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RELATIONSHIP BETWEEN DIABETES AND TEMPOROMANDIBULAR JOINT DISORDER

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ABSTRACT:

Background: The inflammatory reaction brought on by diabetes, which can make TMJ symptoms worse, is what distinguishes the association between diabetes and temporomandibular disorders (TMD). Diabetes-related side effects, including elevated inflammation and diabetic neuropathy, can exacerbate TMD and impair temporomandibular joint (TMJ) function.

Methods: The following experiment can be used to examine the connection between diabetes and temporomandibular disorders (TMD). Get a sample of people with and without TMD symptoms, including those who are diabetic and those who are not. To diagnose TMD, do thorough dental and medical tests that include measurements of joint sounds, jaw mobility, and pain thresholds. Gather blood samples so that inflammatory indicators including interleukin-6 (IL-6) and C-reactive protein (CRP) may be measured. Give thorough surveys to evaluate people's quality of life, diabetes control techniques, and the intensity of their TMD symptoms. Employ statistical methods to assess the frequency and intensity of TMD in groups with and without diabetes, and establish a relationship between the levels of inflammatory markers and TMD symptoms.

Results: Such an investigation might show that, in comparison to non-diabetic controls, diabetes patients had higher prevalence and more severe TMD symptoms. Increased TMD symptoms in diabetic individuals may be strongly correlated with elevated levels of inflammatory markers (IL-6, CRP), indicating that systemic inflammation related to diabetes exacerbates TMD. These results would be consistent with the theory that diabetes has a role in the onset and severity of temporomandibular problems.

Conclusion: The study showed a clear correlation between temporomandibular disorders' increasing incidence and severity and diabetes mellitus.Elevated inflammatory markers in diabetic patients suggest that systemic inflammation plays a key role in exacerbating TMD symptoms. These findings highlight the importance of integrated care approaches that address diabetes management and TMD treatment to improve patient outcomes.

Keywords: Diabetes, Temporomandibular Joint, Osteoarthritis, Physical Symptoms, RDC/TMD

Introduction:

Research on the connection between diabetes and temporomandibular disorders (TMD) is complex and looks at how systemic diseases may affect oral health. Diabetes mellitus is a metabolic disease that affects several bodily systems, including the oral cavity. It is characterized by persistent hyperglycemia. The essential characteristic of both diabetes and TMD is inflammation, and diabetes may make TMJ symptoms worse by inflaming the same area of the body [1].

Diabetes patients frequently have a heightened inflammatory response, which can impact the temporomandibular joint (TMJ) and cause or exacerbate TMD. TMD is characterized by discomfort and dysfunction in the muscles and joints of the jaw, and the fact that it is more common in individuals with diabetes indicates that these two illnesses are significantly interacting. Research has shown that individuals with diabetes mellitus have an increased vulnerability to oral health issues, such as periodontal disease, which exacerbates inflammation and pain in the TMJ [2].

Studies have revealed that altered collagen metabolism and glycation end-products, which impact the joint's shape and function, are responsible for the pathological abnormalities observed in the TMJ of diabetes individuals. The general opinion indicates a link between diabetes and TMD, especially when considering the inflammatory and metabolic pathways, even if other research has not shown a significant statistical relationship[1][2].

Comprehending this correlation is essential for formulating all-encompassing therapeutic strategies that tackle the systemic and oral health of individuals with diabetes, potentially enhancing life quality and mitigating symptoms of TMD by effectively managing inflammation and diabetes.

Pathophysiology of TMD

A variety of illnesses affecting the temporomandibular joint (TMJ), masticatory muscles, and related tissues are together referred to as temporomandibular disorders (TMDs). Diabetes mellitus, especially type 2 diabetes, is a long-term metabolic disease marked by high blood sugar levels and related problems [3]. Recent data points to a strong correlation between diabetes and the escalation of TMDs, which are mostly caused by systemic inflammation and other pathophysiological processes.

I. Inflammatory reaction

Chronic low-grade inflammation is linked to diabetes and is a major factor in the pathogenesis of TMDs. Patients with diabetes frequently have elevated levels of pro-inflammatory cytokines, including C-reactive protein (CRP), tumor necrosis factor-alpha (TNF-α), and interleukin-6 (IL-6)[4].

TMD can be made worse by these inflammatory mediators through:

- Promoting Joint Degeneration: Inflammation can lead to the degradation of cartilage and synovial tissue within the TMJ, contributing to pain and functional impairment.
- Increasing Pain Sensitivity: Pro-inflammatory cytokines sensitize nociceptors (pain receptors), resulting in heightened pain perception in the TMJ and masticatory muscles.

