EPIDEMIOLOGICAL STUDY OF LATEROGNATHIA, MANDIBULAR DEVIATION AND POSTERIOR CROSSBITE IN CHILDREN AGED 7-17 YEARS FROM PLOVDIV

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ABSTRACT
AIM: To conduct an epidemiological study and find the prevalence of some transverse anomalies of occlusion in children aged 7-17 years from the region of Plovdiv; to determine the most appropriate time for early orthodontic treatment based on the results of the study.
MATERIAL AND METHODS: The study included 883 children from Plovdiv (7-17 years old). The children were studied by means of extraoral examination, a clinical examination of dental arches and occlusion and by doing a clinical test to assess mandibular displacement.
RESULTS: The prevalences of mandibular deviation, laterognathia and posterior crossbite (unilateral or bilateral of single teeth or a group of teeth) were 30.4%, 1.02%, 10.53%, respectively.
CONCLUSION: Our results are consistent with the results reported by other authors which indicate that these malocclusions cannot self-regulate and for this reason they should be subject to strict prevention and early treatment.

Key words: deviation of the mandible, posterior crossbite, laterognathia

INTRODUCTION
Laterognathia, mandibular deviation and posterior crossbite are transverse occlusal anomalies of dentition and jaw. The mandible in these disorders is shifted to the left or to the right relative to the maxilla in central occlusion.

Although relatively rare, these anomalies can occur in all ages. In laterognathia, the mandible deviates in the transverse direction, the shift being fixed in the temporomandibular joint. This malocclusion may be combined with developmental changes, changes in the size of the jaws and occlusal ratios. It also occurs in older age.1 Khoroshilkina and Uzhumetskene find that the prevalence of the disorder is 0.39-1.9% in young people and 3% in adults.1-3 Including lateral dental deviations in this malocclusion, Chateau M. finds this disorder in up to 30% of all cases.1,4

In lateral deviation of the mandible, the temporomandibular joint is not adapted to the displacement. This is a functional mandibular shift (to the left or the right) in the final phase of mouth closure as a result of some occlusal interference.1,5

Posterior crossbite is a transverse occlusal deviation manifested with abnormal vestibulolingual ratio of one or more teeth of the upper and lower jaws in central occlusion. In this condition the maxillary teeth occlude with their vestibular cusps with the fissures of the corresponding mandibular teeth. It will often be accompanied by deviation of the mandibular midline in central occlusion to the right or left with respect to the maxillary midline.1,6

Unilateral posterior crossbite can occur as early as 19 months to 5 years of age. It is often associated with narrow maxilae. This type of crossbite is the first morphological sign of temporomandibular joint dysfunction associated with changes in processus condylaris, hence of facial asymmetry in growing children. The prevalence of this crossbite is between 5.9% and 9.4%.7 Peter H. Lam reports that the prevalence of the condition is between 8.7% and 23.3%.8 The prevalence of unilateral posterior crossbite reported by M. Langlad is quite high - 51.4% of all patients with orthodontic anomalies.6 Kurol J. and Berglund L. found the prevalence of the unilateral crossbite to be between 5% and
In an epidemiological study of unilateral posterior crossbite in primary dentition, Gabriel da Silva O. and Santamaria M. found it to have a prevalence of 11.65%. In this country G. Koev has studied the prevalence of almost all dental and jaw anomalies in nearly 50,000 children of different ages and places of residence. As their number was very small he does not include mandibular deviations and laterognathia in his study’s tables. He grouped the anterior crossbite in conjunction with the unilateral posterior crossbite finding their prevalence to be 4%. In the available literature we found no other study about the prevalence of these malocclusions in Bulgaria.

AIM

Our objective was to conduct an epidemiological study to find the prevalence of transverse anomalies of the occlusion in children aged 7-17 years from the region of Plovdiv. Based on the results, we aimed at determining the most appropriate period for early orthodontic treatment.

MATERIAL AND METHODS

The study was carried out in the Simeon Veliki and the Sophronius of Vratsa schools in Plovdiv. We examined 883 children aged 7-17 years. Of these, 433 were boys and 450 - girls. They were divided into three age groups: 7-9-year-olds, 10-13-year-olds, and 14-17-year-olds (Table 1).

We chose to allocate all the children into three age groups because of the characteristic changes in the dental arches occlusion occurring in these age intervals in mixed and permanent dentitions. - Age 7 to 9 years - this is the time of eruption of the first permanent molars and the change of incisors. According to Vladislavov, in this period, the dental arch has the highest growth in transverse direction. This author also finds that in this period the intercanine distance increases by 2.6 to 2.7 mm. - Age 10 to 13 years - the primary molars and canines change. The active growth of dental arches in this period is associated with the formation of the roots of the premolars and the eruption of the canine teeth (from 11 to 13 years). After the eruption of the canines is complete in both jaws, the distance between them does not change any more. Dental arches also grow during the eruption of the seventh teeth (12-13 years). Transverse growth of dental arches continues until 13-14 years for the maxillae and until 10-12 years for the mandibles. - Age 14 to 17 years - the period of permanent dentition. The growth in width continues until 15 years of age and is the first to complete.

