

## 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 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  $2.29 \pm 1.23$  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.

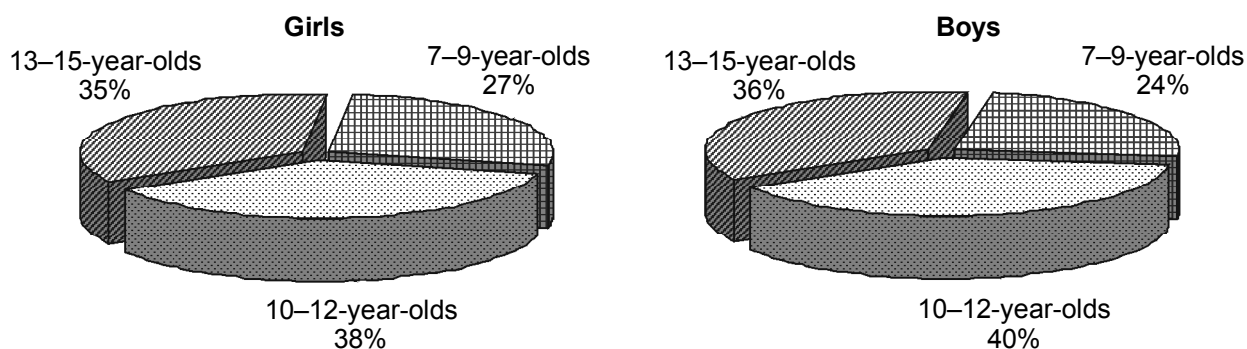
The aim of this study was to describe the prevalence of malocclusion among Lithuanian schoolchildren in the 7–9-, 10–12-, and 13–15-year age groups assessing occlusal morphology.

### 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



**Fig. 1. Distribution of the contingent according to age and gender**

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).

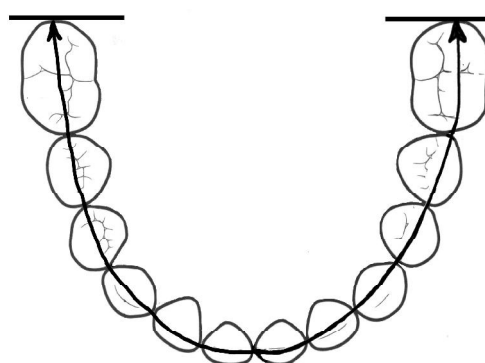
The relationship of the first upper and lower molars was evaluated according to Angle's classification: class I, the mesiobuccal cusp of the first upper molar occludes in the buccal groove of the first lower molar; class II, the first lower molar is distally positioned relative to the first upper molar;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



A



B

**Fig. 2. Evaluation of dental crowding**

The difference between available and required space in the dental arch (measured in millimeters).

A – space required is the sum of the mesiodistal widths of all individual teeth; B – measurement of available space.

dent'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  $2.56\pm 1.85$  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       | %    |
| 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**

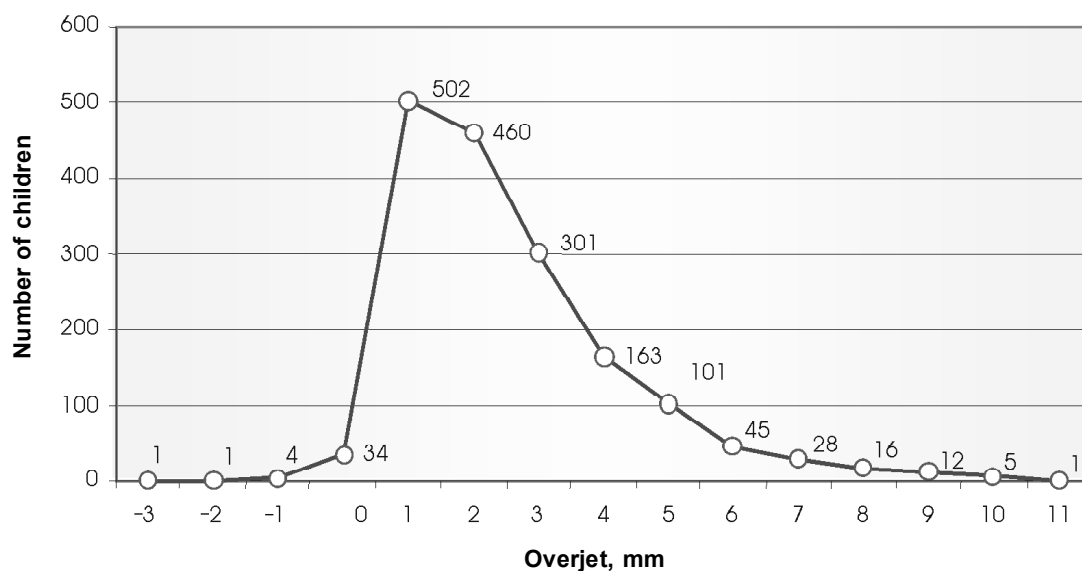
| Age group   | Crowding in the lower dental arch |       |            |       |            |       |         |      |
|-------------|-----------------------------------|-------|------------|-------|------------|-------|---------|------|
|             | 0–2.0 mm                          |       | 2.1–4.0 mm |       | 4.1–7.0 mm |       | >7.0 mm |      |
|             | n                                 | %     | n          | %     | n          | %     | n       | %    |
| 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       | %    |
| 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.