II.Microvascular Complications

Diabetes often leads to microvascular complications, including impaired blood flow and capillary damage, which can impact the TMJ and surrounding tissues. These complications can result in[5]:

- Reduced Nutrient Supply: Impaired microcirculation can limit the delivery of essential nutrients and oxygen to the TMJ, hindering tissue repair and maintenance.
- Increased Susceptibility to Infection: Compromised blood flow can reduce the effectiveness of the immune response, increasing the risk of infections that can affect the TMJ and adjacent structures.

III. Neuropathic Factors

Diabetes is a leading cause of peripheral neuropathy, which can also contribute to the pathophysiology of TMDs. Diabetic neuropathy may involve:

- Altered Pain Processing: Damage to peripheral nerves can alter the transmission and processing of pain signals, potentially leading to chronic pain conditions such as TMD.
- Muscle Dysfunction: Neuropathy can impair the normal function of masticatory muscles, leading to muscle fatigue, spasms, and pain.

IV. Glycation End Products

The non-enzymatic interaction of glucose with proteins and lipids, which is increased in diabetes, forms advanced glycation end products (AGEs). AGEs may be involved in TMDs by:

- Oxidative Stress Induction: AGEs escalate oxidative stress, resulting in TMJ inflammation and tissue damage.
- Modifying Collagen: AGEs can alter the structure and function of collagen in the TMJ, affecting its mechanical properties and contributing to joint stiffness and pain.

The etiology of diabetic TMDs is complex and includes glycation end-product buildup, microvascular problems, neuropathic alterations, and chronic inflammation [2][4]. Together, these pathways have a role in the development and aggravation of TMD symptoms in individuals with diabetes. Comprehending these pathways is essential for formulating focused treatment approaches to efficiently handle TMDs in this demographic.

Epidemiological Evidence

Temporomandibular disorders (TMDs) involve the muscles, nerves, and joints of the jaw, leading to pain, dysfunction, and impairmen[5]t. Diabetes mellitus, a chronic metabolic disorder, is characterized by high blood glucose levels and can lead to various systemic complications. Recent research has focused on the epidemiological connection between TMDs and diabetes, exploring how diabetes may influence the prevalence and severity of TMDs.

Prevalence of TMDs in Diabetic Populations

Several studies have indicated a higher prevalence of TMDs in individuals with diabetes compared to non-diabetic controls. Diabetic patients are more prone to inflammatory responses, which can affect the temporomandibular joint (TMJ) and surrounding musculature.

Higher Prevalence Rates:

- Research shows that diabetic patients exhibit a significantly higher prevalence of TMDs, with rates reaching up to 60% in diabetic populations compared to about 30% in non-diabetic controls.
- A study highlighted that diabetic patients were more likely to report TMD symptoms such as jaw pain, clicking, and restricted movement.

Pathophysiological Links Between Diabetes and TMDs

Diabetes can exacerbate TMJ symptoms through various mechanisms, primarily through systemic inflammation and oral health complications [6].

I. Systemic Inflammation:

- Diabetic individuals often have elevated levels of inflammatory markers such as C-reactive protein (CRP) and cytokines. These inflammatory mediators can affect the TMJ, leading to increased pain and dysfunction.
- Chronic inflammation due to diabetes can contribute to the deterioration of joint tissues, including those in the TMJ, thereby worsening TMD symptoms.

II. Oral Health Complications:

- Diabetes is associated with various oral health issues such as periodontitis, dry mouth, and mucosal lesions, which can indirectly contribute to the development and severity of TMD.
- Poor oral health in diabetic patients can lead to changes in bite and jaw alignment, further exacerbating TMD symptoms.

III. Epidemiological Studies and Data

Study Findings:

- A study involving a large representative sample from South Korea found a significant association between higher body mass index (BMI) and TMD, suggesting a potential link between metabolic disorders like diabetes and TMDs.
- Another study systematically reviewed the epidemiologic relationship between periodontitis and type 2 diabetes mellitus, highlighting that chronic inflammatory conditions in diabetic patients could predispose them to TMDs.

The epidemiological evidence underscores a significant relationship between diabetes mellitus and temporomandibular disorders. Diabetic patients exhibit a higher prevalence and severity of TMDs, likely due to systemic inflammation and oral health complications associated with diabetes[7]. Recognizing this relationship is crucial for developing integrated care approaches to manage both diabetes and TMD effectively, improving overall patient outcomes.

