

# TIME AND SEQUENCE CHARACTERIZATION OF PERMANENT TEETHING AS A CRITERION OF BIOLOGICAL MATURITY OF CHILDREN IN UZBEKISTAN

Roza Kamilova<sup>a</sup>, Javlon Kamilov<sup>b</sup>

<sup>a</sup> Research Institute of Sanitation, Hygiene and Occupational Diseases of the Ministry of Health, Tashkent, Uzbekistan

<sup>b</sup> Tashkent State Dental Institute, Tashkent, Uzbekistan

## Abstract

The research targeted 3,232 children, 49,7% boys and 50,3% girls, aged 4,5 to 17, living in Tashkent city. The initial and average timing of permanent teeth on the lower jaw was characterized by incisor type and on the upper jaw by molar type; the age of completion of teething on both jaws was characterized by molar type. In children of both sexes, the teething sequence did not differ in the initial and middle teething stages, except for the upper canines and lower second premolars, and gender differences were clearly visible when the permanent bite was completed in the sequence of lower canines, lower first premolars and upper second premolars. In children, the lower teeth were teething before the upper teeth except for the premolars. In terms of teething timing, the asymmetry between contralateral teeth ranged from 1 to 3 months, indicating left-handed teething in boys and right-handed teeth in girls. In the 15-year-old age group, children in Tashkent have a complete permanent bite formation.

**Keywords:** children, permanent teeth, teething, teeth antagonists, antimony teeth.

## INTRODUCTION

Biological maturation is one of the main indicators characterizing a child's health status. Permanent teeth eruption is a physiological process and is directly related to the general state of child health; timely, in a certain sequence, tooth growth indicates normal development of the child's organism [41]. The timing of permanent central incisors and first molars eruption, in comparison with other parameters, characterizes biological age of children most reliably [31, 37]. Physiological norm of teething is considered to be when teething is carried out in time with observance of sequence and symmetry [32]. When observing permanent teeth eruption, it is necessary to take into account the number, timing, sequence and twoness; the shape, position and type of teeth closure are also important [30]. Permanent teething is a sequential process, which has its own characteristics in different populations, depends on the age and sex group and the state of health of the child; infringements of timing, sequence and twoness of teething can be observed in children with deviations in the state of health and are considered pathological [1, 5, 14].

There have not been any researches aimed at determination of terms and sequence of teething before in Uzbekistan, though it is known that studying of age and sex regional peculiarities of teething of permanent teeth is of diagnostic and prognostic interest that determines not only criteria of biological maturity and general development of child's organism [34], but also development of purposeful therapeutic and prophylactic measures. Therefore, the development of regional age and sex normative estimating values of terms and sequence of permanent teeth teething is necessary and possible on the basis of the received results that confirms the urgency of researches in this direction.

Consequently, the purpose of this work was to determine

the timing, sequence and symmetry of teething of permanent teeth on the upper and lower jaws of children of different age and sex groups living in the city of Tashkent, Uzbekistan.

## MATERIALS AND METHODS

The research program included examination of start, middle and end dates, sequence and symmetry of permanent teething. Dental examination of children was carried out at randomly selected pre-school educational institutions and secondary schools in Tashkent, which is the capital of the Republic of Uzbekistan. The examination was carried out in four pre-school educational institutions (No. 83, 106, 473, 547) and four general education schools (No. 64, 71, 102 and 302) located in five randomly selected districts (Almazar, Mirzo-Ulugbek, Shaikhontakhur, Yunusabad and Chilanzar) out of the eleven existing. The object of the study was 3,834 children (1,1907 boys and 1,927 girls) aged 3 to 17 years of Uzbek nationality, born and permanently residing in Tashkent city, without any chronic diseases. The results of the study were recorded in specially designed "Children's dental health cards". For the statistical processing of dental examination materials, 3,322 children were selected from the total number of those surveyed: 975 (49,9% boys and 50,1% girls) aged 4 to 6 months; and 2,257 (49,6% boys and 50,4% girls) aged 7 to 17 years (table 1).

The teething criterion for a permanent tooth was considered to be the appearance of one or more chewing hillocks of the crown of the tooth above the mucous membrane of the gum of any part of the gum - the cutting edge. Examination for permanent teeth began with the right upper jaw quadrant and then the left upper jaw, left lower jaw and right lower jaw quadrant were examined. Teeth that were not in the mouth were considered incised unless

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the child, his or her parents or guardians provided information about the removal of these teeth.

