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Prevalence of Dental Anomalies in Norwegian School Children

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ABSTRACT

Introduction: Dental anomalies have been widely examined, but no such studies have been conducted in Norway. The purpose of this study was to examine the prevalence of dental anomalies and investigate their possible association with gender and dental occlusion. Methods: Panoramic radiographs and study models of 500, 12-year-old school children (273 girls, 227 boys) were analyzed for the presence of dental anomalies including agenesis, taurodontism, pulp stones, microdontia, macrodontia, impaction, short roots, supernumerary teeth, ectopic eruption and transposition. The subjects were divided into three groups according to the Angle classification (Class I, *n* = 252. Class II, *n* = 227. Class III, *n* = 21). Percentages and chi-square test were used for evaluation of the data. Results: In this population 28.2% of the subjects showed at least one dental anomaly. Statistically significant associations were observed between agenesis and Angle Class II dental occlusion (*P* = 0.03), and between agenesis and gender (*P* = 0.004). Conclusions: Agenesis was a predominant dental anomaly in girls and was found twice as often in subjects with Class II, than with Class I dental occlusion.

Keywords: Dental Anomalies; Dental Occlusion; Prevalence

1. INTRODUCTION

Malformations of the teeth are designated as dental anomalies, including aberrant dimensions, numbers, morphology, and eruption patterns [1-5]. The causes of dental anomalies are largely unknown, but published data point out a possible genetic link between malocclusions and dental anomalies [6,7]. However, environmental factors cannot be ruled out [8,9].

Studies on the prevalence of dental anomalies show divergent results [5,8-10]. While some investigations show the prevalence of tooth anomalies as low as 21% [11], other studies show the prevalence at almost 75% [10]. Several investigations report a prevalence of tooth anomalies to be between 34% and 40% [5,8,9]. The reasons for such discrepancies can be multifold. Ethnical differences can be one explanation, but the type of dental anomalies investigated and the use of different diagnostic criteria can also contribute to the divergent results.

Dental anomalies are more common among orthodontic patients than the comparable population, and seem to be associated with certain malocclusions [6,7]. Basdra *et al*. [2] evaluated dental anomalies in relation to the Class II division 2 malocclusion in a sample of German individuals. The conclusion was that this malocclusion is closely related to tooth anomalies. Peck *et al.* [6] identified systematically reduced tooth-size as a trait associated with Class II division 2 malocclusion. These findings indicate the presence of a common genetic influence between skeletal and tooth-size features in this malocclusion [6].

Dental anomalies can increase the risk of caries and periodontitis, and can lead to endodontic, aesthetic or orthodontic problems [12]. If undiscovered, they can complicate orthodontic treatment and affect the treatment outcome.

The aim of the present study was to examine the prevalence of dental anomalies in a population of Norwegian school children, and investigate their possible association with gender and dental occlusion.

2. MATERIAL AND METHODS

Diagnostic records: panoramic and periapical radiographs, dental casts and dental histories of 500 subjects (273 girls, 227 boys) were drawn from the growth files of the Department of Orthodontics, University of Oslo, Norway [4]. All subjects were recorded during the year of their 12th birthday. The subjects were classified into 3

groups according to the Angle classification: Angle Class I (143 girls, 109 boys), Angle Class II (118 girls, 109 boys), and Angle Class III (12 girls, 9 boys) [13].

Data were evaluated and classified by one of the authors (LH) after calibration with an experienced orthodontist (VVR). In order to reduce radiographic misinterpretations, blurred image teeth were left out. Permanent third molars were also excluded from the examination.

The following ten types of dental anomalies were diagnosed from dental cast and radiographic material:

1) Agenesis: Congenital absence of one or more teeth, excluding the third molars [14].

2) Taurodontism: A morpho-anatomical variation in the shape of teeth in that the body of the tooth is enlarged and the roots decreased in size [15].

3) Pulp stone: Discrete calcified bodies in the dental pulp [16].

4) Microdontia: An inherited condition that produces at least one disproportionately small tooth [17].

5) Macrodontia: An inherited condition that produces at least one disproportionately large tooth [18].

6) Impaction: A tooth that is obstructed in its path of eruption by an adjacent tooth, bone or soft tissue [8].

7) Short roots: Roots as long as or shorter than the crowns in the incisors and visually evaluated as short in the posterior teeth were recorded as short roots [19].

8) Supernumerary teeth: Teeth that appear in addition to the regular number of teeth [5].

9) Ectopic eruption: Eruption of a tooth in an abnormal position [5].

10) Tooth transposition: The positional interchange of two adjacent teeth, especially their roots, or the development or eruption of a tooth in a position normally occupied by a non-adjacent tooth [20].

Statistical analysis was performed using the statistical software SPSS, version 20 (IBM).