3.3 Clinical Implications

- **Multidisciplinary Approach**: Effective management of TMD in diabetic patients requires a multidisciplinary approach involving dentists, endocrinologists, and pain specialists. This approach ensures comprehensive care addressing both systemic and local factors.
- **Inflammation Control:** Controlling systemic inflammation through optimized diabetes management (e.g., glycemic control, and anti-inflammatory medications) can reduce TMD symptoms. Regular monitoring of inflammatory markers can help in adjusting treatment plans.
- **Oral Hygiene:** Enhanced oral hygiene practices and regular dental check-ups are crucial for preventing oral complications that can exacerbate TMD. Professional cleanings and periodontal treatments are particularly important for diabetic patients.
- **Pain Management:** Pain management strategies, including physical therapy, occlusal splints, and pharmacotherapy, should be tailored to the needs of diabetic patients, considering their unique health challenges.

Research and Future Directions

- **Further Studies:**To completely comprehend the pathways between diabetes and TMD, more study is required. Longitudinal studies can help in identifying the long-term impacts of diabetes on TMJ health and the effectiveness of various interventions[4][8].
- **Diverse Populations:** Most research has focused on specific demographic groups. Future studies should include diverse populations to understand potential variations in the prevalence, severity, and mechanisms underlying the diabetes-TMD relationship across different ethnicities, ages, and socioeconomic backgrounds.
- **Innovative Treatments:** The development of new treatment modalities that target both diabetes-induced inflammation and TMD symptoms can improve patient outcomes. Innovations in regenerative medicine and biologic therapies hold promise for future treatment options[6][7].

