Original Research

DENTAL MEDICINE

Implications of type 1 diabetes mellitus in the etiology and clinic of dento-maxillary anomalies - questionnaire-based evaluation of the dentists' opinion

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Abstract

Background and aims. Type 1 diabetes is one of the most common chronic childhood diseases, which can be diagnosed at any age, with implications on the general development, but also on the craniofacial structure. It is widely speculated that diabetes occurs when inherited genetic characteristics are triggered by environmental factors. Oral pathology is complex and it includes a series of clinical entities: dental caries, periodontal disease, dento-maxillary anomalies, diseases of the oral mucosa, which implies a significant responsibility for the doctor, but also for society. This study aims to highlight the association of dento-maxillary anomalies with juvenile diabetes, starting from its increased prevalence among children and adolescents, the oral manifestations of diabetes mellitus and its influence on the oral microbiome, the increased incidence of periodontal and dental diseases, by means of a questionnaire.

Method. A cross-sectional study was carried out on a number of 60 dentists, between 01.01.2023 and 01.03.2024, using a questionnaire with 14 items, which was distributed by e-mail and social networks to dentists of different specialties, from various university. Before completing the questionnaire, the doctors were informed about the purpose of the study and that their answers were anonymous and did not imply any responsibility.

Results. Our results indicated awareness of the association between oral health, the presence of dento-maxillary anomalies and the pathology of type 1 diabetes, among dentists of different specialties. The most frequent changes that occur in the oral cavity in the examined patients are represented by carious lesions, reported by 21 examiners (35.00%), of which 18 (39.13%) are female, aged between 25-35 years.
Among the reported dentomaxillary anomalies, those of Angle class II were the most frequent - 17 examiners (28.33%), of which 12 (26.09%) are female reported the presence of these anomalies. The presence of Angle class I anomalies was reported by 13 examiners (21.67%) of which 9 (19.57%) are female, while 6 examiners (10.00%) reported the presence of Angle class III anomalies.

Conclusions. The evaluation of modern therapeutic methods through questionnaires distributed online represents a feedback of the tested activity and shows that most doctors know the correlations between diabetes and oro-dental diseases and have an obvious healthy attitude. The possible association between oral diseases and the presence of type 1 diabetes was reported by most of the dentists interviewed, however the information on the correlations between oral health and the presence of type 1 diabetes in children was not sufficiently explored by dentists. The dentist must know the clinical particularities of diabetes mellitus and its implications on the oral status, in order to be able to intervene effectively in reducing the oral and systemic complications of diabetes.

Keywords: type I diabetes, dento-maxillary anomaly, questionnaire, respondent, oral pathology

DOI: 10.15386/mpr-2822

Manuscript received: 23.09.2024
Received in revised form: 22.11.2024
Accepted: 29.12.2024

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Introduction

Diabetes is a group of metabolic disorders characterized by high blood sugar levels, induced by defects in insulin secretion and/or insulin sensitivity. Diabetes is a chronic disease that occurs when the pancreas can no longer produce insulin (or does not produce insulin at all), or when the body can no longer use insulin properly.

Type 1 diabetes mellitus, formerly known as insulin-dependent, juvenile or childhood-onset, is characterized by absolute insulin deficiency and requires daily insulin administration. The etiology of type 1 diabetes is multifactorial and two subtypes of this diabetes are described: autoimmune and idiopathic [1].

From what we currently know, this type of diabetes cannot be prevented. The disease usually occurs in children or young adults. Symptoms include excessive urine excretion (polyuria), thirst (polydipsia), continuous hunger, weight loss, changes in vision, and feeling tired. These symptoms can appear suddenly. Patients need insulin injections every day to control their blood glucose levels. If people with type 1 diabetes do not have access to insulin, they will die [2-4].

Risk factors are numerous and include: nutritional factors, poor hygiene, trauma, stress, smoking etc. These factors are risk factors for most chronic diseases, and oral health management strategies should be approached as a common entity in the control of general chronic diseases. The risk factors for oral and dental health have exacerbated in the meantime, at least as a result of the globalization of the food market, the increase in the supply of sweet drinks and highly processed foods, as well as the increase in the involvement of the parent in the economic life, with the decrease of the time allocated for the family and especially for the child's health education [5]. Studies in the literature found significant associations between sweet/sweetened beverage consumption and the development of new cavity carious lesions [6-8].

