

## RESEARCH ARTICLE

# Orthodontic anomalies in mixed dentition

**Gordana Todorovska<sup>1</sup>, Vesna Ambarkova<sup>2</sup>, Olga Kokocheva-Ivanovska<sup>2</sup>, Biljana Dzipunova<sup>3</sup>, Natasha Tosheska-Spasova<sup>3</sup>, Katerina Sibinoska<sup>4</sup>**

<sup>1</sup> Health Centre Skopje, Skopje, Republic of Macedonia

<sup>2</sup> Department of Child and Preventive Dentistry, Faculty of Dentistry, University Sv. Cyril & Methodius, Skopje, Republic of Macedonia

<sup>3</sup> Department of Orthodontics, Faculty of Dentistry, University Sv. Cyril & Methodius, Skopje, Republic of Macedonia

<sup>4</sup> Student at the Faculty of Dentistry, University Sv. Cyril & Methodius, Skopje, Republic of Macedonia

\*Corresponding author: Vesna Ambarkova; E-mail: ambveki@yahoo.com

## ABSTRACT

**Aim:** To estimate the frequency of orthodontic anomalies in the period of mixed dentition in children, and to highlight the importance of prompt treatment in order to prevent more serious disorders of the child oral health.

**Materials and methods:** For accomplishing the goal we've conducted systematic and control check-ups on children at the age of 9; 95 children from urban areas, and 68 from rural areas.

**Results:** Of 95 analyzed children from urban areas with ethnic Macedonian population, 81 have an orthodontic anomaly. Nearly half of them i.e. 39 have mobile appliances. The most common anomaly are protrusion of teeth standing at 28.3%, a deep bite with 21% and crowding with 17.2%. Of 68 analyzed children from rural areas of ethnic Albanians, 54 have an orthodontic anomaly, while only 3 children wear mobile appliances. The most common anomalies are both crowding and maxillary protrusion of teeth with an equal 27.7%. If we compare the results: the occurrence of orthodontic anomalies is slightly higher in the Macedonian population.

**Conclusion:** Orthodontic anomalies are diagnosed during regular systematic dental check-ups for children aged 7-13. The period of mixed dentition, which is characterized by an intense growth of the jaws, is ideal for orthodontic treatment. The parents have opportunities to inform themselves of the orthodontic anomaly of their children and promptly visit an orthodontist. With properly conducted activities on behalf of the preventive teams, we can severely decrease the percentage of children with orthodontic irregularities.

**Keywords:** Orthodontic anomalies; Mixed dentition; Orthodontic therapy; Pedodontology.

## OPEN ACCESS

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## INTRODUCTION

The proper growth of jaws and the positioning of primary and permanent teeth is part of the oral health in

children. All functions of the oral cavity such as chewing, swallowing and talking, play a crucial role in the development of the jaws and the overall facial skeleton, as well as the correct aesthetical appearance. Properly positioned teeth and a nice smile contribute to a good social status of the individual, whereas poorly positioned teeth and jaws have a negative effect [1, 2].

Orthodontic anomalies, malocclusions, are both disorders of the growth and development of the jaws and teeth, with morphological and functional imbalance of the dentofacial system. Malocclusions don't just have an impact on teeth positioning, but also on the functions of the orofacial apparatus, and they also generate problems with the temporomandibular joint, thus increasing the predisposition of dental traumas, paradontal disorders and cavities [3-5]. Because malocclusion is not only a problem of the dental union, but rather of the whole craniofacial complex, all of this has a psychosocial reflection and impacts on the development of the each person.

The age from 6 to 12 is the period of mixed dentition. This stadium begins with the sprout of the first permanent molars, and sometimes of the lower central incisives. The correct intercuspitation is achieved when the mesiobuccal tuber of the first upper molar lies in the buccal cavity of the first lower molar [1]. The upper central incisives overlap the lower both horizontally and vertically for 2 mm. Every normal child forms their own model of normal occlusion [1, 6].

There is significant number of etiological factors that contribute to many orthodontic anomalies. For an easier interpretation of the complex effects and their causes, they can be divided into general factors (genetics, disorders, malnutrition, endocrinal dysfunctions, congenital anomalies) and local factors (disorders, traumas, outer pressure, improper functions, bad habits, hyperdontia, hypodontia, macrodontia, microdontia, improper positioning of the teeth, labial frenulum, early extraction of teeth, persistence of primary teeth, insignificant treatment of teeth and improper orthodontic treatment) [1].

