The prevalence of malocclusion among 7–15-year-old Lithuanian schoolchildren

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Key words: malocclusion; prevalence.

Summary. The epidemiological data on the prevalence of malocclusion is an important determinant in planning appropriate levels of orthodontic services. The occurrence of occlusal anomalies varies between different countries, ethnic and age groups. The aim of this study was to describe the prevalence of malocclusion among Lithuanian schoolchildren in the 7–9-, 10–12-, and 13–15-year age groups assessing occlusal morphology. The study included 1681 schoolchildren aged 7–15 years. The crowding, spacing, overbite, overjet, the relationship of the first upper and lower molars according to Angle’s classification, and posterior crossbite were assessed. The study demonstrated that only 257 children had normal occlusion, and 44 had undergone orthodontic treatment among them. The greatest overjet in the studied contingent was 11 mm, and the negative overjet – 3 mm. The overbite ranged between 0 and 6 mm with a mean of 2.29±1.23 mm. Posterior crossbite was recorded in 148 children (8.8%).

This study showed that the prevalence of malocclusion among 7–15-year-old Lithuanian schoolchildren is 84.6%. The most common malocclusion was dental crowding. The upper dental arch crowding was registered for 44.1% and lower for 40.3% of all schoolchildren. The class I molar relationship was detected in 68.4% of the subjects, class II – in 27.7%, and class III – in 2.8%.

Introduction

The epidemiological data on the prevalence of malocclusion is an important determinant in planning appropriate levels of orthodontic services. The occurrence of occlusal anomalies varies between different countries, ethnic and age groups (1–6). The incidence of malocclusion has been reported to vary from 11% up to 93% (2–5). These significant variations are difficult to explain. The factors such as study design, subjects’ age, sample size, and diagnostic criteria must be considered when assessing malocclusion and comparing results (6, 7). The diagnostic criteria are the key factor determining the prevalence of malocclusion. Majority of epidemiological studies are based on occlusal indices. Numerous indices such as IOTN, DAI, ICON have been developed to rank or score the deviation of malocclusion from the normal (9–12). Majority of these indices assess not only severity of dental occlusion but also include evaluation of the aesthetics. The aesthetic component of the indices is more subjective and less readily measurable than the morphological characteristics. The subjectivity of indices used to record orthodontic anomalies, their questionable validity and reliability may contribute to inconsistency of results. An alternative approach to the use of indices is a registration of measurable occlusal characteristics such as overjet, overbite, crowding, crossbite, and other.

The aim of this study was to describe the prevalence of malocclusion among Lithuanian schoolchildren in the 7–9-, 10–12-, and 13–15-year age groups assessing occlusal morphology.

Materials and methods

The study included 1681 schoolchildren aged 7–15 years from five schools. The distribution of subjects by age and gender is presented in Fig. 1. All children were examined by one orthodontist (K.L., author of article) in a dental setting in schools. The crowding, spacing, overbite, overjet, relationship of the first upper and lower molars according to Angle’s classification, and posterior crossbite were recorded.

The crowding was assessed by subtracting space required for tooth alignment from the dental arch length (Fig. 2). The lack of space not exceeding 2 mm was considered as no crowding, 2.1–4.0 mm – mild crowding, 4.1–7.0 mm – moderate crowding, more than 7.1 mm – severe crowding. Surplus space in the dental arch exceeding 2 mm was considered as spacing. Overjet (OJ), the distance between the edge of the
upper central incisor and the labial surface of the lower central incisor, was measured in millimeters. The overjet from 0 mm to 3.5 mm was accepted as normal. The increased OJ from the point of clinical relevance was divided into three groups: from 3.5 to 6 mm, from 6 to 9 mm, and more than 9 mm, respectively.

Overbite (OB), the perpendicular distance from the edge of the central lower incisor to the upper central incisor edge, was measured in millimeters and considered as open bite (<0 mm), normal overbite (from 0 to 3.0 mm), and deep bite (more than 3.0 mm).

