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Study of correlation between occurrence of caries in deciduous dentition and physical development of children in the first six months of their lives

Deciduous dentition caries still constitute a serious epidemiological and clinical problem in pedodontics. Its frequency is still high, as confirmed by many studies (2, 3, 4, 5, 6, 10). Due to the fact that its etiology has not been fully explained, prophylaxis is difficult. It is known that only a tooth with normal micro-and macro-structure and appropriate level of mineralization has a chance to be resistant to caries. The resistance is reinforced by undisturbed odontogenesis. Development of deciduous dentition begins in the 4th week of intrauterine life and is closely connected with individual development. Part of the process of odontogenesis takes place in the first six months after birth. We can divide this time into two periods: neonatal and infantile. The neonatal period is a difficult time of adaptation to extrauterine life. It is characterized by weight loss (up to 10% of birth weight) in the first 4–5 days of life, and it takes 7–10 days to regain it. This is due to water loss through skin, lungs and kidneys, excretion of meconium and limited intake of milk in the first days of life. 48 to 72 hours after birth there occurs so called physiological jaundice, which is the result of the presence of excessive unconjugated bilirubin in the liver. After 7 or 8 days the symptoms spontaneously subside, and the concentration of bilirubin does not exceed 12 mg%. The neonatal period is considered to be completed when weight returns to the birth level, jaundice subsides, umbilical cord stump falls off and the wound heals, the child becomes adapted to new life conditions and its organism starts to function independently. The infantile period begins at the end of the neonatal period and lasts till the end of the 1st year of the child's life and is characterized by very intensive growth. Metabolism level is very high and energy requirement is 3 times higher than in an adult person. At about 4 to 5 months of life an infant doubles its birth weight. The average monthly increase of weight in the first 6 months is 600 g. The average yearly body length increase is about 25 cm (9).

The purpose of the study was an attempt to determine the correlation between the occurrence of caries in deciduous dentition and the process of a child's development within the first 6 months of life.

MATERIAL AND METHODS

356 children aged 1 to 4 attending day nurseries in Lublin were included in the study. A clinical dental examination was performed using a mirror and a probe in artificial lighting. The condition of dentition was evaluated using mean def_d index.

From the child's health record books supplied by the parents we acquired data concerning the development of the studied children within the first 6 months of life (birth weight and length,

postnatal weight loss level, bilirubin level in blood in the course of postnatal physiological jaundice, weight and length increase in the first month of life and body length in the sixth month of life).

On the basis of the clinical examination and a questionnaire filled in by the parents, we analyzed the correlation between caries intensity in deciduous dentition in the studied children using mean dmf_s value and the process of the child's development within the first 6 months of a child's life. The results of the study were statistically analyzed using t-Student test.

RESULTS

The analysis of mean dmf_s value in the studied children compared to their birth rate is presented in Table 1. It was found that mean dmf_s value increases proportionally to the increase of birth weight. In children with birth rate lower than or equal to 2500g the mean dmf_s value was 2.8. In children with birth weight between 2501g and 3000g it increased to 3.7 and in children with

Table 1. Correlation between birth weight and mean dmf_s value in children

Body weight	n	%	Average age		Mean dmf_s value		Statistical significance
			months	SD	dmf_s	SD	
up to 2500 g	24	6.7	34.2	8.8	2.8	7.2	p>0.05
2501-3000 g	70	19.7	35.6	9.9	3.7	6.0	
3001-3500 g	118	33.1	33.3	9.8	4.2	6.5	
over 3501 g	144	40.4	32.7	9.8	5.0	7.9	
Total	356	100	33.6	9.8	4.3	7.1	

birth weight between 3001g and 3500g it reached the level of 4.2. The highest mean dmf_s value of 5.0 was observed in children who weighed over 3500g at birth. The differences turned out not to be statistically significant ($p>0.05$). A similar tendency was observed in case of analyzing mean dmf_s value in comparison with body length at birth (Tab. 2). In the shortest children, up to 52 cm, mean dmf_s value was the lowest and equaled 3.7. The value of 4.1 was observed in children with birth body length from 53 cm to 55 cm. The highest value (dmf_s = 5.4) was found in children whose body length at birth was higher than 56 cm. The differences were not statistically significant ($p>0.05$). Performing the analysis,differences (though not statistically significant, $p>0.05$) were observed in mean dmf_s value as compared to postnatal weight loss level (Tab. 3). Mean dmf_s value was lower in children whose postnatal weight loss did not exceed 5% of birth weight (dmf_s = 3.9) and higher in children who experienced 6-10% weight loss (dmf_s = 5.0).

