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## ASSESSMENT OF THE RELATIONSHIP OF DENTAL ANOMALIES WITH SKELETAL MALOCCLUSIONS IN KOSOVO SUBJECTS

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**Abstract:** Dental anomalies are common disorders in clinical practice. Their frequency prevents the normal positioning of other teeth within the arch resulting in occlusal changes and facial growth. Early diagnosis and intervention reduce complications. The primary aim of this study was to evaluate the prevalence of dental anomalies according to frequency, distribution and gender status. As a secondary outcome, the study examined the correlation between dental anomalies and skeletal malocclusions in the sagittal direction.

**Material and method:** the study includes 100 patients of both sexes. Through intraoral clinical examination, orthopantomography analysis and study models, dental abnormalities were evaluated according to groups (number, size, shape, position and structure of teeth); gender and affected teeth in the maxilla and mandible. In lateral cephalometric, the skeletal ratio was analyzed in the posterior-anterior direction where the ANB angle was determined as class I malocclusion (from 2° to 4°), class II malocclusion (> 4°) and class III malocclusion (< 2°).

**Conclusion:** rotation and inclination were the most frequent 50 (50.0%) and the rarest were 5 (5.0%) concrescence and dens invaginatus 5 (5.0%). Of the patients, 51 (51.0%) had two dental anomalies, 24 (24.0%) had three dental anomalies, 14 (14.0%) had one dental anomaly. Hypodontia 5 (62.5%) and microdontia 4 (50.0%) were associated with skeletal class III, a statistically significant association was observed for  $p < 0.05$ .

**Keywords:** dental anomalies, skeletal malocclusion, ANB angle.

### 1. INTRODUCTION

Genetic mechanisms have more influence on the morphogenesis of the craniofacial structure during embryonic life, while environmental factors influence developing occlusion, especially during the early postnatal period. Teeth and occlusion coordinate the changes. By studying them in their entirety, we gain a better understanding of treatment and timely intervention. Many initial malocclusions, under the influence of environmental factors during the primary or mixed dentition, are detectable and preventable. (Christian, 1979 and Harris et al., 1991). Therefore, timely intervention reduces complications Alqahtan et al., (2021) and Zou et al., (2018). Cases beyond the possibilities of gene control and the severe degree of malocclusion will have to be managed later with surgical intervention.

The prevalence for the presence of at least one dental anomaly varies from 5.46% to 74.7% depending on the size of environmental conditions, ethnic groups, food traditions and diagnostic criteria by Altug-Atac et al (2007) and Thongudomporn et al (1998). The combination of them hinders function, occlusion and aesthetics that can lead to intermaxillary and craniofacial problems by Sacerdoti et al., (2004) and Basdra et al., (2000).

In a group of 600 students in India analyzed for the prevalence of dental anomalies and their relationship to gender differences, hypodontia and microdontia were found to be more common in females compared to males. The most frequent abnormalities were tooth rotation and impaction, especially in the upper jaw by Kathariya et al (2013). Other authors Sella Tunis, et al (2021) find certain anomalies in the frontal maxillary and distal mandibular region, without differences in age and gender.

Other studies find a significant relationship between dental anomalies and the facial skeleton. An association of microdontia with skeletal class III and tooth agenesis with the hypodivergent type of facial growth is confirmed.

Both microdontia and agenesis of the teeth in the maxillary dental arch affect the underdevelopment of this jaw, which is one of the characteristics of skeletal class III. Confirmation of the significant connection between skeletal malocclusions and multiple congenitally missing teeth. The combination of impaction of the canines with the agenesis of the maxillary lateral incisor on one side and the conical shape on the other side and their connection with skeletal malocclusion of class II/2 Basdra et al (2000), (2001) and Fernandez et al (2018) and **Dwijendra et al** (2015). They specify the correlation of dental anomalies with skeletal malocclusions. Therefore, this study aimed to assess the prevalence of dental anomalies according to frequency, distribution and gender status. Also, the correlation between dental anomalies and skeletal malocclusion in the sagittal direction.

## 2. MATERIAL AND METHOD

This prospective study includes 100 male and female patients, for the first time in the orthodontic clinic. The clinical examination was done, the individual card was filled out, and the study models, intraoral photographs, orthopantomography and lateral cephalometry were made. After a careful clinical examination and analysis of diagnostic tools, a diagnosis was made, and the classification of dental anomalies (5 groups and sub-groups) and skeletal malocclusions (Class I, II, III) was made. Both groups were analyzed for a significant relationship between dental abnormalities and skeletal malocclusions in the sagittal direction. The data were collected and analyzed for frequency and gender distribution. At first, the total frequency was analyzed for one, two, three or more dental anomalies. Then the dominant groups and subgroups, gender differences and the most affected jaw. Skeletal malocclusions were classified into 3 groups: Class I (ANB angle  $0^{\circ}$  to  $4^{\circ}$ ); Class II (ANB angle  $>4^{\circ}$ ) and Class III (ANB angle  $<0^{\circ}$ ), according to Steiner. It was analyzed if there is a relationship between dental abnormalities and skeletal malocclusions in the sagittal direction. The same X-ray equipment and the same standardized method were used. Clinical evaluation was done for inclusion and exclusion criteria. The patient's data is stored in an individual file.