**Fig. 3. Distribution of the overjet in study sample**

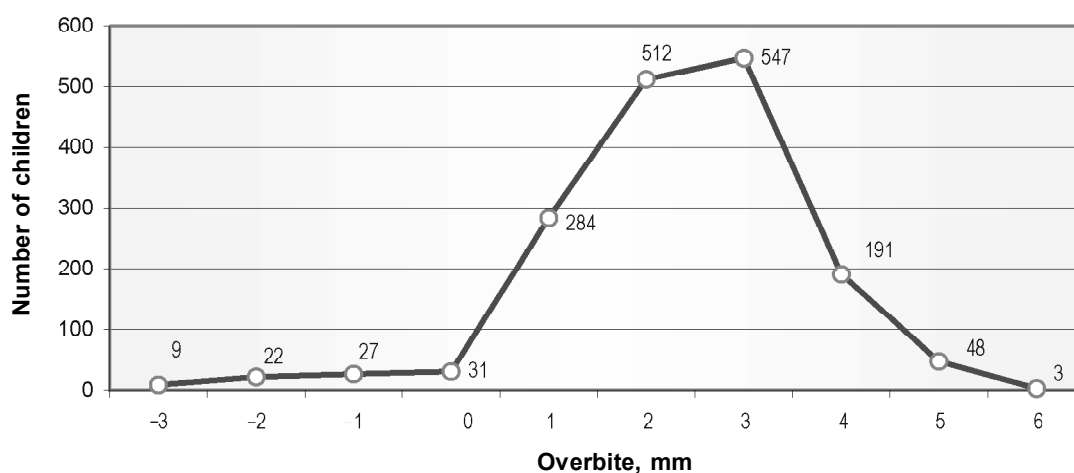
2.7±1.8 mm, and among 13–15-year-old children – 2.11±1.57 mm. Negative overjet was detected in 6 children (0.4%).

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

**Table 4. Distribution of the overbite by age groups**

| Age group   | Overbite  |      |                 |       |                   |       |
|-------------|-----------|------|-----------------|-------|-------------------|-------|
|             | open bite |      | normal 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. 4. Distribution of the overbite in all study sample**

**Table 5. Prevalence of malocclusion according to Angle's classification**

| Age group   | Molar relationship |       |          |       |           |      |
|-------------|--------------------|-------|----------|-------|-----------|------|
|             | Class I            |       | Class II |       | Class III |      |
|             | n                  | %     | n        | %     | n         | %    |
| 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.

age group, respectively).

The overbite and overjet was not measured due to unerupted or missing permanent central incisors in 7 children.

The prevalence of malocclusion according to Angle's classification is presented in Table 5. Angle class I occlusion was found in 1150 children (68.4%); 465 children (27.7%) had Angle class II, and 47 children (2.8%) – Angle class III occlusion. The relationship of the first permanent molars was not determined due to unerupted or removed first molars in 19 schoolchildren.

Analysis of dental arch relationship for transverse dimensions revealed comparatively low range of anomalies. Posterior crossbite was found in 148 children (8.8%). Unilateral crossbite was detected in 101 children (6.0%), and bilateral crossbite – in 47 children (2.8%). The mean number of teeth involved in the unilateral and bilateral crossbites was  $1.92 \pm 0.91$  and  $4.41 \pm 1.47$ , respectively. The distribution of the crossbite according to the age was following: 10.3% of children aged 7–9 years had crossbite (6.8% unilateral and 3.5% bilateral), 8.8% in the group of 10–12 years (6.2% unilateral and 2.6% bilateral), and 7.7% in the group of 13–15 years (5.5% unilateral and 2.2% bilateral). There were no differences in the mean number of teeth involved in unilateral and bilateral crossbite when comparing different age groups.

### 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, Hannuksela 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%.

## Ortodontinių anomalijų paplitimas tarp 7–15 metų Lietuvos moksleivių

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**Raktažodžiai:** ortodontinės anomalijos, paplitimas.

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

**Tyrimo tikslas.** Nustatyti ortodontinių anomalijų paplitimą ir sąkandžio morfologinių požymių nukrypimų 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, tarpai tarp dantų, horizontalusis kandžių persidengimas, vertikalusis kandžių persidengimas, viršutinių ir apatinių pirmųjų nuolatinių krūminių dantų santykis pagal Angle klasifikaciją, kaplių ir krūminių dantų santykis skersine kryptimi. Nustatyta, kad tik 257 vaikai turėjo taisyklingą sąkandį, iš kurių 44 buvo taikytas ortodontinis gydymas. Didžiausias horizontalusis kandžių persidengimas siekė 11 mm, o atvirakščias persidengimas – 3 mm. Vertikalusis kandžių persidengimas svyravo nuo 0 iki 6 mm, didžiausias atviras tarpas tarp kandžių siekė 4 mm. Vertikaliojo kandžių persidengimo vidurkis buvo  $2,29 \pm 1,23$  mm. Kryžminis kaplių ir krūminių dantų srities sąkandis 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., apatiniame – 40,3 proc. tirtųjų. Pirmųjų pastoviųjų krūminių dantų santykio pagal Angle klasifikaciją pasiskirstymo dažnis: I klasė – 68,4 proc.; II klasė – 27,7 proc.; III klasė – 2,8 proc. moksleivių.

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