In the orthodontic examination, the clinical diagnosis was based on extraoral and intraoral examinations, and a clinical functional test for the displacement of the mandible.

The child was seated in a chair with the legs and arms tucked to the body. The head was oriented in such a way that the Frankfort horizontal line (the line connecting the tragus and the orbital point), and the bipupilar line are parallel to the floor of the room. A millimetre ruler was used for this purpose to connect the individual points, thus visually orienting the two horizontal lines.

EXTRAORAL EXAMINATION

We traced the line joining the nasal point, nasion (N) - the depression at the root of the nose, the subnasale point (Sn) - the lowest point under the nose and pogonion (Pg) - the lowest point of the chin, pre-labelled with a marker on the face of the children. Using a millimetre ruler, we searched for a deviation from the pogonion point (to the left or to the right) along the line connecting the nasion point and the subnasale point. Then, a record was made of the children who had this deviation, regardless of its size (Fig. 1).

INTRAORAL EXAMINATION

We measured the displacements to the left or right of the mandibular midline relative to that of the upper jaw in central occlusion. The midlines were carefully recorded as the incisal points are generally not essential for their determination. For the upper jaw we tracked the median palatal suture.
and its extension on the crowns of the first incisors. It should be borne in mind that the front edge of the papilla incisiva shifts together with the incisal point. For the lower jaw we measured whether the incisal point was offset or not from the mid-catching place of lingual frenum. The buccolingual ratio of the posterior upper and lower teeth in central occlusion was examined. We included in the findings only the children with unilateral or bilateral posterior crossbite of a single tooth or a group of teeth. Such a crossbite is recorded when the vestibular cusps of the upper posterior teeth occlude with the fissures of the mandibular teeth.\(^1\)

**Clinical functional test**

We assessed the deviation of the mandible in the examined children.\(^1,4,6,14\) The children were asked to slowly open and close their mouths, and using

![Figure 1](image1.png)

**Figure 1.** Measuring the pogonion point deviation relative to the nasion-subnasale line using a millimetre ruler.

![Figure 2](image2.png)

**Figure 2.** Clinical functional test to measure mandibular deviation.

A) Finding the deviation of the mandible.

B) Finding if there was laterognathia.
a millimetre ruler connecting the nasal point (N) and subnasale point (Sn) we checked whether the pogonion point (Pg), pre-labelled with a marker on the child’s face, was within normal limits or deviates to the left or right of that line. The mandibular displacement was measured in the following way: with mouth closed Pg is shifted left or right of the nasion-subnasale line, and when the mouth starts opening, the face becomes symmetrical (Pg coincides with the nasion-subnasale line). When closing the mouth in the last phase of occlusion, the person resumes their asymmetric state (Pg is shifted from the nasion-subnasale line) (Fig. 2A).

Laterognathia was registered if there was a deviation of pogonion point to one side (left or right) relative to the nasion-subnasale line both in central occlusion and during the opening or closing of the mouth (Fig. 2B).

A dynamic analysis of mandibular displacement allowed us to outline the path travelled during opening and closing of the mouth. In the majority of the children studied for transverse malocclusions, the displacement of the mandible was S-shaped at the beginning, middle or end of the first path, which is characteristic of a functional mandibular deviation.\(^1,5,6\) A differential diagnosis is made, thus differentiating between laterognathia and mandibular deviation.

All data from the examinations were entered into questionnaires designed by the authors and the Department of Pediatric Dentistry at the Faculty of Dental Medicine, Plovdiv.

For assessment of the results we used the alternative analysis and the \(\chi^2\) criterion.

For the null hypothesis we accepted \(p < 0.05\) as significant. Statistical analysis was performed using SPSS v. 11.0.

**RESULTS AND DISCUSSION**

Of all 882 children in the study, 268 (30.35%) were found to have mandibular deviation. These results differ from those reported by Chateau M. (30%), who examined laterognathia including lateral displacement in it.\(^1,4\)

No statistically significant difference was found in the prevalence of this malocclusion between the two genders (Fig. 3).

Analysis of the age variable showed a statistically significant difference in the distribution of this malocclusion in all three age groups. The highest rate of mandibular deviation (131 children, 35.3%) was again found for the children between 10 and 13 years of age (Fig. 4). The increase of this percentage with age is probably related to the growth and development of the individual.

The cases with deviation of the mandible increased significantly in the age group 10 to 13 years compared with those in the 7-to-9-year group, and decreased in the group 14 to 17 years compared to the age group 10 to 13 years, the latter not reaching statistical significance. The slight increase (not statistically significant) in the cases of mandibular deviation in the 14-to-17-year olds compared with that of 7-to-9-year olds clearly indicate that this malocclusion cannot self-regulate. Therefore, it is necessary to begin treatment as early as possible to avoid any adaptation of the temporomandibular joint to the deviations in the mandible in transverse direction and to prevent any asymmetrical change in the morphology of the mandible while the child still grows up.