In dental literature, we have a wide range of classifications regarding malocclusions, though the most detailed classification was made by Markovic, based on morphological characteristics and it encompasses: irregularities on individual teeth, irregularities in the dental pattern, irregularities in the aspect ratio of the jaws in a sagittal, transversal and vertical ways [1]. All irregularities in the orofacial region should promptly be diagnosed and treated. In the period of mixed dentition, the orthodontic treatment assures the correction of many small anomalies [6]. The prompt diagnosis and early treatment successfully prevents the occurrence and progression of malocclusions, which is the main goal of the orthodontic preventive and interceptive, in which pedodontics are actively involved. Kingsley and his colleagues, as one of the first orthodontists in the USA, only focused on equalizing the dental pattern and correction of the facial proportions, and they barely focused on the details of occlusions due to the rarity of good oral health in that time [7].

According to Meshtrovik, the ideal age of the first orthodontist visit is 7, which correlates to the sprouting of the first permanent molars and incisives. He also states that in some cases orthodontic therapy may begin at the age of 9-10, with the beginning of the first invasive change of the primary molars and the sprout of premolars [3]. Proffit WR, et al, believe that orthodontic therapy have to be started at the age of 6 and to be ended by puberty of the child [8].

There have been a large number of epidemiological experiments and surveys in the world, in order to create national strategies for preventive measures and early treatment. Also, in our country, the National Strategy for Prevention and Oral Diseases in children from 0 to 14 year of age, started to be implemented in 2007 [9].

Angle (1907) is the first to highlight the huge number of various dental anomalies [1, 8]. Chievaro highlighted the irregularities in the bite of 29% of children aged 3-6 [10]. Kraus highlighted it in 52% of children living in Prague, whereas Tielmann and Thatz highlighted an occurrence of 76% in the population of Munich [1, 8, 10]. Markovic and his colleagues also highlighted the large percentage of malocclusions in milk dentition, with 52% [1].

Many have pointed out the increase in the frequency of anomalies in mixed and permanent dentition. Bikar and Tabori have confirmed 60,5% of the dental anomalies are present in children aged 8-14 [10], and Mileusnic registered 77,1%, 30 years later [1]. The first epidemiological experiments on the territory of

Skopje, in children aged 3-14, were conducted by Serafimova and her colleagues, with 2032 case studies and a confirmed frequency of malocclusions in 68% of the participants. The next territorial experiment was conducted by Bojadziev and his colleagues, who confirmed an occurrence of 59%, of which 72,4% were first class, 25,5% were distocclusion and 2,1% were mesiocclusion [11].

The large occurrence of anomalies points out the need of education and guidance to register these anomalies, as well as other specialties. Maximal prevention of early extraction of milk teeth and other non-genetic causes of anomalies is crucial, as well as promoting the importance of good oral hygiene and educating the population about a healthy diet and regular check-ups.

It is extremely important to know the occurrence of orthodontic anomalies, in order to plan the professional potential and infrastructure of dentists, as well as to manage the resources.

The goal of this project is to register the occurrence and the type of orthodontic anomalies in children with mixed dentition, to highlight the importance of orthodontic irregularities as well as their meaning and their consequences, why the period of mixed dentition is vital and why the timely orthodontic treatment is necessary.

## **MATERIALS AND METHODS**

In order to achieve our goal, we have conducted a dental check-up of the oral cavities of 95 children of both sexes at the age of 9, all being students of primary school „Vlado Tasevski”, a school from an urban area with children of ethnic Macedonian descent, and 68 children from primary school „Naim Frasheri” together with primary school „Ibe Palikukja”, schools from rural areas with ethnic Albanian students.

Permission for the study was obtained from the kindergarten and school authorities, who sought and obtained consent from the parents of the children concerned. Ethical approval was obtained from the Ministry of Health. World Health Organization [12] caries diagnostic criteria were followed. The DMFT, decayed, missed, or filled surfaces for permanent teeth and DMFT, decayed, missed, or filled surfaces for primary teeth were used to evaluate children dental caries experience. It was decided to use cluster sampling because it was more economical and achievable within constraints of resources and finance. All classes (fourth grades) in these schools were included in study. Recently in the Republic of Macedonia, the compulsory primary education is prolonged for one more year. The starting time for primary education has been lowered with the introduction of the nine-year primary education, which starts from the age of 6 and lasts till the age of 15.