The beginning of teething was the age at which 5% of the examined children had a certain category of teething, the average teething period was the age at which 50% of the examined children had a permanent tooth, and the end of teething was considered the age at which 95% of the examined children had a certain category of teething [28, 45].

In this research, information on the child's date of birth is obtained by interviewing the child himself or herself and/or his/her parents or guardians, pre-school teachers, and teachers of general education schools. The exact age of the child was calculated as the number of years, months, and days between the date of birth and the survey date. Age groups were formed, as is customary in anthropometric studies, and for children from 3 to 7 years the interval was calculated by half-year, and from the age of 8 years - by one year. The teething rate of permanent teeth was studied separately for girls and boys. The examination material was developed separately for the upper and lower jaws and for the right and left quadrants of each jaw.

Before the basic research was carried out, the researchers were trained to fill in a dental formula and conduct a clinical evaluation of permanent teething, followed by a preliminary examination of a group of children consisting of 4-5 people aged 3, 5, 7, 9, 11 and 13 years. The dental examination of the children was carried out under natural adequate lighting and additional artificial light sources were used, if necessary. Collection of primary material for dental examination was carried out by the generalization method, which consists in one-stage examination of large groups of children in order to obtain material for the development of regional age and sex standards and assessment tables used for individual assessment of child development [38]. The work was carried out in accordance with the basic normative and ethical requirements for conducting this type of research. Preliminary permission was received from the Main Department of Public Education of Tashkent city, district departments of public education and administration of preschool educational institutions and schools. Children and/or their parents (guardians) were briefed on the purpose and methods of the research and gave their written consent.

Statistica-6 and Microsoft Excel application packages were used to statistically process the primary material of the examined parameters of children's dental development of different age groups in terms of timing, sequence and symmetry of teething. For comparative estimation of the results obtained we used data of scientific works of foreign authors.

### **RESULTS**

This research determined that the starting age at which 5% of the children surveyed had central lower incisors cut on both sides (31, 41) was 4 years 9 months for boys and 4 years 7 months for girls. Then, at 4 years 10 and 4 years 11 months of age, the first right and left molars (36, 46) were cut sequentially on the lower jaw. Simultaneously, in the lower jaw for boys, the age at which the first molar began to erupt on the left is 5 years 1 month (36), and on the right - 5 years 2 months (46). The age of the beginning of the top first molars (16, 26) in girls is defined as 5 years 1 month and in their peers - 5 years 4 months. In the 5,5 year age group, the start of the central upper incisors (11, 21) was observed

3 months later for boys in the left quadrant than for girls (5 years 8 months vs. 5 years 5 months) and 6 months later in the right quadrant (5 years 9 months vs. 5 years 3 months). In this age group, the average penetration time of the central lower incisors (31, 41) was 5 years 8 months for boys and 5 years 7 months for girls.

At the age of 6, boys had a start time of 5 years 11 months (32) and 6 years 1 month (42) for both lateral lower incisors, which were 1-4 months later than girls 5 years 10 months (32) and 5 years 9 months (42). The 6-year age group of boys is characterized by an average period of teething such as: first lower molars (36, 43) - 5 years 10-11 months; first upper molars (16, 26) - 6 years 2 months. For 6-year-old girls, the average age at which permanent teeth are erupted was established, when 50% of the female population surveyed had their first lower molars (36, 46) - 5 years 9-10 months, the first upper molars - 5 years 11 months (16) and 6 years 1 month (26). Consequently, the average age at which girls perceive the first lower and upper molars was recorded 1-3 months earlier than their male counterparts.

For the girls surveyed, the age group of 6,5 years was determined to be 6 years 7 months (12, 22) when the upper lateral incisors began to erupt. Also for this age group of girls, the average age at which the upper lateral incisors start to emerge is 6 years 8 months (11, 21).

