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Eruption of the Permanent Teeth in Bulgarian Children: Preliminary Data

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The aim of the study is to evaluate the time of the eruption of permanent teeth in children aged 6 – 8 years. A total of 121 subjects aged 6 to 8 years, divided into three age groups were investigated. Height, body weight and cephalometric characteristics - bizygomatical breadth, bigonial breadth, physiognomical, morphological face height, etc. were measured. Dental status – type of bite, number of erupting teeth, carious activity, rotations were determined. The results are processed by the statistical program SPSS 16. The first molars (both upper and lower) and the central lower incisors erupt the earliest at the age of 80 months (6 years and 8 months). The eruption of these teeth is earlier in boys than in girls. Girls tend to have more erupted teeth in the all age groups and earlier eruption of teeth 14, 24, 25, 33, 43, 44. Results are similar compared to other studies.

Key words: eruption, permanent teeth, Bulgarian children

Introduction

The term *eruption* and in particular *tooth eruption* is the process of forming the dental germ, all dental structures and its movements inside the jaw, penetrating the mucosa, appearing inside the mouth and getting or not in contact with its antagonist tooth or teeth. The process of developing of the teeth begins intrauterine in the moment of forming the dental germ and finishes in the teenage years of life with forming of the root system of the last permanent teeth. The eruption of permanent teeth is influenced by various factors: genetics, sex, nutrition, preterm birth; socioeconomic factors; body height and weight; systemic diseases [1]. Tooth eruption is used in forensic medicine for determination of age in cases of identification of an individual; in criminal cases in connection with the offences of rape, kidnapping, and infanticide; in criminal cases involving children, to determine whether the child has reached an age at which the law holds him responsible for his actions [16]. Tooth eruption is also used in paleoanthropology to determine age and life expectancy [9].

The age of tooth eruption is one of the main indicators used to evaluate the biological maturity and morpho-functional status of children. The assessment of the time and sequence of eruption of the different groups of teeth in children allows to establish whether it is normal, retained, retarded or complicated and to take timely measures to optimize their oral health. The eruption of permanent teeth is used in the process of preparing a treatment plan in dentistry and orthodontics [15]. Understanding and knowledge of the processes of normal tooth eruption and its variation is required by each clinician for diagnosing and treatment [14].

The aim of the study is to estimate the time of the eruption of permanent teeth in Bulgarian children aged 6-8 years.

Materials and Methods

The present study includes 121 children – 53 boys and 63 girls, divided into three age groups – 6, 7 and 8 years. The distribution of the subjects by age and sex is presented in **Table 1**.

Table 1. *Distribution of the children by age and sex*

Sex	Count	Age			Total
		6	7	8	
boys	n	15	29	14	58
	% within Sex	25,9%	50,0%	24,1%	
	% within Age	60,0%	42,6%	50,0%	
girls	n	10	39	14	63
	% within Sex	15,9%	61,9%	22,2%	
	% within Age	40,0%	57,4%	50,0%	
Total	n	25	68	28	121

Before starting the examination children and their parents were informed about the purpose of the study. Written informed consent was obtained, in accordance with the ethical principles for medical research involving human subjects in the Helsinki Declaration of World Medical Association [19]. Only children in good general and clinical health were included in the study. The oral and dental status included number of erupted teeth, carious activity and lesions; type of bite, rotations and orthodontic pathology, oral lesions, hypoplasia, dysplasia of the teeth was taken with dental mirror and dental probe. Tooth was registered as erupted when any part of the clinical crown was presented inside the oral cavity. The degree of eruption (from early eruption – only part of the tuberculum or incisive edge presented in the oral cavity to in full occlusion) was also assessed. Some cephalometric characteristics, height and body weight, were also measured by Martin-

Saller's [12] classical method. The statistical analysis was done with the SPSS program 16.0. Frequencies analysis and Pearson Chi-square test were used for determining differences between the sex and age groups.

Results and Discussion

Eruption of teeth 12 (upper right lateral incisor), 11(upper right central incisor), 21 (upper left central incisor), 22 (upper left lateral incisor), 32 (lower left lateral incisor), 42 (lower right lateral incisor) is observed in the children aged 6, 7 and 8 years.

In **Fig. 1** is shown the differences in the eruption of upper right lateral incisor (tooth 12) between the children in the three studied age groups. In the group of 6-year-old boys and girls only 12% have eruptive tooth 12. In the group of 7-year-olds the percentage rises significantly with 26.8% and reaches 38.2%, and in the group of 8-year-olds more than half children (57.1%) have erupted upper right lateral incisor. The increment between the 7 and 8 years is significant too (18.9%).