We conducted check-ups on both groups of children, in the 4<sup>th</sup> grades. During the checkups, apart from the oral hygiene we also noted all irregularities and anomalies in the positioning of the teeth and the occlusion: crowding, protrusion of teeth, progeny, crossbite, deckbiss, open bite, deep bite and we also noted other anomalies (hypodontia, hiperdontia, diastema mediana, cheilognathopalatoshisis). The classification of malocclusions was done from the aspect of children and preventive dentistry, the way a pedodontics looks at orthodontic anomalies. In the cases where more anomalies were noted on the same child, we highlighted the anomaly that was most notable.

The children from urban areas attended all check-ups with their parents, who were introduced to the state of the oral cavity of their children, the occasional occurrence of an orthodontic anomaly and the need of orthodontic therapy. Simultaneously, they received advice about dental irregularities, the importance of orthodontic therapy and the results of its manifestation.

The children from rural areas attended the check-ups usually with an elder sibling, a grandfather or a grandmother, a neighbor or school teachers. The information about the children in need of orthodontic treatment was received by various people and was also advised to visit an orthodontist.

After holding conversations with parents and other responsible individuals who accompanied the children, we received various information. Some parents were unaware of their child's orthodontic anomaly and the need of an orthodontic apparatus, some even didn't know how to visit an orthodontist, and a small number of parents were completely uninterested in the preservation of the teeth or a visit to the orthodontist. Only a small percentage of parents in the Macedonian population seriously considered the advice and their children had already visited an orthodontist on multiple occasions.

We included participants at the age of 9, because mixed dentition occurs during this period, as well as with existence of primary and permanent teeth. In the participants of this age we noticed the effect of the 3-year-long education of parents and children; to estimate the health of the oral cavity, as well as to confirm the number of patients with orthodontic anomalies, as well as the occurrence of various types of malocclusions. We received information from some parents regarding conducted.

## RESULTS

Statistical data that was collected were from primary school children in the Skopje Region of the Republic of Macedonia. All children were 9 year old.

For each child following data after the conducted preventive activities and advising of the parents and other company was recorded: sex (male or female), ethnic group, area (urban or rural). In Table 1, the distribution of individuals from the urban area, Macedonian ethnic group, and the mean DMFT of permanent teeth in studied sample are given.

In Table 2, the distribution of individuals from the rural area, Albanian ethnic group, and the mean DMFT of permanent teeth in six classes is given.

In Table 3, the distribution of individuals from the urban area, Macedonian ethnic group, and the mean DMFT of primary teeth in four classes from primary school Vlado Tasevski are given.

**Table 1.** DMFT on permanent teeth in participants from urban areas (Macedonian children), students of primary school Vlado Tasevski.

| Grade | Decayed teeth |    |    | Extracted teeth |    |    | Filled teeth |   |   | Mean DMFT |    |    |      |      |      |
|-------|---------------|----|----|-----------------|----|----|--------------|---|---|-----------|----|----|------|------|------|
|       | M             | F  | T  | M               | F  | T  | M            | F | T | M         | F  | T  |      |      |      |
| IVa   | 15            | 17 | 32 | 8               | 1  | 9  | 0            | 0 | 0 | 2         | 14 | 16 | 0.68 | 0.88 | 0.76 |
| IVb   | 14            | 12 | 26 | 11              | 10 | 21 | 0            | 0 | 0 | 3         | 8  | 11 | 1.00 | 1.48 | 1.24 |
| IV c  | 10            | 11 | 21 | 5               | 7  | 12 | 0            | 0 | 0 | 1         | 8  | 9  | 0.64 | 1.36 | 1.00 |
| IVd   | 8             | 8  | 16 | 2               | 8  | 10 | 0            | 0 | 0 | 1         | 5  | 6  | 0.37 | 1.63 | 1.00 |
| Total | 47            | 48 | 95 | 26              | 26 | 52 | 0            | 0 | 0 | 7         | 35 | 42 | 0.68 | 1.32 | 1.00 |

Mean DMFT=1.00

**Table 2.** DMFT on permanent teeth in participants from rural areas (Albanian children): students from primary school Naim Frasheri and primary school Ibe Palikukja.