Statistical analyses were performed using the program: Statistica 7.1 for Windows and SPSS 23. In the series with attributive features (gender of subjects, dental anomalies: number, size, form, position, structure, indicator of the inconsistency of the sagittal skeleton (ANB angle), structure percentages are determined (%). The relationship between dental anomalies and skeletal malocclusions in the sagittal direction and the difference in the representation and distribution of dental anomalies in both sexes were analyzed using Fisher's exact test (p), Fisher's exact test / Monte Carlo Sig. (2-sided) (p). The difference in age between male and female respondents and the difference in the number of dental anomalies between male and female respondents was analyzed using the Mann-Whitney U test (Z / p). For to determine statistical significance, a two-way analysis was used with a significance level of  $p < 0.05$ .

## 3. RESULTS

A total of 100 patients in the study were 54 (54.0%) men and 46 (46.0%) women. With an average age of  $12,27 \pm 2,89$  for the minimum/maximum age of 8-18 years. Table 1. Shows the frequency of dental anomalies among the respondents: 51(51.0%) had two dental anomalies, 24 (24.0%) had three dental anomalies, 14(14.0%) had one dental anomaly and the others had more than three dental anomalies.

**Table 1. The frequency of dental anomalies in the total subjects.**

	Frequency	Percent	Valid Percent	Cumulative Percent
1	14	14,0	14,0	14,0
2	51	51,0	51,0	65,0
3	24	24,0	24,0	89,0
4	8	8,0	8,0	97,0
5	3	3,0	3,0	100,0
Total	100	100,0	100,0	

The rate of occurrence of each dental abnormality is presented as a percentage of the total sample (Tab.2). From number anomalies: there were: 8 (8.0%) hypodontia, 6 (6.0%) hyperdontia and 86 (86.0%) had no dental anomalies related to the number of teeth. Of the tooth size: 8 (8.0%) had microdontia. From abnormalities of forms: 3 (3.0%) had gemination and 1 (1.0%) had concrescence and dens invaginatus. We found combined positional anomalies from a total of 100 patients in the study, 50 (50.0%) of them had rotation and inclination, while 10 (10.0%) had no

positional anomaly. In 40 (40.0%) they are found combined in 3 position anomalies: rotation, inclination and ectopy; rotation, inclination and impaction any of the 4 anomalies within the group. Of the structural abnormalities, 13 (13.0%) had enamel hypoplasia and 3 (3.0%) dilaceratio dentis.

**Table 2. The rate of occurrence of dental anomalies**

	Frequency	Percent	Valid Percent	Cumulative Percent
Hypodontia	5	8,0	8,0	94,0
Hyperdontia	6	6,0	6,0	100,0
Microdontia	4	8,0	8,0	100,0
Gemination	3	3,0	3,0	98,0
Concrescensa	1	1,0	1,0	99,0
Dens invaginatus	1	1,0	1,0	100,0
Amelogenesis imperfecta	13	13,0	13,0	95,0
Tooth Dilaceration	3	3,0	3,0	98,0
Dentinogenesis imperfecta	1	1,0	1,0	99,0
Enamel Hypoplasia	1	1,0	1,0	100,0

  

Rotation, Inclination	50	50,0	50,0	50,0
Inclination	6	6,0	6,0	66,0
Rotation, Inclination, Ectopia	6	6,0	6,0	72,0
Rotation, Inclination, Impaction	5	5,0	5,0	77,0
Rotation	4	4,0	4,0	81,0
Inclination, Inclination	3	3,0	3,0	84,0
Inclination, Ectopia	3	3,0	3,0	87,0
Impaction	2	2,0	2,0	89,0
Transposition	2	2,0	2,0	91,0
Rotation, Inclination, Infraposition	2	2,0	2,0	93,0
Rotation, Inclination, Transposition	2	2,0	2,0	95,0
Rotation, Inclination, Infraposition, Ectopia	1	1,0	1,0	96,0
Rotation, Inclination, Infraposition, Impaction	1	1,0	1,0	97,0
Inclination, Ectopia	1	1,0	1,0	98,0
Rotation, Inclination, Ectopia Impaction	1	1,0	1,0	99,0
Rotation, Inclination, Impaction Transposition	1	1,0	1,0	100,0
Total	100	100,0	100,0	

Position anomalies with their combination of rotation and inclination 50 (50%) were more prevalent, structure anomalies with 18 (18.0%) and number anomalies with 14 (14.0%). Dental anomalies were statistically independent of gender, but hyperdontia was presented with a higher difference in male respondents compared to female respondents, but  $p < 0.05$  ( $p=0.88$ ). The Mann-Whitney U test did not show any significant difference. A total of 531 teeth with dental anomalies in the maxilla were registered were inclined teeth where 222 (41.81%).