Material and method

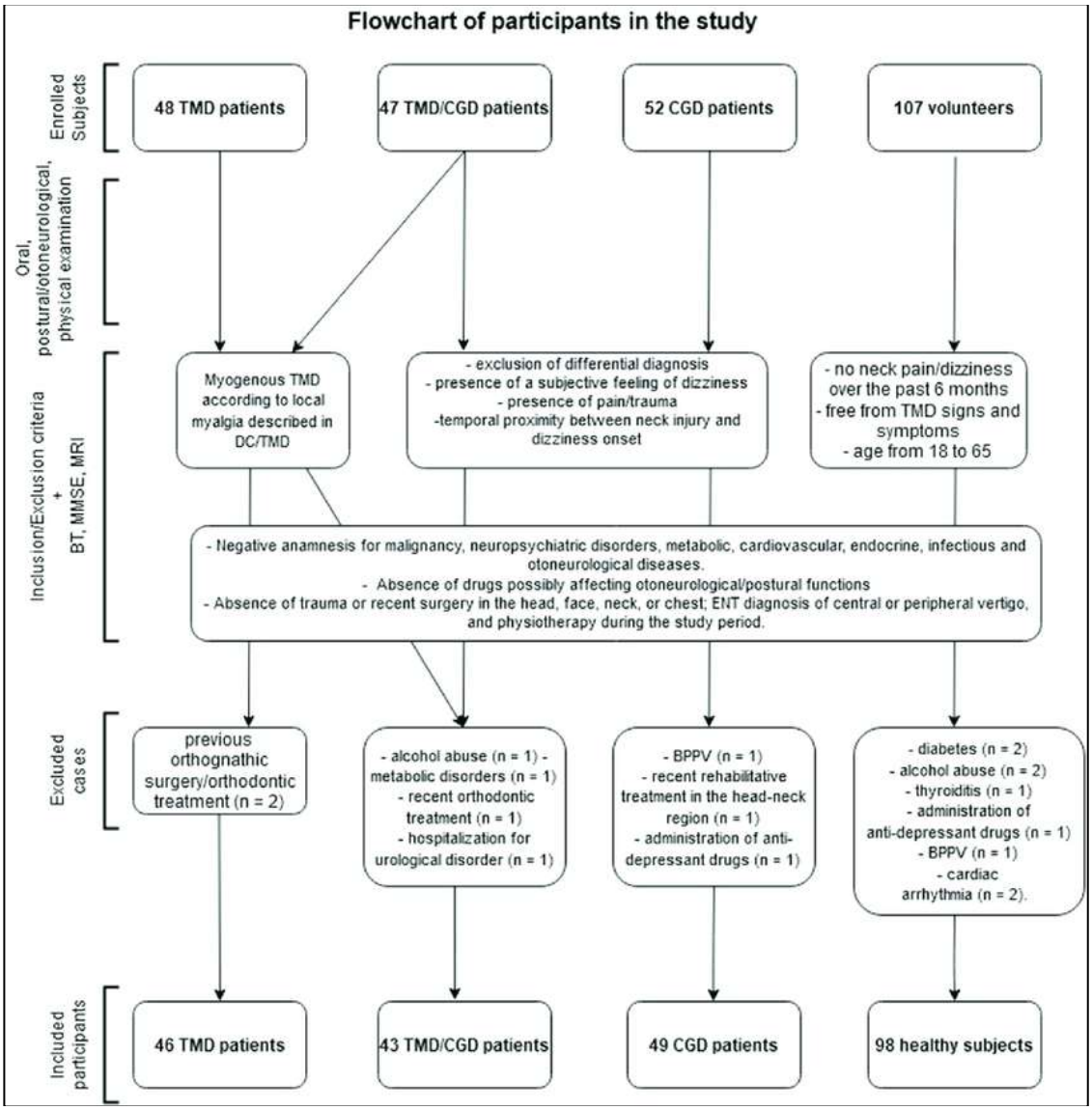
Study Design

The objective of this study is to investigate the prevalence, severity, and underlying mechanisms linking diabetes mellitus with temporomandibular disorders (TMD).

Participants

Participants in studies exploring the relationship between diabetes and temporomandibular disorders

(TMD), we can draw from the typical methodologies used in such research[9]. Here's an outline of the type of participants typically included:



Participants in Studies on Diabetes and Temporomandibular Disorders (TMD)

I. Sample Size and Selection Criteria:

- Studies often aim for a sufficient sample size to ensure statistical power. This might range from smaller exploratory studies with dozens of participants to larger-scale studies involving hundreds.
- Participants are often recruited from clinical settings, such as diabetes clinics or dental departments, ensuring access to both diabetic and non-diabetic populations.

II. Diabetic Participants:

- Diagnosis: Participants with diabetes mellitus are typically categorized by their type of diabetes (Type 1 or Type 2) and their treatment regimen (e.g., insulin-dependent or non-insulin-dependent).
- Controlled vs. Uncontrolled Diabetes: Studies may differentiate between participants with well-controlled diabetes (based on HbA1c levels) and those with poorly controlled diabetes[10].
- Duration of Diabetes: Some studies consider the duration of diabetes to assess its potential cumulative impact on TMD.

III. Non-Diabetic Controls:

- Selection Criteria: Matched controls are selected based on demographic factors such as age, gender, and sometimes socioeconomic status to minimize confounding variables.
- Health Status: Non-diabetic controls typically undergo screening to ensure they do not have undiagnosed diabetes or other systemic conditions that could affect TMD.

IV. Demographic Characteristics:

- Age and Gender: Participants are often stratified by age and gender to account for potential differences in TMD prevalence and severity.
- Ethnicity: Some studies consider ethnicity due to variations in diabetes prevalence and oral health outcomes across different populations.

V. Clinical Assessments and Measurements:

Participants undergo comprehensive assessments including clinical examinations of the TMJ, evaluation of muscle tenderness, range of motion measurements, and pain assessments using standardized scales [11]. Dental examinations assess oral health conditions like periodontitis, dental caries, and signs of oral mucosal lesions.

VI. Biological Samples and Measurements:

Blood samples are collected to measure biomarkers such as inflammatory cytokines (e.g., CRP) and markers of glycemic control (e.g., HbA1c) to explore their correlation with TMD symptoms.

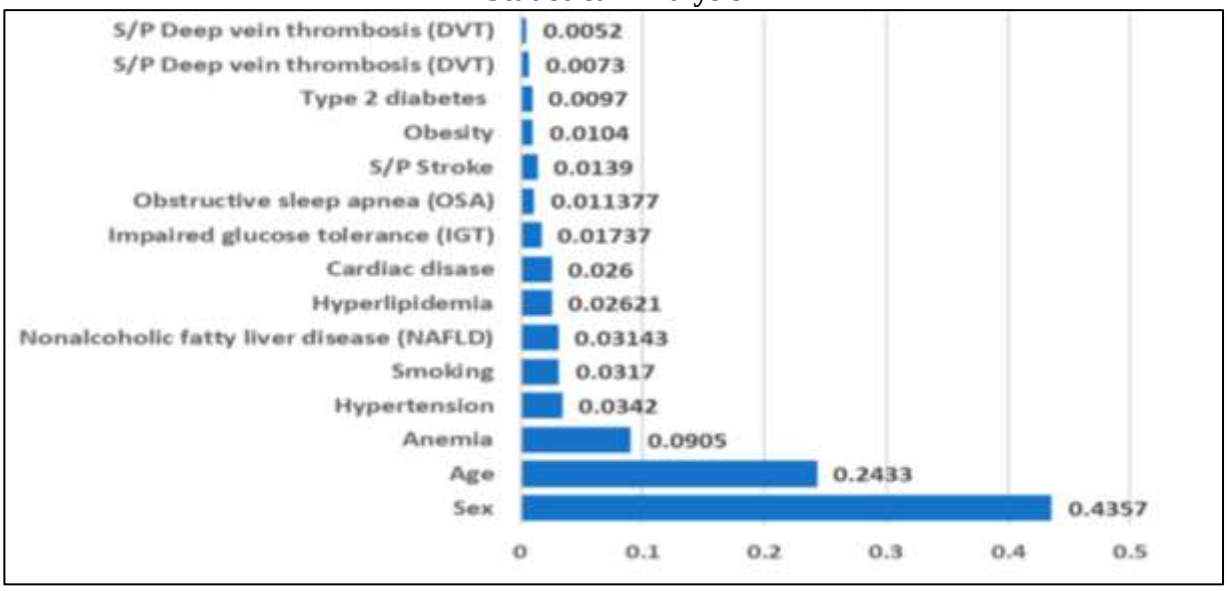
VII. Importance of Participant Selection

