

MONITORING OF EFFICIENCY OF DENTAL CARIES MANAGEMENT IN CHILDREN'S TEMPORARY TEETH THROUGHOUT POLTAVA OBLAST

MONITOROWANIE SKUTECZNOŚCI LECZENIA PRÓCHNICY ZĘBÓW MLECZNYCH U DZIECI W OBWODZIE POŁTAWSKIM

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ABSTRACT

Introduction: Dental caries is still a major health care problem not only in Ukraine but throughout the world. Complicated dental caries currently ranks the leading position among the oral diseases in children.

The aim of this study is to carry out a analysis of the epidemiology of dental caries and its complications, and to evaluate the efficiency of the caries treatment for temporary teeth among the children of Poltava oblast over the last decade based on the data of the annual reports.

Materials and methods: We have studied the figures reflecting the epidemiology of dental caries and its complications in Poltava oblast over the past ten years obtained through the analysis of the annual reports on the quantitative and qualitative indicators of paediatric dental service.

Review: According to the annual reports from the districts, the number of cases of temporary teeth treatment for complicated caries did not change significantly when comparing the relevant data of 2007 and 2017. When carrying out the comparative analysis of annual reports for 2007 and 2017 by the indicator of the share of complicated caries, attention should be focused on the average increase of the value from 30.4% in 2007 to 35.9% in 2017.

Conclusions: The analysis of annual reports for 2007 and 2017 through Poltava oblast points out the low efficiency of dental caries management in the children's temporary teeth. As a result, outcomes of the dental caries treatment and caries complications in the children's temporary teeth are assessed as unsatisfactory both in the preventive and the therapeutic aspects.

KEY WORDS: dental caries, children, complicated caries

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INTRODUCTION

Dental caries is still a major health care problem not only in Ukraine but throughout the world. Caries is known as the most prevalent chronic disease among children and occurs five times more often than asthma, four times more often than obesity, and twenty times more often than diabetes. Leading experts in cariology consider that dental caries is a disease that can never be eliminated due to the complex interaction of cultural, social, behavioural, nutritional and biological risk factors triggering the diseases and contributing into its progression [1,2].

Complicated dental *caries* currently ranks the leading position among the oral diseases in children. Failures to invest in preventive dental care have led to deplorable consequences. The high prevalence of complicated caries affecting both temporal and permanent teeth indicates an inadequate efficiency in managing the diseases including approaches and measures of caries prevention and treatment, which sometimes are far from been perfect [3,4,5, 6].

Unfortunately, parents hardly realize the importance of regular oral cavity sanitation in keeping oral health of their children that in many instances results in the occurrence of unsatisfactory or sometimes even severe consequences. Left untreated, chronic caries of temporary teeth and its complication, periodontitis first of all, often serve as sources of chronic intoxication of the child's body and impact the general health by triggering inflammation or keeping it in other body organs and systems. Such diseases as endocarditis, rheumatoid arthritis, nephritis, tonsillitis can be associated with caries progression as evidenced in relevant reports [7, 8].

Consequences caused by local inflammation in the periodontal structures of a temporary tooth are very serious as well starting from enamel hypoplasia up to the death of the dental germ of a permanent tooth and the formation of odontogenic cyst with subsequent complicated osteomyelitis of a jaw bone, and as a result – delayed growth of the jaw, occurrence of a variety of orthodontic problems [9].

Table I. Affection of temporary teeth with dental caries in 6-year-old children of Poltava oblast

