

## RISK FACTORS FOR DENTAL CARIES DEVELOPMENT IN CHILDREN

HSEE OF Ukraine «Ukrainian Medical Stomatological Academy» (Poltava)

korotich\_nat@mail.ru

The research has been carried out within the research scientific work, entitled «Enhancement of methods of prevention and treatment of major dental diseases in children with risk factors» code AMN 079.10, state registration number: 0111U006760.

**Relevance of the topic.** Dental caries is considered the major dental disease of child population in Ukraine. Notwithstanding the achievements in medicine, widespread introduction of state-of-the-art approaches and means of prevention and treatment in children's dental therapeutic medical practice the rate of dental caries and its complications is not reduced to date [1, 13, 19]. According to statistics 3-3,5 carious teeth are accounted for each child aged 12 years [20].

At the same time the indices are increasing in children with old or concomitant somatic diseases [4, 8, 11], including scoliosis, showing hormonal imbalance, amino acid and mineral metabolism disorder, decreased activity of enzymatic systems [2, 5, 6, 14] that, indisputably, is displayed on the resistance of the hard tooth tissues [9, 16, 18].

We hypothesize that dental care should be focused primarily on the development and improvement of methods of early detection of individual predisposition, as well as forecasting the development and progression of dental caries, especially in children. Detection of the caries-susceptibility contingent provides timely dental prophylactic medical examination and prescription of appropriate treatment and consequently, reduction of the incidence of the diseases [3, 15].

Generally, the development of carious process depends on the resistance of enamel, which is conditioned by the processes of mineralization. The presence of somatic pathology weakens the host defense and creates the conditions to reduce the resistance of the hard tooth tissues.

Structural and functional acid resistance of tooth enamel with vital pulp, estimated by the enamel acid resistance test (ERT) is considered the most effective, from the point of view of predictive value, indicator of predisposition to carious lesions [10].

Therefore the assessment of the level of enamel resistance in children with dysplastic scoliosis is crucial for prediction of caries progression and development of efficient preventive measures.

**Purpose.** The paper was aimed at the study of prevalence and intensity of dental caries in children with dysplastic scoliosis of different severity, to estimate the structural and functional enamel acid resistance (ERT-test) of their teeth to follow up the development of complex of caries-preventive measures.

**Object and methods.** To meet the objectives of the study we have examined 551 children aged 7 to 15 years, assigned to two groups according to the state of their health. The main group was populated with 315 children with scoliosis of I-II degree and the control group was represented by 236 almost healthy children. Tooth decay analysis has been carried out according to conventional technique, recommended by the WHO (1989). At the same time the prevalence (%) and intensity of dental caries has been studied according to cf, CFE+cf, CFE indices (Caries Filling Extraction Index) [17].

To estimate the structural and functional enamel acid resistance 138 children aged 11-12 years with scoliosis and 65 children of the same age have been selected. ERT-test has been made according to L.I. Kosaryeva methodology, using the author's rapid modification [7]. The test assessment was made by the twelve-field half-tone printing scale of blue color in %, where the index of coloring of one field was 8,3%. The results have been statistically processed by the Student's t-test [12].

**Results and discussion.** The study of the intensity and prevalence of dental caries in children with dysplastic scoliosis shows that these indices are higher the similar ones in controls and increase with age. In this way, if the prevalence of caries of deciduous teeth is accounted for 69,6±9,6% in children aged 7 years, and increases to 77,3±8,93% in children aged 8 years, then at the beginning of physiological change occurred in 9 years of old it decreases and at the age of 12 years it accounts for 16,22±4,28% against 24,39±6,71% in controls, indicating about the premature extraction of periodontal deciduous molars. However, no significant difference between the indices of controls has been noted.

At the same time rise of prevalence of dental caries of permanent teeth from 17,39±7,9% at the age of 7 years to 96,15±3,77% at the age of 15 years has been found that significantly differs from the values in controls ( $p < 0,05$ ) (**table 1**).