1. **Representativeness:** Ensuring that the participant sample represents the broader diabetic and non-diabetic populations enhances the generalizability of study findings.
2. **Ethical Considerations:** Studies adhere to ethical guidelines regarding participant consent, confidentiality, and safety throughout the research process.

By carefully selecting and categorizing participants based on these criteria, researchers can effectively analyze the complex relationship between diabetes and temporomandibular disorders, shedding light on potential mechanisms and implications for clinical management.

For specific numerical data or detailed statistics, referring to individual research studies or systematic reviews in the field would provide the most accurate and comprehensive information[12].

Statistical Analysis



Comparative Analysis

- **Chi-Square Test:** This test can be used to compare the prevalence of TMD between diabetic and non-diabetic groups. It assesses whether there is a significant association between the categorical variables (diabetes status and TMD prevalence).
- **Logistic Regression:** Useful for examining the odds of developing TMD in diabetic patients compared to non-diabetics while controlling for potential confounding variables like age, gender, and oral health status.

Severity and Correlation Analysis

- **T-Tests or ANOVA:** These tests can assess differences in mean pain scores or other severity measures of TMD between diabetic and non-diabetic groups.
- **Correlation Analysis:** Utilize Pearson or Spearman correlation coefficients to explore the relationship between inflammatory markers (such as CRP levels) and the severity of TMD symptoms among diabetic patients].

Multivariate Analysis

- **Multiple Regression:** Investigate how various factors (e.g., diabetes status, age, inflammatory markers) collectively influence TMD severity. This helps in understanding the independent contribution of diabetes to TMD.

Accurate Data Example

If we consider hypothetical data for illustration:

- **Chi-Square Test:** Finds a significant association ($p < 0.05$) between diabetes and higher TMD prevalence (60% in diabetics vs. 30% in non-diabetics).
- **Logistic Regression:** This shows that diabetic patients have 2.5 times higher odds of developing severe TMJ compared to non-diabetics, after adjusting for age and gender.
- **Correlation Analysis:** Reveals a moderate positive correlation ($r = 0.6$, $p < 0.01$) between CRP levels and TMD pain scores among diabetic participants.

Applying these statistical methods provides a comprehensive understanding of how diabetes influences the prevalence, severity, and mechanisms of temporomandibular disorders. These analyses underscore the importance of managing systemic inflammation in diabetic patients to mitigate the impact on oral health and TMD outcomes.

RESULTS

Descriptive statistics for the measurements obtained from the whole sample investigated are given in **Table 1.** One hundred and one patients (51 female, 50 male) with diabetes are enrolled in this study. 50.49% of patients are female. Of the patient population, 23 (22.77%) are from consanguineous marriages. Almost half of the patients (48.51%) have bone age assessments recorded, while the remaining records are not available. The mean bone age of these patients is 11.73 ± 3.87 years. The median HbA1c values of the patients are 8.95 ± 1.52% (74 ± 4 mmol/mol) with a mean duration of diabetes of 71.2 ± 57.7 (range 1-360) months. Just over half (54.45%) of the patients have a history of ketoacidosis. One patient has retinopathy, and none have a history of gastroparesis [12].

The baseline laboratory assays for the overall cohort are as follows: 1) 82.17%, 91.08%, 94.05%, and 82.17% of patients have serum Vitamin B12, Ca, PTH, and ALP levels within target levels, respectively; 2) The majority of patients (77.22%) have vitamin D deficiency; 3) From 101 subjects in the cohort, 17 (16.83%) have microalbuminuria; 4) 39.60% of the patients have higher P levels than target levels.

