

## Overview of prevalence of malocclusions in primary dentition

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### Summary

The perfect primary dentition is the predictor of future normal permanent occlusion. One of the main roles of primary dentition is to determine permanent occlusion and keep spaces for erupting teeth. The knowledge of different signs and characteristics of primary dentition, gives us opportunity to predict future changes and disorders in permanent dentition development. Early diagnosis, preventive measures and early treatment may let us avoid the further development of maxillofacial anomalies, deformities and functional disorders. Also at early age we can manage facial growth, thus avoid physiological disturbances associated with malocclusions and maxillofacial anomalies (1).

**Key words:** Primary dentition, deciduous dentition, malocclusion, deformity, anomaly.

### Introduction

The primary dentition was not paid sufficient attention from practitioners for many years. In this age group it is sometimes difficult to examine patient, make good contact and the degree of cooperation is quite low. However there are several conditions that should be treated as soon they are discovered, to avoid development of fully established skeletal form of malocclusion. According to worldwide guideline, orthodontic treatment is divided in two stages: early treatment or the first stage, and late treatment or the second stage. First stage is meant to be held during early mixed dentition period. There is lack of information about treatment during primary dentition, as in basic literature, as in scientific articles and studies. There are just several examination characteristics and classifications that concern primary dentition.

Our aim was to review the literature about the prevalence of malocclusion in primary dentition, early diagnosis and importance of early treatment, also recommendations that raise awareness to this age group. We studied the basic literature, also the articles and publications of last 5 years. We evaluated epidemiological data, examination criteria used in primary dentition and treatment guidelines.

According to guidelines the best period for orthodontic treatment is early permanent dentition. Some preventive or limited orthodontic treatment can be done during primary or early mixed dentition. This treatment prevents the complications of malocclusion, but doesn't correct it fully. According to the main opinion, treatment started at early age may last longer, requires more financial costs, more timing

and also more cooperation and patience from patient. That is why most of orthodontists think that it is better to start full orthodontic treatment before the adolescent growth spurt, that the active growth will be used for growth modification. This appropriate age is meant to be 11+ years, and early treatments meant to be 7-9 (2). According to William R. Proffit there are several characteristics, and in case of their presence orthodontist should do some preventive or limited orthodontic treatment. These are:

- ◇ The incorrect position or crowding of primary teeth is quite rare, but this can be predictor for future space problems for permanent teeth. It is not recommended to start treatment before the period of mixed dentition.
- ◇ Space maintenance in case of premature loss of primary molars, no need to intervene if incisors are lost.
- ◇ Cross bite with functional shift of mandible, this case should be treated by upper jaw expansion or by grinding deciduous canines or molars.
- ◇ Underbite caused by medial shift of mandible should be corrected at early age.
- ◇ Children with sagittal or vertical plane malocclusions should be monitored and treatment should be started at later stage.

According to Graber M. Thomas the best time for orthodontic intervention to prevent and reduce maxillofacial deformities, is late primary and early mixed dentition. So it is obvious that better is to avoid malocclusion development from the beginning, than to treat fully established malocclusion.

Table 1. Early orthodontic treatment protocol. +++ The most effective; ++ the less effective; + more or less effective; - generally non-effective; RME -Rapid palatal expansion (3).

Angle's classification	I	II	III
primary	+	-	++
early mixed	+++	RME	+++
late mixed	++	+++	+
early permanent	+	+++	-

The most orthodontists prefer to do early orthodontic treatment (4). There is different approach to the treatment of Angle's Class III. Particularly, if class III is the consequence of genetically induced excessive mandibular growth and maxillary deficiency, it is recommended to do late orthodontic treatment with orthognathic surgery. If the reason of class III is maxillary deficiency or distal position to the cranial base, it is necessary to treat earlier (5).

Guideline on Management of the Developing Dentition and Occlusion in Pediatric Dentistry has quite big part dedicated to primary and mixed dentition and their management. This guideline was elaborated by American Academy of Pediatric Dentistry in 2014. According to this guideline, the non-nutritive sucking habits and cross bite should be evaluated first. It is important to eliminate these factors to support future normal growth of jaws. Parent should be advised that orthodontic treatment will be necessary for their child (6).

The formation of primary dentition is terminated with the eruption of primary second molars. The terminal surface between distal surfaces of primary second molars is the main determinate of occlusion. This surface is called terminal plane and was described and classified by Baume in 1950. There are three types of terminal plane:

1. *Flush terminal plane*: When the distal surfaces of the upper and lower second primary molars were in the same vertical plane in centric occlusion.

2. *Distal step*: When the distal surface of the lower second primary molar is more distal to that of the upper in centric occlusion.
3. *Mesial step*: When the distal surface of the lower second primary molar is more mesial to that of the upper in centric occlusion (7).

Presence of spaces in physiological primary dentition is necessary. The presence and size of spaces varies in different ethnic groups and is between 42% to 98% (8). The absence of spaces indicates future arch length tooth size discrepancy.

