Dependence of Deciduous Tooth Eruption Terms and Tooth Growth Rate on the Weight-Height Index at Birth in Macrosomic Children over the First Year of Life

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ABSTRACT

The aim of this research is to study the effect of body overweight at birth (fetal macrosomia) on the processes of tooth eruption and tooth growth during the first year of life in children in the Kharkiv City (Ukraine) population. One of the research tasks is to examine the features of deciduous teeth eruption in children who were born with macrosomia with different values of the weight-height index at birth.

Materials and methods. The medical records of the children born between 1977 and 2013 have been analyzed. The database has been collected in one of the Kharkiv City clinic. The Main Group is comprised of the medical records of the children (separately for boys and girls) born with fetal macrosomia. All the medical records of the Main Group have been divided into subgroups taking into account the gender and the harmonious (well-balanced) development coefficient. The Comparison Group is comprised of the medical records of the children also born within the normal term range, but with weight and height that correspond to the gestation age (fetal normosomia).

To determine the average time of the first tooth eruption, as well as the deciduous teeth growth rate for each of the groups under the study, we have used the hypothesis about a linear dependence between the number of erupted teeth and the age of the child. The statistical data processing and verification of the consistency of this hypothesis is performed using the multiple linear regression analysis with the STATISTICA 6.0 software package (Multiple Regression module). The number of delayed eruption and premature eruption cases observed is calculated along with the corresponding confidence intervals for the significance level, p, of less than 0.05, taking into account the binomial distribution of the random variable.

The results of the study indicate a slowed growth rate of deciduous teeth in children born with macrosomia, as well as an increased number of cases (by a factor of 2 to 4 times) of deviations in the timing of teeth eruption compared to regional norms. The smallest growth rate of deciduous teeth and the smallest number of teeth at the age of one year are registered in macrosomic boys and macrosomic girls with a long body and a relatively reduced birth weight, as well as in macrosomic girls with intrauterine obesity. The macrosomic girls with intrauterine acceleration with obesity at the background have the largest average tooth growth rate and the largest percentage of premature eruption cases among all subgroups.

Conclusions. The somatometric features of fetal macrosomia suggest the influence on the number of teeth that erupt by a certain age. The data on the deviation from the generally accepted terms of teeth eruption in children born with macrosomia, can be the basis for developing new and improving existing prevention programs aimed at preserving dental health.

KEYWORDS

fetal macrosomia; height-weight index; deciduous teeth

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INTRODUCTION

The preventive care issues aimed at reducing the caries intensity and eliminating other dental disorders in children can not be solved without understanding the mechanisms for deciduous teeth eruption and their maturation. The patterns of both deciduous and permanent teeth eruption pertains to children's general-somatic health. These patterns are also components of somatic health. The processes of coronal and root teeth system formation and mineralization, and the tissues surrounding them, begin to develope long before the child's birth and are the stages of craniofacial complex development (1).

A great number of hereditary and environmental factors affect the terms, parity and the sequence of tooth eruption (2). The influence of prenatal period, preterm birth, state of health and parents' age has already been proved (3). Several studies have been recently carried out to reveal the effects of the pathological course of pregnancy on dental health (4).

The processes of teeth eruption and maturation are influenced by childhood diseases and feeding preferences (5, 6). There are sexual, racial and even regional differences in the mean values of teeth eruption terms (7). The influence of weight gaining rate in the first months of life on the processes of deciduous teeth eruption is also studied (8).

In the previous research (9), we have revealed a significant impact of weight-growth parameters at birth on the terms of teeth eruption in children in the Kharkiv City. The results obtained agree with the studies of other scientists (10), and prove that fetal macrosomia leed to the violation of maxillofacial system development (11). Diagnosis of fetal macrosomia is made when the weight of the child's body at birth is equal to or more than 4,000 g (12). Using the chronological standards (1) for the desidious teeth eruption, it is found that macrosomic newborns have, on average, a lower teeth growth rate and a larger spread in the number of teeth that have erupted before a certain age. Moreover, the effect of weight gaining rate after birth on these processes is excluded (11).

Different researchers give controversial information about the terms of teeth eruption in macrosomic newborns (1, 13, 14). Some authors (14) indicate the premature eruption of deciduous teeth in macrosomic newborns, whereas Khuraseva (13), on the contrary, reveales a delay in the deciduous teeth eruption in this group of children. Existing controversies can be explained by many factors. The literature shows that many factors can lead to the macrosomic child birth. The processes that cause intrauterine weight gainining may also affect the terms of teeth eruption. As is well known, macrosomic children do not comprise a homogeneous group due to various factors leading to the formation of fetal macrosomia and the individual characteristics of newborn infants.