The relationship of the first upper and lower molars was evaluated according to Angle’s classification: class I, the mesiobuccal cusp of the first upper molar occludes in the buccal groove of the first lower molar; class II, the first lower molar is distally positioned relative to the first upper molar; and class III, the first lower molar is mesially positioned relative to the first upper molar.

Posterior crossbite was evaluated assessing transversal relationship of the upper and lower premolars and molars. The normal transversal relationship was considered when the tips of the buccal cusps of the lower teeth occlude with the central fossae of the opposing upper premolars and molars. The crossbite was considered when the tips of the buccal cusps of one or more upper molar or premolar occlude in the central fossae of the lower molars or premolars, either buccal aspects of buccal cusps of the upper molars or premolars contact with lingual aspects of buccal cusps of appropriate lower teeth.

Statistical data analysis was performed using the software package “STATISTICA 5.0.” The analyzed characteristics of the studied groups were described using standard statistical methods. Hypotheses about the relationships between quantitative variables were verified using chi-square ($\chi^2$) criterion. The comparison of quantitative data was performed using Student’s or Fisher’s $F$ criteria. The mean and the standard error of the sample of the descriptive statistics were calculated.

**Results**

The study demonstrated that only 257 children (15.3%) had normal occlusion, and 44 of them had undergone orthodontic treatment. The distribution of
the children with normal occlusion in the age groups was the following: 39 children (9.2%) in the first age group, 84 children (19.86%) in the second age group, and 134 children (31.68%) in the third age group. The number of children was increased in the third age group ($P<0.05$).

The upper dental arch crowding was detected in 645 children (38.4%). The distribution of dental crowding among age groups was the following: 102 children (24.1%) in the first age group, 259 children (39.2%) in the second age group, and 284 children (47.6%) in the third age group (Table 1). Dental crowding in the upper dental arch was found to be related to age – this anomaly was more common among older children ($P<0.001$). Spacing in the upper dental arch was detected in 133 children (7.9%); this anomaly was equally distributed in all age groups.

Dental crowding in the lower dental arch was detected in 593 children (35.4%), and the distribution of this anomaly in age groups was the following: 129 children (30.5%) in the first age group, 218 children (33.0%) in the second age group, and 246 children (41.2%) in the third age group (Table 2). Dental crowding in the lower dental arch was more common among older children ($P<0.001$). Spacing in the lower dental arch was detected in 73 children (4.3%); this anomaly was evenly distributed in all age groups.

The distribution of the overjet is presented in Table 3. The greatest overjet in the studied contingent was 11 mm, and the negative overjet was 3 mm (Fig. 3). The mean overjet among 7–9-year-old children was $2.56\pm1.85$ mm, among 10–12-year-old children –

### Table 1. Distribution of the crowding in the upper dental arch by age groups

| Age group        | Crowding in the upper dental arch |       |       |       |       |
|------------------|-----------------------------------|-------|-------|-------|-------|
|                  | 0–2.0 mm                          | 2.1–4.0 mm | 4.1–7.0 mm | >7.0 mm |       |
|                  | n %                               | n %    | n %    | n %    | n %    |
| 7–9 years        | 321 75.88                         | 57 13.48 | 34 8.04 | 11 2.60 |
| 10–12 years      | 402 60.82                         | 136 20.57 | 99 14.98 | 24 3.63 |
| 13–15 years      | 313 52.43                         | 143 23.95 | 98 16.42 | 43 7.2  |
| Total            | 1036 61.60                        | 336 19.99 | 231 13.74 | 78 4.67 |

$\chi^2=63.6$, $P<0.001$.