Oral health is important in childhood, therefore promoting a healthy attitude in schools is a socio-economic health option, thus redistributing financial resources to prevention, not to long-term dental therapy. The close bidirectional relationship between oral and general health, as well as its impact on the health and quality of life of the individual, provides a strong conceptual basis for integrating oral health care into general healthcare approaches. Policies to implement school curricula to build a positive environment for oral health are beneficial for children, regardless of the socio-economic conditions of their families [9,10].

Tooth decay is the most prevalent chronic disease worldwide, with a global prevalence of 40% for all ages, according to the Global Burden of Disease, and constitutes a major public health challenge. It is the most common childhood disease, but it affects people of all ages throughout their lives. In this context, diet and nutrition play an important role in the etiology of this condition, but also in the development and maturation of tissues and organs. The predominant effect of diet on dental integrity depends on the consistency, shape, and frequency of food consumption, as well as its composition, the time of exposure of dental tissue to food components, and oral microflora. Nutritional intake and quality have a systemic impact on the development and maintenance of dental tissue integrity [11-14].

The aim of this study was to highlight the association of dento-maxillary anomalies with juvenile diabetes, starting from its increased prevalence among children and adolescents, the oral manifestations of diabetes mellitus and its influence on the oral microbiome, the increased incidence of periodontal and dental diseases, by means of a questionnaire.

Methods

A cross-sectional study was carried out on a number of 60 dentists, between 01.01.2023 and 01.03.2024, using a questionnaire with 14 questions, which was distributed by e-mail and social networks to dentists of different specialties, from various university. Before completing the questionnaire, the doctors were informed about the purpose of the study and that their answers were anonymous and did not imply any responsibility. The analyzed variables included age, gender, environment in which they work as well as the specialty of the responding physicians, and the statistical analysis was focused on the following parameters: age and number of patients examined, weight status of patients, changes in the oral cavity as well as the presence and type of dento-maxillary anomalies

Using this 14-question multiple-choice questionnaire we were able to collect information on:

- ✓ personal data (gender, age, specialty and years of practice),
- ✓ information on the age and number of patients examined,
- ✓ patient's weight status
- ✓ knowledge about the link between type I diabetes and changes in the oral cavity
- ✓ as well as information on the presence and type of dento-maxillary anomalies.

The questionnaire had no time limit, was anonymous and most participants spent between 5 and 10 minutes to complete the entire written questionnaire.

The statistical analysis included elements of descriptive statistics (frequency, percentage, and elements of inferential statistics. The Fisher test and the Chi-square test were applied to determine the association between the qualitative variables. The materiality threshold chosen for the p-value was 0.05. The statistical analysis was performed using the GraphPad utility demo version.

Results

➢ ***Demographics***

• Most of the respondents were women (76.67%), who work in urban areas (83.33%), are under 40 years old (63.33%), have the specialty of orthodontics and orthopedics – facial dentistry (50.00%) and with less than 10 years of medical practice (48.33%) (Table I-V).

Table I. Gender distribution.

Question 4	Number	Percent
Feminine	46	76.67%
Masculine	14	23.33%
Total	60	100.00%

Table II. Environment in which they operate.

Question 5	Number	Percent
Mixed	9	15.00%
Rural	1	1.67%
Urban	50	83.33%
Total	60	100.00%

Table III. Distribution by age.

Question 3	Number	Percent
>55 years old	9	15.00%
25 – 35 years	38	63.33%
36 – 45 years old	10	16.67%
46 – 55 years	3	5.00%
Total	60	100.00%

Table IV. Distribution according to specialty.

Question 1	Number	Percent
Dento-alveolar surgery	1	1.67%
Endodontics	1	1.67%
Orthodontics	30	50.00%
Orthodontics + Pedodontic	1	1.67%
Orthodontics + General Dentistry	1	1.67%
Periodontology	1	1.67%
Pedodontics	5	8.33%
Prostheetics	3	5.00%
Prostheetics – General Dentistry	2	3.33%
General Dentistry	14	23.33%
Total	60	100.00%

Table V. Distribution of doctors according to seniority in activity.