**Table 3. Correlation between dental anomalies and skeletal malocclusion**

		ANB angle			Total
		Malocclusion I class	Malocclusion II class	Malocclusion III class	
There is none	Count	28	32	26	86
	%	32,6%	37,2%	30,2%	100,0%
Hypodontia	Count	2	1	5	8
	%	25,0%	12,5%	62,5%	100,0%
Hyperdontia	Count	1	2	3	6
	%	16,7%	33,3%	50,0%	100,0%
Total	Count	31	35	34	100
	%	31,0%	35,0%	34,0%	100,0%
There is none	Count	29	33	30	92
	%	31,5%	35,9%	32,6%	100,0%
Microdontia	Count	2	2	4	8
	%	25,0%	25,0%	50,0%	100,0%
Total	Count	31	35	34	100
	%	31,0%	35,0%	34,0%	100,0%
Enamel Hypoplasia	Count	7	3	3	13
	%	53,8%	23,1%	23,1%	100,0%

  

Rotation, Inclination	Count	18	14	18	50
	%	36,0%	28,0%	36,0%	100,0%

Hypodontia 5 (62.5%) and microdontia 4 (50.0%) were associated with skeletal class III, while enamel hypoplasia with skeletal class I 7 (53.8%), ( $p < 0.05$ ). No statistically significant relationship was observed for the combination of rotation and inclination in class I/III with 18 (36.0%).

#### 4. DISCUSSION

Orthopantomograms for dental and lateral cephalometric anomalies in 2D for malocclusions remain important for the diagnosis and implementation of orthodontic treatment. (Jha, 2021). Based on studies, but also our results, we suggest that orthodontic patients have a high frequency of dental anomalies. Also pure race and ethnic group, the same environmental factors can give us more accurate results. The frequency of dental anomalies was 14 (14.0%) for at least one dental anomaly. Drenskiet et al (2022) found a dental anomaly in 24.1% of the subjects in the study and more than one in 1.2% of them. Turkish authors Altug-Atac & Erdem, (2007) in 3043 orthodontic patients found at least one dental anomaly in 5.46% of them. Roslan et al. (2018) also from Turkey, with a smaller sample of 370 patients, 28.4% of patients with a dental anomaly were found. The difference is that our findings about the frequency of two 51 (51.0%), three 24 (24.0%) or more dental anomalies were higher. The reasons for such great extremes even within the same ethnic group make us understand that the prevalence varies not only between populations but also within the same population. In these cases, we would have to look at other diagnostic criteria in which the study was done, such as gender, age, jaws and group size. Other studies obtained results almost similar to ours. Brook, (1974) in his studies finds microdontia with a frequency of 3.5–6.5% (34). In our studies, occurs in 8 (8.0%), without gender differences, while the most affected teeth are in the maxillary frontal region with a total of 20 teeth. We consider as an important finding the connection of hypodontia 5 (62.5%) and microdontia 4 (50.0%) with skeletal class III. Hypodontia with 15 missing maxillary teeth and microdontia with 20 maxillary teeth have caused the nerve impulses for the development of the upper jaw have not been sufficient. The hypo-divergent maxilla is one of the characteristics of skeletal class III. Similar links were also found by Fernandez et al (2018). Enamel hypoplasia is a developmental disorder of the tooth enamel matrix (Estivals, et al., 2023). In our studies, it is presented with 13 (13.0%), with 44 affected maxillary teeth in the frontal region. Our percentages were slightly higher than in other studies, this is often related to general diseases. The reasons will need to be studied because we had carefully applied the inclusion and exclusion criteria. Hypoplasia in our studies was associated with skeletal class I 7 (53.8%) while Uslu et al. (2009) found it in skeletal class I and II. Anomalies of the position are found more often in our study. They are characterized by combinations between them. Rotation and inclination comprised 50 (50.0%) of the patients. Rotation, inclination and ectopia in 6 (6.0%) and rotation, inclination and impaction in 5 (5.0%). We find rotation as the first and most widespread anomaly. The most affected teeth were in the frontal maxillary and mandibular region, as other authors found in 87% of teeth in this region (Bakhurji, et al., 2021). The combination of rotation with other anomalies within position anomalies can be explained by its multifactorial aetiology as pre-eruptive and posteruptive. Since it is not a developmental anomaly, it has the possibility of causing obstacles in the eruption of other teeth or accompanying ectopy, inclination, or impaction. Rotation and inclination are proportionally distributed in class I with 18 (36.0%) and class III malocclusion with 18 (36.0%).

#### 5. CONCLUSION

A significant number of orthodontic patients had two dental anomalies, 51 (51.0%). The combination of rotation and inclination 50 (50.0%) were the most frequent abnormalities. Hypodontia and microdontia were related to skeletal class III. Enamel hypoplasia with skeletal class I, while the combination of rotation and inclination with class I and class III malocclusion. We consider that there is a correlation between dental anomalies and skeletal malocclusion. Orthodontists in treatment planning should be careful about the frequency of dental anomalies and their connection with malocclusion.

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