One of the classifications of fetal macrosomia is grounded on the harmonious development coefficient, which has been introduced and later repeatedly improved by Kharkiv scientists (15). This classification is based on the weight-height index at birth. In this paper, we attempt to assess the averaged teeth eruption terms in children born with macrocomia, taking into account weight, length and weight-height index of a newborn child.

The purpose of this research is to study the effect of body overweight at birth (macrosomia) on the processes of teeth eruption and of teeth growth during the first year of life, taking into account different values of the weight-height index at birth.

The research aims to perform the following tasks:

1. Based on extensive factual material, to confirm the correlation between the states (macrosomia/normosomia) of a child at birth and the terms (delayed/timely/premature eruption) of deciduous teeth eruption expressed in teeth quantity at the age of one year.
2. Depending on the value of the harmonious (well-balanced) development coefficient at birth, to detect the features of teeth eruption in children born with macosomia: for children with harmonious intrauterine development; with intrauterine accelerated growth and relatively low body weight; with intrauterine obesity on the background of large body length; and for children with intrauterine obesity on the background of the average body length.

MATERIAL AND METHODS

We carried out a retrospective analysis of 9,177 medical records of patients born between 1977 and 2013 and then treated in the First Department of the Municipal Children's Clinic number 23 in Kharkiv (Ukraine).

The Ethical and bioethical committee of the Kharkiv National Medical University (minutes No. 5 of 10 May 2016) confirms that the techniques used in this study have been applied with the respect to human rights in accordance with the current legislation in Ukraine, meet international ethical requirements and do not violate ethical norms in science and standards for conducting biomedical research.

All the patients have been divided into two groups in accordance with their weight-height indexes at birth. The Main Group included 748 children with fetal macrosomia (8.2% of the total number of studied medical records). There are 485 boys and 263 girls among them born within the normal term range of 37–42 weeks' gestation age. The Comparison Group involved 706 children (413 boys and 293 girls) born within the normal term range of 37 to 42 weeks' gestational age with height and weight corresponding to the gestational terms (fetal normosomia). The body weight at birth in this group is from 2,800 g to 3,799 g. The distribution of the number of medical records analyzed within the years, remained steady and comparable for both macrosomic and normosomic children of both sexes.

To determine possible features in the process of teeth eruption and teeth growth, all children of the Main Group have been divided into four subgroups in accordance with weight-height parameters at birth using the harmonious coefficient by V. I. Hryschenko et al. (15). These subgroups are presented in Figure 1.

Subgroup I consisted of medical records of the 247 macrosomic newborns (160 boys and 87 girls) with harmonious intrauterine development.

Subgroup II includs medical records of 96 macrosomic children (66 boys and 30 girls) who were born with long body height and relatively decreased intrauterine body weight.

Subgroup III is made up of medical records of 145 macrosomic children (104 boys and 41 girls) born with long body height and being overweight, which is classified by V. I. Hryschenko as the intrauterine acceleration in the background of obesity.

Subgroup IV is comprised of the medical records of 260 macrosomic children (154 boys and 106 girls) who were born with average weight parameters in combination with intrauterine obesity.

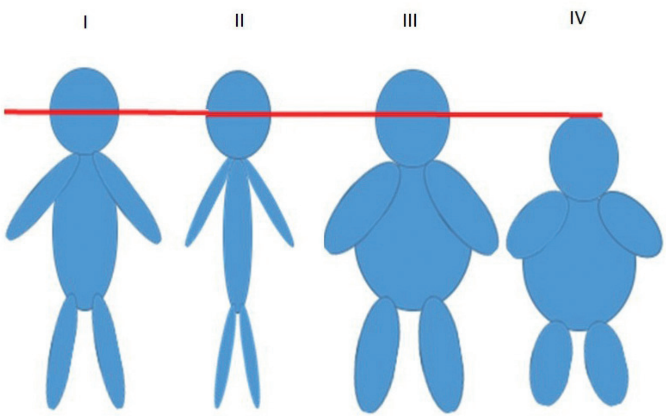

Fig 1 Schematic depicting of macrosomic newborns in subgroups (15), where *Subgroup I* children are long, harmoniously developed newborns; *Subgroup II* children are newborns with increased body length and relatively low body weight; *Subgroup III* children are newborns with intrauterine acceleration in combination with intrauterine obesity; *Subgroup IV* chidren are newborns with average body length and severe obesity.