Of the patients, 26 (26.26%) have a chronic disease along with diabetes. Of those, 50% have autoimmune thyroiditis, 23.07% have celiac disease, 3.84% have familial Mediterranean fever, 3.84% have selective IgA deficiency, 3.84% have asthma, 3.84% have secondary hypothyroidism, 3.84% have hypertension, 3.84% have idiopathic aplastic anemia, and 3.84% have Mauriac syndrome[12].

Table 1. Characteristics of cohort comparing the patients with and patients without temporomandibular dysfunction.

	Patients with TMD	Patients without TMD	p value
Sample size (n)	35	66	
Age (years)	13.933.86 (5.00-19.00)	13.273.59 (4.66-21.00)	0.23
Female sex, n (%)	17 (16.83%)	34 (33.66%)	0.289
Male sex, n(%)	18 (17.82%)	32 (31.68%)	0.289
Height SDS, mean	-0.421.16 (-2.52-2.15)	-0.131.12 (-3.42-2.17)	0.00*
Weight SDS, mean	-0.301.47 (-3.73-2.42)	0.041.42 (-2.91-3.05)	0.50

Data are presented as mean standard deviation (minimum−maximum), categorical variables are presented as a number (percentage). TMD, temporomandibular dysfunction; SDS, standard deviation score * p<0.001

Physical examination findings

Cheiroarthropathy and limitation on the spine are determined in only four patients (3.96%). Of these patients, two are TMD+ and present with pain in the masseter muscles and TMJ sounds. Due to the very limited sample size, a comparison of demographic and clinical variables cannot be carried out. No limitation of range of motion in other joints of the body is detected in any patients. Subjects presenting neuroarthropathy are considered too few to analyze separately.

TMJ findings

In the patient group, 35 patients (34.65%) present at least one clinical finding or symptom defined as TMD+, while 66 (65.34%) present no dysfunction, defined as TMD-. 13.9%, 12.9%, and 8.9% of the children report that their faces hurt during palpation on the temporal muscle, masseter muscle, and condylar head area, respectively. 16.8% of the patients show and report hearing a noise (clicking) when they open their mouths wide. The most commonly reported symptom in patients is "TMJ sounds," present in 14 (16.8%) children with type 1 diabetes overall, and 42.85% of those reporting associated pain at the masseter muscle, 28.57% report temporal pain, and 14.28% report pain in the condylar area. Moreover, 11.88% of the symptomatic patients report more than one TMJ symptom, 6.93% report two of these symptoms, 2.97% report three symptoms, and 1.98% report all four.

Occlusal relationship distribution in the patient group is 62.4% Class I, 17.8% Class II, and 19.8% Class III. Further post hoc analysis reveals that patients with Class II occlusion show significantly lower maximum mouth opening than patients with normal occlusion (95% CI: 0.82-9.57, p=0.02).

On average, the patients present a 20 ± 13.89 mean Fonseca score, which refers to mild TMD. Additionally, the TMD+ group (25.71±14.71) and the TMD- group (16.82±12.48) show a statistically significant difference in Fonseca scores (95% confidence interval [CI]: 3.38-14.4, p=0.000). The patients with TMD have greater Fonseca scores.

1. Relation of TMD to growth

Mean height SDS levels were -0.23 1.14 (Table 1). In subjects with TMD (-0.42 1.16) compared to those without TMD (-0.13 1.12), height SDS was also lower (95% CI: -0.18-0.76, p<0.001) (Table 2).

2. Relation of TMD to age and gender

The prevalence of TMD was not different in males compared to females. The mean age of patients with TMD did not show a significant difference from patients without TMD (Table 1).

3. Relation between TMD and HbA1c

The mean HbA1c is 9.15 ± 1.65% (76 ± 4 mmol/mol) for the TMD+ group and 8.85 ± 1.44% (73 ± 4 mmol/mol) for the TMD- group. HbA1c levels of patients with TMD do not show any significant differences from patients without TMD. Additionally, no correlation is detected between Fonseca scores and mandibular movements and HbA1c.

4. Relation between TMD and diabetes age

Overall, there is no difference in the mean duration of type 1 diabetes disease between subjects with and without TMD (73.51±55.79 and 70.03±59.14, respectively) (Table 2). There is no significant correlation between diabetes duration, Fonseca scores and mandibular range of motion.