The age group of 7 years was determined for the first time as the age of completion of teething, where 95 percent of the children surveyed had permanent teeth such as first molars and central incisors: for boys 7 years 0 months (16, 36), 7 years 2 months (26, 46); for girls in this age group, the completion time for the lower central incisors was determined to be 7 years 0 months (31) and 7 years 2 months (41), as well as for the first antagonist molars in the right quadrant to be 6 years 10 months (16, 46) and for the left to be 6 years 11 months (26, 36). In the age group of boys 7 years old, the sequence of permanent teeth is as follows: central upper incisors (21 - 49,0% and 11 - 46,0%) with an average age of 7 years 1 month and lower lateral incisors (32 - 47,0% and 42 - 45,0%) with an average age of 7 years 2 months; then the upper lateral incisors (22 - 5,0% and 12 - 4,0%) with an average cutting age of 7 years 0 months (22) and 7 years 1 month (12); also in this age group, boys were recorded as having an upper jaw premolar of the left side (24) for 7 years 5 months. Girls in the 7-year age group were characterized by further penetration of the lower lateral incisors (42 - 58,82% and 32 - 53,92%) with an average penetration period of 6 years 10-11 months.

It is determined that 8 years of age for boys is the age of permanent teeth eruption completion such as the lower central incisors - 7 years 6 months (31, 41). In this age group, boys consistently continue to erupt: upper lateral incisors (12 - 36,63% and 22 - 33,66%), for which the average age of eruption is 8 years 4 months; upper first premolars (24 - 11,88% and 14 - 9,90%) with an initial age of 14 teeth - 7 years 7 months, lower first premolars (44 - 5,94% and 34 - 2,97%) with an earlier (by 2 months) initial age of the right first premolar compared to the left one - 7 years 11 months (44) vs. 8 years 1 month (34); upper second premolars (3,96% each), whose initial age of penetration differed by 1 month, amounting to 8 years 4 months (15) and 8 years 3 months (25); lower canines (43 - 2,97% and 33 - 1,98%) with the age of penetration beginning - 8 years 2-3 months. At 8 years of age, girls continue to have upper lateral incisors (22 - 54,46% and 12 - 53,47%) with an average cutting period of 7 years 10-11 months. Also in this analyzed

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age group for girls, the age at which the top fourth teeth begin to erupt has been set at 7 years 6 months (24) and 7 years 9 months (14). For girls at 8 years of age, the beginning of teething of the lower canines (33 and 43 per 3,96%) and the lower first premolars (34 and 44 per 1,98%) was observed, for which the age of teething beginning was set at 8 years 1 month, and the upper second premolars at 8 years 5-6 months (25 and 15).

Based on the obtained data analysis, the age of 9 years for boys is considered to be the age at which permanent teeth such as the central upper incisors are completed - 8 years 9-10 months (21, 11) and the lateral lower incisors - 8 years 10 months (32, 42). While for girls the age of completion of the central upper incisors was 3 months earlier than for boys and was 8 years 6-7 months (21, 11) and for the lateral lower left incisor (32) 1 month earlier (8 years 9 months), while the age of completion of the right lateral incisor was the same as for boys and was 8 years 10 months (42). Boys at 9 years of age had upper canines (13 - 5,0%, 23 - 9,0%) and lower second premolars (35 - 4,0%, 45 - 7,0%), which were defined as 8 years 10 months (23), 8 years 11 months (45), 9 years 0 months (13), and 9 years 1 month (35). In the 9-year age group of the examined girls start to erupt the upper canines (13 - 8,66% and 23 - 10,24%) and the lower second premolars (35 - 11,81% and 45 - 11,02%), for this category of teeth the exact age of eruption beginning was determined as 8 years 6 months (23) and 8 years 7 months (13, 35 and 45). Female teeth for the lower second molars started to erupt at 9 years 5-6 months (37, 47).

The obtained data analysis shows that children in the 10-year-old age group are now at the age of completion of the upper lateral incision (12, 22), which was 9 years 11 months for boys and 9 years 8 months for girls. Boys have an average age of 9 years 10 months (14) and 10 years 0 months (24) for the upper first premolars, and lower jaw canines and first premolars 10 years 5 months (33, 34) and 10 years 6 months (43, 44). The initial circumcision time of the upper second molars (17, 27) in males is 10 years 3 months and the lower second molars 9 years 11 months (37) and 10 years 0 months (47). Girls in the age group under analysis continue to erupt sequentially: upper first premolars (24 - 62,63%, 14 - 59,60%) with an average cutting time of 9 years 8-9 months (24, 14); lower first premolars (34 - 62,63%, 44 - 57,58%) with an average cutting time of 9 years 9 months; lower canines (43 and 33 - 60,61% each) with an average cutting length of 9 years 9-10 months, and upper second premolars (15 - 38,38%, 25 - 34,34%) with an average cutting length of 10 years 4-5 months (15, 25). In girls, the age at which teeth began to erupt was 17 at 9 years 10 months and 27 at 10 years 0 months, as the proportion of these teeth in the 10-year age group was 5,05% (27) and 6,06% (17).