Table 1 shows the average weight-height parameters of all the participants under study based on their body weight-height index at birth. The differences in the weight-height parameters between the groups and subgroups proved to be for the significance level, p, of less than 0.05.

Taking into account the scientific findings that breastfeeding has a significant impact on the craniofacial complex development; we have analyzed the medical records of the patients under study and found that 67% macrosomic and 64% normosomic children have been breastfed by the age of 6 months.

The degree of the maxillofacial area development is evaluated using the chronological norms of deciduous tooth eruption, i.e., using the number of teeth erupted before the age of one year (6). We calculated the percentage of the delayed or premature teeth eruption in all groups and subgroups with the respective confidence intervals and the significance level $p < 0.05$ for the binomial distribution law of the random value (16).

To determine the average term of first tooth eruption, as well as the deciduous teeth growth rate for each of the groups under the study, we have used the hypothesis about a linear dependence between the number of erupted teeth and the age of the child. Testing this hypothesis and defining the coefficient of the multiple linear regression have been performed with the STATISTICA 6.0 software package (Multiple Regression module). The coefficient of determination, B, (at a level of 0.6) is estimated from a regression fit, and the Pearson's chi-squared test is applied to evaluate the degree to which the distribution of residuals is consistent with the normal distribution (for the significance level, p, of less than 0.05). Student's t-test is used for assessing the statistic significance of the difference between the regression coefficients for different groups and subgroups for the significance level, p, of less than 0.05 (17).

RESULTS OF THE STUDY

We have analyzed the data from children medical records as to the number of teeth, which they had between the ages of 4 and 12 months. The data on girls and boys are calculated separately. Table 2 shows the amount of statistics for children with both fetal macrosomia and normosomia.

The records of baby age, measured in months, are almost uniformly distributed, and the distributions for macrosomic – normosmic child pairs for girls and boys are comparable. The difference in the number of records by a factor of 3 is less for all age groups.

The available data have been used for calculating the regression lines. The data obtained prove that the relationship between the dependent variable (number of teeth) and the predictor (age) is adequately represented by a linear regression. The determination coefficient is

Tab. 1 Average participant weight, height, head and chest circumference at birth with both fetal macrosomia and normosomia.

Groups and Subgroups	Body weight (kg)	Height (cm)	Head circumference (cm)	Chest circumference (cm)	Weight-height index (kg/m³)
Normosomia (N = 706)	3.31 ± 0.02	51.79 ± 0.14	35.13 ± 0.10	34.32 ± 2.58	23.94 ± 0.21
Macrosomia (N = 748)	4.18 ± 0.01*	54.57 ± 0.16*	35.96 ± 0.22*	36.71 ± 2.75	26.20 ± 0.10*
Subgroup *I* (N = 247)	4.16 ± 0.02*	55.60 ± 0.16*	36.72 ± 0.65*	36.21 ± 4.83	24.19 ± 0.12
Subgroup *II* (N = 96)	4.16 ± 0.04*	58.34 ± 0.30*	36.65 ± 0.27*	36.19 ± 0.27	20.99 ± 0.24*
Subgroup *III* (N = 145)	4.35 ± 0.04*	54.38 ± 0.12*	36.99 ± 0.20*	36.54 ± 6.58	27.05 ± 0.17*
Subgroup *IV* (N = 260)	4.12 ± 0.02*	52.30 ± 0.11*	36.55 ± 0.18*	35.87 ± 0.35	28.88 ± 0.25*

* The difference between the macrosomic and normosomic children of the same gender is significant (within the 0.95 confidence interval).

Tab. 2 Sample sizes and parameters from linear regression analysis for the children with both fetal macrosomia and normosomia at birth.

Groups	**Macrosomia**		**Normosomia**	
Participants	**Boys**	**Girls**	**Boys**	**Girls**
Total number of medical records	483	265	413	293
Number of data in medical records for 4–12-month-old children	1,947	1,040	1,773	1,187
Average age the child has no teeth, month	5.18 ± 0.22	5.22 ± 0.35	5.07 ± 0.20	5.10 ± 0.27
Teeth growth rate, teeth per month	0.933 ± 0.016*†	0.829 ± 0.022*†	0.963 ± 0.014†	0.911 ± 0.018†
Average age the child has 1 tooth, month	6.25 ± 0.24	6.42 ± 0.38	6.11 ± 0.22	6.20 ± 0.29
Average number of teeth for 12-month-old children	6.37 ± 0.32	5.63 ± 0.42	6.67 ± 0.29	6.29 ± 0.37

* The difference between the macrosomic and normosomic children of the same gender is significant (within the 0.95 confidence interval).
† The difference between children of opposite sex in the same group is significant (within the 0.95 confidence interval).

significantly higher and varies in the 0.61–0.69 range for different subgroups.