Question 2	Number	Percent
10 - 15 years	1	1.67%
12 years	2	3.33%
15 - 20 years	4	6.67%
5 - 10 years	9	15.00%
More Than 20 years	15	25.00%
Less than 5 years	29	48.33%
Total	60	100.00%

➢ ***Data on age and number of patients examined***

• Most of the respondents declared that they have a minimum number of children under treatment (between 1-5 children - 33.33%) and 28.33% have a number > 20 under treatment (Table VI).

Table VI. Distribution according to the number of children examined per month.

Question 6	Number	Percent
>20	17	28.33%
1 – 5	20	33.33%
10 – 20	13	21.67%
5 – 10	10	16.67%
Total	60	100.00%

Table VII. Number of patients examined according to the gender of doctors.

QUESTION 6	1-5 patients	5-10 patients	10-20 patients	> 20 patients	P-value
Feminine	15 (75.00%)	7 (70.00%)	11 (84.62%)	13 (76.47%)	0.8640
Masculine	5 (25.00%)	3 (30.00%)	2 (15.38%)	4 (23.53%)	
Total	20 (100.00%)	10 (100.00%)	13 (100.00%)	17 (100.00%)	

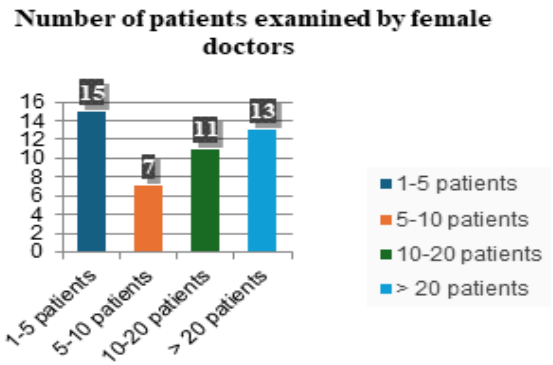

Figure1 - Number of patients examined by female doctors.

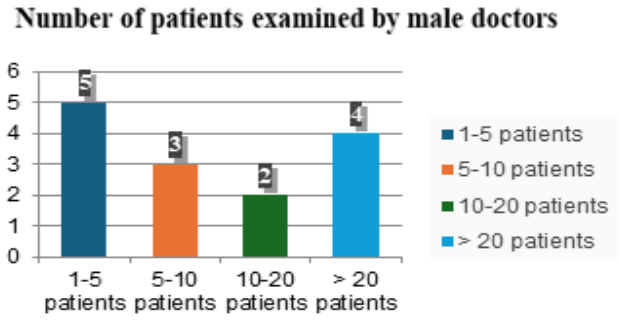

Figure 2 - Number of patients examined by male doctors.

• There is no statistically significant association between sex and the number of children, on average per month, in treatment.

Table VIII. Distribution of doctors according to age and number of patients examined.

QUESTION 6	1-5 patients	5-10 patients	10-20 patients	> 20 patients
25-35 years old	13 (65.00%)	8 (80.00%)	7 (53.85%)	10 (58.82%)
36-45 years old	3 (15.00%)	0 (0.00%)	4 (30.77%)	3 (17.65%)
46-55 years old	1 (5.00%)	1 (10.00%)	0 (0.00%)	1 (5.88%)
> 55 years old	3 (15.00%)	1 (10.00%)	2 (15.38%)	3 (17.65%)
Total	20 (100.00%)	10 (100.00%)	13 (100.00%)	17 (100.00%)

➢ ***Information on patients' weight status***

• Analyzing the respondents' answers to question number 8, we can see that 57 examiners (95.00%) declared that the patients examined by them were normal weight, 16 examiners (26.67%) declared that they had overweight patients, while 7 (11.67%) had underweight patients (Table IX).

Table IX. Weight status of the examined children.

QUESTION 8	Number	Percent
Underweight	7	11.67%
Normal weight	57	95.00%
Overweight	16	26.67%

➢ ***Information on the link between type I diabetes and changes in the oral cavity***

• 71.67%, (43) of the respondents stated that they did not identify the presence of type 1 diabetes in the group of children examined, while 28.33%, 17 also identified the presence of type 1 diabetes (Table X).

Table X. Number of physicians who have identified type 1 diabetes as associated.

	Number	Percent
Yes	17	28.33%
No	43	71.67%
Total	60	100.00%

• Of the 17 examiners who identified the presence of type 1 diabetes, 12 examiners (70.59%) were female and 5 (29.41%) were male (Table XI).