Boys at 11 years of age consistently continue to have upper second premolars (25 - 59,46% and 15 - 61,26%) with an average cutting period of 10 years 7-8 months (25, 15), lower second premolars (35 - 54,05% and 45 - 57,66%) with an average cutting period of 10 years 10 months, then - upper canines (13 - 44,14% and 23 - 42,34%) with an average cutting period of 11 years 1 month. The sequence of penetration of girls at the same age period was presented as follows: lower second premolars (35 - 55,88%, 45 - 60,78%) and upper canines (23 - 67,65% and 13 - 59,80%) with an average age of 10 years 7 months (23, 45), 10 years 8 months (13) and 10 years 9 months (35); lower second molars (37 and 47 - 41,18% each) with an average age of 11

years 5 months.

It is determined that in children of both sexes at the age of 12 years, in addition to 100% of teething of the upper and lower first molars, central and lateral incisors, boys consistently continued to teething the following categories of teeth: upper first premolars (24 - 96,04% and 14 - 93,07%) with determination of the age of teething completion 24 teeth equal to 11 years 11 months and 14 teeth 12 years 2 months; lower second molars (37 - 64,36% and 47 - 58,42%) and upper second molars (17 - 33,66% and 27 - 39,60%) with an average teething age of 11 years 8 months (37), 11 years 9 months (47), 12 years 4 months (27) and 12 years 6 months (17). For girls in the 12-year-old age group, the teething sequence was the same as that of males: Upper first premolars (24 - 97,03% and 14 - 93,07%), with 24 teeth set at 11 years 10 months and 12 years 1 month for 14 teeth; lower canines (43 - 96,04% and 33 - 98,02%) with an age of teething completion equal to 11 years 11 months; the lower first premolars (34 - 95,05% and 44 - 94,06%) - the end of teething was 12 years 0 months (34) and 12 years 2 months (44); the upper second molars (17 - 44,55% and 27 - 48,51%) with an average teething period of 12 years 4 months (17) and 12 years 2 months (27).

In the 13 years age group of boys surveyed, the age at which teething is completed is the upper left second premolar (25) - 12 years 11 months, then the upper right premolar (15), lower canines (33, 43) and the lower first left premolar (34) - 13 years 1 month. For girls in the age group under analysis, the age at 13 years 1 month is the age at which the upper second premolar (15, 25) is complete.

At 14, the age of completion of the second left premolar on the lower jaw is 13 years 11 months (35), the second premolar on the right side is 14 years 1 month (45) and the upper canines 13 years 8 months (13, 23). For girls in this age group, the top canines were first completed at 13 years 6 months (13, 23), then the bottom second premolars at 13 years 7 months (35) and 13 years 9 months (45), followed by the bottom second molars at 14 years 4 months (37) and 14 years 6 months (47).

The 15-year-old age group was characterized by the fact that it was at this age that the permanent bite formation was completed. For boys, at 15 years of age, the second molar bite was completed at the age of 14 years 10 months (37, 47) and 14 years 11 months (17, 27). Girls in the 15-year-old group, as well as their male peers, complete the formation of a constant bite with completion of the second top molars at 14 years 7 months (17) and 14 years 9 months (27).

It has been determined that at the age of 16, there have been isolated cases of cutting of the lower third molars, both boys (38 - 1,98% and 48 - 0,99%) and girls (38 and 48 - 0,99%), and girls have also observed the appearance of the upper third molar on the left side (28 - 0,99%). Of the total 17-year-old population surveyed, only some boys (38 - 2,97%, 48, 18 and 28 - 1,98% each) and girls (38 - 3,96% and 48 - 2,97%, 18 and 28 - 1,98% each) have seen the thinning of the lower and upper third molars.