The generalized results of calculations using the regression relations obtained and the corresponding confidence intervals for the significance level, *p*, of less than 0.05 are also presented in Table 2. The fifth row in Table 2 shows the average age until the child has no teeth.

The results obtained showed that eruption began during the first or second week of the sixth month from the birthday, i. e., until this age, teeth are absent on average. In boys, teeth began to erupt slightly earlier than in girls, but this difference is within the confidence interval. These results agree with the results of other researchers (18).

The differences in the teeth growth rate in girls and boys with both fetal macrosomia and normosomia at birth are under consideration now. The sixth row in Table 2 shows that the average teeth growth rate in the macrosomic children is less than in the normosomic ones with an error probability that does not exceed 0.05. This is true for the children of both sexes, and the teeth growth rate in both macrosomic and normosomic girls, in turn, is significantly lower than in boys.

The last two rows in Table 2 give reference information about the average age when a child has one tooth, as well as the average number of teeth at the age of one year for the children of each group. These facts occur with a delay both in boys and girls of the macrosomic group, as compared to the normosomic. Unfortunately, it is impossible to confirm the validity of these differences.

The regression analysis suggests a normal distribution of the residuals. We have constructed and analyzed the histograms showing the distribution of the residuals. The Pearson’s chi-squared test confirmed that the distribution of residuals is consistent with the normal distribution for the significance level, *p*, of less than 0.05. Thus, the validity of linear regression analysis applicability to our research is additionally confirmed.

The next task is to consider the differences in terms of teeth eruption and deciduous tooth growth rate in Main Group (macrosomic children) taking into account weight-height parameters at birth. This has been achieved by calculating the regression lines for every subgroup and gender. Table 3 shows the total amount of records containing the number of erupted teeth in children of different sexes born with macrosomia and normosomia. The data in Table 3 colomns are presented in accordance with their body length and weight-height index at birth and gender.

Given in Table 3 are summarized calculations for these regression models. On average, there is a tendency for a later teeth eruption in macrosomic children in all subgroups as compared with normosomic ones of the same sex, which agrees with the results obtained by Khurasseva (13), as can be seen in the fifth row in Table 3. In macrosomic boys teeth began to erupt on average of 0.1–0.2 months earlier than in girls. This is true for all subgroups, except for *Subgroup I*. But this difference is unreliable and is within the confidence interval. Teeth eruption occurs in boys in *Subgroup IV* before it occurrs in all other macrosomic children, almost in the same terms as in normosomic children.

The most interesting differences in the teeth growth rate are found between macrocomic and normosomic subgroups. Table 3 (sixth row) shows that the teeth growth rate in all macrosomic children is slower than in normosomic, except for girls in *Subgroup III*. The teeth growth rate in boys with macrosomia is slower than that in normosomic boys, and the difference for different subgroups is 0.02–0.14 tooth per month. In *Subgroups II* and *III* this difference is reliable within the 95% confidence interval.

The teeth growth rate in girls with macrosomia is also slower than that in girls with normosomia, except for girls from *Subgroup III*. The difference for variuos subgroups is 0.72–1.17 tooth per month. It is reliable within the 95% confidence interval.

It is also important to pay attention to the fact that within the subgroups the teeth growth rate in boys is faster than in girls, except for *Subgroup III*. For children in *Subgroups I* and *IV* this difference is significant (for the significance level, *p*, of less than 0.05).

The seventh row in Table 3 proves that the average age of the first tooth eruption in a macrosomic child falls within the 6.15–6.65-month interval, and it falls within the 6.11–6.20-month interval in a normosomic child. In other words, there is a tendency for a later beginning of teeth eruption in all subgroups of macrosomic children, although the 0.95 confidence intervals overlap. Moreover, the average age of the first tooth eruption is slower in boys than in girls.

The last row in Table 3 shows that the mean number of teeth in one-year-old boys at the significance level of

Tab. 3 Sample sizes and multiple linear regression analysis for the children from different ranks.