№	District	Caries prevalence, %		Caries intensity, (dft)	
		2007	2017	2007	2017
1	The city of Poltava	61,3	62,5	1,9	1,3
2	The city of Kremenchuk	78,0	62,5	3,2	2,5
3	The city of Horishni Plavni	71,0	83,0	2,6	1,7
4	Velyka Bahachka D.	32,0	36,0	2,3	2,6
5	Hadiach D.	74,0	72,4	1,9	2,1
6	Hlobyne	72,0	72,1	2,5	2,6
7	Hrebinka	72,8	73,0	2,1	2,3
8	Dykanka	49,0	56,0	1,8	2,3
9	Zinkiv	69,0	69,0	2,0	2,1
10	Karlivka	64,0	66,0	2,4	2,1
11	Kobeliaky	46,1	52,3	1,8	2,4
12	Kozelshchyna	73,0	72,0	2,4	2,5
13	Kotelva	72,0	72,0	2,0	2,3
14	Kremenchuk	77,0	78,4	2,5	2,3
15	Lokhvytsia	57,0	58,0	2,4	2,4
16	Lubny	49,3	56,8	2,9	2,7
17	Mashivka	76,0	75,0	2,0	2,1
18	Myrhorod	57,0	53,2	1,9	1,9
19	Novi Sanzhary	53,0	53,0	2,6	2,4
20	Orzhytsia	82,0	75,0	2,3	2,0
21	Pyriatyn	68,0	57,1	1,2	2,2
22	Poltava	67,0	68,0	2,5	2,1
23	Reshetylivka	63,8	64,2	3,1	3,2
24	Semenivka	72,4	76,0	2,4	2,4
25	Khorol	86,0	84,0	2,5	2,1
26	Chornukhy	72,0	68,2	2,4	2,3
27	Chutove	73,0	72,0	2,4	2,4
28	Shyshaky	58,0	50,0	1,8	1,8
Total		66,0	65,6	2,3	2,2

To elaborate the regional programs in order to enhance the efficiency of measures in caries prevention, it is necessary to assess the prevalence and the severity of dental caries, i. e. characteristics of caries epidemiology typical for a particular region, common caries complications and to evaluate the effectiveness of the treatment of complicated and uncomplicated forms of dental caries.

THE AIM

The aim of this study is to carry out a detailed analysis of the epidemiology of dental caries and its complications, and to evaluate the efficiency of the caries treatment for temporary teeth among the children of Poltava oblast over the last decade based on the data of the annual reports provided by the municipal dental settings throughout the Poltava oblast.

MATERIALS AND METHODS

We have studied the figures reflecting the epidemiology of dental caries and its complications in Poltava oblast over the past ten years (2007 – 2017) obtained through the analysis of the annual reports on the quantitative and qualitative indicators of paediatric dental service performance provided by the municipal dental settings throughout the oblast.

The following indicators were taken as representative characteristics and then scrutinized:

1. Prevalence and intensity of dental caries in temporary teeth among 6-year-old children;
2. The proportion of complicated caries: this indicator is calculated as a ratio between the number of the teeth with complicated caries, i.e. the sum of the teeth filled to arrest complicated caries and teeth

Table II. Affection of temporary teeth with complicated forms of dental caries in children of Poltava oblast

№	Districts	Teeth have been treated for complicated caries, n		Teeth have been extracted for complicated caries, n,	
		2007	2017	2007	2017
1	The city of Poltava	2669	4336	3583	6293
2	The city of Kremenchuk	2791	4216	2541	1976
3	The city of Horishni Plavni	413	923	633	112
4	Velyka Bahachka	210	322	37	22
5	Hadiach d.	690	314	31	48
6	Hlobyne d.	771	1420	460	716
7	Hrebinka d.	136	140	11	13
8	Dykanka d.	204	119	180	111
9	Zinkiv d.	738	490	469	452
10	Karlivka d.	288	375	123	201
11	Kobeliaky d.	693	343	305	220
12	Kozelshchyna d.	342	457	110	76
13	Kotelva d.	480	705	78	56
14	Kremenchuk d.	805	874	307	218
15	Lokhvytsia d.	398	550	121	91
16	Lubny d	1219	879	55	-
17	Mashivka d.	215	146	173	54
18	Myrhorod d.	1442	292	758	102
19	Novi Sanzhary d.	183	154	85	116
20	Orzhytsia d.	113	168	56	16
21	Pyriatyn d.	1732	699	191	119
22	Poltava d.	859	402	175	74
23	Reshetylivka d.	423	353	186	827
24	Semenivka d.	325	547	195	274
25	Khorol d.	266	233	321	312
26	Chornukhy d.	291	147	-	27
27	Chutove d.	167	102	62	80
28	Shyshaky d.	111	29	42	8
Total		19858	19735	11288	12616

removed (missing) due to the same reason, and the number of temporary teeth filled due to uncomplicated caries.