For children of both sexes, the starting and average teething period of permanent teeth, in which, respectively, 5 and 50 per cent of the children surveyed had one or another category of teeth, was characterized by an incisor type on the lower jaw and a molar type on the upper one. The teething sequence at the initial and middle stages in children of both sexes was the same, except for the upper canines (13, 23) and lower second premolars (35, 45) in the

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middle stage in boys. The teething sequence was carried out in the following order: lower center incisors, lower first molars, upper first molars, upper center incisors, lower lateral incisors, upper lateral incisors, upper first premolars, lower first premolars, lower canines, upper second premolars, upper canines (lower second premolars for boys in the middle stage), lower second premolars (upper canines for boys in the middle stage), lower second molars, upper second molars.

The age at which permanent teeth were teething was completed in boys and girls was characterized by the molar type, since the teething sequence at the stage of completion, when 95 per cent of children had one or another category of teeth, was in the following order: lower first molars, upper first molars, lower central incisors, upper central incisors, lower lateral incisors, upper lateral incisors, lower canines (in girls), upper first premolars, upper second premolars (in boys), lower first premolars (in girls), lower canines (in boys), upper second premolars (in girls), lower first premolars (in boys); further the sequence in children of both sexes did not differ and was of the following nature: upper canines, lower second premolars, lower second molars and upper second molars. The data presented showed that in girls, the lower canines erupt after the upper lateral incisors and the upper canines after the upper second premolars, while in boys, the lower canines erupt after the upper second premolars and the upper canines after the lower first premolars.

Thus, for children of both sexes, the teething sequence in the initial and middle stages did not differ, except for the upper canines and lower second premolars, and when the constant bite was completed, the sequence of lower canines, lower first premolars and upper second premolars clearly showed gender differences.

By analyzing the initial, middle and final teething periods of permanent teeth, it was determined that in most cases, children of both sexes had their lower teeth teething before the upper teeth. However, the exceptions were the upper first premolars (14, 24) and the second premolars (15, 25), which were 4-10 months earlier than boys' antagonist teeth (44, 34 and 45, 35) and the second premolars (15, 25), which were 1-2 months earlier than girls' antagonist teeth (45 and 35). The exceptions to the average eruption time were the upper first premolars (14, 24) for boys and the second premolars (15, 25) for children of both sexes, who were 1-8 months earlier than their antagonist teeth (44, 34 and 45, 35) and the first premolars (14, 24) for girls, who erupted almost simultaneously with 44 and 34 teeth. In the analysis of timing of completion of teething of the upper and lower permanent teeth, the exceptions were the upper first premolars (14, 24) in boys and the second premolars (15, 25) in children of both sexes, who were teething 6-14 months faster, than their antagonists (44, 34 and 45, 35), as well as the upper first premolars (14, 24) for girls and the upper first molars for children of both sexes (16, 26), which were teething simultaneously with 44, 34, 46 and 36 antagonist teeth.

According to the timing of teething, it was found that the available teething asymmetry between the antimony teeth was 1-3 months. At the initial stage of teething, the asymmetry was more pronounced in boys than in girls. The exceptions were the boys' upper first and second molars (16, 26 and 17, 27), the lower central incisors (31, 41) and the girls' upper lateral incisors (12, 22) and the upper first molars (16, 26), and on the lower jaw - the central incisors (31, 41), canines (33, 43), the first and second premolars (34,

44 and 35, 45), when no difference between these antimony teeth was revealed. Conversely, in the middle and final stages, the teething asymmetry of the contralateral teeth was more common in females. At the same time, boys had average teething periods between 11 and 21, 12 and 22, 16 and 26, 13 and 23, 31 and 41, 32 and 42, 35 and 45, while girls had no difference between 11 and 21, 31 and 41, 34 and 44, 36 and 46, 37 and 47 antimony teeth. Antimony teeth such as 12 and 22, 13 and 23, 17 and 27, 31 and 41, 32 and 42, 33 and 43, 37 and 47 for boys, and 12 and 22, 13 and 23, 15 and 25, 33 and 43 for girls were teething at the same time. The observed asymmetry of the antimony teeth by the timing of teething indicated left-handed teething in boys and right-handed teething in girls.

### **DISCUSSION**

Some Russian researchers have analyzed scientific works carried out in different years to study the nature of permanent teething in children of different ages, gender and nationality living in different countries of the Commonwealth of Independent States (CIS). In the analysis of these works the examination methods applied by different authors were discussed, disadvantages were pointed out and unified criteria of permanent teething estimation were recommended [35, 42]. Therefore, we have considered the revealed drawbacks as well as comments and suggestions made by these authors.