Groups and subgroups	Subgroup I		Subgroup II		Subgroup III		Subgroup IV		Normosomia	
Participants	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	160	86	65	31	104	42	156	104	413	293
Number of samples in medical records for 4–12 month-old children	729	374	231	123	427	140	681	512	1,773	1,187
Average age the child has no teeth, month	5.22 ± 0.38	5.14 ± 0.57	5.16 ± 0.71	5.38 ± 0.98	5.16 ± 0.48	5.12 ± 1.04	5.10 ± 0.34	5.30 ± 0.50	5.07 ± 0.20	5.10 ± 0.27
Teeth growth rate, teeth per month	0.959 ± 0.028 †	0.839 ± 0.037*†	0.822 ± 0.044*	0.796 ± 0.059*	0.917 ± 0.032*	0.992 ± 0.077	0.960 ± 0.025†	0.793 ± 0.030*†	0.963 ± 0.014†	0.911 ± 0.018†
Average age the child has 1 tooth, month	6.26 ± 0.41	6.34 ± 0.62	6.38 ± 0.78	6.65 ± 1.08	6.26 ± 0.52	6.13 ± 1.11	6.15 ± 0.37	6.56 ± 0.54	6.11 ± 0.22	6.20 ± 0.29
Average number of teeth at the age of one year	6.52 ± 0.56	5.78 ± 0.73	5.66 ± 0.89	5.33 ± 1.17	6.29 ± 0.67	6.91 ± 1.56	6.63 ± 0.50†	5.33 ± 0.59*†	6.67 ± 0.29	6.29 ± 0.37

* –The difference between the macrosomic and normosomic children of the same gender is significant (within the 0.95 confidence interval).
† –The difference between children of opposite sex in the same Subgroup is significant (within the 0.95 confidence interval).

$p < 0.05$ is greater than that for girls for all macrosmic and normosomic subgroups, excluding *Subgroup III*. The macrosomic children have more teeth than the normosomic children of the same sex. The girls exhibit this difference reliably in *Subgroups I* and *IV*, while the boys show it in *Subgroup II*. The macrosomic girls in *Subgroup III* are the exception: they have more teeth than the normosomic girls, which is in agreement with the results obtained by Suri L. and co-authors (1).

The above-mentioned results reflect the statistically average differences in teeth eruption terms up to 1 year on the basis of the data of the number of teeth in the medical records. However, there is another approach to assessing the teeth eruption terms based on comparison with the regional chronological norm of eruption. The chronologic delay of deciduous teeth eruption is considered to be an eruption that occurs later than 2 standard deviations from the mean of the regional norm for eruption time in the population (6). Conversely, a chronologic premature eruption is considered to be an eruption, which occurs earlier than 2 standard deviations from the mean of the regional norm for eruption time in the population. In our study, if the first tooth eruption occurred at the age of 4 months or earlier, it is recorded as a premature teeth eruption. If the first tooth eruption occurred in 11 months old child, or later, it is recorded as a delayed eruption.

In addition, using 2 standard deviations from the median number of teeth in one-year-old children in the Kharkiv population, we have calculated the number of teeth that a child had at one-year-old age. If a child, after reaching this age, has 2 or less teeth, a slow teeth growth rate is recorded. If a child had 11 or more teeth, the teeth growth rate is accelerated. Table 4 provides information on the number of cases of delayed eruption, premature eruption, cases of slow and accelerated teeth growth rate, separately for girls and boys in different groups and subgroups, using regional chronologic norms. Table 4 also presents the corresponding occurrence rates calculated for the binomial distribution law of the random variable and their confidence intervals for the significance level, p, of less than 0.05.

Table 4 shows that in the macrosomic children, the percentage of detected cases of delayed teeth eruption is greater than in the normosomic group by a factor of almost 4. Subcategorisation shows significant differences for girls in *Subgroup IV*, as well as for boys in *Subgroup I* and *II*. The percentage of cases of premature teeth eruption in macrosomic children is also greater than that in normosomic ones by a factor of approximately 2. Nonetheless, the confidence intervals for the given significance level of $p < 0.05$ overlap. A true increase is found only for girls in *Subgroup III*.

Such significant deviations from regional norms for the number of delays and premature teeth eruption in macrosomic children can be attributed to various causes that led to the macrosomia formation and to extremely different weight-height parametres at birth.

As shown above, the children in *Subgroup I* confirm their name "harmoniously developed". The age when teeth begin to erupt, the age when the child has 1 tooth, and the average number of teeth in these children at the age of 1 year, practically do not differ from indices in normosomic children. In addition, we do not observe extreme values of any indicators listed in Table 4 in children in this subgroup. In other authors' studies (19), this group is conventionally termed "true accelerates".

The children in *Subgroup II* have the slowest tooth growth rate and the least number of teeth at the age of 1 year from all participants in the study (Table 3). In comparison with others, in this subgroup also are the highest percentage of boys with delayed teeth eruption and the highest percentage of children of both sexes who had 2 or less teeth at the age of 1 year. In our opinion, the relatively insufficient body weight, which these children have during intrauterine period, the same period when the anlage and formation of deciduous teeth and partially permanent

Tab. 4 Numerical data (numbers, percentage, confidence interval (CI)) on tooth eruption terms and the number of teeth in one-year-old children.

