SMART DENTAL UPDATES

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Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you **"SMART DENTAL UPDATES"** which contain latest and interesting news in the field of Dentistry.

This issue contains:

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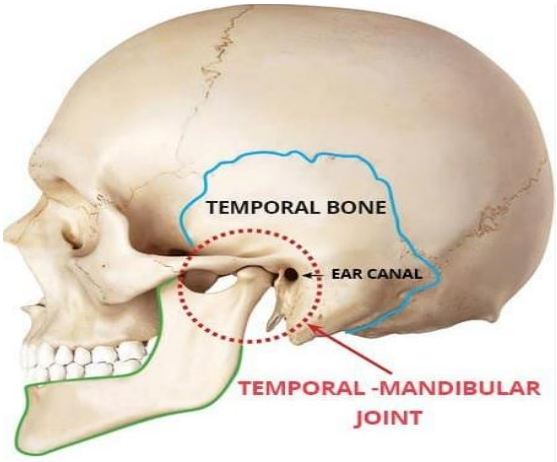
Association Between Mouth Breathing and Temporomandibular Disorder Symptoms in Children and Adolescents: A Cross-Sectional Study

INTRODUCTION

Temporomandibular disorders (TMDs) encompass issues affecting the masticatory muscles, the temporomandibular joint (TMJ), and surrounding structures. Common signs and symptoms of TMDs include pain, limited or deviated mouth opening, and joint sounds.[1] Mouth breathing (MB) is a common and often overlooked symptom of sleep-disordered breathing (SDB), which encompasses conditions such as snoring, upper airway resistance syndrome (UARS), and obstructive sleep apnea (OSA).[2] The prevalence of MB in children and adolescents ranges from approximately 11% to 56%. MB can result from genetic predispositions, improper maxillary growth associated with malocclusions or oral clefts, and nasal obstructions due to enlarged adenoids or tonsils, allergic rhinitis, or a deviated nasal septum. It can also stem indirectly from harmful oral habits. While MB may resolve with age-related shrinkage of the adenoids, if it persists, it can have lasting detrimental effects on dental and facial development. MB was linked to craniofacial and dental issues such as elongated facial appearance ("adenoid faces"), narrow nostrils, class II malocclusion, maxillary hypoplasia, posterior crossbite, posture changes, gingivitis, and tooth decay. Recent studies have indicated that MB can impair TMJ development in its early stages.[3] Based on these observations, the authors hypothesized that individuals with MB might be more prone to TMD signs and symptoms, suggesting a potential link between MB and TMD. Consequently, this paper aimed to examine the prevalence of TMD signs and symptoms and investigate the possible connection between MB and TMD, considering other risk factors, in a subgroup of children and adolescents.



TEMPORO-MANDIBULAR JOINT

Signs and symptoms of TMD are more common in girls, bruxists, those with divorced parents, and people who have MB behavior. Early detection and treatment of MB and the indications and symptoms of TMD can assist in reducing the adverse effects of these disorders on adolescent and child development and quality of life.

METHODS

This retrospective study utilized archival data from patients presenting with orthodontic concerns. The study included 945 children and adolescents, with a mean age of 14.82±2.06 years. Inclusion criteria were patients under 18 years of age, those without any syndromes affecting the maxillofacial region, and those with no history of surgeries in the head and neck

area. Data on demographic characteristics, family background, systemic health, occlusion, breathing patterns, oral habits, and bruxism were extracted from the archival record.