**LATEROGNATHIA**

We found laterognathia in 9 children out of all
studied subjects (883). The prevalence rate of this malocclusion was found to be 1.02%. Our results are in the range reported by Khoroshilkina F. and Uzhumetskene I. which is from 0.39 to 1.9% in adolescents.1-3

We found no statistically significant difference in laterognathia prevalence rate in gender between all three age groups; this shows that this malocclusion tends to remain stable with age (Figs 5, 6). This makes it necessary for the treatment to start at a very early age.

**Posterior Crossbite (Unilateral or Bilateral) of Single Teeth or a Group of Teeth.**

Only 93 children out of all 883 children were found to have posterior crossbite (unilateral or bilateral) of a single tooth or a group of teeth. The prevalence of this malocclusion was 10.53%. Our results are consistent with those reported by R. Lam (8.7% – 23.3%), Kurol J. and Berglund L. (5% – 23.3%) and are very similar to those published by Pinto S. (5.9% to 9.4%) and Gabriel da Silva O. and Santamaria M. (11.65%).7-10

The distribution of posterior crossbite (PCB) by age and gender is shown in Figs 7, 8.

Analysis of the prevalence rate of this malocclusion by gender and age groups showed no statistically significant differences. In a very small percentage of all cases, it is probably corrected by the eruption of permanent teeth, causing natural transverse expansion (compensatory growth change). These results indicate that both laterognathia and posterior crossbite (unilateral or bilateral) cannot self-regulate, since, in principle, the management of posterior crossbite of single tooth or a group of teeth requires a permanent unblocking of the

![Figure 5](image5.png)  
**Figure 5.** Distribution of studied sample by gender, age and presence of laterognathia.

![Figure 6](image6.png)  
**Figure 6.** Distribution of studied sample with laterognathia by age groups.

![Figure 7](image7.png)  
**Figure 7.** Distribution of studied sample by gender and presence of PCB.

![Figure 8](image8.png)  
**Figure 8.** Distribution of studied sample by age and presence of PCB.
teeth involved in the crossbite, so that they move in the opposite transverse direction: the upper teeth in vestibular direction, while the lower ones - in lingual direction. This confirms the need to start treatment as early as possible, even before children turn 7 years of age.

CONCLUSIONS
1. The prevalence rates for deviation of the mandible, laterognathia, and posterior crossbite (unilateral or bilateral) of a single tooth or a group of teeth were 30.35%, 1.02%, and 10.53%, respectively.
2. The malocclusions we studied here affect both genders equally.
3. With age, a marked peak is observed of mandibular deviation (between 10 and 13 years of age) (35.31%), suggesting that this malocclusion consolidates firmly. The increase with age is probably related to the growth and development of the individual, as well as with the inability of self-regulation of the malocclusion. That is why it is necessary to start treatment of this deviation while children are still in the range of the first age group (7-9 years of age).
4. We did not find statistically significant differences with increase of age in the prevalence rate of laterognathia between the age groups (7 to 9 yrs, 1.8%, 10 to 13 yrs, 0.8%, 14 to 17 yrs, 0.7%) and unilateral or bilateral posterior crossbite (7 to 9 yrs, 10.5%, 10 to 13 yrs, 11.3%, 14 to 17 yrs, 9.5%). This is probably due to the lack of self-regulation by these malocclusions and shows that it is absolutely necessary that their treatment should start at a very early age, even before the age span of the first age group (7-9 yrs).

REFERENCES
ЭПИДЕМИОЛОГИЧЕСКОЕ ИССЛЕДОВАНИЕ ЛАТЕРОГНАТИИ, ДЕВИАЦИИ НИЖНЕЙ ЧЕЛЮСТИ И СКРЕЩЕННОЙ ОККЛЮЗИИ В БОКОВОМ УЧАСТКЕ ПРИКУСА У ДЕТЕЙ В ВОЗРАСТЕ 7-17 ЛЕТ ИЗ Г. ПЛОВДИВА

С. Крыстева

РЕЗЮМЕ

Цель: Провести эпидемиологическое исследование для установления частоты трансверсальных отклонений у детей в возрасте 7-17 лет из региона города Пловдива и на основании полученных результатов определить самый подходящий период для начала ортодонтического лечения.

Материал и методы: Обследовано 883 детей для установления частоты девиации нижней челюсти, латерогнатии и скрещенной окклюзии в боковом участке прикуса. Проведены экстраоральный осмотр, клинический осмотр зубных дуг и окклюзии с помощью клинической пробы для движений нижней челюсти.

Результаты: Установлено: частота девиации нижней челюсти - 30.4%, латерогнатии - 1.02%, скрещенной окклюзии в боковом участке прикуса - односторонняя или двусторонняя единичных или групп зубов - 10.53%.

Выводы: Полученные данные подтверждают результаты других авторов, подтверждают отсутствие саморегуляции этой деформации и необходимость в профилактике и лечении в самом раннем возрасте.