anxiety than did their unmarried counterparts. There are inherently numerous pressures that students who enter dental clinics must contend with. For this reason, students in their final three years of undergraduate study would benefit significantly from the implementation of anxiety coping mechanisms.

In a recent systematic evaluation, the effectiveness of psychological interventions for alleviating anxiety among university students was examined. According to the study, anxiety levels decreased significantly in response to cognitive, behavioral, and mindfulness interventions. Research suggests that universities should provide interventions for their students, given the correlation between elevated levels of anxiety and diminished academic performance, increased suicidal ideation, and decreased engagement [34]. In clinical settings, students frequently encounter distress as a result of apprehension regarding their aptitude for patient management. By instituting routine evaluation and direction at the unit level, this concern might be mitigated.

The research was carried out exclusively at a dentistry college at King Khalid University in Aseer Province. It is unclear whether our results can be generalized to different sets of dental students nationwide. The study population primarily comprised clinical students, which differed from the overall student cohort in the college. Although there were some limitations,

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we used standardized instruments with robust psychometric properties, and the participant count exceeded the required sample size, providing initial support for the relevance of the study's results.

Conclusions

The findings of our research indicate that the majority of clinical students did not perceive any impact on their OHRQoL. However, there was a significant correlation between anxiety and both oral physical function impairment and psychosocial distress in specific subsets of married and female students. Moreover, anxiety affects not only the quality of life associated with oral health but also the engagement of students in the learning process and their academic performance. Given the anxiety levels documented among this cohort of students, the implementation of anxiety reduction interventions might prove beneficial in potentially mitigating symptoms associated with the temporomandibular joint (TMD).

Declarations

Ethics approval

The Research Ethics Committee, College of Dentistry, King Khalid University has reviewed and approved the research with an ethical review wavier with no: IRB/KKUCOD/ETH/2022-23/017

Consent for publication: Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: "The authors declare that they have no competing interests"

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Contributions

“Conceptualization, J.H. and A.A.; methodology, S.A.A.; validation, J.H., S.A. and A.M.A.; formal analysis, A.H.A.; investigation, S.A.A.; resources, A.A.; data curation, A.H.A.; writing—original draft preparation, J.H.; writing—review and editing, A.A.; visualization, S.A.; supervision, J.H.; project administration, A.A.; funding acquisition, A.A. All authors have read and agreed to the published version of the manuscript.”

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