Permanent teeth affected by caries have been found in children aged 7 years. CFE index=0,17±0,07. At the age of 8 years this index dramatically increases to 0,68±0,20, that significantly differs from the indices in controls. At the age of 9-10 years CFE index gradually increases and at the age of 11 it dramatically increases to 1,63±0,21 against 0,92±0,15 in healthy children. In each age group the intensity of permanent teeth caries in children with scoliosis is significantly higher than in healthy children. Thus at the age of 12-14 years the CFE index was twice higher in children with scoliosis than in healthy children and at the age of 15 years it was higher by 2,4 times. No significant difference between the level

of prevalence and intensity of dental caries in boys and girls has been found (table 2).

Additionally, the tendency in dynamics of prevalence and intensity of carious process in children with scoliosis according to the severity of the disease has been established. In this way beginning from the age of 8 years the prevalence of caries in children with scoliosis of II degree is 80-100%, that significantly exceeds the indices of children with scoliosis of I degree. The intensity of carious process is also significantly higher in children with scoliosis of II degree. The difference is especially notable at the age of 8-10 years and 12 years, when the cf, CFE indices are higher by 2-2,5 times than the similar ones in children with scoliosis of I degree (table 3).

One of the most important indicators of the homeostasis of the oral cavity is structural and functional enamel acid resistance. It has been established that dental caries in children occurs in its decreasing. The study of level of this index in children with dysplastic scoliosis showed its decrease as compared with controls (table 4), which is proved by high prevalence and intensity of dental caries in these children. Generally, in groups of sick children and children with scoliosis of I degree structural and functional enamel acid resistance was 5,62±0,16 and 4,91±0,15, respectively, corresponding to mean level. Low enamel resistance (7,54±0,28) has been found in children with scoliosis of II degree. This index was significantly better in controls and was 3,23±0,16, indicating about high structural and functional enamel acid resistance.

Study of enamel resistance in children with dental caries and without it in main and control groups showed significant difference in this index, i. e., in children with scoliosis it is considerably worse regardless of the availability of caries. In the group of children with scoliosis of II degree the index of ERT-test was 1,5 times higher than in children with scoliosis of I degree regardless of availability of carious or intact teeth.

High structural and functional enamel acid resistance has been detected in 19 children (13,77±2,93%) with scoliosis that was by 4,6 times higher than in group of healthy children. More than the half of children with

Table 1.

Prevalence of dental caries in children with dysplastic scoliosis (M±m)

Age	Groups	Number	Children with dental caries					
			total		deciduous teeth		permanent teeth	
			abs.	%, (M±m)	abs.	%, (M±m)	abs.	%, (M±m)
7	control	25	16	64,00±9,60	16	64,00±9,60	-	-
	main	23	16	69,60±9,60	16	69,60±9,60	4	17,39±7,9*
8	control	25	14	56,00±9,92	14	56,00±9,92	4	16,00±7,33
	main	22	17	77,30±8,93	17	77,30±8,93	8	36,36±10,25
9	control	25	17	68,00±9,32	17	68,00±9,32	4	16,00±7,33
	main	25	18	72,00±8,97	16	64,00±9,60	9	36,00±9,60
10	control	26	15	57,69±9,68	12	46,15±9,77	6	23,07±8,26
	main	26	18	69,23±9,05	14	53,84±9,77	12	46,15±9,77
11	control	24	16	66,66±9,62	11	45,83±10,17	14	58,30±10,06
	main	67	52	77,61±5,09	32	47,76±6,10	42	62,68±5,90
12	control	41	27	65,85±7,40	10	24,39±6,71	21	51,22±7,81
	main	74	57	77,02±4,89	12	16,22±4,28	56	75,68±4,99*
13	control	25	15	60,00±9,79	-	-	15	60,00±9,79
	main	30	24	80,00±7,30	-	-	24	80,00±7,30
14	control	23	15	65,22±9,93	-	-	15	65,22±9,93
	main	25	23	92,00±5,43*	-	-	23	92,00±5,43*
15	control	22	15	68,20±9,90	-	-	15	68,20±9,90
	main	26	25	96,15±3,77*	-	-	25	96,15±3,77*

Note: \* — reliability of differences of indices of main and control groups (p<0,05).

Table 2.