### Table 2. Distribution of the crowding in the lower dental arch by age groups

| Age group        | Crowding in the lower dental arch |       |       |       |       |
|------------------|-----------------------------------|-------|-------|-------|-------|
|                  | 0–2.0 mm                          | 2.1–4.0 mm | 4.1–7.0 mm | >7.0 mm |       |
|                  | n %                               | n %    | n %    | n %    | n %    |
| 7–9 years        | 294 69.50                         | 74 17.49 | 41 9.69 | 14 3.32 |
| 10–12 years      | 443 67.02                         | 141 21.33 | 51 7.72 | 26 3.93 |
| 13–15 years      | 351 58.79                         | 139 23.28 | 88 14.74 | 19 3.19 |
| Total            | 1088 64.72                        | 354 21.02 | 180 10.71 | 59 3.55 |

$\chi^2=24.8$, $P<0.001$.

### Table 3. Distribution of the overjet by age groups

| Age group        | Overjet |       |       |       |       |
|------------------|---------|-------|-------|-------|-------|
|                  | 0–3.5 mm | 3.6–6.0 mm | 6.1–9.0 mm | >9.0 mm |       |
|                  | n %      | n %    | n %    | n %    | n %    |
| 7–9 years        | 308 74.44 | 68 16.39 | 37 8.89 | 1 0.28 |
| 10–12 years      | 504 76.48 | 110 16.72 | 40 6.10 | 5 0.70 |
| 13–15 years      | 504 84.69 | 66 11.05 | 24 4.07 | 1 0.19 |
| Total            | 1316 78.89 | 244 14.62 | 101 6.06 | 7 0.41 |

$\chi^2=21.6$, $P<0.001$. Negative overjet was evaluated in 6 children.

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2.7±1.8 mm, and among 13–15-year-old children – 2.11±1.57 mm. Negative overjet was detected in 6 children (0.4%).

The results of the analysis of overbite are shown in Table 4. The overbite in the subjects ranged between 0 and 6 mm, and the maximal open bite was 4 mm (Fig. 4). The mean of the overbite was 2.29±1.23 mm. There was no significant variation in overbite among age groups: the mean overbite in 7–9-year-old children was 2.24±1.32 mm, in 10–12-year-old children – 2.46±1.20 mm, and in 13–15-year-olds – 2.14±1.29 mm. The mean incidence of open bite was 3.5% (4.7% in the 7–9-year age group, 2.1% in the 10–12-year age group, 4.1% in the 13–15-year age group).

| Age group        | Overbite                        |
|------------------|---------------------------------|
|                  | open bite | norma l 0–3.0 mm | deep bite >3.0 mm |
|                  | n   | %     | n   | %     | n   | %     |
| 7–9 years        | 23  | 5.53  | 338 | 81.21 | 55  | 13.26 |
| 10–12 years      | 16  | 2.43  | 533 | 80.63 | 112 | 16.94 |
| 13–15 years      | 19  | 4.64  | 503 | 82.78 | 75  | 12.58 |
| Total            | 58  | 3.46  | 1374| 82.02 | 242 | 14.46 |

Fig. 3. Distribution of the overjet in study sample

Table 4. Distribution of the overbite by age groups

Fig. 4. Distribution of the overbite in all study sample
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Table 5. Prevalence of malocclusion according to Angle’s classification

| Age group     | Molar relationship | Molar relationship |
|---------------|--------------------|--------------------|
|               | Class I | % | Class II | % | Class III | % |
| 7–9 years     | 283     | 66.90 | 134      | 31.68 | 2          | 0.47 |
| 10–12 years   | 448     | 67.78 | 196      | 29.65 | 12         | 1.82 |
| 13–15 years   | 419     | 70.18 | 135      | 22.61 | 33         | 5.52 |
| Total         | 1150    | 68.42 | 465      | 27.66 | 47         | 2.79 |

Molar relationship was not evaluated in 19 children.

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Discussion

The present study was carried out to evaluate the prevalence of malocclusion among Lithuanian schoolchildren in the 7–9-, 10–12-, and 13–15-year age groups assessing occlusal morphology. This study demonstrated that 84.7% of schoolchildren had different types of occlusal pathology. These results of the study correspond to the findings of other studies. Thilander (2001) reported that malocclusion was detected in 88.0% of 5–17-year-old children; Ng’ang’a (1996) found that the prevalence of malocclusion was 72% among 13–15-year-old children.