RESULTS

No significant differences were found between participants with and without TMD in terms of the number of siblings (p=0.726), systemic health status (p=0.895), allergies (p=0.509), or delivery method (p=0.176). However, significant differences were noted in gender (p=0.024), age (p=0.008), and parental marital status (p=0.009). Among the participants, 66% were girls, 60.4% were born via C-section, 8.4% had at least one systemic disease, 9.2% had allergies, and 4.3% of participants' parents were divorced. Additionally, 18.7% exhibited oral habits, 6.6% had bruxism, 29.8% had malocclusion, and 14.1% had mouth breathing. Signs or symptoms of TMD were present in 8.5% of participants, including 2.9% with pain, 3.7% with joint sounds, 1.4% with deflection, and 3.9% with deviation. Risk factor analysis showed significant associations between TMD signs and symptoms and bruxism (OR 8.07, 95% CI 4.36–14.92), gender (OR 2.01, 95% CI 1.13–3.59), parental marital status (OR 2.62, 95% CI 1.07–6.42), and mouth breathing (OR 3.26, 95% CI 1.86–5.71) (Table 1).

		N	n (%)	Crude OR	95% CI		p	Adjusted OR	95% CI		p
Age of children and adolescent				1.17	1.04	1.32	**0.006**	1.12	0.99	1.27	0.071
Gender	**Girl**	624	62	1.85	1.07	3.19	**0.025**	**2.01**	**1.13**	**3.59**	**0.017**
	Boy (ref)	321	18								
Marital status of parents	**Married (ref)**	904	72								
	Divorced	41	8	2.8	1.24	6.29	**0.013**	**2.62**	**1.07**	**6.42**	**0.035**
Number of siblings				0.99	0.78	1.26	0.977				
Delivery type	**Normal (ref)**	374	40								
	C-Section	571	65	1.39	0.85	2.27	0.178				
Breathing pattern	**Nose (ref)**	812	54								
	Mouth	133	26	3.41	2.04	5.67	**<0.001**	**3.26**	**1.86**	**5.71**	**<0.001**
Bruxism	**No (ref)**	883	59								
	Yes	62	21	9.32	5.23	16.63	**<0.001**	**8.07**	**4.36**	**14.92**	**<0.001**
Oral habit	**No (ref)**	768	56								
	Yes	177	24	1.61	0.95	2.74	0.074				

DISCUSSION

Table 1. Risk factors for TMD in univariate and multivariate logistic regression models (N = 945)

The study's findings indicate that girls, individuals with bruxism, those with divorced parents, and those with mouth breathing are at a higher risk for developing signs and symptoms of TMD. Consistent with other research that highlights a higher prevalence of TMD in females, 66% of the participants in this study were girls. The risk of exhibiting TMD signs or symptoms was found to be 2.1 times greater in girls compared to boys, aligning with Khan et al., which reported a 1.96-fold increased risk for females.[4] Ostenjenso et al. found that living in a

divorced family significantly increased the likelihood of experiencing TMD pain. Additionally, their study observed that engaging in regular physical activity was associated with a reduced frequency of TMD occurrences.[5] In this study, participants with divorced parents were found to have a 2.62-fold increased risk of developing TMD signs and symptoms. Conversely, the number of siblings did not have a significant impact on TMD risk. This finding may reflect the psychological distress experienced by children and adolescents due to parental divorce. The authors suggested that children from divorced families should receive heightened attention and screening for TMD. Additionally, increased awareness about TMD risks among families were recommended.

CONCLUSION

The study found that girls, individuals with bruxism, those with divorced parents, and those with mouth breathing were more prone to developing signs and symptoms of TMD. Although age alone significantly impacts the occurrence of TMD signs and symptoms, its effect diminishes when considered alongside other factors. This underscored the importance of monitoring the early effects of mouth breathing on craniofacial development. Early screening and intervention for both mouth breathing and TMD were crucial for ensuring proper craniofacial development and function, and for mitigating their potential negative impacts on growth and quality of life in children and adolescents. Longitudinal studies were needed to further clarify the causal and temporal relationships between TMD and mouth breathing.