In the present research, for the first time in Uzbekistan, the terms (initial, middle, final), as well as sequence and symmetry of teething of upper and lower permanent teeth in children aged from 4 years 6 months to 17 years were determined. Analysis of available literature showed that studies of initial, middle and final periods of permanent teeth teething were carried out in single cases, the results of which were presented in scientific papers by L.B.Belugina [29], S.I.Volkova and Y.V.Gretchenko [33].

When analyzing the timing of the beginning of teething it was determined that the advance in children of Tashkent with children of Saratov city was from 1 to 7 months, and with children of Sergach city - from 1 to 24 months, while the delay - from 1 to 11 months and from 1 to 6 months, respectively, compared with the cities of Saratov and Sergach [29, 33] (Table 2). When comparing the average timing of permanent teething in Tashkent children with the children of Russian cities, it was found that Tashkent children in most groups of teeth are 1-9 months ahead of their Saratov peers, and Sergach - 1-11 months, at the same time inferior to them in teething by 1-16 and 1-14 months, respectively. At comparative estimation of terms of completion of teething of permanent teeth it is defined that the Tashkent children equally are ahead of the peers of the cities of Sergach and Saratov on 4-17 months and concede - on 1-16 months. It is determined that the timing of permanent teething in Tashkent children did not significantly differ from their Saratov peers and girls had less differences than men.

According to our data, the average period of permanent teeth eruption on the lower jaw in children of both sexes of Tashkent city was characterized by incisor type and on the upper jaw by molar type, which agrees with the results of work of Lithuania [2], England [7] and Russia [46]. In other studies girls were characterized by a cutter type [4, 29], and boys - by a molar type [17, 24, 29, 33]. In some works, the types of teething were also defined in girls as incisor and in boys as molar, but without regard to the position of teeth

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on the upper or lower jaw [33, 42]. It was found that the average age of teething occurs earlier in girls than in boys for all permanent teeth [12, 19]. Thus, our findings that permanent teeth in the average age of teeth erupted earlier in girls than in boys are confirmed by the majority of other researchers, but we found some exceptions in the initial and final stages of teething, when the premolars in boys erupted earlier than in girls. Similar exceptions have been found for second molars and canines in Irish and South African children [16, 25].

The teething sequence of permanent teeth was compared with the results of studies of various works by foreign authors (Table 3). The teething sequence in children of different countries, presented in the table, showed that our data are more similar to the results of Lithuania [2] and significantly differ from the results of children in Uganda [16] and New Zealand [12].

According to our data, in children the sequence of permanent teeth teething on the upper jaw was different from that on the lower one. When comparing the upper jaw to the lower jaw, no difference in the teething sequence was registered in children of India [17]. In all other countries we analyzed, a difference in the teething sequence of antagonist teeth was found, which is caused by a change in the ratio of not only canines to premolars, but also the first molars to central incisors.

When comparing teething in children from different countries, it was determined that the sequence of teething of upper jaw teeth in boys in Uzbekistan did not differ from India [17], Jordan [24], Spain [4], Lithuania [2] and Russia [33], while the sequence of teething of lower jaw teeth in boys examined by us coincided only with Lithuanian peers [2]. In the girls we examined the sequence of the upper jaw teeth appearance coincided with the girls of England [7], Jordan [24] and Russia [33], and for the lower jaw teeth a similar teething sequence was not revealed.

When comparing the teething of permanent teeth in children from different countries, it was determined that in Uzbekistan and India [23] no gender differences in the sequence of teeth appearance, both on the lower and upper jaws were revealed. The sequence of teething of upper jaw teeth in girls and boys in India [17] is consistent with Denmark [10], Libya [20] and Oregon [22]. The absence of gender differences in the upper jaw was observed among children in Jordan [24], New Zealand [12] and Russia [33], and in the lower jaw among children in England [7] and Spain [4]. The eruption sequence has been shown to vary among children of different sexes living in Northern Ireland and Denmark [6, 15].

The gender differences we observed were found in the sequence of canines cutting in relation to the premolars and, to a much lesser extent, the first molars in relation to the central incisors. A high frequency of polymorphism has been observed in the sequence of premolars and canines, and children have much more jaw sequences such as the second premolar, then the first premolar, and then canine (25). With regard to teething sequences in children in India [1] and Kenya [9], it has been observed that the first premolars on the upper jaw were teething in front of canines, while on the lower jaw canines were teething in front of the first premolars.