Numbers of subjects and rates of dental anomalies were calculated for the overall study sample, and by sex and malocclusion type. Chi-square test was conducted to determine the statistical significance of dental anomalies by sex and malocclusion type. P values ≤ 0.05 were considered significant.

3. RESULTS

A total of 141 subjects (28.2%) had at least one dental anomaly (**Table 1**). The distribution was rather equal between girls and boys, but predominant in the Angle Class I and Class II dental occlusions (**Figure 1**). The most prevalent dental anomaly was impaction (8.4%), followed by agenesis (6.6%) and taurodontism (6.2%) (**Table 1**). Agenesis had significantly higher prevalence in girls than boys ($P = 0.004$) (**Table 1**).

The distribution of dental anomalies by occlusion group showed that agenesis was significantly lower in the Class I group than Class II group ($P = 0.03$), and not observed in Class III group (**Table 2**). None of the other dental anomalies showed significant differences between the different malocclusion groups or with gender (**Tables 1** and **2**).

Table 1. Distribution of children with one or more dental anomalies.

	Dental anomalies	No dental anomalies	Total
	n (%)	*n* (%)	*n* (%)
Boys	82 (36.1)	145 (63.9)	227 (45.4)
Girls	96 (35.2)	177 (64.8)	273 (54.6)
Total	178 (35.6)	322 (64.4)	500 (100)

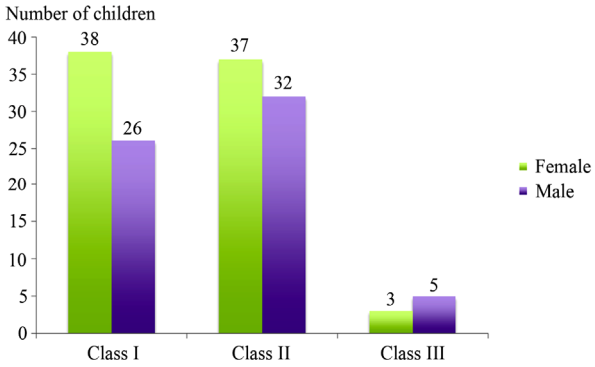

Figure 1. Distribution of subjects with dental anomalies in Angle Class I, Class II and Class III groups in girls and boys.

Subjects with 2 or more dental anomalies were scarce and therefore merged in one group (**Tables 3** and **4**). The distribution of dental anomalies by gender and malocclusion groups and the subsequent results of Pearsons chi-square test showed no significant differences between subjects with and without a dental anomaly (**Tables 3** and **4**).

The distribution of dental anomalies by region was as follows: the rate of agenesis (excluded third molars) was highest in the mandibular premolar region (5.4%), followed by the maxillary premolar region (3.0%) and the maxillary anterior region (1.6%). Supernumerary teeth and macrodontia were found only in the maxillary anterior region. Pulp stones and taurodontism were found only in maxillary and mandibular molars, and observed at higher rates in the maxilla then in the mandible. Impaction was observed most often in the premolar (9.4%), and in the maxillary canine region (2.2%).

4. DISCUSSION

There are numerous studies reporting the prevalence of dental anomalies, however, a similar study has not been conducted in Norway. The results obtained from the selected group provide an estimation of the prevalence of dental anomalies and their association with dental occlusionand gender in the general population.

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Table 2. Distribution of children with one or more dental anomalies in Angle groups.

	Dental anomalies	No dental anomalies	Total
	n (%)	*n* (%)	*n* (%)
Angle Cl. I	84 (33.4)	168 (66.6)	252 (50.4)
Angle Cl. II	85 (37.4)	142 (62.6)	227 (45.4)
Angle Cl. III	9 (42.9)	12 (57.1)	21 (4.2)
Total	178 (35.6)	322 (64.4)	500 (100)

Table 3. Distribution of dental anomalies in girls and boys and results of Pearson chi-square test.

	No dental anomaly	1 dental anomaly	2 or more dental anomalies	Total	*P*
	n (%)	*n* (%)	*n* (%)	*n* (%)	
Boys	163 (71.8)	50 (22.0)	14 (6.2)	227 (45.5)	NS
Girls	193 (70.7)	61 (22.3)	16 (5.9)	273 (54.6)	NS
Total	359 (71.8)	111 (22.2)	30 (6.0)	500 (100)	-

Table 4. Distribution of dental anomalies in Angle Class I, Class II and Class III groups, and results of Pearson chi-square test.

	No dental anomaly	1 dental anomaly	2 or more dental anomalies	Total	*P*
	n (%)	*n* (%)	*n* (%)	*n* (%)	
Cl. I	188 (74.6)	48 (19.0)	16 (6.4)	252 (50.4)	NS
Cl. II	158 (69.6)	56 (24.7)	13 (5.7)	227 (45.4)	NS
Cl. III	13 (61.9)	7 (33.3)	1 (4.8)	21 (4.2)	NS
Total	259 (51.8)	111 (22.2)	30 (6.0)	500 (100)	-

The prevalence rate of the investigated dental anomalies was 28.2% and was lower than most similar random sample studies [5,8-10]. This may be due to the fact that subjects selected in this study were gathered from a school sample of 12-year-old children and not from a pool of patients referred for orthodontic treatment. Previous studies have shown that orthodontic patients are more likely to have dental anomalies than the general population [10]. Nevertheless, divergent definitions of dental anomalies, various diagnostic criteria, ethnic variations, and local environmental influences may also affect this prevalence.