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Comparison of the accuracy, precision, and differences between the caries predictive capability of AI vs. traditional multivariable regression techniques

INTRODUCTION

Dental caries is the most common oral disease in children and adolescents, leading to a decline in oral health and, eventually, tooth loss.[1] The Centers for Disease Control and Prevention reports that approximately 23% of children have dental caries. Therefore, early management of dental caries is crucial, as early detection enables more effective preventive care. The

In terms of predicting childhood dental caries, the machine learning model performed better than the traditional statistical approach.

decayed–missing–filled teeth (DMFT) index is widely used as a population-based metric for assessing dental caries.[2] Traditional multivariable regression methods are long-established and dependable for predicting dental caries, but they have limitations. These models require meeting specific assumptions, such as independence and normal distribution, which can be challenging. Additionally, the impact of multicollinearity among variables was not always thoroughly addressed with these regression techniques.[3] Therefore, there was a need to explore more robust modeling techniques for predicting dental caries. Recent advancements in Artificial Intelligence (AI), particularly Machine Learning (ML), have demonstrated higher accuracy in predictions compared to traditional methods. These newer techniques were expected to significantly enhance the diagnostic process. Additionally, AI can manage and analyze complex datasets with multiple features, a capability that traditional regression models often lack, including the ability to evaluate and improve the model's performance.[1]

METHODS

The study utilized secondary data from the electronic health records system (axiUm) at the Temple University Kornberg School of Dentistry, focusing on pediatric patients aged 6–16 years who were recorded at the Pediatric Dentistry Clinic. The study included a total of 3,586 subjects. The outcome measures were the DMFT and the decayed–extracted–filled teeth (deft) scores. Participants with a DMFT/deft score of 0 were categorized as “no caries,” while those with a DMFT/deft score greater than 0 were classified as “having caries.” Predictors examined included age, sex, insurance status, fluoride exposure, having a dental home, sugary food consumption, family history of caries, special needs, visible plaque, medications affecting salivary flow, and responses to overall assessment questions.

RESULTS

The average DMFT score was 0.85 ± 2.15, and the average deft score was 0.81 ± 2.15. Significant associations for DMFT were observed with age, sugary meal consumption, and visible plaque. For deft, significant associations were found with age, family history of caries, special healthcare needs, and dental appliance use. Among the predictors of dental caries in the primary dentition, only age [OR = 1.65, 95% CI (−0.69 to −0.53)], special needs [OR = 2.66, 95% CI (0.02–0.20)], and visible plaque [OR = 1.31, 95% CI (0.05–0.88)] were statistically significant (Table 1). In predicting childhood dental caries, the XGBoost algorithm outperformed others with an accuracy of 81%, sensitivity of 84%, and a Kappa of 61%, followed by the Support Vector Machine and Lasso Regression algorithms, both showing 84% specificity. Age and visible plaque emerged as the most critical variables for prediction.

Table 1. Logistic regression (DMFT and deft)

Model	Variables	OR (95% CI)	CI (95%) LL	CI (95%) UL
DMFT	Age	0.89	**0.27**	**0.38**
	Sex (M)	0.96	**−0.63**	**−0.05**
	Fluoride exposure (Yes)	1.49	−0.15	1.26
	Sugary meals (No)	1.19	**0.15**	**0.74**
	Dental Home (No)	0.74	−0.06	0.61
	Plaque (No)	1.18	**0.09**	**0.78**
	Dental appliances causing xerostomia (No)	0.97	−0.89	0.18
	Patient offered fluoride and declines (Yes)	0.68	−0.58	0.07
deft	Age	1.65	**−0.69**	**−0.53**
	Sugary meals (Frequent consumption)	0.73	−0.05	0.65
	Special needs yes (age 6–14)	2.66	**0.02**	**0.20**
	Plaque (No)	1.31	**0.05**	**0.88**
	Patient offered fluoride and declines (No)	1.29	−0.75	0.04

LL- Lower Limit, UL- Upper Limit

DISCUSSION

In this study, both machine learning and traditional statistical methods successfully identified predictors of dental caries. However, the machine learning model demonstrated superior performance compared to the traditional statistical model in predicting primary caries. Previous research on childhood dental caries prediction using machine learning alone reported an AUC-ROC value of 0.74, with sensitivity of 0.67 and accuracy of 0.64 for their proposed models.[4] Another study involving children found that the AUC-ROC values for machine learning models were 0.78 for Logistic Regression, 0.785 for XGBoost, and 0.780 for Support Vector Machine.[5] The prediction data from this study for children showed an AUC-ROC value of 0.87 for traditional logistic regression and 0.86 for machine learning, with traditional logistic regression slightly outperforming the machine learning model in terms of AUC-ROC.[5] This study found that the XGBoost model achieved a sensitivity of 0.84 and an accuracy of 0.81, outperforming the metrics reported by Karhade.[4]