It has been determined that the children we examined had the first premolars on the lower jaw, then canines, followed by the second premolars, while the upper jaw had the second premolars, then canines, and then the second

molars. The same sequence was observed in the children of Kiev - the canine on the lower jaw erupts after the first premolars and on the upper jaw after the second one [39, 40, 43]. These data are fully consistent with the results of some researchers in Russia [33] and Belgium [18], and on the upper jaw - with those of children in Venezuela [19]. While in Saratov children, the canines of boys emerge after the first premolars and the upper second premolars, and in girls, the lower canines emerge after the first premolars but before the second premolars and the upper canines after the second premolars [29]. The results of studying the sequence of permanent teeth eruption in Transbaikalia children showed that the canine on the lower jaw erupts simultaneously with the first and second premolars [43]. According to researchers, in boys of New Zealand [12] and Russia [33] on the lower jaw, and in girls of Uganda [16] on the upper jaw, canines are teething simultaneously with the first premolars.

According to the average timing of antimony teeth eruption in children of Tashkent city, asymmetry was observed, which ranged from 1 to 3 months. Moreover, teething asymmetry was more pronounced in girls than in boys, while according to Belugina L.B. (2004) it was vice versa [29]. Among boys on the upper and lower jaws we revealed a tendency to the left-hand teething, while in girls the number of teeth on the right side prevailed, which agrees with the results of studies conducted in Russia [29]. According to the results of other international studies, no statistically significant difference in teething time between homologous contralateral teeth was found [3, 8, 11, 13, 19, 21, 27].

In the present study, teeth on the lower jaw erupted earlier than on the upper jaw, with the exception of the upper first premolars in boys and the second premolars in children of both sexes who were ahead of their antagonist teeth, which was confirmed by other studies that found that the upper premolars erupted earlier than the lower ones [4, 13, 15, 26, 36, 44].

Thus, the studied parameters in children of Tashkent city have their own peculiarities: in the 15-year-old age group girls and boys have a complete formation of a constant bite, except for third molars; age and gender differences are determined by the timing of teething antagonists and antimony teeth, as well as by the sequence of the central incisors, first molars, canines and premolars.

### **CONCLUSIONS**

1. In the examined children, the initial and average time for permanent teeth to erupt on the lower jaw was characterized by the incisor type and on the upper jaw by the molar type; the age of completion of permanent teeth eruption on both jaws was characterized by the molar type.
2. In boys and girls, the teething sequence of permanent teeth on the upper jaw was different from that on the lower jaw, but there were no gender differences in both the upper and lower jaws.
3. In children of both sexes, the teething sequence did not differ in the initial and middle teething stages, except for the upper canines and lower second premolars, and gender differences were clearly visible when the permanent bite was completed in the sequence of lower canines, lower first premolars and upper second premolars.
4. By analyzing the initial, middle and final teething periods of permanent teeth, it was determined that in most

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cases, children of both sexes had their lower teeth erupted before the upper teeth, except for the premolars.

5. Sex dimorphism manifested itself in terms of the timing of permanent teeth eruption, which in girls were erupting earlier than their male counterparts and, depending on the eruption stage, the gender difference in the upper jaw was 1 to 6 months and in the lower jaw was 1 to 14 months.
6. In terms of timing of teething, the asymmetry between contralateral teeth ranged from 1 to 3 months, indicating left-hand teething in boys and right-hand teething in girls.
7. The studied parameters for children in Tashkent city have their own distinctive features from those of children in other countries and, therefore, the nature of permanent teething should be assessed according to regional standards developed for children in Uzbekistan.