Statistically significant differences were observed between girls and boys in relation to agenesis; agenesis was more prevalent in girls than in boys. However, no other dental anomalies were gender related. There are conflicting reports on gender differences and dental anomalies as some studies show no significant differences [8, 16,21], while other studies present opposite results [22]. Thongudomporn and Freer [10] showed that dental invagination and short roots were significantly more prevalent in girls than boys, and Ezoddini *et al.* [9] showed that dilacerations, taurodontism and supernumerary teeth were more prevalent in boys than girls.

The prevalence of agenesis, excluding third molars, was 6.6% which is comparableto the findings of Aasheim and Ögaard [4]. They also reported a higher prevalence of agenesis in girls (7.2%) than in boys (5.8%), but found no statistically significant difference between genders. In general, the prevalence of agenesis excluding third molars is shown to be between 4.19% and 10.60% [8,10,22]. Uslu *et al.* [5] reported a prevalence of 21.6%, however, in this case, third molars were included in the investigation. Studies conducted among orthodontic patients show a higher prevalence of agenesis [22] than studies with subjects without the need of orthodontic treatment [4,8]. Hence, the relative low prevalence of agenesis found in our sample can be due to the non-orthodontic sample and the exclusion of third molar agenesis.

The subjects were divided in groups according to the Angle classification. This classification enabled grouping according to the sagittal molar relationship, but did not necessarily mean that they required orthodontic treatment. Agenesis was the only dental anomaly that showed statistically significant difference between the occlusion groups. Subjects with Angle Class II occlusion had significantly more agenesis than subjects with Angle Class I, while none of the subjects with Angle Class III occlusion displayed agenesis. Uslu *et al.* [5] reported a slightly higher rate (36.3%) of congenital tooth anomalies in subjects with Class II malocclusion, compared to 30.4% in this study. This is not unexpected, as the subjects in their investigation were all patients referred for orthodontic treatment. Close association between Angle Class II malocclusion and congenital tooth anomalies has previously been reported [6,7]. Peck *et al.* [6] indicated genetic influences for Class II Division 2 malocclusion, which has a low prevalence rate. It was also shown that Class II Division 2 malocclusions are related to gene-controlled dental anomalies [6,7,23]. In the present study we did not classify Class II malocclusion in subgroups.

The prevalence of impaction was 8.4% when excluding third molars. Ezoddini *et al.* [9] and Thongudomporn and Freer [10] found a somewhat similar prevalence of respectively 8.3% and 9.9% in non orthodontic patients. Afify and Zawawi [21] found a prevalence of impaction of 21.1% when including third molars in non-orthodontic patients. The prevalence of impacted third molars was the highest (15.9%) compared to the upper canines (3.3%) [21]. Gupta *et al.* [8] found a prevalence of 3.74% of impacted teeth in non-orthodontic patients (excluding third molars), while Uslu *et al.* [5] found that 2.9% of the teeth including third molars where impacted in orthodontic patients. The low prevalence could be explained by

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ethnical variation, different diagnostic criteria and/or misdiagnosis.

The rate of agenesis (excluding third molars) was highest in the mandibular premolar region (5.4%), followed by the maxillary premolar region (3.0%) and the maxillary anterior region (1.6%). This agrees with the findings by Aasheim and Ögaard [4] and Magnússon [24], studies also undertaken in Scandinavian populations. Noticeably, supernumerary teeth and macrodontia were found only in the maxillary anterior region. Pulp stones and taurodontism were found only in maxillary and mandibular molars, and observed at higher rates in maxillary molars then in mandibular molars. Ranjitkar *et al.* [16] found pulp stones in only six (0.4%) of 1632 premolars and in 327 (19.7%) of 1667 molars. Several studies found taurodontism only in maxillary and mandibular molars [5,10,22].

Impaction was observed most often in the premolar region (9.4%), and in the maxillary canines (2.2%). Similar studies found the rate of impaction to be highest in the maxillary canines when excluding third molars [5,8, 10,21]. Impacted premolars could have been overlooked in these studies because of the late eruption of the premolars.

5. CONCLUSIONS

1) The prevalence of subjects with at least one congenital dental anomaly in a Norwegian population was 28.2%. Impaction occurred most often, followed by agenesis and taurodontism.

2) Agenesis was more predominant in girls than boys, and was found twice as often in subjects with Angle Class II than with Angle Class I dental occlusion.

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