CONCLUSION

Both ML and traditional statistical methods were effective in identifying caries predictors, but ML demonstrated superior performance in predicting primary caries. The ML model exhibited higher accuracy, sensitivity, specificity, and Kappa values compared to traditional statistical approaches. Therefore, ML can be confidently regarded as a more accurate and effective tool for dental caries risk assessment.

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Assessment of Dental Students' Opinions on the Use of a Case Difficulty Assessment Form at Different Stages of Root Canal Therapy

INTRODUCTION

By using the AAE form, dental students were able to distinguish between instances that were complicated and those that weren't, which decreased the level of difficulty they experienced.

An endodontic procedure necessitates skilled and experienced dental professionals to provide effective root canal treatments.[1] Dental students often find it difficult to translate theoretical knowledge and preclinical training into practical clinical skills. To boost their confidence in performing root canal treatments, it is essential for them to receive thorough training in case selection for general dentists and to understand when to refer patients to an endodontist.[2] Several tools are currently available to assist in evaluating the difficulty of endodontic cases before treatment. These tools help determine whether a patient should be referred to a specialist. Notable examples include the Endodontic Case Assessment Form (ECAF), the Dutch Endodontic Treatment Index (DETI), and the American Association of Endodontists (AAE) case assessment form, all developed by various international organizations.[1] The AAE case difficulty assessment form was the most frequently studied in the literature. It serves as a standardized tool for collecting data and assessing the complexity of individual cases.[2] According to the literature, no studies have explored the relationship between the AAE case assessment form and dental students' confidence in performing nonsurgical root canal treatments. Therefore, this study aimed to evaluate whether the use of the AAE case assessment form influences dental students' perceptions of the difficulty encountered at each stage of root canal treatment. Additionally, the study seeked to identify the challenges of dental students face while performing non-surgical root canal procedures.

METHODS

This a cross-sectional online survey involving 195 dental students. The questionnaire was designed to include sections on informed consent, demographic information, the use of the AAE case assessment form, various stages of root canal treatment (RCT), diagnosis, local

anesthesia administration, tooth isolation, and the endodontic procedure itself. Data were collected and analyzed using SPSS version 23.

RESULTS

The study revealed significant differences between students who used the AAE assessment form and those who did not, particularly in their ability to make accurate diagnoses ($p = 0.005$), achieve effective tooth isolation ($p = 0.03$), and rate the difficulty of the endodontic procedure ($p = 0.018$). A positive correlation was observed between the use of the AAE form and improvements in diagnosis, tooth isolation, and overall procedure difficulty. The most challenging diagnostic step was performing the electric pulp test (ETP), followed by analyzing periapical radiographs and establishing pulpal diagnosis. Among local anesthesia techniques, intrapulpal injection was rated as most difficult, with 24% of participants finding it challenging and 14% rating it as very difficult. Conversely, 30% of participants found the regional block to be only slightly difficult. The step of tooth buildup after caries excavation was considered the most challenging in tooth isolation, with 28% of students finding it difficult and 6% reporting it as very difficult. Canal obturation was identified as the most challenging part of the endodontic procedure, with 23% of participants rating it as difficult and 5% as very difficult. Overall, 16% of participants reported a moderate level of difficulty with root canal treatment (Figure 1). Most students found the diagnosis step to be of low difficulty (94.4%), while 5.6% experienced moderate difficulty. For isolation, 59.5% reported low difficulty, and only 1% experienced high difficulty. The endodontic procedure was rated as having low difficulty by 68.2% of participants, with 0.5% reporting high difficulty.