• From the analysis of the answers to question number 9 of the questionnaire, it can be seen that there is no statistically significant association between gender, age and the identification of associated type 1 diabetes (Figures 3, 4).

Table XI. Identification of the presence of type 1 diabetes by gender of examining physicians.

QUESTION 9	Yes, we have identified type 1 diabetes associated	We have not identified type 1 diabetes associated	P-value
Feminine	12 (70.59%)	34 (79.07%)	
Masculine	5 (29.41%)	9 (20.93%)	0.5114
Total	17 (100.00%)	43 (100.00%)	

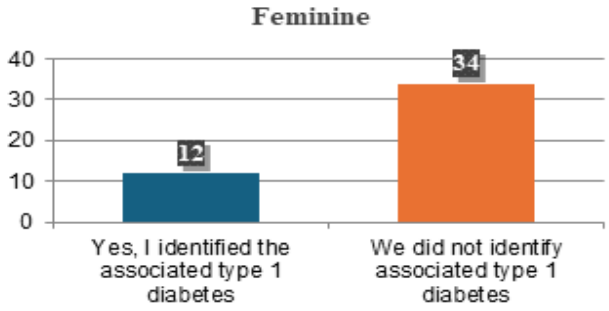

Figure 3 - Number of female doctors who identified type 1 diabetes.

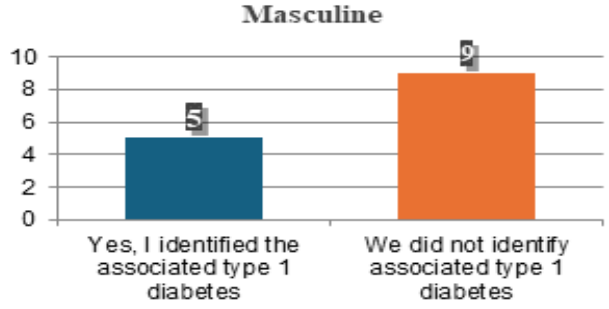

Figure 4 - Number of male doctors who identified type 1 diabetes.

Table XII. There is no statistically significant association between age and the identification of associated type 1 diabetes.

QUESTION 9	Yes, we have identified type 1 diabetes associated	We have not identified type 1 diabetes associated	P-value
25-35 years old	10 (58.82%)	28 (65.12%)	0.1680
36-45 years old	1 (5.88%)	9 (20.93%)	
46-55 years old	1 (5.88%)	2 (4.62%)	
> 55 years old	5 (29.41%)	4 (9.30%)	
Total	17 (100.00%)	43 (100.00%)	

• Analyzing the answers to question number 10, it can be seen that a number of 18 doctors (30.00%) identified a maximum of 5 children with type 1 diabetes, 4 doctors (6.67%) identified a number between 5-10 patients, while 37 doctors (61.67%) did not identify any patients (Table XIII).

Table XIII. Number of patients identified with type 1 diabetes by examining physicians.

QUESTION 10	Number	Percent
10 patients	1	1.67%
1-5 patients	18	30.00%
5-10 patients	4	6.67%
No patients	37	61.67%
Total	60	100.00%

• Of the respondents who identified the presence of type 1 diabetes, 3 examiners (72.22%) were female and 5 examiners (27.78%) were male (Table XIV).

Table XIV. Gender distribution.

QUESTION 10	1-5	5-10	>10	None
Feminine	13 (72.22%)	3 (75.00%)	0 (0.00%)	30 (81.08%)
Masculine	5 (27.78%)	1 (25.00%)	1 (100.00%)	7 (18.92%)
Total	18 (100.00%)	4 (100.00%)	1 (100.00%)	37 (100.00%)

• If we analyze the age of the examiners who reported the presence of patients with associated type 1 diabetes, we will notice that most of them are between 25-35 years old, i.e. 13 doctors (72.22%) (Table XV).

Table XV. Distribution by age.

QUESTION 10	1-5	5-10	>10	None
25-35 years old	13 (72.22%)	2 (50.00%)	1 (100,00%)	22 (59.46%)
36-45 years old	1 (5.56%)	1 (25.00%)	0 (0.00%)	8 (21.62%)
46-55 years old	0 (0.00%)	1 (25.00%)	0 (0.00%)	2 (5.41%)
> 55 years old	4 (22.22%)	0 (0.00%)	0 (0.00%)	5 (13.51%)
Total	18 (100.00%)	4 (100.00%)	1 (100.00%)	37 (100.00%)

➢ ***Medical information regarding the changes that occur in the oral cavity as well as the presence and type of dento-maxillary anomalies***

Among the most frequent changes that occur in the oral cavity in the examined patients, the highest frequency reported by the examiners is carious lesions, 21 examiners (35.00%), 18 female;

• examiners (39.13%), and 13 examiners (34.21%) are aged between 25-35 years (Table XVI-XVIII).