| Grade    | Decayed teeth |    |    | Extracted teeth |    |    | Filled teeth |   |    | Mean DMFT |   |    |      |      |      |
|----------|---------------|----|----|-----------------|----|----|--------------|---|----|-----------|---|----|------|------|------|
|          | M             | F  | T  | M               | F  | T  | M            | F | T  | M         | F | T  |      |      |      |
| IVa- Bu. | 8             | 5  | 13 | 5               | 5  | 10 | 1            | 1 | 2  | 1         | 2 | 3  | 0.87 | 1.60 | 1.15 |
| IVb- Bu. | 9             | 6  | 15 | 7               | 7  | 14 | 3            | 0 | 3  | 5         | 0 | 5  | 1.66 | 1.16 | 1.46 |
| IV -Cha  | 5             | 3  | 8  | 6               | 5  | 11 | 0            | 1 | 1  | 2         | 0 | 2  | 1.60 | 2.00 | 1.75 |
| IV -Ar.  | 4             | 6  | 10 | 4               | 7  | 11 | 0            | 2 | 2  | 0         | 0 | 0  | 1.00 | 1.50 | 1.30 |
| IV -La.  | 13            | 5  | 18 | 11              | 6  | 17 | 1            | 1 | 2  | 0         | 2 | 2  | 0.92 | 1.80 | 1.16 |
| IV -Pa   | 3             | 1  | 4  | 7               | 2  | 9  | 0            | 4 | 4  | 0         | 0 | 0  | 2.33 | 6.00 | 3.25 |
| Total    | 42            | 26 | 68 | 40              | 32 | 72 | 5            | 9 | 14 | 8         | 4 | 12 | 1.26 | 1.73 | 1.44 |

Legend: Bu.- v.Bukovikj, Cha-v.Chajlane, Ar.-v.Arnakia, La.-v.Laskarci, Pa-v.Panichari. Mean DMFT=1.44

**Table 3.** DMFT of primary teeth in participants from urban areas, Macedonian ethnic group, students from primary school Vlado Tasevski.

| Grade  | Decayed teeth |    |    | Extracted teeth |    |     | Filled teeth |    |    | Mean DMFT |    |    |      |      |      |
|--------|---------------|----|----|-----------------|----|-----|--------------|----|----|-----------|----|----|------|------|------|
|        | M             | F  | T  | M               | F  | T   | M            | F  | T  | M         | F  | T  |      |      |      |
| IVa    | 15            | 17 | 32 | 30              | 35 | 65  | 12           | 6  | 18 | 17        | 19 | 36 | 3.92 | 3.52 | 3.72 |
| IVb    | 14            | 12 | 26 | 22              | 14 | 36  | 12           | 9  | 21 | 12        | 9  | 21 | 3.28 | 2.66 | 3.00 |
| IV c   | 10            | 11 | 21 | 19              | 18 | 37  | 4            | 5  | 9  | 6         | 18 | 24 | 2.90 | 3.72 | 3.33 |
| IVd    | 8             | 8  | 16 | 21              | 20 | 41  | 7            | 1  | 8  | 2         | 8  | 10 | 3.75 | 3.62 | 3.69 |
| Total. | 47            | 48 | 95 | 92              | 87 | 179 | 35           | 21 | 56 | 37        | 54 | 91 | 3.48 | 3.37 | 3.43 |

Mean DMFT=3.43

**Table 4.** Decayed, Missed, or Filled teeth DMFT of primary teeth in participants from rural areas, Albanian ethnic group, students from primary school Naim Frasheri and primary school Ibe Palikukja.