Groups and subgroups	Delayed teeth eruption		Premature teeth eruption		Two or less teeth at the age of 1 year		11 or more teeth at the age of 1 year	
Participants	Girls (number; %, CI)	Boys (number; %, CI)	Girls (number; %, CI)	Boys (number; %, CI)	Girls (number; %, CI)	Boys (number; %, CI)	Girls (number; %, CI)	Boys (number; %, CI)
Normosomia (413 boys, 293 girls)	7; 2.4%; 1.2%–4.4%	6; 1.5%; 0.7%–2.8%	5; 1.7% 0.8%–3.5%	7; 1.7% 0.8%–3.1%	16; 5.5% 3.4%–8.3%	14; 3.4% 2.0%–5.3%	8; 2.7% 1.4%–4.9%	6; 1.5% 0.7%–2.8%
Macrosomia (485 boys, 263 girls)	24; 9.1% 6.2%–12.8%*	29; 6.0% 4.2%–8.2%*	9; 3.4% 1.8%–5.9%	16; 3.3% 2.1%–5.0%	13; 4.9% 2.9%–7.8%	17; 3.5% 2.2%–5.3%	7; 2.7% 1.3%–4.9%	10; 2.1% 1.1%–3.5%
Subgroup I (160 boys, 86 girls)	6; 7.0% 3.3%–13.0%	12; 7.5% 4.4%–12.0%*	2; 2.3% 0.7%–6.3%	4; 2.5% 1.0%–5.4%	3; 3.5% 1.3%–8.1%	7; 4.4% 2.2%–8.0%	2; 2.3% 0.7%–6.3%	3; 1.9% 0.7%–4.4%
Subgroup II (65 boys, 31 girls)	3; 9.7% 3.6%–21.4%	5; 7.7% 3.5%–15.0%*	1; 3.2% 0.8%–11.2%	2; 3.1% 1.0%–8.3%	3; 9.7% 3.6%–21.4%	4; 6.2% 2.5%–12.9%	0; 0% 0% –11.2%	1; 1.5% 0.4%–5.5%
Subgroup III (104 boys, 42 girls)	3; 7.1% 2.7%–16.2%	5; 4.8% 2.1%–9.6%	4; 9.5% 4.0%–19.5%*	3; 2.9% 1.1%–6.8%	2; 4.8% 1.5%–12.6%	4; 3.8% 1.6%–8.2%	1; 2.4% 0.6%–8.4%	4; 3.8% 1.6%–8.2%
Subgroup IV (156 boys, 104 girls)	12; 11.5% 6.8%–18.1%*	7; 4.5% 2.2%–8.2%	3; 2.9% 1.1%–6.8%	9; 5.8% 3.1%–9.9%*	5; 4.8% 2.1%–9.6%	2; 1.3% 0.4%–3.5%	4; 3.8% 1.6%–8.2%	3; 1.9% 0.7%–4.6%

* The difference between the macrosomic and normosomic children of the same gender is significant (within the 0.95 confidence interval

teeth occur, could contribute to the above violation. The results obtained to some extent coincide with the results published by Sajjadian N. and co-authors (3), which indicate that the birth weight and the age of first tooth eruption are directly proportional. The research conducted also suggests that the low weight-height index at birth in children of this subgroup correlates with delayed eruption.

The children from *Subgroup III* show the most deviant results. Despite the fact that boys of this subgroup have a significantly lowered teeth growh rate (Table 3), they also have the highest percentage of having 11 or more teeth at the age of 1 year among all the children. The girls of this subgroup exhibit the highest teeth growth rate among all participants in the study. Moreover, their teeth growth rate is significantly higher than that of normosomic children, with the highest percentage of preterm teeth eruption among all subgroups.

Subgroup IV is comprised of children with intrauterine obesity. Despite the averaged metrics for children in *Subgroup IV* and in the group of normosomic boys are comparable, as can be seen in Table 4, the macrosomic boys have a significantly higher percentage of premature teeth eruption among all participants in the study, as can be seen in Table 5. The girls in this subgroup have the slowest teeth growth rate, as compared to others, the smallest number of teeth at the age of 1 year (Table 3) and the highest percentage of delayed teeth eruption. We can assume that the intrauterine obesity in combination with the average or large weight-height indexes has a different effect on the teeth formation in children of different sexes.