• The most frequent changes that were detected following the analysis of the OPGs performed were simple carious lesions reported by 20 examiners (33.33%) followed by complicated carious lesions reported by 17 examiners (28.33%) (TableXIX).

Table XVI. Changes in the oral cavity.

QUESTION 11	Frequency	Percent
Accelerated eruption	6	10.00%
Delayed eruption	6	10.00%
Gingivitis and bleeding	1	1.67%
Numerous cavities	21	35.00%
TMJ Pathologies	1	1.67%
Plaque/Tartar	22	36.67%
We have not identified patients with type 1 diabetes	33	55.00%
No changes	4	6.67%
Total	60	100.00%

Table XVII. Changes in the oral cavity identified according to the gender of the examining physicians.

QUESTION 11	Feminine	Masculine
Accelerated eruption	5 (10.87%)	1 (7.14%)
Delayed eruption	4 (8.70%)	2 (14.28%)
Gingivitis and bleeding	1 (2.17%)	0 (0.00%)
Numerous cavities	18 (39.13%)	3 (21.43%)
TMJ Pathologies	1 (2.17%)	0 (0.00%)
Plaque/Tartar	16 (34.78%)	6 (42.86%)
We have not identified patients with type 1 diabetes	27 (58.70%)	6 (42.86%)
No changes	1 (2.17%)	3 (21.43%)
Total	46 (100.00%)	14 (100.00%)

Table XVIII. Changes in the oral cavity identified by age of the examining physicians.

QUESTION 11	25-35 years old	36-45 years old	46-55 years old	> 55 years old
Accelerated eruption	5 (13.16%)	1 (10.00%)	0 (0.00%)	0 (0.00%)
Delayed eruption	4 (10.53%)	1 (10.00%)	0 (0.00%)	1 (11.11%)
Gingivitis and bleeding	1 (2.63%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Numerous cavities	13 (34.21%)	2 (20.00%)	2 (66.67%)	4 (44.44%)
TMJ Pathologies	1 (2.63%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Plaque/Tartar	14 (36.84%)	2 (20.00%)	2 (66.67%)	4 (44.44%)
We have not identified patients with type 1 diabetes	20 (52.63%)	8 (80.00%)	1 (33.33%)	4 (44.44%)
No changes	3 (7.89%)	0 (0.00%)	0 (0.00%)	1 (11.11%)
Total	38 (100.00%)	10 (100.00%)	3 (100.00%)	9 (100.00%)

Table XIX. Changes observed on the OPG (orthopantomogram).

QUESTION 12	Frequency	Percent
Presence of simple carious lesions	20	33.33%
Presence of complicated carious lesions	17	28.33%
Resorptions	7	11.67%
We have not identified patients with type 1 diabetes	33	55.00%
No changes	4	6.67%
Total	60	100.00%

• The presence of simple carious lesions was reported by 15 female examiners (32.61%), 5 female examiners (35.71%), and complicated ones were reported by 14 female examiners (30.43%), compared to those reported by males, 5 examiners (35.71%) reported the presence of simple carious lesions, and 3 examiners (21.43%) reported the presence of simple carious lesions. complicated carious lesions (Table XX).

Table XX. Reporting of changes by gender.

QUESTION 12	Feminine	Masculine	P-value
Presence of simple carious lesions	15 (32.61%)	5 (35.71%)	0.1425
Presence of complicated carious lesions	14 (30.43%)	3 (21.43%)	
Resorptions	5 (10.87%)	2 (14.29%)	
We have not identified patients with type 1 diabetes	27 (58.70%)	6 (42.86%)	
No changes	1 (2.17%)	3 (21.43%)	
Total	46 (100.00%)	14 (100.00%)	

• There is no statistically significant association between gender and observation changes on OPG.

Table XXI. Reporting of observed changes by age of the examiner.