3. The ratio between teeth, which have been treated due to uncomplicated caries and the teeth with complicated caries;
4. The ratio between the teeth restored due to complicated caries and the teeth extracted for the same reason.

The Indicators mentioned above were calculated for each district (rayon), for cities where there are specialized dental clinics (Poltava, Kremenchuk, Horinshni Plavni) and for the Poltava oblast in general. The comparison of the findings was based on the analysis of annual reports for 2007 and 2017 years.

REVIEW AND DISCUSSION

The study of the data presented in the annual reports has revealed that in 2007 the prevalence of dental caries among 6-year-old children in Poltava oblast made up 66.0%, and up to 2017 it went up 65.6%, with the intensity of 2.3 ± 0.22 and 2.2 ± 0.21 , respectively, i.e., the indices did not differ significantly. At the same time, in some districts, the prevalence of dental caries among the children in this age group reached over 80% (Table I).

The most dramatic situation was found out in Khorol and Orzhytsia districts, and in the city of Horishni Plavni.

The high values of the indicators of complicated caries shown in the (Table II) require a particular attention to. According to the annual reports from the districts, the number

Table III. Indicators of the efficiency of the treatment of complicated caries in temporary teeth among the children of Poltava oblast

№	Districts	Teeth treated in 2007, n				Teeth treated in 2017, n			
		Total	Caries	Complicated caries	Ratio	Total	Caries	Complicated caries	Ratio
1	The city of Poltava	28792	26123	6252	23,9	32144	27808	10629	38,2
2	The city of Kremenchuk	13263	10472	5332	50,9	19019	14803	6192	41,8
3	The city of Horishni Plavni	3635	3222	1046	32,5	6696	5773	1035	17,9
4	Velyka Bahachka	2084	1874	2247	119,9	1678	1356	344	25,4
5	Hadiach d.	2031	1971	721	36,6	1349	1035	362	34,9
6	Hlobyned.	4630	3859	1231	31,9	3602	2182	2136	97,9
7	Hrebinka d.	521	385	147	38,2	502	362	153	42,3
8	Dykanka d.	923	719	384	53,4	377	258	130	50,4
9	Zinkiv d.	4121	3383	1207	35,7	2451	1961	942	48,0
10	Karlivka	3799	3511	411	11,7	1777	1402	576	41,1
11	Kobeliaky d.	3009	2316	998	43,1	1616	1273	563	44,2
12	Kozelshchyna d.	2229	1887	452	23,9	2327	1870	533	28,5
13	Kotelva d.	1760	1280	558	43,6	1717	992	761	76,7
14	Kremenchuk d.	6305	5500	1112	20,2	6161	5287	1092	20,7
15	Lokhvysia d.	1516	1118	519	46,4	1698	1148	641	55,8
16	Lubny d.	7352	6133	1274	20,8	6051	5172	879	16,9
17	Mashivka d.	1149	934	388	41,5	848	702	200	28,5
18	Myrhorod d.	6824	5382	2200	40,9	2949	2357	394	16,7
19	Novi Sanzhary d.	2036	1853	268	14,5	1952	1798	270	15,0
20	Orzhysia d.	376	263	169	64,3	519	351	184	52,4
21	Pyriatyn d.	5526	3794	1923	50,7	2217	1518	818	53,9
22	Poltava d.	6143	5284	1034	19,6	4610	4208	476	11,3
23	Reshetylivka d.	2572	2149	609	28,3	1675	1322	1180	89,3
24	Semenivka d.	3205	2880	520	18,1	2813	2266	821	36,2
25	Khorol d.	2995	2729	587	21,5	1175	942	545	57,9
26	Chornukhy d.	958	667	291	43,6	937	790	174	22,0
27	Chutove d.	2343	2176	229	10,5	960	858	182	2,1
28	Shyshaky d.	661	550	153	27,8	468	439	37	8,4
Total		122272	102414	31146	30,4	20505	90233	32351	35,9