Intensity of dental caries in children with dysplastic scoliosis (M±m)

Age years	Groups	Number	Intensity of dental caries according to indices		
			cf	CFE	cf+CFE
7	control	25	1,24±0,23	-	1,24±0,23
	main	23	2,57±0,53*	0,17±0,07	2,74±0,55*
8	control	25	1,08±0,21	0,16±0,07	1,24±0,24
	main	22	2,91±0,41****	0,68±0,20**	3,59±0,52****
9	control	25	1,40±0,22	0,16±0,07	1,56±0,27
	main	25	1,80±0,31	0,84±0,23***	2,64±0,43*
10	control	26	1,04±0,23	0,31±0,11	1,35±0,25
	main	26	1,23±0,25	1,04±0,24***	2,27±0,39
11	control	24	0,58±0,14	0,92±0,15	1,58±0,24
	main	64	1,12±0,18**	1,63±0,21**	2,75±0,25**
12	control	41	0,24±0,06	1,07±0,17	1,32±0,17
	main	74	0,22±0,06	2,12±0,20****	2,34±0,21****
13	control	25	-	1,20±0,21	-
	main	30	-	2,40±0,32***	-
14	control	23	-	1,39±0,23	-
	main	25	-	2,68±0,28****	-
15	control	22	-	1,68±0,27	-
	main	26	-	4,07±0,39****	-

Note: \* — reliability of difference of indices of main and control groups:

\* — p<0,05; \*\* — p<0,02; \*\*\* — p<0,01; \*\*\*\* — p<0,001.

scoliosis (55,80±4,23%) had moderate enamel resistance, low and extremely low resistance was detected

Table 3.

**Prevalence and intensity of dental caries in children with dysplastic scoliosis according to age and degree of severity of the disease (M±m)**

Age years	Groups	Number	Prevalence of dental caries		Intensity of dental caries cf+CFE
			абс.	%	
1		3	4	5	6
7	control	25	16	64,00±9,60	1,24±0,25
	scoliosis of I degree	19	13	68,42±10,66	2,37±0,55
	scoliosis of II degree	4	3	75,00±21,65	4,50±1,43*
8	control	25	14	56,00±9,92	1,24±0,24
	scoliosis of I degree	18	13	72,22±10,55	2,83±0,46** ****
	scoliosis of II degree	4	4	100,00±0,00****	7,00±0,50****
9	control	25	17	68,00±9,32	1,56±0,20
	scoliosis of I degree	20	13	65,00±10,66	2,00±0,41****
	scoliosis of II degree	5	5	100,00±0,00**	5,20±0,59****
10	control	26	15	57,69±9,68	1,35±0,25
	scoliosis of I degree	21	14	66,66±10,28	1,76±0,33°
	scoliosis of II degree	5	4	80,00±17,88	4,40±1,04**
11	control	24	16	66,66±9,62	1,58±0,24
	scoliosis of I degree	47	35	74,47±6,36	2,29±0,26* ****
	scoliosis of II degree	17	17	100,00±0,00****	4,00±0,45****
12	control	41	27	65,85±7,40	1,32±0,17
	scoliosis of I degree	54	38	70,37±6,21	1,83±0,19* ****
	scoliosis of II degree	20	19	95,00±4,87****	3,70±0,49****
13	control	25	15	60,00±9,79	1,20±0,21
	scoliosis of I degree	21	15	71,43±9,86	2,38±0,59
	scoliosis of II degree	9	9	100,00±0,00****	3,44±0,52****
14	control	23	15	65,22±9,93	1,39±0,23
	scoliosis of I degree	17	15	88,23±7,82	2,23±0,29* °
	scoliosis of II degree	8	8	100,00±0,00****	3,60±0,49****
15	control	22	15	68,20±9,90	1,68±0,27
	scoliosis of I degree	16	16	93,75±6,05*	3,56±0,57** °
	scoliosis of II degree	10	10	100,00±0,00**	4,90±0,29****

**Notes:**

1. \* — reliability of difference of indices of main and control groups:  
 \* — p<0,05; \*\* — p<0,01; \*\*\* — p<0,002; \*\*\*\* — p<0,001.  
 2. ° — reliability of difference of indices of I and II degree of scoliosis severity:  
 ° — p<0,05; °° — p<0,02; °°° — p<0,01; °°°° — p<0,001.

Table 4.