QUESTION 12	25-35 years old	36-45 years old	46-55 years old	> 55 years old
Presence of simple carious lesions	13 (34.21%)	2 (20.00%)	2 (66.67%)	3 (33.33%)
Presence of complicated carious lesions	9 (23.68%)	3 (30.00%)	1 (33.33%)	4 (44.44%)
Resorptions	3 (7.89%)	1 (10.00%)	1 (33.33%)	2 (22.22%)
We have not identified patients with type 1 diabetes	20 (52.63%)	8 (80.00%)	1 (33.33%)	4 (44.44%)
No changes	3 (7.89%)	0 (0.00%)	0 (0.00%)	1 (11.11%)
Total	38 (100.00%)	10 (100.00%)	3 (100.00%)	9 (100.00%)

• From the analysis of the answers to question number 13, it can be seen that the most frequent anomalies reported by the examiners were those of class II Angle: 17 examiners (28.33%) and 12 examiners (26.09%) are female, 13 examiners (21.67%) reported the presence of class I Angle anomalies, 9 examiners (19.57%) are female, while 6 (10.00%) reported the presence of class III Angle anomalies (Table XXII).

Table XXII. Type of dento-maxillary anomalies identified.

QUESTION 13	Frequency	Percent
Cls I Angle Anomaly	13	21.67%
Anomalies from Cls to –II- to Angle	17	28.33%
Anomalies from Cls to –III- to Angle	6	10.00%
We have not identified patients with type 1 diabetes	34	56.67%
Total	60	100.00%

Table XXIII. Distribution by gender of examiners who detected the presence of dento-maxillary anomalies.

QUESTION 13	Feminine	Masculine	P-value
Cls I Angle Anomaly	9 (19.57%)	4 (28.57%)	0.5105
Anomalies from Cls to –II- to Angle	12 (26.09%)	5 (35.71%)	
Anomalies from Cls to –III- to Angle	5 (10.87%)	1 (7.14%)	
We have not identified patients with type 1 diabetes	29 (63.04%)	5 (35.71%)	
Total	46 (100.00%)	14 (100.00%)	

• There is no statistically significant association between gender and observation of dental abnormalities (Table XXIII).

Table XXIV. Age distribution of examiners who detected the presence of dento-maxillary anomalies.

QUESTION 13	25-35 years old	36-45 years old	46-55 years old	> 55 years old
Cls I Angle Anomaly	8 (21.05%)	1 (10.00%)	0 (0.00%)	4 (44.44%)
Anomalies from Cls to –II- to Angle	11 (28.95%)	3 (30.00%)	1 (33.33%)	2 (22.22%)
Anomalies from Cls to –III- to Angle	4 (10.53%)	1 (10.00%)	0 (0.00%)	1 (11.11%)
We have not identified patients with type 1 diabetes	20 (52.63%)	8 (80.00%)	2 (66.67%)	4 (44.44%)
Total	38 (100.00%)	10 (100.00%)	3 (100.00%)	9 (100.00%)

➢ ***Medical information on recommendations made to patients***

Analyzing the answers provided by respondents to question number 14 of the questionnaire, it can be seen that 24 examiners (40.00%), of which 17 are female (36.96%), recommended proper tooth brushing; 17 examiners (28.33%) of which 14 (30.43%) are female recommended reducing carbohydrate consumption; 18 examiners (30.00%), of which 14 (30.43%) are female, recommended periodic check-ups with a diabetologist; 18 examiners (30.00%) recommended an orthodontic consultation and are also female and aged between 25-35 (Tables XXV-XXVII).

Table XXV. Recommendations indicated to patients.

QUESTION 14	Frequency	Percent
Orthodontic consultation	18	30.00%
Periodic check-ups with the diabetologist	18	30.00%
Professional sanitation 3-4 times a year	1	1.67%
Dental brushing associated with auxiliary means (mouthwash, dental floss)	24	40.00%
Reducing carbohydrates in the diet	17	28.33%
We have not identified patients with type 1 diabetes	33	55.00%
No recommendations	2	3.33%
Total	60	100.00%

Table XXVI. Gender distribution of examiners who indicated various recommendations.