Table 2. Correlation between birth length and mean dmf_s value in children

Body length	n	%	Average age		Mean dmf_s value		Statistical significance
			Months	SD	dmf_s	SD	
up to 52 cm	113	31.9	34.1	9.7	3.7	6.6	p>0.05
53 – 55 cm	143	40.4	33.8	9.9	4.1	6.3	
56 cm and more	98	27.7	32.5	9.8	5.4	8.4	
Total	354	100	33.5	9.8	4.3	7.1	

Table 3. Correlation between birth weight loss level and mean dmf_s value in children

Postnatal birth weight loss level	n	%	Average age		Mean dmf_s value		Statistical significance
			months	SD	dmf_s	SD	
up to 5% of birth weight	43	29.1	33.0	9.4	3.9	6.6	p>0.05
6% - 10% of birth weight	105	70.9	34.8	9.7	5.0	7.7	
Total	148	100	34.2	9.7	4.6	7.3	

The influence of blood bilirubin level in the course of postnatal jaundice on the mean dmf_s value in the studied children is presented in (Tab. 4). It was observed that in children who, in the course of physiological jaundice, had the bilirubin level lower than 12 mg% the mean dmf_s value was lower (dmf_s =3.7) than in children who suffered a pathological course of physiological jaundice with bilirubin level exceeding 12 mg% (dmf_s = 5.7). The differences were not statistically significant (p>0.05).

Table 4. Correlation between the course of postnatal physiological jaundice and mean dmf_s value

Bilirubin level in blood	n	%	Average age		Mean dmf_s value		Statistical significance
			months	SD	dmf_s	SD	
12 mg% and lower	141	66.5	33.8	9.3	3.7	5.8	p>0.05
over 12 mg%	71	33.5	35.6	8.9	5.7	9.4	
Total	212	100	34.4	39.2	4.4	7.3	

Performing statistical analysis using t-Student test statistically significant differences (t = 2.1; p<0.05) were found in mean dmf_s value compared to body weight increase in the first month of child's life (Tab. 5). In children whose weight increased by no more than 500g the mean dmf_s value was 7.9 and it was significantly higher than mean dmf_s value (3.7) in children in whom the

Table 5. Correlation between weight gain within the first month of child's life and mean def_d value

Body weight increase within the first month	n	%	Average age		Mean dmf_s value		Statistical significance
			months	SD	dmf_s	SD	
120 – 500 g	28	11.2	34.0	10.1	7.9*	9.7	p<0.05; t = 2.10
501 – 1000 g	113	45.4	34.7	8.5	4.5	6.6	
1001 – 2150 g	108	43.4	34.0	9.4	3.7*	7.2	
Total	249	100	34.3	9.1	4.5	7.4	

* Statistical significance found

weight increase was higher than 1000g. In children with the first month body weight increase between 501g and 1000g the mean dmf_s value was 4.5. An opposite correlation was observed while analyzing the mean dmf_s value compared to body length increase in the first month of life (Tab. 6).

Table 6. Correlation between body length increase within the first month of child's life and mean dmf_s value.

Length increase within the first month of life	n	%	Average age		Mean dmf_s value		Statistical significance
			months	SD	dmf_s	SD	
0 – 2 cm	67	48.9	32.5	8.3	3.5	5.8	p>0.05
2.1 – 4 cm	46	33.6	35.0	7.1	3.4	5,6	
4.1 – 9 cm	24	17.5	36.5	9.8	5.1	6.8	
Total	137	100	34.0	8.4	3,7	6.0	

Lower mean dmf_s values were observed in children in whom the length increase was lower than 4 cm (mean dmfs value = 3.5 in children with the increase of up to 2 cm and 3.4 in children with the increase of 2.1 to 4 cm). In children with the body length increase higher than 4 cm the dmf_s value was higher and equaled 5.1. The differences were not statistically significant (p>0.05).

Table 7. Correlation between body length increase within the first 6 months of child's life and mean def_d value

Length increase within the first 6 months of life	n	%	Average age		Mean dmf_s value		Statistical significance
			months	SD	dmf_s	SD	
8 – 11 cm	23	11.2	33.9	8.7	2.9*	3.5	
11.1 – 18 cm	147	71.7	34.7	9.5	4.9*	7.7	p<0.05; t = -2.10
18.1 – 24 cm	35	17.1	37.7	9.2	5.5	8.3	
Total	205	100	35.2	9.4	4.8	7.5	

* Statistical significance found

Statistically significant differences between mean dmf_s values in the studied children were found in the course of analysis of their correlation with body length increase in the first 6 months of child's life (Tab. 7). In children in whom body length increase in the first 6 months of life was low (up to 11 cm), a statistically significant difference was found between their mean dmf_s value (t = -2.10; p<0.05) and the value observed in children whose body length in the first 6 months increased by more than 11 cm. Mean dmf_s value in children who gained less than 11 cm in body length was 2.9, in children whose growth was between 11.1 and 18 cm was 4.9 and in children whose body length increased by more than 18 cm it was 5.5.