DISCUSSION

The reasons for the differences in the tooth growth process in first-year macrosomic children remain studied incompletely. However, the hormonal system dominance in this prosses is obvious. Macrosomic children with different somatotypes have some hormonal system features that were previously studied by the pathologists at Kharkiv National Medical University (15, 19). We have repeatedly mentioned in this paper the difference in terms of teeth eruption and the deciduous tooth growth rate in macrosomic children of different sexes, which can also be ascribed to sex hormones providing better developed muscle system in boys than in girls. This aspect requires further research.

The studies (20, 21) we have conducted earlier have revealed hypoplastic processes in the minor and parotid salivary glands in macrosomic at birth experimental animals, and the delayed tooth eruption revealed in this study in macrosomic at birth children suggests that the hypoplastic process is a generalized process, and a significant cell division inhibition during intrauterine period in case of fetal macrosomia occur. The cases of premature tooth eruption can be explained by axceleration processes.

Data about the deviation from the generally accepted terms of teeth eruption in children born with macrosomia, taking into account different weight-height rates at birth, can explain differences in existing publications.

When analyzing the health state of the children in the first year of life, non-invasive diagnosis is used. Among the commonly accepted developmental criteria (body weight, body length, head circumference, chest circumference), the criteria are used that indicate the parity, sequence and symmetry of deciduous teeth eruption, as well as the averaged regional terms of their eruption. In this way, the data we obtain may be of interest to pediatricians and pediatric dentistry.

All dental preventive procedures and treatments are based on the knowledge of the exact timing of eruption, formation and resorption (in the case of deciduous teeth) of the root system of the teeth. Our observations and observations made by other authors indicate that children born with macrosomia have high caries intensity of deciduous teeth (4, 22, 23). Taking into account the delayed or premature eruption recorded in our study and the slowered growth rates of deciduous teeth in children, macrosomic at birth, we can assume a low mineralization of hard tooth tissue in this sample of children. Consequently, the prevention of caries in them should begin earlier than usual, namely, from the moment of the first tooth eruption onward. That multiplicity of examinations by children's dentist should be increased. Carious lesions, including the caries of the approximal surfaces of the teeth, in turn, lead to a shortening of the dentition (23), and as a consequence, the progenia or prognatism formation. That is, the average terms of initiation of orthodontic prophylactic procedures, which are usually carried out in a child at the age of 3 to 4 years, should begin earlier in these children.

When the parents of a child, whose parameters at birth were higher than the norm, consult a doctor, the doctor should propose a certain algorithm for taking preventive care or providing treatment. Information about the somatometric indices of the macrosomic child at the time of birth, namely, the weight-height index and the body length, make it possible to predict the averaged terms of deciduous teeth eruption and can significantly simplify the diagnostic process, make it useful when diagnosing and timely (which is very important) prescribing treatment and preventive care individualized for each specific child.

CONCLUSION

1. The retrospective statistical study of data accumulated over a 30-year period have confirmed that there are differences in the process of odontogenesis in both girls and boys born macrosomic in comparison with children whose parameters correspond to the regional norms. The features considered include a slow deciduous teeth growth rate in children born with macrosomia and an increased frequency (by a factor of 2 to 4 times) of deviations in the timing of teeth eruption compared to regional norms.
2. In macrosomic boys with harmonious intrauterine weight and height parameters, the desiduous teeth growth rates are close to the corresponding index in the *Comparison group*. In girls in this group, the teeth growth rate is significantly slower.
3. In macrosomic children born with a long body and with relatively decreased intrauterine body weight, tooth growth rate is significantly slower as compared to normosomic children. In addition, we have singled out a significantly higher percentage of delayed teeth eruption in the boys of this subgroup.
4. The teeth growth rate in macrosomic boys born with long body in combination with intrauterine obesity, is significantly slower than that in the *Comparison group*. For girls, the result turned out to be the opposite.
5. Macrosomic boys with intrauterine obesity and average body weight at birth have a significantly higher percentage of premature teeth eruption. Instead, macrosomic girls show a significantly slower tooth growth rate and a higher percentage of delayed teeth eruption.
6. The exact timing of eruption, formation and resorption of deciduous teeth in macrosomic at birth children, are criteria for general and dental health. These data can significantly simplify the diagnostic process, they are simple, cheap, and non-invasively obtained (in contrast to X-ray examination and general blood count), which, in case of children, is extremely important.