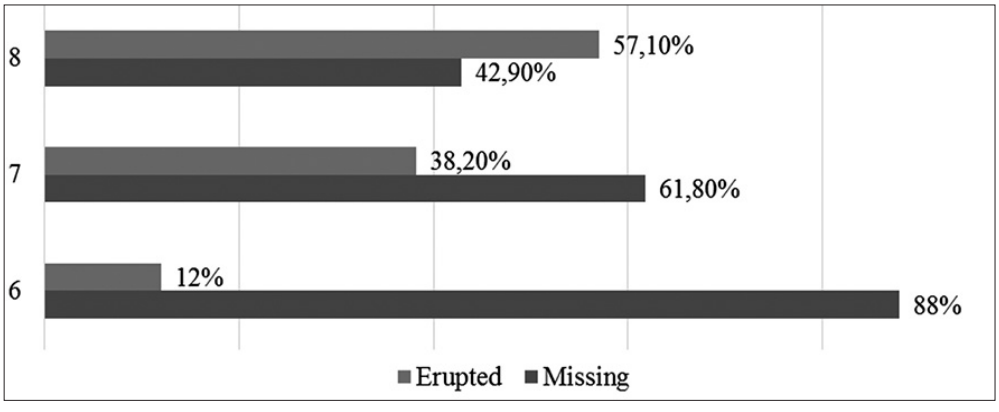

Fig. 1. Age difference in eruption of upper right lateral incisor (12)
($\chi^2_{(2, N = 121)} = 11.595$, p= .003) . The size effect is moderate (Cramer's V = .310)

In **Fig. 2** is shown the differences in the eruption of upper right central incisor (tooth 11). In the group of 6-year-old boys and girls almost half (48%) have eruptive tooth 11. In the group of 7-year-olds the percentage rises significantly with 29.9% and reaches 77.9%, and in the group of 8-year-olds almost 90 % of the children (89.3%) have erupted upper right central incisor. The increment between the 7 and 8 years is significant too (11.4%).

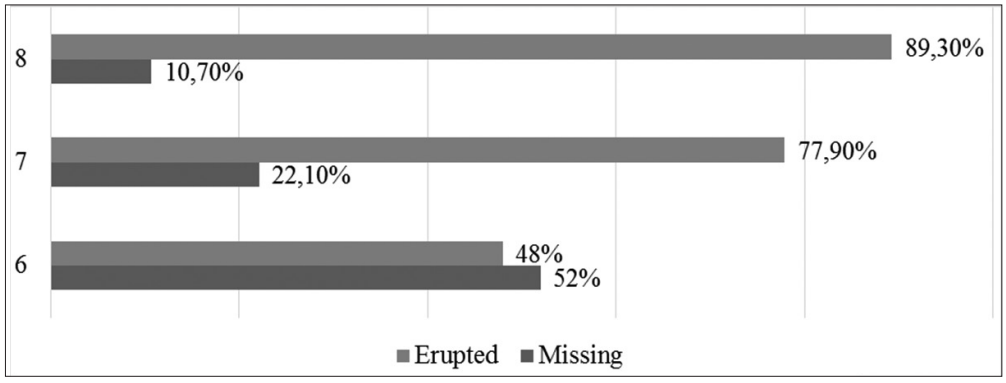

Fig. 2. Age difference in eruption of upper right central incisor (11)
($\chi^2_{(2, N = 121)} = 12.847$, p= .002) . The size effect is moderate (Cramer's V = .326)

In **Fig. 3** is shown the differences in the eruption of upper left central incisor (tooth 21). The results are similar with tooth 11. In the group of 6-year-old children half of them (48%) have eruptive tooth 21. In the group of 7-year-olds the percentage rises significantly with 31.4% and reaches 79.4%, and in the group of 8-year-olds 90 % of the children (89.3%) have erupted upper right central incisor. The increment between the 7 and 8 years is also significant (9.9%).