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### TABLES

**Table 1.** Distribution of the studied population of children by age and sex, %

Age, in years	Boys		Girls		Total
	n	%	n	%	
4 years 6 months	101	3,13	98	3,03	199
5 years	100	3,09	96	2,97	196
5 years 6 months	94	2,91	92	2,85	186
6 years	92	2,85	100	3,09	192
6 years 6 months	100	3,09	102	3,16	202
7 years	100	3,09	102	3,16	202
8 years	101	3,13	101	3,13	202
9 years	100	3,09	127	3,93	227
10 years	101	3,13	99	3,06	200
11 years	111	3,43	102	3,16	213
12 years	101	3,13	101	3,13	202
13 years	101	3,13	102	3,16	203
14 years	102	3,16	100	3,09	202
15 years	101	3,13	101	3,13	202
16 years	101	3,13	101	3,13	202
17 years	101	3,13	101	3,13	202
Total	1607	49,72	1625	50,28	3232

**Table 2.** Comparative assessment of the average period of permanent teeth eruption in children in Uzbekistan (Tashkent city) and Russia (Saratov and Sergach cities), year and month

Teeth	Uzbekistan, Tashkent	Russia, Saratov	Russia, Sergach	Difference, month.	
				Tashkent-Saratov	Tashkent-Sergach
Boys					

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11,21	7,1	5,9	6,9	+1,4	+0,4
12,22	8,4	8,0	8,0	+0,4	+0,4
13,23	11,1	11,4	11,4	-0,3	-0,3
14,24	9,11	10,0	10,0	-0,1	-0,1
15,25	10,8	11,1	11,1	-0,5	-0,5
16,26	6,2	6,5	6,5	-0,3	-0,3
17,27	12,5	12,6	12,6	-0,1	-0,1
31,41	5,8	6,5	6,7	-0,9	-0,11
32,42	7,2	6,9	7,1	+0,5	+0,1
33,43	10,6	10,10	10,10	-0,4	-0,4
34,44	10,6	10,10	10,10	-0,4	-0,4
35,45	10,10	11,7	11,6	-0,9	-0,8
36,46	5,11	6,3	6,3	-0,4	-0,4
37,47	11,9	11,11	11,11	-0,2	-0,2
Girls					
11,21	6,8	6,7	6,7	+0,1	+0,1
12,22	7,11	7,10	7,10	+0,1	+0,1
13,23	10,8	10,8	10,8	0	0
14,24	9,9	9,8	9,8	+0,1	+0,1
15,25	10,5	10,4	10,1	+0,1	+0,4
16,26	6,0	6,4	6,3	-0,4	-0,3
17,27	12,3	11,1	11,1	+1,2	+1,2
31,41	5,7	6,0	6,4	-0,5	-0,9
32,42	6,11	7,2	7,2	-0,3	-0,3
33,43	9,10	9,6	9,6	+0,4	+0,4
34,44	9,9	10,1	10,1	-0,4	-0,4
35,45	10,8	10,8	10,8	0	0
36,46	5,10	6,3	6,3	-0,5	-0,5
37,47	11,5	11,4	11,4	+0,1	+0,1

**Table 3.** The sequence of permanent teeth teething by average timing in comparison to the last decade in children from different countries

Countries	Consistency	
	Upper jaw	Lower jaw
Boys		
Uzbekistan, 2020	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>
England, 2010	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
India, 2011	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>
Jordan, 2012	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>
Spain, 2013	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
Lithuania, 2012	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>
New Zealand, 2012	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>	(I <sub>1</sub> - M <sub>1</sub> ) - I <sub>2</sub> - (C - P <sub>1</sub> ) - P <sub>2</sub> - M <sub>2</sub>
Russia, 2016	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - (C - P <sub>1</sub> ) - P <sub>2</sub> - M <sub>2</sub>
Uganda, 2013	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - P <sub>2</sub> - P <sub>1</sub> - M <sub>2</sub> - C	I <sub>2</sub> - M <sub>1</sub> - I <sub>1</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>
Girls		
Uzbekistan, 2020	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>
England, 2010	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
India, 2011	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>
Jordan, 2012	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
Spain, 2013	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
Lithuania, 2012	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
New Zealand, 2012	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>	I <sub>1</sub> - M <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
Russia, 2016	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - P <sub>2</sub> - C - M <sub>2</sub>	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - C - P <sub>1</sub> - P <sub>2</sub> - M <sub>2</sub>
Uganda, 2013	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - (C - P <sub>1</sub> ) - P <sub>2</sub> - M <sub>2</sub>	M <sub>1</sub> - I <sub>1</sub> - I <sub>2</sub> - P <sub>1</sub> - C - P <sub>2</sub> - M <sub>2</sub>

Note: I<sub>1</sub> central cutter; I<sub>2</sub> lateral cutter; C canine; P<sub>1</sub> first premolar; P<sub>2</sub> second premolar; M<sub>1</sub> first molar; M<sub>2</sub> second molar.