| Grade    | Decayed teeth |    |    | Extracted teeth |     |     | Filled teeth |    |     | Mean DMFT |   |   |      |       |      |
|----------|---------------|----|----|-----------------|-----|-----|--------------|----|-----|-----------|---|---|------|-------|------|
|          | M             | F  | T  | M               | F   | T   | M            | F  | T   | M         | F | T |      |       |      |
| IVa- Bu. | 8             | 5  | 13 | 45              | 36  | 81  | 16           | 13 | 29  | 0         | 3 | 3 | 7.62 | 10.46 | 8.69 |
| IVb- Bu. | 9             | 6  | 15 | 32              | 27  | 59  | 41           | 9  | 50  | 2         | 1 | 3 | 8.33 | 6.16  | 7.46 |
| IV -Cha  | 5             | 3  | 8  | 18              | 10  | 28  | 25           | 5  | 30  | 0         | 0 | 0 | 8.60 | 5.00  | 7.25 |
| IV -Ar.  | 4             | 6  | 10 | 16              | 20  | 36  | 14           | 12 | 26  | 0         | 0 | 0 | 7.50 | 5.33  | 6.20 |
| IV -La.  | 13            | 5  | 18 | 39              | 14  | 53  | 34           | 14 | 48  | 2         | 0 | 2 | 5.76 | 5.60  | 5.72 |
| IV -Pa   | 3             | 1  | 4  | 5               | 0   | 5   | 14           | 8  | 22  | 0         | 0 | 0 | 6.33 | 8.00  | 6.75 |
| Total    | 42            | 26 | 68 | 155             | 107 | 262 | 144          | 61 | 205 | 4         | 4 | 8 | 7.21 | 6.61  | 6.98 |

Legend: Bu.- v.Bukovikj, Cha-v.Chajlane, Ar.-v.Arnakia, La.-v.Laskarci, Pa-v.Panichari. Mean DMFT=6.98

The mean value of DMFT index for the whole sample is 1.18 for the permanent teeth and mean DMFT for the primary teeth was 4.91 (mean DMFT=4.91).

After the conducted preventive activities and advising of the parents and other companions of the children, we have reached the following conclusions.

In the children from urban areas (Macedonian children): good oral hygiene was present in the majority of the children, 85.3% had orthodontic anomalies, and 48.1% of the children had previously visited an orthodontist.

In the children from rural areas we noticed a lack of oral hygiene in most children, especially in the retrocanine region. In the rural area 79.4% of the children had orthodontic anomalies, and only 5.6% of them were mobile appliances.

In Table 5 we can see the participants from urban areas (Macedonian ethnic group of children).

Properly positioned teeth were present in only 14 children (14.7%), while 81 children had anomalies (85.3%), of which 39 (48.1%) wear mobile appliances.

In Table 6 we can see the occurrence of malocclusions according to the sexes and the type in participants from urban areas (Macedonian children).

According to the sex we have an equal ratio of occurrence of orthodontic anomalies, with 49.5% in males to 50.5% in females. The deep bite is twice as present in males as it is in females. According to the types of anomalies, in all children the most present is protrusion of teeth with 28.3%, with a deep bite coming in second with 21% and crowding coming in third with 17.2%.

In Table 7 we can see the participants from rural areas (Albanian children).

**Table 5.** Orthodontic anomalies in participants from urban areas (Macedonian ethnic group of children), students of primary school Vlado Tasevski.

| Grade  | Participants with proper teeth |    |    | Participants with orthodontic anomalies |   |    | Participants who wear braces |    |    | Participants who don't wear braces |    |    |        |    |    |
|--------|--------------------------------|----|----|---|---|----|------------------------------|----|----|------------------------------------|----|----|--------|----|----|
|        | M                              | F  | T  | M                                       | F | T  | M                            | F  | T  | M                                  | F  | T  |        |    |    |
| IVa    | 15                             | 17 | 32 | 1                                       | 1 | 2  | 14                           | 16 | 30 | 9                                  | 7  | 16 | 5      | 9  | 14 |
| IVb    | 14                             | 12 | 26 | 4                                       | 0 | 4  | 11                           | 11 | 22 | 4                                  | 7  | 11 | 6      | 5  | 11 |
| IVc    | 10                             | 11 | 21 | 3                                       | 3 | 6  | 7                            | 8  | 15 | 3                                  | 6  | 9  | 4      | 2  | 6  |
| IVd    | 8                              | 8  | 16 | 0                                       | 2 | 2  | 8                            | 6  | 14 | 0                                  | 3  | 3  | 8      | 3  | 11 |
| Total. | 47                             | 48 | 95 | 8                                       | 6 | 14 | 40                           | 41 | 81 | 16                                 | 23 | 39 | 23     | 19 | 42 |
|        |                                |    |    | /14.7%                                  |   |    | /85.3%                       |    |    | /48.1%                             |    |    | /51.9% |    |    |

Legend: m-male, f-female, t-total number.