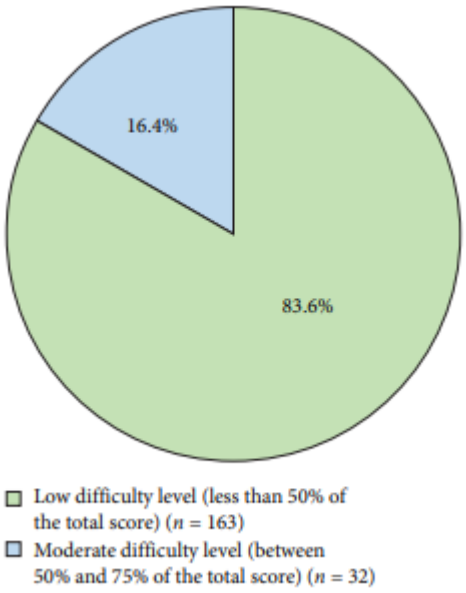

Figure 1. Overall difficulty levels of root canal therapy

DISCUSSION

The study indicated that the difficulty score for diagnosis was notably influenced by two primary factors: the students' academic level and the use of the AAE endodontic case difficulty assessment form. The AAE case assessment form, developed by the American Association of Endodontists, was designed to assist clinicians, faculty, and students in evaluating the complexity of endodontic cases and aiding their decision-making processes.[3] The study results indicate a positive link between using the AAE case difficulty assessment form and increased confidence among students when performing root canal treatments. Additionally, previous reports have suggested that employing the AAE form leads to fewer endodontic errors and a reduction in the number of visits needed to complete treatments for dental students.[4]

CONCLUSION

The AAE difficulty assessment form has proven valuable for dental students, helping them distinguish between complex and straightforward cases, which reduces the challenges faced during root canal treatments. This tool aids students in deciding whether to handle a case themselves or refer it to an endodontist.

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Case report on the Management of Oral Health in a Patient with Trismus associated with Isaacs' Syndrome

INTRODUCTION

Dentistry procedures became possible, but only temporarily, after plasmapheresis therapy temporarily decreased trismus.

Isaacs' syndrome is an autoimmune condition marked by spontaneous or continuous muscle fiber activity due to peripheral nerve hyperexcitability (PNH).[1] Clinical manifestations of Isaacs' syndrome include muscle cramps, fasciculations, myokymia (undulating skin movements), and pseudomyotonia (delayed muscle relaxation after contraction). While initial treatment focuses on alleviating symptoms, immune therapy was frequently necessary and can be effective, with plasmapheresis often showing positive results. Despite common symptoms such as generalized body pain, muscle stiffness, and excessive sweating reported in many cases, there are limited reports on oral-related symptoms associated with Isaacs' syndrome.[2] Paliwal described a case where electromyography identified myokymic discharges in the masseter muscle of a patient with Isaacs' syndrome who also had trismus.[3] To the best of the researchers' knowledge, there were no existing reports on dental treatment and oral management for patients with trismus.