Modification in Angle's classification has been proposed by Kaushik Narendra Chandranee for application in primary dentition. Small roman numbers i/ii/iii are used for primary dentition notation to represent Angle's Class I/II/III molar relationships as in permanent dentition, respectively (9). In addition to the Class i, ii, and iii molar relationships; half cusp Class ii, half cusp Class iii, and subdivision molar relationship are recorded as described below [Figures 1 and 2].

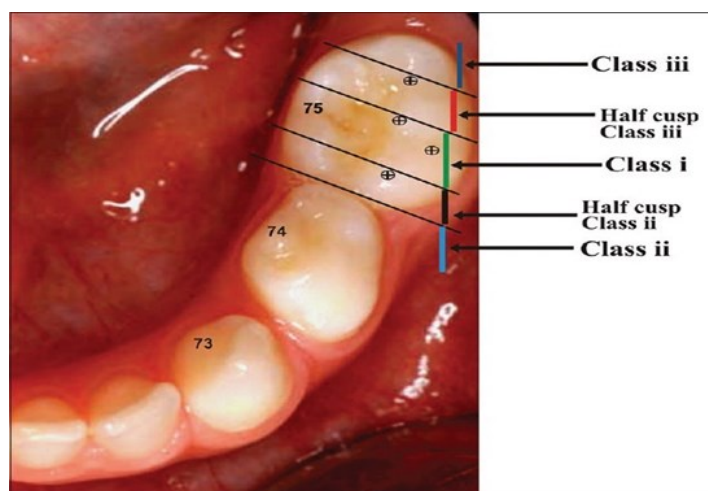


Figure 1. Primary second molar cuspal relationship – Occlusal view

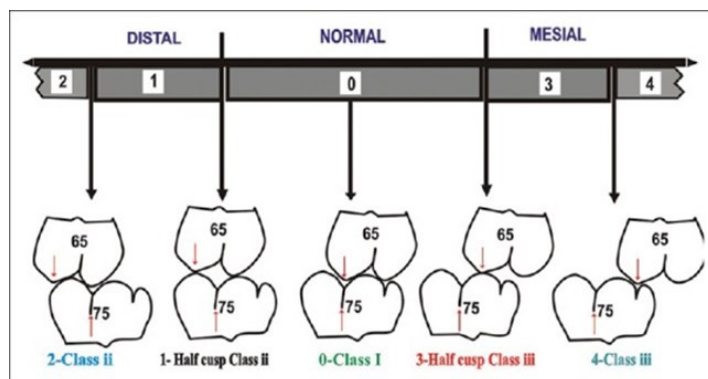


Figure 2. Primary second molar cuspal relationship – Buccal view

The most used criteria for malocclusion assessment in primary dentition is Foster and Hamilton Criteria. According this criterion, following signs are evaluated:

1. Primary second molar relationship. Class I: flush terminal plane between distal surfaces of second primary molars; Class II: there is distal step between upper and lower primary second molars distal surfaces; Class III: lower second primary molar is located medially to the upper second primary molar and there is mesial step between them.
2. Canine relationship. Class I: The cusp tip of upper primary canine is located in one plane with the distal surface of lower primary canine; Class II: The cusp tip of upper primary canine is located medially to the distal surface of lower primary canine; Class III: The cusp tip of upper primary canine is located distally to the distal surface of lower primary canine; If it is class I on one side and class II or class III on the other, the malocclusion is recorded as mixed.
3. Overjet. This is measured from the palatal surface of the mesial corner of the most protruded maxillary incisor to the labial surface of the corresponding mandibular incisor using periodontal ruler; Normal overjet: positive and is equal to  $\leq 2$  mm. Excessive overjet: the space is more than 2mm. Mandibular overjet: Anterior cross bite or underbite. Edge to edge relationship: when incisors are contacting with incisal edges.
4. Vertical anomalies. The space is measured between the incisal edges of primary incisors; Overbite: This is graded according to coverage of the mandibular incisor by the most protruded fully erupted maxillary incisor. In normal overbite cases lower incisors should be touching palatal surfaces of upper incisors; Reduced overbite: lower incisors are not touching upper incisors on palatal surfaces, they might be touching palate; Excessive overbite: anterior open bite cases, vertical space between incisal edges of primary incisors.
5. Transversal anomalies. This is recorded when one or more of the maxillary primary molars occlude the lingual to the buccal cusps of the opposing mandibular teeth; Scissors bite: This is recorded when one or more maxillary primary molars occlude the buccal to the buccal surfaces or the lingual to the lingual surfaces of the corresponding mandibular teeth; Midline displacement.
6. Space Discrepancies. The presence of spaces and primary spaces on both arches is evaluated. The absence of spaces and crowding is a warning sign (10).