**Table 6.** The occurrence of malocclusions in accordance to their type and the sex of the participants from urban areas (Macedonian children).

| Types of malocclusions | Participants with orthodontic anomalies from urban areas |      |    |      |       |      |
|------------------------|--|------|----|------|-------|------|
|                        | M  | %    | F  | %    | Total | %    |
| Crowding               | 7  | 8.6  | 7  | 8.6  | 14    | 17.2 |
| Spacing                | 2  | 2.5  | 2  | 2.5  | 4     | 5.0  |
| Protrusion of teeth    | 10   | 12.3 | 13 | 16.0 | 23    | 28.3 |
| Deck biss              | 2  | 2.5  | 3  | 3.7  | 5     | 6.2  |
| Progenio               | 0  | 0    | 0  | 0    | 0     | 0    |
| Crossbite              | 2  | 2.5  | 5  | 6.1  | 7     | 8.6  |
| Open bite              | 4  | 5.0  | 2  | 2.5  | 6     | 7.5  |
| Deep bite              | 11   | 13.6 | 6  | 7.4  | 17    | 21.0 |
| Other anomalies        | 2  | 2.5  | 3  | 3.7  | 5     | 6.2  |
| Total                  | 40   | 49.5 | 41 | 50.5 | 81    | 100  |

**Table 7.** Orthodontic anomalies in participants from rural areas (Albanian children): students from primary school Naim Frasheri and primary school Ibe Palikukja.

| Grade    | Participants with proper teeth |    |    | Participants with orthodontic anomalies |   |    | Participants who wear braces |    |    | Participants who don't wear braces |   |   |        |    |    |
|----------|--------------------------------|----|----|---|---|----|------------------------------|----|----|------------------------------------|---|---|--------|----|----|
|          | M                              | F  | T  | M                                       | F | T  | M                            | F  | T  | M                                  | F | T |        |    |    |
| IVa- Bu. | 8                              | 5  | 13 | 1                                       | 0 | 1  | 7                            | 5  | 12 | 0                                  | 0 | 0 | 7      | 5  | 12 |
| IVb- Bu. | 9                              | 6  | 15 | 2                                       | 0 | 2  | 7                            | 6  | 13 | 1                                  | 1 | 2 | 6      | 5  | 11 |
| IV -Cha  | 5                              | 3  | 8  | 1                                       | 0 | 1  | 4                            | 3  | 7  | 1                                  | 0 | 1 | 3      | 3  | 6  |
| IV -Ar.  | 4                              | 6  | 10 | 1                                       | 3 | 4  | 3                            | 3  | 6  | 0                                  | 0 | 0 | 3      | 3  | 6  |
| IV -La.  | 13                             | 5  | 18 | 4                                       | 0 | 4  | 9                            | 5  | 14 | 0                                  | 0 | 0 | 9      | 5  | 14 |
| IV -Pa   | 3                              | 1  | 4  | 1                                       | 1 | 2  | 2                            | 0  | 2  | 0                                  | 0 | 0 | 2      | 0  | 2  |
| Total    | 42                             | 26 | 68 | 10                                      | 4 | 14 | 32                           | 22 | 54 | 2                                  | 1 | 3 | 30     | 21 | 51 |
|          |                                |    |    | / 20.6%                                 |   |    | /79.4%                       |    |    | /5.6%                              |   |   | /94.4% |    |    |

Legend: Bu.- v.Bukovikj, Cha-v.Chajlane, Ar.-v.Arnakia, La.-v.Laskarci, Pa.-v.Panichari, m-male, f-female, t-total number.

Only 14 children have properly positioned teeth (20.6%). 54 children have an orthodontic anomaly (79.4%), of which only 3 children (5.6%) wear braces.

In Table 8 we can see the occurrence of malocclusions according to their type and the sex of participants from rural areas (Albanian ethnic group of children).

**Table 8.** The occurrence of malocclusions according to their type and the sex of participants from rural areas (Albanian ethnic group of children).

| Types of malocclusions | Participants with orthodontic anomalies from rural areas |      |    |      |       |      |
|------------------------|--|------|----|------|-------|------|
|                        | M  | %    | F  | %    | Total | %    |
| Crowding               | 6  | 11.0 | 9  | 16.7 | 15    | 27.7 |
| Spacing                | 0  | 0    | 2  | 3.7  | 2     | 3.7  |
| Protrusion of teeth    | 11   | 20.3 | 4  | 7.4  | 15    | 27.7 |
| Deck biss              | 2  | 3.7  | 1  | 1.9  | 3     | 5.6  |
| Progenio               | 0  | 0    | 0  | 0    | 0     | 0    |
| Crossbite              | 3  | 5.6  | 1  | 1.9  | 4     | 7.4  |
| Open bite              | 5  | 9.3  | 4  | 7.4  | 9     | 16.7 |
| Deep bite              | 4  | 7.4  | 1  | 1.9  | 5     | 9.3  |
| Other anomalies        | 1  | 1.9  | 0  | 0    | 1     | 1.9  |
| Total                  | 32   | 59.2 | 22 | 40.8 | 54    | 100  |