**State of structural and functional enamel acid resistance in children aged 11-12 years with dysplastic scoliosis of different degrees of severity (M±m)**

Group of children	Number (n)	ERT-test indices, points		
		mean index	in children with caries	in children without caries
control	65	3,23±0,16	3,81±0,18¤	2,17±0,12
main	138	5,62±0,16**	6,18±0,16**¤ n=109	3,41±0,15** n=29
scoliosis of I degree	101	4,91±0,15***	5,51±0,15***¤ n=73	3,36±0,14*** n=28
scoliosis of II degree	37	7,54±0,28**	7,61±0,28**¤ n=36	5,00±0,00* n=1

**Notes:**

1. \* — reliability of difference of indices of main and control groups: \* — p<0,05; \*\* — p<0,001.  
 2. ° — reliability of difference of indices of I and II degree of scoliosis severity: (p<0,001).  
 3. ¤ — reliability of difference of indices of children without caries (p<0,001).

in 30,43±3,92% children with scoliosis, mostly with II degree (72,92±7,31% against 14,85±3,54% with I degree). No low or extremely low structural and functional enamel acid resistance was detected in children with scoliosis who had intact teeth and in healthy children regardless of availability of caries.

**Conclusions.** In summary, the studies show that the prevalence and intensity of dental caries in children with dysplastic scoliosis is significantly higher as compared with healthy children, especially in children with

scoliosis of II degree indicating about the impact of this disease on dental caries origination.

Generally, children with scoliosis have moderate and low structural and functional enamel acid resistance, which getting worse in more severe degree of scoliosis, indicating about the predisposition of hard tooth tissues to dental caries origination and provides for necessity of preventive measures towards the increase of enamel resistance in children with scoliosis.

### References

1. Борисенко А.В. Кариес зубов / А.В. Борисенко. – К.: Книга плюс, 2005. – 416 с.
2. Верхотурова В.Т. Минеральная плотность костной ткани у детей и подростков с идиопатическим сколиозом: автореф. дис. на соискание науч. степени канд. мед. наук: спец. 14.00.21 «Стоматология» / В.Т. Верхотурова. – Новосибирск, 2012. – 25 с.
3. Епідеміологічні дослідження – основа планування заходів профілактики стоматологічних хвороб у дітей / Л.Ф. Каськова, Н.В. Левченко, О.Ю. Андріанова [та ін.] // Український стоматологічний альманах. – 2011. – № 2. – С. 25-26.
4. Каськова Л.Ф. Фактори ризику виникнення карієсу тимчасових зубів / Л.Ф. Каськова, Г.О. Акхитова // Актуальні проблеми сучасної медицини. – 2008. – Т. 8, № 4, ч. 1. – С. 28-29.
5. Коротич Н.Н. Взаимосвязь заболеваний органов полости рта у детей с диспластическим сколиозом / Н.Н. Коротич // Актуальні проблеми сучасної медицини. Вісник Української медичної стоматологічної академії. – 2002. – Т. 2, Вип. 2 (4). – С. 13-17.
6. Коротич Н.М. Метаболізм колагену в ротовій рідині дітей з диспластичним сколіозом / Н.М. Коротич // Світ медицини та біології. – 2016. – № 2 (56). – С. 33-36.
7. Косарева Л.И. Методы клинической оценки структурно-функциональной резистентности эмали и его применение в системе диспансеризации школьников: автореф. дис. на соискание науч. степени канд. мед. наук: 14.01.21 «Стоматология» / Л.И. Косарева. – К., 1983. – 16 с.
8. Косенко К.Н. Иммуный статус и интенсивность кариеса у часто болеющих детей / К.Н. Косенко, С.В. Скульская, О.В. Мороз // Вісник стоматології. – 2001. – № 1. – С. 45-47.
9. Нарєпаха О.П. Структурно-функціональна резистентність емалі (ТЕР-тест) у дітей, які навчаються в інтернатних закладах / О.П. Нарєпаха, Т.Ю. Лисак // Український стоматологічний альманах. – 2015. – № 6. – С. 56-58.
10. Окушко В.Р. Основы физиологии зуба: учебник для врачей-стоматологов и студентов медицинских университетов / В.Р. Окушко. – Тирасполь: Изд-во Приднестр. ун-та, 2005. – 240 с.
11. Павленкова О.С. Показники поширеності й інтенсивності карієсу зубів у дітей 6-7 років, які часто хворіють на гострі респіраторно-вірусні інфекції / О.С. Павленкова // Актуальні проблеми сучасної медицини. – 2015. – Т. 15, Вип 1 (49). – С. 35-38.
12. Реброва О.Ю. Статистический анализ медицинских данных. Применение пакета прикладных программ STATISTICA / О.Ю. Реброва. – М.: МедиаСфера, 2002. – 312 с.
13. Савичук Н.О. Стоматологічне здоров'я дітей, методологічні підходи та критерії оцінки / Н.О. Савичук // Современная стоматология. – 2008. – № 1. – С. 94-98.
14. Самойленко А.В. Вивчення біохімічних показників метаболізму кісткової тканини в пацієнтів із зубощелепними аномаліями, ускладненими захворюваннями пародонту, на тлі сколіозу / А.В. Самойленко, В.О. Дрок, Т.О. Піндус // Український стоматологічний альманах. – 2012. – № 6. – С. 17-20.
15. Сафонова Ю.С. Методи клінічної та доклінічної діагностики уражень твердих тканин зубів / Ю.С. Сафонова // Новини стоматології. – 2009. – № 2 (59). – С. 59-62.
16. Смоляр Н.И. Кариес постоянных зубов и структурно-функциональная резистентность эмали у детей школьного возраста / Н.И. Смоляр, Н.Л. Чухрай // Стоматология детского возраста и профилактика стоматологических заболеваний: материалы IV Российско-Европейского конгресса по детской стоматологии, посвященные 25-летию кафедры детской стоматологии, 28-30 сент. 2015 г. – М., 2015. – С. 265-267.
17. Стоматологические обследования. Основные методы. – 3 изд. Всемирная организация здравоохранения. – Женева, 1989. – 62 с.
18. Удод О.А. Сучасні підходи до клінічної оцінки структурно-функціональної кислотостійкості емалі зубів / О.А. Удод, О.В. Сироткіна // Український стоматологічний альманах. – 2013. – № 2. – С. 44-47.
19. Хоменко Л.О. Стан стоматологічного здоров'я та оцінка чинників ризику щодо розвитку карієсу постійних зубів / Л.О. Хоменко, Ю.М. Трачук // Дентальные технологии. – 2006. – № 1-2 (26-27). – С. 31-33.
20. Хоменко Л.О. Стоматологічна профілактика у дітей / Л.О. Хоменко, В.І. Шматко, О.І. Остапко. – К.: ІСДО, 1993. – 192 с.