In 2014 Grippaudo C, Paolantonio EG, Pantanali F, Antonini G, Deli R introduced new index for malocclusion assessment. This index is called Baby-ROMA (Risk of Malocclusion Assessment index) was set up to assess risks/benefits in early orthodontic therapies. The Baby-ROMA index was designed from the observation that some of the malocclusion signs, observed in primary dentition, can worsen with growth, others remain the same over time and others can even improve. Therefore it would be important to classify the malocclusions observed at an early stage on a risk- based scale. The main advantage of this index is that it can identify that patients who need early orthodontic treatment and distinct them from patients who can be treated later, during mixed or early permanent dentition (11).

In the United States, two large-scale surveys carried out by the U.S. Public Health service (USPHS) covered children ages 6 to 11 years between 1963 and 1965 and youth ages 12 to 17 years between 1969 and 1970. As part of a large-scale national survey of health care problems and needs in the United States in 1989-1994 (National Health and Nutrition Estimates Survey III [NHANES III]), estimates of malocclusions again were obtained. This study of some 14,000 individuals was statistically designed to provide weighted estimates for approximately 150 million persons in the sampled racial/ethnic and age groups. The data provide current information for U.S. children and youths and include the first good data set for malocclusion in adults, with separate estimates for the major racial/ethnic groups. This is the biggest and useful survey, but it doesn't evaluate and describe primary dentition (12).

The articles and surveys about primary or deciduous dentition are already met from the year 1950, but generally they have descriptive form, include normal occlusion and molar relationship assessment. In 1950 Baume described the physiological migration of primary teeth and its impact on the development of permanent dentition (13).

The first epidemiological study about the prevalence of malocclusions in primary dentition dates the year 2003. Ana Beatriz Alonso Chevatarese and co-authors studied 112 children aged 4-6 years. The aim of the study was to establish correlation between malocclusions and non-nutritive sucking habits. According to this study, 75.8% of researched children had malocclusions, and the open bite was the most frequent anomaly (14).

The most of published papers describe the prevalence of all or one of the types of malocclusions in were held in pre-schools. For example, Malandris M1, Mahoney EK studied the prevalence of posterior cross bite in pre-school children in 2004. The authors wanted to reveal the prevalence and

raise awareness for the early treatment for this particular anomaly (15).

Some surveys evaluate all types of problems that are met in primary dentition. In 2013 Bugaighis I examined 800 children aged 3 to 5 years. The position of canines, presence of spaces, crowding, overjet and overbite were checked. The occlusion was checked according to the criteria of World Dental Federation, which was modified for the use with deciduous teeth. This study revealed that I, II and III class were met in 69.6%, 22.4% and 4.4% of children correspondingly. Spaces were present in 81.6 % of cases, and the crowding just in 5%. Overjet more than 3mm had 11.4% of children, open bite in 35%. The main aim of this study was early diagnostics and if necessary early orthodontic treatment to avoid future complications (16).

Very interesting work was done by Sousa RV and co-authors in 2014. The name of this article is "Malocclusion and socioeconomic indicators in primary dentition". The aim of the present study was to determine the prevalence of malocclusion and associations with socioeconomic indicators among preschoolers. Mother's schooling and household income were not associated with malocclusion. Socioeconomic factors were also not associated with the occurrence of malocclusion (17). Another interesting paper that included socioeconomic factors was published by Amaral CC and co-authors in 2017. The name of this published paper is "Perinatal health and malocclusions in preschool children: Findings from a cohort of adolescent mothers in Southern Brazil". The aim of this study was to assess malocclusion in deciduous dentition and its association with prolonged breastfeeding, pacifier use, and perinatal health indicators pertaining to the periods immediately before and after birth. This cross-sectional study was nested in a cohort of adolescent mothers who became pregnant from 13 to 19 years of age. Information on perinatal indicators, including Apgar score (0-10), which is a standardized assessment of the condition of the infant at birth (heart rate, breath rate, muscle tone, reflex irritability, and skin color), head circumference, birth weight, and need for intensive care unit admission were collected after delivery through interviews with the mothers. By the time the children were 24 to 36 months of age, malocclusion was assessed, and information on the use of pacifiers and breastfeeding was collected. Poor perinatal health and pacifier use may be risk factors for malocclusion development in deciduous teeth. Long duration of breastfeeding is associated with better occlusal conditions in children of adolescent mothers. Further studies are needed with other age groups (18).

There is lack of surveys concerning primary dentition in Georgia. The only known study was held in 1984 by T. Mikadze and co-authors and it evaluated the impact of pollution on children living in rural districts of Georgia (19).

## Conclusion:

Among the vast number of articles, there is none that describes the correlation between the prevalence of malocclusions and seek for orthodontic help. The aim of our present study is to reveal this type of correlation between the preschool children of Tbilisi and children whose parents have attended "Orthodontic centre" for orthodontic help. After this collected data we will be able to evaluate preventive measures and practical recommendations for pediatric dentists, pediatricians and other health care providers.

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