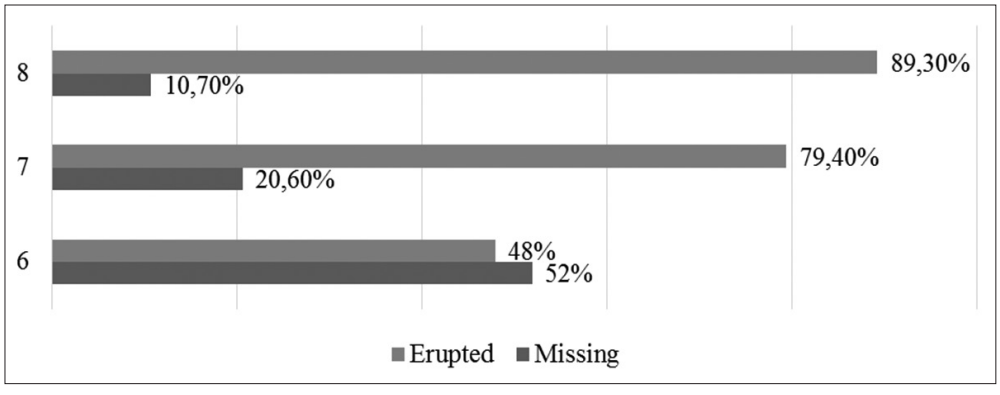

Fig. 3. Age difference in eruption of upper left central incisor (21)
($\chi^2_{(2, N = 121)} = 13.546$, p= .001) . The size effect is moderate (Cramer's V = .335)

In **Fig. 4** is shown the differences in the eruption of upper left lateral incisor (tooth 22) between the children in the three studied age groups. In the group of 6-year-old boys and girls only 8% have eruptive tooth 22. In the group of 7-year-olds the percentage rises significantly with 31.7% and reaches 39.7%, and in the group of 8-year-olds more than half children (53.6%) have erupted upper right lateral incisor. The increment between the 7 and 8 years is considerable too (13.9%).

Fig. 4. Age difference in eruption of upper left lateral incisor (22)
($\chi^2_{(2, N = 121)}$ = 12.603, p= .002) . The size effect is moderate (Cramer's V = .323)

In **Fig. 5** is shown the differences in the eruption of lower left lateral incisor (tooth 32). Twenty four percentages of 6 years old children have eruptive tooth 32. In the group of 7-year-olds the percentage increases significantly with 48.1% and reaches 72.1%, and in the group of 8-year-olds 78.6% of the children have erupted upper right lateral incisor. The increment between the 7 and 8 years is lower 6.5%.

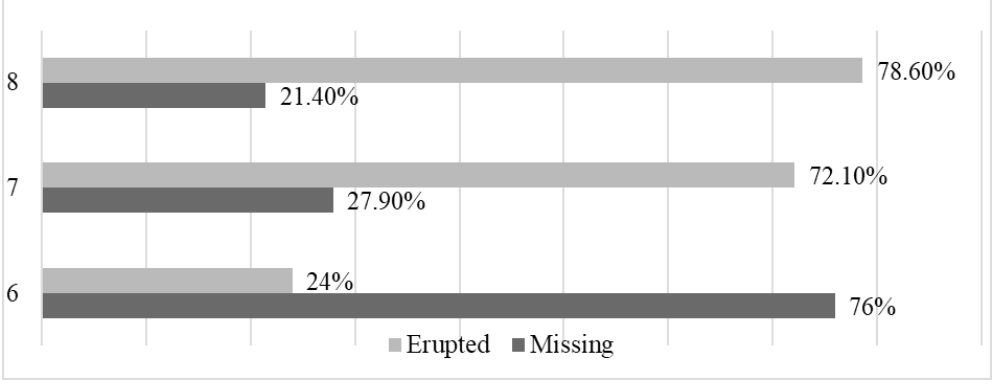

Fig. 5. Age difference in eruption of lower left lateral incisor (32)
($\chi^2_{(2, N = 121)}$ = 21.756, p< .001). The size effect is moderate (Cramer's V = .424)

Similar are the results for tooth 42 (lower right lateral incisor) which are presented in **Fig. 6**. Statistically significant differences (p=.002) in the eruption between the children in the examined age groups are established. In the group of 6-year-olds boys and girls 28% have eruptive tooth 42. In 7-year-old children the percentage achieves 64.7%, with an increase of 36.7%. In the group of 8-year-olds 71.4% of the boys and girls already have erupted upper right lateral incisor. The increment between the 7 and 8 years is 6.7%.