УДК 616.314-002.4-053.5

#### ФАКТОРИ РИЗИКУ ВИНИКНЕННЯ КАРІЄСУ ЗУБІВ У ДІТЕЙ

Коротич Н. М.

**Резюме.** Метою роботи було вивчення показників поширеності та інтенсивності карієсу у дітей, що страждають на диспластичний сколіоз різного ступеня тяжкості, оцінка структурно-функціональної кислотостійкості емалі (ТЕР-тест) їх зубів для подальшого розроблення комплексу карієспрофілактичних заходів. Була обстежена 551 дитина віком від 7 до 15 років з диспластичним сколіозом та 236 практично здорових дітей.

Результати дослідження свідчать про те, що показники поширеності та інтенсивності карієсу у дітей з диспластичним сколіозом у 1,2-2 рази вищі, ніж у здорових дітей, особливо помітна різниця при II ступені тяжкості сколіозу, що свідчить про вплив цього захворювання на виникнення карієсу зубів.

Діти зі сколіозом мають в основному середню та низьку структурно-функціональну кислотостійкість емалі, яка погіршується при тяжкому ступеню сколіозу, що говорить про схильність твердих тканин зубів до виникнення карієсу та обумовлює необхідність проведення профілактичних заходів, спрямованих на підвищення резистентності емалі у дітей зі сколіозом.

**Ключові слова:** диспластичний сколіоз, поширеність, інтенсивність, карієс, резистентність емалі.

УДК 616.314-002.4-053.5

### ФАКТОРЫ РИСКА ВОЗНИКНОВЕНИЯ КАРИЕСА ЗУБОВ У ДЕТЕЙ

Коротич Н. Н.