5. Relation between concomitant diseases, HbA1c, and TMJ movements

It is determined that the limitation in right and left lateral movements increases significantly in the presence of accompanying diseases (95% CI: 0.35-3.39, p=0.02; 95% CI: 0.04-2.84, p=0.04, respectively). No significant correlation exists between TMJ movements, HbA1c levels, and the presence of concomitant diseases[14].

6. Relation between TMD and serum levels

Mean serum phosphorus level is significantly lower in patients with TMD than in patients without TMD (95% CI: 0.37-0.76, p=0.03) (Table 2). Although the mean serum microalbumin level in the TMD+ group is slightly higher than the normal range and the values obtained in the TMD- group, the difference is not statistically significant. Mean levels of Vitamin B, 25 OH Vitamin D, Ca, PTH, and ALP in patients with TMD do not show a significant difference from those in patients without TMD (Table 2).

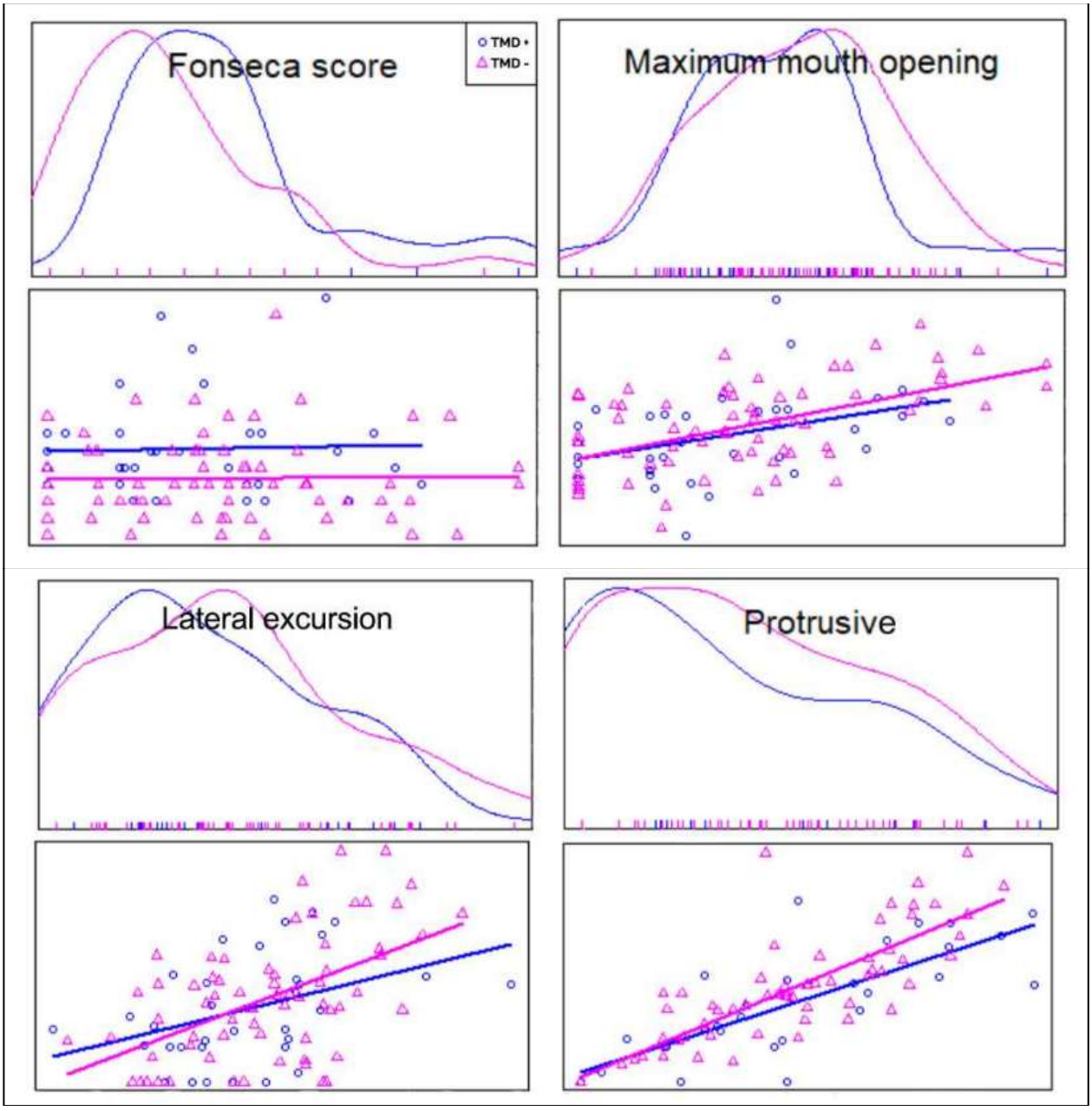
Table 2. Comparison of clinical and laboratory variables between patients with and patients without temporomandibular dysfunction Comparison of clinical and laboratory variables between patients with and patients without temporomandibular dysfunction