of cases of temporary teeth treatment for complicated caries did not change significantly when comparing the relevant data of 2007 and 2017 (19858 and 19735 teeth, respectively). However, the number of complicated caries in temporary teeth registered in some cities and districts of the oblast has almost doubled. For example, in Poltava, in 2007, a number of 2669 temporary teeth were reported to have been treated for complicated caries, while in 2017 this number went up to 4336 teeth that points out the progression of complicated caries. A similar situation is observed in the city of Kremenchuk, where

in 2007, according to the reports, 2791 temporary teeth with complicated caries were treated, while in 2017 this number reached 4216 teeth, and in the city of Horynshni Plavni, where in 2007, 413 teeth were reported as cured, while in 2017 this figure rose to 923 teeth. In Hlobyne district this figure doubled from 771 teeth in 2007 to 1420 teeth in 2017. Thus, we can conclude that there is a tendency towards twofold increase in the number of temporary teeth treated for complicated caries in 2017 compared with 2007 that is the evidence of growing prevalence and intensity of dental caries.

Table IV. Analysis of the treatment efficiency for complicated and uncomplicated caries of temporary teeth in children of Poltava oblast

№	Districts	Ratio between teeth, which have been treated for uncomplicated caries and teeth treated for complicated caries		Ratio between teeth, have been treated for complicated caries and teeth extracted due to complicated caries	
		2007	2017	2007	2017
1	The city of Poltava	9,8:1	6,4:1	7,5:1	6,9:1
2	The city of Kremenchuk	3,7:1	3,5:1	1,1 :1	2,1:1
3	The city of Horishni Plavni	7,8:1	6,3:1	6,5:1	8,2:1
4	Velyka Bahachka d.	8,9:1	4,2:1	5,7:1	14,6:1
5	Hadiach d.	2,9:1	3,3:1	22,3:1	6,5:1
6	Hlobyne d.	5,0:1	1,5:1	1,7:1	1,9:1
7	Hrebinka d.	2,8:1	2,6:1	12,4:1	10,9:1
8	Dykanka d.	3,5:1	2,2:1	1,1:1	1,1:1
9	Zinkiv d.	4,6:1	4,0:1	1,6:1	1,1:1
10	Karlivka d.	1,2:1	3,7:1	2,3:1	1,9:1
11	Kobeliaky d.	3,3:1	3,7:1	2,3:1	1,6:1
12	Kozelshchyna d.	5,5:1	4,1:1	3,1:1	6,0:1
13	Kotelva d.	2,7:1	1,4:1	6,2:1	1,3:1
14	Kremenchuk d.	6,8:1	6,0:1	2,6:1	4,0:1
15	Lokhvytsia d.	2,8:1	2,1:1	3,3:1	6,0:1
16	Lubny d.	5,0:1	5,9:1	22,2:1	-
17	Mashivka d.	4,3:1	4,8:1	1,2:1	2,7:1
18	Myrhorod d.	3,7:1	8,1:1	1,9:1	2,9:1
19	Novi Sanzhary d.	10,1:1	11,7:1	2,2:1	1,3:1
20	Orzhytzia d.	2,3:1	2,1:1	2,0:1	10,5:1
21	Pyriatyn d.	2,2:1	2,2:1	9,1:1	5,9:1
22	Poltava d.	6,2:1	10,5:1	4,9:1	5,4:1
23	Reshetylivka d.	5,1:1	3,7:1	2,3:1	4,3 :1
24	Semenivka d.	8,9:1	4,1:1	1,7:1	1,9:1
25	Khorol d.	10,3:1	4,0:1	8,3:1	7,5:1
26	Chornukhy d.	2,3:1	5,4:1	-	5,4:1
27	Chutove d.	13,0:1	8,4:1	2,7:1	1,3:1
28	Shyshaky d.	4,9 :1	15,1 :1	2,6:1	3,6:1
Total		5,2:1	4,6:1	1,8:1	1,6:1