**Резюме.** Целью работы было изучение показателей распространенности и интенсивности кариеса у детей, страдающих диспластическим сколиозом различной степени тяжести, оценка структурно-функциональной кислотоустойчивости эмали (ТЭР-тест) их зубов для дальнейшей разработки комплекса кариеспрофилактических мероприятий. Был обследован 551 ребенок в возрасте от 7 до 15 лет с диспластическим сколиозом и 236 практически здоровых детей.

Результаты исследования свидетельствуют о том, что показатели распространенности и интенсивности кариеса у детей с диспластическим сколиозом в 1,2-2 раза выше, чем у здоровых детей, особенно заметна разница при II степени тяжести сколиоза, что свидетельствует о влиянии этого заболевания на возникновение кариеса зубов.

Дети со сколиозом имеют в основном среднюю и низкую структурно-функциональную кислотостойкость эмали, которая ухудшается при более тяжелой степени сколиоза, что говорит о склонности твердых тканей зубов к возникновению кариеса и обуславливает необходимость проведения профилактических мероприятий, направленных на повышение резистентности эмали у детей со сколиозом.

**Ключевые слова:** диспластический сколиоз, распространенность, интенсивность, кариес, резистентность эмали.

UDC 616.314-002.4-053.5

### RISK FACTORS FOR DENTAL CARIES DEVELOPMENT IN CHILDREN

Korotych N. M.

**Abstract.** Dental status depends on the number of factors, including the state of child somatic health and dysplastic scoliosis, in particular.

The purpose of the paper was to study the indices of prevalence and intensity of dental caries in children with dysplastic scoliosis of different severity, to estimate the structural and functional enamel acid resistance (ERT-test) of their teeth to follow up the development of complex of caries-preventive measures.

551 children aged 7 to 15 years with dysplastic scoliosis and 236 almost healthy children have been examined.

Results. Prevalence and intensity of dental caries in children with dysplastic scoliosis is higher as compared with almost healthy children of all age periods. In this way in patients aged 8 years the prevalence of caries of permanent teeth was accounted for 36,36±10,25%; intensity according to CFE index was 0,68±0,20, whereas in controls these indices were 16,00±7,33% and 0,16±0,07, respectively. Indices got higher with age and at the age of 10 the prevalence of caries reached 46,15±9,77%, intensity was 1,11±0,29, and in controls the indices were 23,07±8,26% and 0,31±0,11, respectively. The prevalence of caries of 12 year-old children was 75,68±4,99%, intensity — 2,12±0,20, whereas in almost healthy children the indices were 51,22±7,81 and 1,07±0,17, respectively. In adolescents with dysplastic scoliosis aged 15 years the prevalence of caries increased to 96,15±3,77%, intensity — to 4,07±0,39 against 68,20±9,90% and 1,68±0,27, respectively, in control group (p<0,05).

The direct dependence of caries affection on the severity of the scoliosis has been established. In this way in scoliosis of II degree the prevalence was accounted for 96,34±4,30, intensity was 4,20±0,11, and in children with scoliosis of I degree the indices were 73,82±8,29% and 2,29±0,08, respectively.

Children with dysplastic scoliosis showed the decreased structural and functional enamel acid resistance: 4,91±0,15 points in scoliosis of I degree and 7,54±0,28 points in scoliosis of II degree indicating about moderate and low resistance. The ERT-test was significantly better (3,23±0,16 points) in healthy children. The lowest indices were found in individuals with carious teeth (6,18±0,16 points), and in children with intact teeth the ERT-test was accounted for 3,41±0,15 points; the value of ERT index in almost healthy children with caries was 3,81±0,18 points, and in intact teeth it was 2,17±0,12 points (p<0,05).

Conclusions. The findings show that the prevalence and intensity of dental caries in children with dysplastic scoliosis is significantly higher as compared with healthy children, especially in children with scoliosis of II degree, indicating about the impact of this disease on the onset of dental caries.

Generally, children with scoliosis have moderate and low structural and functional enamel acid resistance, indicating about the predisposition of hard tooth tissues to dental caries origination and provides for necessity of preventive measures towards the increase of enamel resistance in children with scoliosis.

**Keywords:** dysplastic scoliosis, prevalence, intensity, dental caries, enamel resistance.

Рецензент — проф. Ткаченко П. І.

Стаття надійшла 26.11.2016 року