Dental crowding was detected in 38.4% of children in the upper dental arch and in 35.4% of children in the lower dental arch. Dental crowding was more common among older children, which corresponds to the findings of other clinical epidemiological studies (1, 6).

The prevalence of malocclusion according to Angle’s classification was as follows: class I, in 68.4% children; class II, in 27.7% children; and class III, in 2.8% children. Our findings corresponds to results of other studies; in Hosseini, Hannukela and Thilander studies, Angle class II malocclusions were reported to be in 15% to 20% and Angle class III malocclusions – in 0.8% to 4.2% of investigated persons (1, 5, 6).

We found increased overjet (more than 3.5 mm) in 20.11% of the children; this corresponds to the results of other studies (1). The numerous studies reported that overjet decreased with the age. It can be explain by bone and jaw growth, eruption of permanent posterior teeth, and some individuals having received orthodontic treatment of this problem. We did not find a significant decrease in overjet among children of different age groups.

The prevalence of posterior crossbite as reported in recent studies varies from 8% to 16% (1, 4, 6). It corresponds to the results of our study where posterior crossbite was found in 8.8% of the studied children.

Conclusions

1. The prevalence of malocclusion among 10–15-year-old schoolchildren is 84.6%.
2. The most common malocclusion was dental crowding. The upper dental arch crowding was registered for 44.1% and lower for 40.3% of all schoolchildren.
3. The class I molar relationship was detected in 68.4% of the subjects; class II, in 27.7%; and class III, in 2.8%.
Raktažodžiai: ortodontinės anomalijos, paplitimas.

Santrauka. Epidemiologiniai ortodontinių anomalijų paplitimo duomenys yra svarbūs planuojant ortodontinės pagalbos reikalavimą bei apimtį. Ortodontinių anomalijų paplitimas labai skirtingai įvairiose šalyse, etninėse bei amžiaus grupėse.

Tyrimo tikslas. Nustatyti ortodontinių anomalijų paplitimą ir sąsą kandinių morfolodžinių požymių nukrypimui nuo normos dažnį tarp 7–9, 10–12 ir 13–15 metų Lietuvos moksleivių. Ištirtas 1681 7–15 metų amžiaus moksleivis. Klinikinio tyrimo metu vertintas dantų susigrūdimas, tarpdantų horizontalusis kandinių persidengimas, vertikalusis kandinių persidengimas, viršutinių ir apatininių pirmųjų nuolatiniių kūrinių dantų santykis pagal Angle klasifikaciją, kaplių ir kūrinių dantų santykis skersine kryptimi. Nustatyta, kad tik 257 vaikai turėjo taisyklingą sąsą kandinių iš kurių 44 buvo taikytas ortodontinis gydymas. Didžiausias horizontalusis kandinių persidengimas siekė 11 mm, o atvirkščias persidengimas – 3 mm. Vertikalusis kandinių persidengimas slyvavo nuo 0 iki 6 mm, didžiausias atviras tarpas tarp kandinių siekė 4 mm. Vertikaliuojo kandinių persidengimo vidurkis buvo 2,29±1,23 mm. Kūrinį priklausančią kūrinį dantų srities sąsą nustatytas 8,8 proc. moksleivių. Ortodontinių anomalijų nustatyta 84,7 proc. 7–15 metų Lietuvos moksleivių. Dažniausiai diagnozuota ortodontinė anomalija – dantų susigrūdimas, kuris viršutiniame dantų lanke nustatytas 44,1 proc., apatiname – 40,3 proc. turtųjų. Pirmųjų pastoviu kūrinių dantų santykio pagal Angle klasifikaciją pasiskirstymo dažnis: I klasė – 68,4 proc.; II klasė – 27,7 proc.; III klasė – 2,8 proc. moksleivių.

Ortodontinių anomalijų paplitimas tarp 7–15 metų Lietuvos moksleivių

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Received 28 August 2008, accepted 5 February 2009

Medicina (Kaunas) 2009; 45(2)