QUESTION 14	Feminine	Masculine
Orthodontic consultation	14 (30.43%)	4 (28.57%)
Periodic check-ups with the diabetologist	14 (30.43%)	4 (28.57%)
Professional sanitation 3-4 times a year	1 (2.17%)	0 (0.00%)
Dental brushing associated with auxiliary means (mouthwash, dental floss)	17 (36.96%)	7 (50.00%)
Reducing carbohydrates in the diet	14 (30.43%)	3 (21.43%)
We have not identified patients with type 1 diabetes	27 (58.70%)	6 (42.86%)
No recommendations	1 (2.17%)	1 (7.14%)
Total	46 (100.00%)	14 (100.00%)

Table XXVII. Age distribution of examiners who indicated various recommendations.

QUESTION 14	25-35 years old	36-45 years old	46-55 years old	> 55 years old
Orthodontic consultation	10 (26.32%)	2 (20.00%)	2 (66.67%)	4 (44.44%)
Periodic check-ups with the diabetologist	10 (26.32%)	2 (20.00%)	2 (66.67%)	4 (44.44%)
Professional sanitation 3-4 times a year	1 (2.63%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Dental brushing associated with auxiliary means (mouthwash, dental floss)	15 (39.47%)	2 (20.00%)	2 (66.67%)	5 (55.56%)
Reducing carbohydrates in the diet	10 (26.32%)	2 (20.00%)	2 (66.67%)	3 (33.33%)
We have not identified patients with type 1 diabetes	20 (52.63%)	8 (80.00%)	1 (33.33%)	4 (44.44%)
No recommendations	2 (5.26%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Total	38 (100.00%)	10 (100.00%)	3 (100.00%)	9 (100.00%)

Discussion

There is little data in the literature that assess dentists' knowledge of the correlation between oral health, the presence of dento-maxillary anomalies and the association with type 1 diabetes. Our results indicated awareness of the association between oral health, the presence of dento-maxillary anomalies and the pathology of type 1 diabetes among dentists of different specialties.

This information is extremely important in the practical approach of patients with dentomaxillary anomalies with type 1 diabetes. In the study published by Cresio Alves et al., in 2013 [15] it was demonstrated that there was no difference between DMF-T and def-t values in diabetics and non-diabetics. Using the World Health Organization's target of a DMF-T index of less than 3 in the descriptive analysis of T-DMF values by age range, Cresio Alves et al. (2013) found that diabetic individuals aged 10-14 years and 15-18 years had higher levels of DMF-T compared to the WHO target.

Most of the respondents were female (76.67%), from urban areas (83.33%), under 40 years old (63.33%), being specialists of orthodontics and orthopedics – facial dentistry (50.00%) and had less than 10 years of medical practice (48.33%) Most of the respondents stated that they had a minimum number of children in treatment (between 1-5 children - 33.33%) and 28.33% had a number > 20 under treatment. These data are random and depend on the specialty of the doctor surveyed (Pedodontics and Orthodontics), but also on the availability of general dentists to treat children. Young doctors are better informed about the latest technologies in the profession, through easy access to digital techniques, as noted by other observational studies (Table I-V).

Analyzing the respondents' answers to question number 8, we can see that a large percentage of examiners (95.00%) stated that the patients examined were normal weight, and a percentage of 26.67% of the examiners declared that they had overweight patients, while 7 (11.67%) had underweight patients (Table IX). One of the multitude of factors that influence both dental and skeletal development is the BMI (body mass index) [16]. The relationship between nutritional status, obesity/diabetes and dental development has been much studied in the literature, but the final results are contradictory. The first to investigate the relationship between BMI and dental development were Dupleiss et al., Kumar et al [17,18]. Studies in the literature have shown that obesity and increased weight in children are associated with an advance in dental and skeletal terms and with the possibility of carious lesions (insufficient mineralization of dental hard tissues).

An increased percentage of respondents - 71.67%, (n=43)- stated that they did not identify the presence of type 1 diabetes in the group of children examined, while 28.33% (n=17) also identified the presence of type 1 diabetes. Of the 17 examiners who identified the presence of type 1 diabetes, 12 examiners (70.59%) were female and 5 (29.41%) were male (Tables X-XI).

Among the most frequent changes that occur in the oral cavity in the examined patients, the highest frequency reported by the examiners is carious lesions, 21 examiners (35.00%), 18 female examiners (39.13%), and 13 examiners (34.21%) are aged between 25-35 years (Tables XVI-XVIII).