DISCUSSION

The study shows that there is a correlation between body weight and length gain and intensity of caries in deciduous dentition. With increase of these parameters the intensity of the studied children's caries also grew. The lowest intensity was observed in children with birth body weight of up to 2500g and length of up to 52cm. On the other hand, the highest caries intensity was noted in children with body weight higher than 3500g and length of 54cm. The obtained results can be explained by the fact that children with lower body weight teeth later have better mineralized

enamel, which makes their teeth more resistant to carious factors (11). A similar correlation was found by Fetkowska-Mielnik et al., who analyzed the influence of birth weight on dentition in children. The highest percentage of children with healthy dentition was found in a group of children with the lowest birth body weight of up to 3000g (3).

According to Szpringer-Nodzak, body weight and length do not have any cause-and-effect relation with caries (11,12). However, she found a connection between body weight and the moment of teething. Higher birth weight predisposes to earlier teething in children (11). Mierzwińska reports that children with higher body weight and length begin teeth earlier (7,8).

Analyzing the influence of neonatal period on the intensity of caries in deciduous dentition, two factors were taken into account: the level of postnatal body weight loss and the level of blood bilirubin level in course of physiological jaundice. The study showed that lower caries identity is observed in children whose weight loss did not exceed 5%, which means that they adapted themselves to extrauterine life faster and were better nourished in this difficult period.

Some influence on caries identity may also be attributed to the course of postnatal jaundice. In children who had physiological jaundice with the level of bilirubin in blood not exceeding 12 mg% caries intensity was lower than in children who had pathological jaundice with the hyperbilirubinemia (higher than 12 mg%). Unfortunately, the results cannot be compared with other reports because in the available literature no similar publications could be found. The only thing that is commonly known is the fact that hyperbilirubinemia can be the cause of discoloration in deciduous and permanent dentition. However, more up-to-date studies proved that thanks to good pediatric care such discoloration is very rare (1). Despite lack of statistical significance, the obtained results suggest that the course of neonatal and infantile period can have some influence of teeth mineralization and the width of the neonatal line in enamel, which is connected with higher susceptibility to caries. However, it was proven that there is statistically significant influence of the rate of child's development in the first 6 months of life on caries intensity in deciduous dentition. Unfortunately, also this data cannot be compared with other reports because no such publications were found.

Significant cause-and-effect relation with caries was found in analyzing the level of weight increase in the first month of life. In children, whose weight increased by no more than 500g caries intensity was significantly higher ($dmf_s = 7.9$) than in children in whom the increase was higher than 1000g ($dmf_s = 3.7$). This seems to suggest that a child's nutrition in the first month of life is very important for normal development of dentition resistant to carious factors.

The relationship between caries intensity in deciduous dentition and body length increase in the first six months of life also proved to be significant. Children with the length increase of more than 11cm had higher caries intensity ($dmf_s = 4.9$) than children in whom this increase did not exceed 11 cm ($dmf_s = 2.9$). A similar relationship, but not statistically significant, was observed in the analysis of the increase of body length in the first month of child's life. This correlation can be explained by the fact that children's growth is possible thanks to intensive skeleton development, whose mineralization can take place at the cost of teeth mineralization making them more susceptible to caries.

CONCLUSIONS

1. The child's physical development rate in the first 6 months of life is significantly correlated with the risk of caries in deciduous dentition.
2. Active counseling of children in danger of developing caries should begin as early as the first year of child's life in order for them to be included in a special prophylaxis program.
3. It is advised to perform a large-scale educational program concerning prevention of caries that would reach not only mothers but also pregnant women.

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SUMMARY

The purpose of the study was an attempt to determine the correlation between occurrence of caries in deciduous dentition and the process of a child's development within the first 6 months of life. 356 children aged 1 to 4 attending day nurseries in Lublin were included in the study. The following factors were analyzed: birth weight and length, postnatal weight loss level, bilirubin level in blood in the course of postnatal physiological jaundice, weight and length increase in the first month of life and body length in the sixth month of life. The study shows that the child's physical development rate in the first 6 months of life is significantly correlated with the risk of caries in deciduous dentition.

Badania zależności występowania choroby próchnicowej w uzębieniu mlecznym od rozwoju fizycznego dziecka w pierwszym półroczu życia

Celem pracy była próba znalezienia zależności pomiędzy występowaniem choroby próchnicowej w uzębieniu mlecznym a przebiegiem rozwoju dziecka w pierwszym półroczu życia. Badaniem objęto 356 dzieci w wieku od 1 do 4 lat, uczęszczających do lubelskich żłobków. Analizie poddano następujące czynniki dotyczące rozwoju dziecka: urodzeniową masę i długość ciała, wartość najniższego pourodzeniowego spadku masy ciała, poziom bilirubiny we krwi w przebiegu żółtaczki fizjologicznej, przyrost masy i długości ciała w pierwszym miesiącu życia oraz przyrost masy ciała w pierwszym półroczu życia.