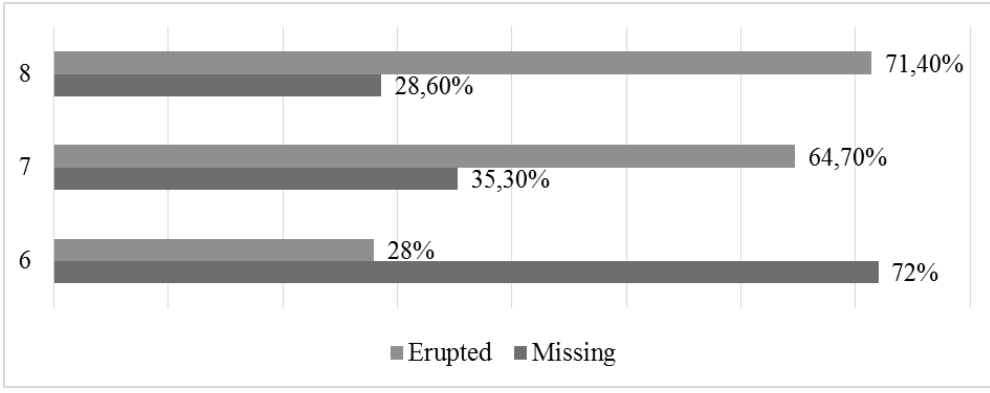

Fig. 6. Age difference in eruption of lower right lateral incisor (42)
($\chi^2_{(2, N = 121)} = 12.600$, p= .002) . The size effect is moderate (Cramer's V = .323)

In **Table 2** are presented the data for percentage of erupted teeth in 6-, 7- and 8-year-olds children, divided by sex.

Table 2. Percentage of erupted teeth in the different age groups divided by sex

Age (years)	Sex	
	Boys	Girls
6	55.5%	60%
7	70.5%	73.9%
8	53.3%	60.5%

The girls have more erupted teeth than boys in all age groups, but the biggest differences is observed at the age of 8 – 7,2%. Similar results are obtained for children from other countries [2, 3, 4, 8, 11, 13, 14].

In the three age groups are presented different erupted permanent teeth (**Fig. 7**). At the age of six, all eight incisors (central and lateral of the two jaws) and the first four molars are erupted. At the age of seven another tooth erupts – the lower right first premolar. The most erupted permanent teeth are established at the age of eight – all incisors (central and lateral), all first premolars, all first molars, lower canines and the upper second left premolar.

The eruption of permanent teeth follows a certain sequence. The earliest permanent teeth to erupt are the central lower incisors and the first upper and lower molars. The age in which they are found to erupt is 80 months (6 years and 8 months). Those cases were in boys. The central lower incisor erupted in half of the children and the molars in all of them, which suggest that molars erupt earlier than the central lower incisors. Similar results are found in other studies performed in Greece [17], Turkey [18], Syria [8],

Fig. 7. Erupted permanent teeth at the different age groups.

6XXX21	12XXX6
6XXX21	12XXX6

Erupted permanent teeth at the age of 6.

6XXX21	12XXX6
6X4X21	12XXX6

Erupted permanent teeth at the age of 7.

6X4X21	12X456
6X4321	1234X6

Erupted permanent teeth at the age of 8.
With "X" are marked the missing teeth

Australia [4], USA [5], Great Britain [7], Lithuania [2], India [6], Spain [10], Uganda [11]. On the other hand at the age of eight years teeth 14, 24, 25, 33, 43, 44 erupt. All of the cases with the mentioned teeth were in girls. Girls tend to have more erupted teeth in all age groups. Dashash and Al-Jazar [8], Carr [4], Almonaitiene [2], Chhabra [6], Kutesa et al [11], Bayrak et al [3], Ogodescu et al [13], Peneva et al [14] present either earlier eruption or more erupted teeth in females.

Table 3 presents the percentage of erupted upper and lower teeth in all age groups in both sexes.

Table 3. Erupted teeth of upper and lower jaws in boys and girls from the three age groups

Teeth	Sex					
	6y		7y		8y	
	Boys	Girls	Boys	Girls	Boys	Girls
Upper molars	83%	95%	91%	95%	100%	100%
Lower molars	93%	100%	90%	97%	100%	100%
Upper central incisors	83%	62%	83%	62%	85%	92%
Lower central incisors	96%	97%	96%	97%	100%	100%
Upper lateral incisors	36%	41%	36%	41%	46%	64%
Lower lateral incisors	62%	73%	62%	73%	67%	67%

The highest percentage of eruptive teeth is observed in the mandible. Other authors obtained similar results - more erupted teeth in the mandible than in the maxilla [2,6,8,10,14].

Conclusion

Tooth eruption is one of the factors to be used when evaluating the process of physical development and it's used by every dental clinician, working with children. The present study shows tendencies for the time, sequence, sex differences in the process of tooth eruption.

The first molars (both upper and lower) and the central lower incisors are the earliest to erupt at the age of 80 months (6 years and 8 months). The eruption of these teeth is earlier in boys than in girls. Girls tend to have more erupted teeth in the all age groups and earlier eruption of teeth 14, 24, 25, 33, 43, 44.

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