REFERENCES

1. Suri L, Gagari E, Vastardis H. Delayed tooth eruption: Pathogenesis, diagnosis, and treatment. A literature review. American Journal of Orthodontics and Dentofacial Orthopedics 2004; 126(4), 432–45.
2. Dmytrenko MI, Gurzhiy OV. Treatment algorithms of patients with impaction of maxillary central incisors caused by supernumerary teeth. Wiadomości Lekarskie 2018; 71(4), 922–32.
3. Sajjadian N, Shajari H, Jahadi R, Barakat M, Sajjadian A. Relationship Between Birth Weight and Time of First Deciduous Tooth Eruption in 143 Consecutively Born Infants. Pediatrics & Neonatology 2010; 51(4), 235–7.
4. Hisano K, Tanaka K, Nagata C, Arakawa M, Miyake Y. High birthweight is associated with increased prevalence of dental caries in Japanese children. International Journal of Dental Hygiene 2018; 16(3), 404–10.
5. Bockmann M, Hughes T, Townsend G. Genetic Modeling of Primary Tooth Emergence: A Study of Australian Twins. Twin Research and Human Genetics 2010; 13(6), 573–81.
6. Răducanu AM, Feraru V. Delayed eruption – Case study. OHDMBSC 2007; 6(4), 58–65.
7. Miller O. Characteristics of the eruption time of temporary teeth in children of early age living in a large industrial center (on the example of Krasnoyarsksity) (Dis. cand. med. science.). 2012; Krasnoyarsk State Medical University named after Professor V. F. Voino-Yasenetsky (In Russian).
8. Un Lam C, Hsu C, Yee R, et al. Influence of metabolic-linked early life factors on the eruption timing of the first primary tooth. Clinical Oral Investigations 2015; 20(8), 1871–9.
9. Garmash O, Likhacheva N, Khizhnyak V, Kopytov A. Differences in the time of primary teeth eruption in children with born prematurely, intrauterine fetal hypotrophy and intauterine growth retardation syndrome diagnosis. Nauchnye vedomosty' Bel GU Sery'ya Medy'cy'na. Farmacy'ya 2013; 11(154) (22/1), 43–7. (In Russian).
10. Peedikayil F. Delayed tooth eruption. E-Journal of Dentistry 2011; 1(4), 81–6.
11. Garmash O. An eruption pattern of deciduous teeth in children born with fetal macrosomia during the first year of life. Georgian Medical News 2017; 2(263), 14–23.
12. Donma M. Macrosomia, top of the iceberg: The charm of underlying factors. Pediatrics International 2011; 53(1), 78–84.
13. Khuraseva AB. Adaptation of newborns and their development in the first year of life depending on body mass at the birth. Nauchnye vedomosty' Bel GU Sery'ya Medy'cy'na. Farmacy'ya 2014; 4(175) (25), 102–5. (In Russian).
14. Karmakar R. Forensic medicine and toxicology: theory, oral & practical. Academic Publishers (5th ed.) 2015: 612.
15. Grischenko VI. Krupnyiy plod (kliniko-morfologicheskoe issledovanie). Kiev: Zdorovya 1991: 183. (In Russian).
16. Gerasimov AN. Medical statistics. Moscow: Medical News Agency 2007: 480. (In Russian).
17. Ferster E, Rents B. Metody korrelyatsionnogo i regressionnogo analiza. Rukovodstvo dlya ekonomistov (Methods of correlation and regression analysis. A guide for economists). Moscow: Finansy i statistika 1983: 304. (In Russian).
18. Aktoren O, Tuna E, Guven Y, Gokcay G. A study on neonatal factors and eruption time of primary teeth. Community Dent Health 2010: 27(1), 52–6.
19. Sorokina A. V. Krupnyj plod: mify i real'nost' (A large fetus: myths and realities). Rossiiskij vestnik akushera-ginekologa 2013; 13(4), 86–8. (In Russian).
20. Garmash, 0, Gubina-Vakulyk GI. Morphofunctional status of parotid salivary glands of three mounth rats in modeling of fetal macrosomia. Patolohiia 2018; 15(1), 81–7. (In Ukrainian).
21. Garmash O, Gubina-Vakulik G, Vondrášek D. Three-dimensional image analysis of minor salivary glands in 180-day rats born with macrosomia. Med Čas (Krag) / Med J (Krag) 2018; 52(1): 7–14.
22. Julihn A, Molund U, Drevsäter E, Modéer T. High birth weight is a risk factor of dental caries increment during adolescence in Sweden. Dent J 2014; 2(3): 118–33.
23. Garmash OV. Features of the dental state of children with fetal macrosomia in the period of the temporary dentition. Visnyk problem biolohii i medytsyny 2018; 4(1/146): 246–53. (In Ukrainian).