CASE PRESENTATION

A 36-year-old male was referred to the Geriatric Dentistry and Perioperative Oral Care Center with swelling and pain around his right lower first molar. Six years earlier, he began experiencing muscle rigidity in his masticatory muscles and cramping in his lower extremities during breakfast. These symptoms worsened over time, leading to a provisional diagnosis of Isaacs' syndrome after several neurology evaluations. Two weeks before his referral, he had visited a local dentist who diagnosed chronic apical periodontitis in the same molar. However, due to Isaacs' syndrome, treatment was initially deferred, and the patient had not received any intraoral pain management because of restricted mouth opening. The patient sought further advice from his primary neurologist, resulting in a referral for more specialized dental care. Upon examination, the patient was prescribed amoxicillin 750 mg in three divided doses over three days and acetaminophen for pain relief. Two months later, he returned with recurrent pain in the same tooth, though no fistula was visible, and pain was noted on percussion. Following recent plasmapheresis therapy aimed at improving mouth opening and alleviating systemic myalgia, his mouth opening improved from 30 mm to 35 mm. To minimize the risk of pain during limited mouth opening episodes, the author recommended tooth extraction over root canal therapy and also started the fabrication of a bridge prosthesis, and an oral appliance for sleep bruxism. One-month post-plasmapheresis, the patient's mouth opening was satisfactory at over 35 mm, allowing successful bridge placement. However, it later reduced to 25 mm and then further to 16 mm after three months (Fig 1). Despite these changes, an effective oral appliance for nocturnal bruxism was successfully designed. The patient continues to receive treatment to manage periodontitis and adjust the oral appliance. Regular morning mouth-opening exercises were advised. Neurological management included pregabalin, baclofen, gabapentin, Shakuyaku-kanzo-to, and loxoprofen to address myokymia, neuromyotonia, and associated pain. Shakuyaku-kanzo-to, a traditional Japanese herbal medicine, has been used for muscle cramps and leg cramps during exercise or sleep.

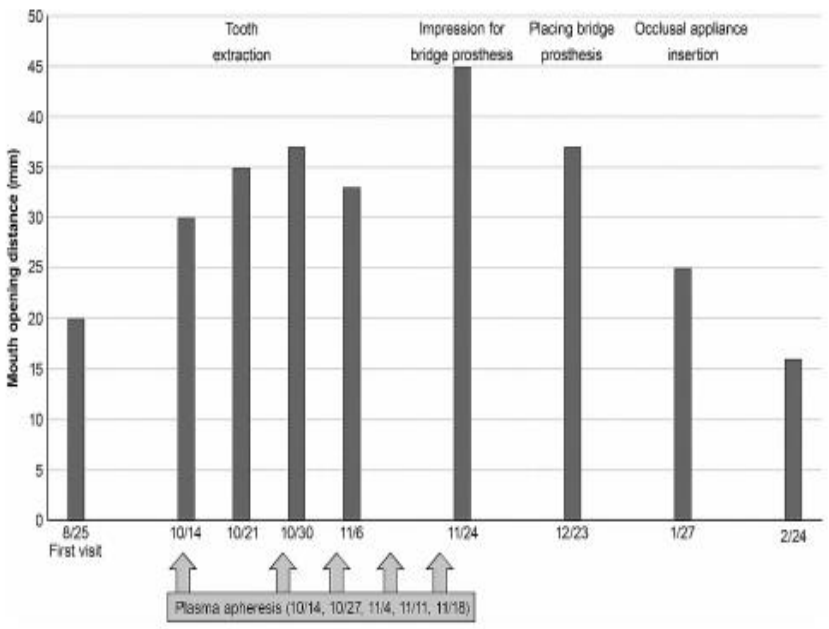

Figure 1. Over the course of five treatments of plasma apheresis (October 14, 27, November 4, 11, and 18), trismus symptoms were significantly reduced, lasting around three months. Concurrently, procedures such occlusal appliance installation, bridge prosthesis implantation, and tooth extraction were performed.

DISCUSSION

In Isaacs' syndrome, neuromyotonia begins with a phase of increasing muscle stiffness, which later progresses to widespread muscle twitching.[1,4] This clinical development is a key feature of the disorder and underscores the underlying neuromuscular overactivity.[1] Restricted mouth opening was identified as a symptom associated with neuromyotonia. Furthermore, a prior review indicated that PNH syndromes, including Isaacs' syndrome, present not only with neuromyotonia but also with chronic pain, muscle atrophy, and bulbar dysfunction.[5] Considering the possibility of symptoms like restricted mouth opening and reduced swallowing ability, ongoing clinical evaluations were crucial for a thorough assessment and management. Additionally, the patient might sometimes clench their teeth to manage pain from muscle cramps during sleep, which aligns with previous observations.[1]

CONCLUSION

Following plasmapheresis treatment, when the patient's mouth opening briefly improved, they were promptly given extensive dental care. The authors recommended that physicians and dentists work closely together in such cases.

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