The most frequent changes that were detected following the analysis of the OPGs performed were simple carious lesions reported by 20 examiners (33.33%) followed by complicated carious lesions reported by 17 examiners (28.33%). The orthopantomogram is a routine investigation of the dental system, with multiple dental

and bone visualizations, a simple, inexpensive technique, increasingly indicated in dental practice. The radiation doses captured by the body at the time of an orthopantomogram are quite low, as Dula et al state [19,20] (Table XIX).

The presence of simple carious lesions was reported by 15 female examiners (32.61%), and complicated ones were reported by 14 female examiners (30.43%), compared to those reported by males, 5 examiners (35.71%) reported the presence of simple carious lesions, and 3 examiners (21.43%) reported the presence of complicated carious lesions. Diabetes frequently correlates with dry mouth, due to the significant decrease in the amount of saliva and, because of this, there is a high probability of tooth decay, infections and oral lesions as reported by recent studies in the literature [21,22] (Table XX).

From the analysis of the answers to question number 13, it can be seen that the most frequent anomalies reported by the examiners were those of class II Angle, 17 examiners (28.33%) and 12 examiners (26.09%) are female, 13 examiners (21.67%) reported the presence of class I Angle anomalies, 9 examiners (19.57%) are female, while 6 (10.00%) reported the presence of class III Angle anomalies (Table XXII-XXIII).

Analyzing the answers provided by respondents to question number 14 of the questionnaire, it can be seen that 24 examiners (40.00%), of which 17 are female (36.96%) recommended proper tooth brushing; 17 examiners (28.33%) of which 14 (30.43%) are female, recommended reducing carbohydrate consumption; 18 examiners (30.00%), of which 14 (30.43%) are female, recommended periodic check-ups with a diabetologist; 18 examiners (30.00%) recommended an orthodontic consultation and are also female and aged between 25-35. Reducing carbohydrate consumption and physical activities represent two of the major objectives indicated by the diabetologist (Table XXV-XXVII). The number of diabetes cases in Romania has increased year by year since 2012, the biggest increase was in 2018, namely in Bucharest (48,911 cases). Comparing the number of cases from 2021 compared to 2020, we find that the biggest increases have been in: Bucharest with 5473 (from 159,640 in 2020 to 165,113 in 2021), Călărași with 4204 (from 10,247 in 2020 to 14,451 in 2021), Cluj with 3580 (from 28,417 in 2020 to 31,997 in 2021). The biggest decreases were in: Caraș-Severin with 3027 (from 21,179 in 2020 to 18,152 in 2021), Brăila with 3026 (from 18,552 in 2020 to 15,526 in 2021), Dolj with 1535 (from 49,655 in 2020 to 48,120 in 2021). There were increases in 35 counties and decreases in 5 counties [24].

Conclusions

✓ The evaluation of modern therapeutic methods through questionnaires distributed online represents a feedback of the tested activity and shows that most doctors know the correlations between diabetes and oro-dental diseases and have an obvious healthy attitude.

✓ The possible association between oral diseases and the presence of type 1 diabetes was reported by most of the dentists interviewed, however the information on the correlations between oral health and the presence of type 1 diabetes in children was not sufficiently deepened by dentists.

✓ The dentist must know the clinical particularities of diabetes mellitus and its implications on the oral status, in order to be able to intervene effectively in reducing the oral and systemic complications of diabetes

✓ The information can be used for future continuing education programmes dedicated to specialists involved in this field.

✓ The novelty of this study consists in the approach of an orthodontic pathology in a population segment with dysmetabolic impairment and the establishment of the correlations between diabetes as an etiological and aggravating factor of dento-maxillary anomalies.

✓ Considering the importance of the subject and the limited availability of specialized literature, the results of this study could justify the realization of further additional research on the oral health of children with type I diabetes.

Limits

✓ A limitation of this study was the low number of respondents and the way in which responses were distributed and collected, and some of the participants may have misunderstood the questions.

✓ Because participants in this study were not chosen in a way that represents a large number of dentists, the results may be difficult to generalize.

✓ In questionnaire-based studies, participants may not answer honestly because of factors such as the desire to be perceived positively (social conformity bias) or because of questions perceived as invasive.

✓ To reduce these limitations, future studies should be well-planned, with a representative sample and clearly formulated questions, and data analysis should be conducted as objectively as possible.

Acknowledgement

We would like to thank all the doctors who participated in this study and who made this study possible.

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