However, in Poltava oblast, according to the analysis conducted, there are districts that have been found out to report the significantly reduced number of temporary teeth, which have been treated for complicated dental caries. Thus, in Myrhorod and Shyshaky districts this figure changed nearly fivefold – from 1442 to 292 teeth and from 111 to 29 respectively, in Gadyach district it decreased approximately twofold, from 690 to 314 teeth, the same tendency was observed in Kobeliaky district – from 693 to 343 teeth, in the city of Poltava from 859 to 402 teeth; in Lubny district this figure lowered from 1219 to 879 teeth, and in Pyriatyn district – from 1732 to 699 teeth.

We suggest this dynamics in the treatment of complicated caries in temporary teeth may be explained by the expansion of the network of private dental offices, which

did not submit their reporting. On the other hand, in some districts over the past 10 years, the positions of paediatric dentists were reduced therefore parents had to seek for dental care in the nearest cities.

Complicated dental caries of temporary teeth is the commonest cause of an outpatient surgical operation – tooth extraction. Although over the past decade, the number of temporary teeth extracted due to complicated caries somewhat increased (by 1328 teeth, from 11288 to 12616 teeth respectively). It has been determined that in 2007 in the city of Poltava complicated caries was the primary cause for extracting 3583 temporary teeth, and in 2017 6293 teeth were extracted for the same reasons that is almost twice as much. Nearly the same situation has been revealed in the Hlobyne district (from 460 to 716 temporary teeth

removed), Semenivka district (from 195 to 274 teeth removed), and in Reshetylivka district the number of teeth extracted for the reasons of complicated caries increased in four times, from 186 teeth in 2007 to 827 teeth in 2017.

At the same time, there are districts, where we registered the decrease in the number of teeth extracted for complicated caries, among them the city of Horishni Plavni, where the number of teeth extracted dropped from 633 to 112 teeth, Lubny district, where 55 teeth were reported to be extracted in 2007 versus none in 2017, Mashivka district, where the number of teeth extracted went down from 173 to 54, the city of Poltava (from 175 teeth to 74 teeth) and Myrhorod district, which demonstrated seven-fold drop from 758 teeth in 2007 to 102 teeth in 2017.

The main indicator characterizing the quality of caries treatment is the share of the cases of complicated caries: this indicator shows the ratio between the number of teeth with complicated forms of caries, i.e. the sum of the number of temporary teeth filled due to complicated caries and teeth extracted for the same reason, and the number of temporary teeth filled due caries. We consider this indicator is relevant to clearly demonstrate the effectiveness of the caries treatment performed in a particular dental setting: the lower the percentage of the indicator, the less number of children with caries complications asked for dental treatment, and, accordingly, the larger number of children has escaped complicated caries.

Data for 2007 show that the relative indicator of the share of complicated is an average 30.4% throughout Poltava oblast (Table III).

Based of the analysis of the indices demonstrating the share of complicated caries, we divided all the districts into 3 groups: 12 districts had the indicators of the share of complicated forms of caries less than the average value (the city of Poltava - 23.9, Karlivka district - 11.7, Kozelshchyna district - 23.9, Kremenchuk district - 20.2%, Lubny district - 20.8%, Novi-Sanzhary district - 14.5%, Poltava district - 19.6%, Reshetylivka district - 28.3%, Semenivka district - 18.1%, Khorol district - 21.5%, Chutove district - 10.5%; Shishaky district - 27.8%); 4 districts with the indicators close to the average values and 12 districts with indicators that significantly exceed the average values (the city of Kremenchuk - 50.9%, Velika Bahachka district - 119.9%, Hrebinka district - 38.2%, Dykanka district - 53.4%, Kobeliaky district - 43.1%, Kotelva district - 43.6%, Lokhvitsa district - 46.4%, Mashivka district - 40.9%, Myrhorod district - 40.9%, Orzhitsia districts - 64.3%, Pyriatyn district - 50.7%, Chornukhy district - 43.6%).