According to the sexes the occurrence of orthodontic anomalies is 59.2% in males to 40.8% in females. According to the type of the present anomalies, the most frequent ones are crowding and protrusion of teeth with an equal 27.7%. According to the sexes, protrusion of teeth is three times more present in males than in females.

The anomalies in participants from the Macedonian children are present in a much lesser percentage as opposed to the Albanian ethnic group of children where they are more prevalent.

## DISCUSSION

Etiological factors that cause various orthodontic anomalies can be divided into general and local. The general etiological factors are: genetics, general sicknesses, malnutrition, endocrinal dysfunctions and congenital anomalies. Local etiological factors are: local sicknesses, traumas, external pressure, improper functions, bad habits, hyperdontia, hypodontia, macrodontia, microdontia, improper positioning of milk teeth, improper treatment of teeth and improper orthodontic treatment, dental trauma, periodontal sicknesses and cavities [1, 3, 4, 13].

Pedodontics is in regular contact with children and that allows them to be the first ones to recognize orthodontic anomalies and to take the necessary precautions for their prevention and treatment [13].

There is a lack of data on dental caries experience in the literature with regard to the Skopje region from the Republic of Macedonia. Ambarkova et al. in 2013 conducted cross-sectional study among 15-year old children from Vardar region. The mean DMFT was 4.97, with standard deviation of 3.5 and 95% confidence interval (CI) of 4.36-5.59 [14]. Dental caries experience vs seen to be moderate (mean DMFT=3.55) among 15-year old students from Strumica city and its surrounding [15]. Also, dental caries experience was seen to be high (mean DMFT=3.47) among 12-year old children in Eastern Region of the Republic of Macedonia [16]. Dental caries experience was seen to be high (mean DMFT=6.01) among 5 year old children from the two municipalities Berovo and Pechcevo in the Eastern region of the Republic of Macedonia [17].

The data from the systematic check-ups shows that we have a high percentage of children who face orthodontic anomalies in both ethnic groups.

From the conversation with the parents and the status of the oral cavity we can infer that there are several factors that contributed to this large number of orthodontic abnormalities, some of them are: improper nutrition and bad dietary habits in children, mainly the consumption of processed food (white bread, cakes, chocolate, sweets, crisps) which led to a decrease in the chewing function of the teeth. Second is the loss of space for the permanent teeth due to untreated decayed primary teeth. It is also worth mentioning that these anomalies are also caused by other bad habits in individual children (sucking of fingers, the lower lip or other objects). And of course, a vital role is played by the negligence on the parents' behalf [18].

We can compare our data with other countries in the region or the world.

There is a study in Split, Croatia, conducted on 1600 children at the age of 7-14. Orthodontic anomalies are present in 52.87% of children of which primary compressions number take up 15.81%, secondary compressions 15.81%, protrusion of teeth takes up 13.53% and crossbite takes up 5.99%, open bite takes up 5.75%, progeny has 5.87%, and the least frequent anomaly is cheilognatopalatoshisis with 0.60% [18].

There is a study in Lithuania conducted within 1681 children at the age of 7-15 that has shown that 84.7% of participants have different types of orthodontic anomalies which correlates with our study [19].

According to the study conducted by Anne-Marie Rauten, with the goal of preventing the need of late orthodontic treatment, in Romania they conducted a study of children aged 6-9 in dental offices where it was revealed that there is a frequent early loss of milk teeth due to untreated cavities. And as a direct result of the above, there is less space for the sprout of permanent teeth, again resulting in orthodontic anomalies i.e. 10.13% of children aged 6 and 24.35% of children aged 9 are in need of early orthodontic treatment [6].

Nicholas Karaiskos conducted a study in 395 Canadian children aged 6-9 that had cavities on their milk teeth which resulted in early extraction. He came to the realization that 28% of the participating children had a chance to develop an orthodontic anomaly in the near future [20]. Morris Al concluded that only 5% of the population has orthodontic anomalies that can be regarded as a handicap [21].