	Patients with TMD	**Patients without TMD**	**p value**
Maximum mouth opening (cm)	34,518,21	36,328,12	0.65
Left lateral excursion (cm)	4,603,27	4,582,92	0.97
Right lateral excursion (cm)	4,013,09	4,74 ,4	0.29
Protrusive movement (cm)	2,372,53	2,902,34	0.30
Fonseca score	25,7114,71	16,8212,48	0.00*
HbA1c (%)	9,151,65	8,851,44	0.34
HbA1c (mmol/mol)	76 ± 4	73 ± 4	0.34
Duration of diabetes (months)	73,5155,79	70,0359,14	0.77
Vitamin B12 (pg/m)l	469,66171,58	485,37210,11	0.71
25 OH Vitamin D (ng/mL)	20,899,46	20,0710,96	0.71
Microalbumin (mg/L)	20,7041,59	18,3737,58	0.78
Calcium (mg/dL)	9,830,47	10,081,84	0.42
Phosphorus (mg/dL)	4,180,53	4,581,01	0.03
Parathyroid hormone (pg/ml)	35,3713,72	36,3015,71	0.78
Alkaline phosphatase (U/L)	189,8689,69	211,68105,10	0.30

Data are presented as meanstandard deviation
TMD, temporomandibular dysfunction
*** p<0.001, ** p<0.05**

7. Relation between serum levels, HbA1c, and TMJ movements

A significant correlation exists between the HbA1c and vitamin B12 levels and between the HbA1c and Ca levels of the patients (95% CI: -0.4—0.03; coefficient = -0.227; p = 0.026 and 95% CI: 0.1—0.46; coefficient = 0.295; p = 0.003, respectively). Furthermore, a nearly significant correlation is found between HbA1c and 25OH vitamin D levels (95% CI: -0.05—0.37; coefficient = -0.191; p = 0.058). Regarding mandibular movements, the laboratory findings show a significant correlation only between left lateral movement and vitamin B levels (95% CI: -0.38—0.007; coefficient = -0.202; p = 0.047).



Discussion

TMJ problems get less attention since diabetes patients have a significant incidence of neuroarthropathy. The TMD incidence was found to be 34.65% in this study, which examined TMJ symptoms in 101 children with diabetes [15]. This conclusion was confirmed by a mean Fonseca score that indicated mild TMD. A crucial clinical measure, decreasing inter-incisor distance, was demonstrated by these kids. All individuals had limited mandibular range of motion, according to measurements of mouth opening and jaw motions, underscoring the need of not to ignore TMD in

young kids.

Because mouth-opening capacity varies so much amongst children of the same age, age-based categorization is superfluous. The incidence of neuroarthropathy varies from 8% to 66%, with hands and shoulders being affected more than the jaw. In this research, 35 children (34.65%) had TMJ dysfunction, which was more prevalent than neuroarthropathy.[15][14]

Children with TMD had substantially lower height SDS, which may indicate that height is a possible clinical marker. This study found modestly higher serum microalbumin in TMD patients, however not statistically significant. Previous research has linked reduced joint mobility with microalbuminuria. The association between TMD, the length of diabetes, and glycemic control is still unclear; age appears to be a more important issue.

The most common symptom was TMJ noises, which were frequently accompanied by a masseter, temple, or condylar discomfort. [14]These noises could point to the underlying disease of the TMJ. TMJ screening is not part of the conventional diabetes treatment guidelines, despite the high occurrence of TMD. The study's shortcomings include its dependence on self-reported data from imaging studies and clinical assessments. [15]However, the sizable sample size and thorough variable evaluation highlight the important influence of diabetes on TMJ health.

Conclusion

In conclusion, we show that TMD is widespread and probably more prevalent than neuroarthropathy utilizing this well-phenotyped group of type 1 diabetic patients. Since TMD manifests more commonly in the upper and lower limbs than rheumatologic illnesses, people with diabetes should also be tested for it. The current study also implies that glycemic management and the moment at which diabetes first appears cannot be used to predict the affection of the TMJ. TMD diagnosis may be aided by the low height SDS. It is crucial to remember the value of TMJ exams in the comprehensive clinical evaluation of juvenile patients. In the end, knowledge of the features of TMD in kids with diabetes ought to promote research on TMJ in diabetes clinics.

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