The prevalence of caries complications among the diseases of hard tissues in temporary teeth indicates the low efficiency of the secondary prevention and the untimely sanitation of the oral cavity in preschoolers. Therefore, we classified the districts where this indicator exceeded the average values, as unfavourable in terms of providing paediatric dental care. It should be noted that in some districts this indicator overstepped the average values in several times. The indices obtained in Orzhitsya district (64.3%), were *more than twice as much as the average*, and in the

Velyka Bahachka district (119.9%) this indicator exceeded the average values in four times. That is, the number of restoration cases of complicated forms of caries exaggerates the number of temporary teeth with uncomplicated caries.

When carrying out the comparative analysis of annual reports for 2007 and 2017 by the indicator of the share of complicated caries, attention should be focused on the average increase of the value from 30.4% in 2007 to 35.9% in 2017. Significant exceeding of the indicator over the average value in 2017 in Hlobyne, Kotelva, Reshetylivka and Khorol districts should compel dental professionals' attention as the situation in these districts has considerably deteriorated compared with 2007 that is regarded as a warning and requires in-depth analysis of the problems and implementing the effective approaches to improve the efforts in providing paediatric dental care in these district.

For more detailed analysis of the treatment efficiency for temporary teeth, we calculated the ration between the teeth with uncomplicated caries, which had been treated for uncomplicated caries and teeth treated for complicated caries: the mean indicator for Poltava oblast was 5.2: 1 in 2007 and 4.6: 1 in 2017. We also found out a number of the districts in which this indicator was significantly lower than the average values in 2007 (the city of Kremenchuk - 3,7: 1, Gadyach district - 2,9: 1, Hrebinka district - 2,8: 1, Dykanka district - 3, 5: 1, Kobeliaky district - 3,3: 1, Kotelva district - 2,7: 1, Lokhvitsa district - 2,8: 1, Myrhorod district - 3,7: 1, Orzhitsia district - 2,3: 1, Pyriatyn district - 2,2: 1 and Chornukhy district - 2,3: 1). No particular changes were found in these districts in 2017, but only in Reshetylivka and Hlobyne districts the situation dramatically deteriorated and the number of cases of complicated caries became higher than the mean value through Poltava oblast.

The analysis of the ratio between temporary teeth treated for complicated caries and teeth extracted for the same reason demonstrated the identical tendency. In the city of Kremenchuk and Dykanka, Zinkiv, Mashivka, Chutove and Novi Sanzhary districts, this indicator is approaching 1:1 (Table IV). This is regarded as a threatening situation for preserving temporary teeth until the period of their physiological replacement with permanent descendants that can lead to the development of dento-facial disorders.

CONCLUSIONS

The analysis of annual reports for 2007 and 2017 through Poltava oblast points out the low efficiency of dental caries management in the children's temporary teeth. As a result, outcomes of the dental caries treatment and caries complications in the children's temporary teeth are assessed as unsatisfactory both in the preventive and the therapeutic aspects. In a decade, i.e. in 2017, the relative indicator of the proportion of complicated forms of dental caries somewhat increased and made up at average 35.9% in the oblast.

The study has revealed the simultaneous increase in the share of complicated caries and exceeding the ratio of temporary teeth removed due to dental caries over the teeth with complicated caries that have been treated with

therapeutic techniques. Taken together, these data, in our opinion, indicate inadequate attention to *the oral cavity* sanitation in children. The decline in the efficiency of primary prevention and oral cavity sanitation in preschoolers and junior schoolchildren may be likely due to lack of funding and the scarcity of paediatric dentists in many districts of the oblast. Such a state of affairs requires immediate boosting of both primary and secondary measures in order to prevent dental diseases among the children that must be the first priority for the paediatric dental care services through Poltava oblast.

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