In the participants from the primary school Vlado Tasevski we can see that half of the children that have orthodontic anomalies have not received any orthodontic treatment. On the other hand, the number of children that wear mobile appliances in the rural area is negligible.

When we posed the question as to why children who have orthodontic anomalies don't wear appliances, the parents gave us the following answers: some of the children just refused to wear braces, some of the parents believe their children are in no need of orthodontic therapy and that the anomaly will be resolved by itself, and some believe that it's better to wear fixed braces, thus missing the period when the anomaly can be resolved with mobile ones. In some cases the children were accompanied by someone else, so contact with the parents couldn't always be established.

All preliminary anomalies can be detected by pedodontics in the earliest stages of their occurrence, and working together with the dentists they can team up to prevent these orthodontic anomalies from progressing further, says German Ramirez-Yanez [22].

Some authors recommend that all children will neutralize their bad habits, if their primary teeth receive appropriate dental treatment when after caries cavities formation, if we control sprouting and intercuspitation of the first permanent molar, and finally if we monitor occlusion and the positioning of the teeth over the mixed dentition period.

A cross-sectional survey was conducted among 2335 children aged 3-5 years from kindergartens in Shanghai, China by Zhou X, et al. [23]. Several occlusal parameters were clinically assessed, including second deciduous molar terminal plane, canine relationship, degree of overjet and overbite, anterior and posterior crossbite, and the presence or absence of physiologic spaces and crowding. All parents of subjects were asked to fill in the oral health knowledge questionnaires. The prevalence of malocclusion in primary dentition in Shanghai was 83.9%, and no significant differences were found in genders. Data showed that the prevalence of deep overbite (63.7%) was the highest in children with malocclusion, followed by deep overjet (33.9%), midline deviation (26.6%), anterior crossbite (8.0%) and anterior crowding (6.5%). They concluded that the



need for preventive orthodontic therapy is extremely desired and oral health education about malocclusion should be strengthened [23].

A large number of orthodontists regard the mixed dentition period as suitable for orthodontic therapy because in this period we can seize the growth potential in children. The goal of early orthodontic treatment is to eliminate and model irregularities and deviations from the normal skeletal development and disorders in the functional matrix.

The early orthodontic treatment guarantees a complete or partial correction of many initial discrepancies or at least reduction of their growth capacity, with the goal to positive impact growth, function, aesthetics and the psychological state of the children [24-27].

The benefits of early orthodontic treatments are:

- correction of bad habits
- reduction or elimination of abnormal swallowing and speech problems
- reduced risk of trauma on protruded frontal teeth
- an opportunity to assure proper growth of the jaws
- an opportunity to assure proper growth of permanent teeth in their right position, and assuring they have enough space
- reduced need of extraction of permanent teeth
- reduced or eliminated need of maxillofacial surgery
- an opportunity to minimize the need of further more expensive treatment
- increased confidence in children.

## CONCLUSION

The period of mixed dentition is one of the most important moments for children to receive prompt orthodontic treatment and to prevent a large number of anomalies as well as to reduce the intensity of the anomaly, while at the same time reducing the number of children with anomalies. Pedodontics and dentists who work with children should focus on:

- knowing the difference between normal occlusion and malocclusion in milk mixed and permanent dentition
- discovering abnormalities, sprouts and the replacement of milk teeth with permanent teeth
- recognizing the predisposatory factors and to suggest the elimination of bad habits that cause orthodontic abnormalities
- taking precautionary measures to control the formation of cavities: proper brushing and preservation of milk teeth, to make proper space for the permanent teeth
- sending the children to an orthodontist who later confirms the anomaly and suggests when the treatment should begin.

Other than the pedodontics and orthodontists, a key role in the timely orthodontic treatment is also played by the parents. That's why they should be completely informed of their child's anomaly. The parents should receive information regarding the benefits of timely orthodontic treatment as well as the repercussions of late or undeceived treatment.

## AUTHORS' CONTRIBUTIONS

Concept and design: GT. Acquisition, analysis and interpretation of data: GT, VA, BD, NTS. Drafting the article: GT. Collection of literature: OKI, KS. Revising it critically for important intellectual content: VA. Approved final version of the manuscript: VA. The final manuscript was read and approved by all authors.

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