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PRACA ORYGINALNA  
ORIGINAL ARTICLE

## PHYSICAL INDICES OF THE ORAL FLUID IN CHILDREN WITH CARIES AND INTACT TEETH AT DIFFERENT AGE PERIODS

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### ABSTRACT

**Introduction:** Caries occurs most frequently among dental diseases of the hard dental tissues in children. Its occurrence and intensity do not decrease, although scientists and practitioners make much efforts directed to the reduction of these indices

**The aim:** Therefore, the objective of our study was to investigate the indices of rate salivation and viscosity of the oral fluid in children at different age periods with caries and intact teeth.

**Materials and methods:** 134 children, 7-9 years old, and 89 children, 10-12 years old, studying at Poltava schools were examined. Dental examination was conducted according to the common methods. Caries intensity in all the children was determined by Caries Filling Extraction (CFE) Index, and CFE+cfe. To determine salivation rate the oral fluid was collected on empty stomach in the morning into sterile calibrated tubes during 5 minutes.

**Results and conclusions:** Investigations of physical indices of the oral fluid in children of 7-9 and 10-12 years of age did not find their reliable difference considering the child's age. Meanwhile the indices of salivation rate and oral fluid viscosity in children with caries and without it were found to differ much. That is, the course of carious process in children is associated with reduced salivation rate and increased index of the oral fluid viscosity, which in its turn deteriorates hygienic state of the oral cavity enabling to activate the activity of dental deposit microflora and its effect on enamel demineralization followed by occurrence of carious defect of temporary and especially permanent teeth recently erupted and poorly mineralized. The results obtained were calculated by variation statistics method. The indices were considered to be reliable with  $p \leq 0,05$ .

**KEY WORDS:** children, caries, intact teeth, salivation rate, oral fluid viscosity

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### INTRODUCTION

Caries occurs most frequently among dental diseases of the hard dental tissues in children. Its occurrence and intensity do not decrease, although scientists and practitioners make much efforts directed to the reduction of these indices [1,2]. There are a number of factors of the disease that should be drawn attention to – homeostasis of the oral fluid having continuous contact with the hard dental tissues located in the oral cavity. Caries resistance of the enamel of the erupted teeth depends much on its characteristics [3]. Salivation rate and viscosity of the oral fluid are important indices. In case of hypersalivation the rate of salivation is 0,61-2,40 ml/min, in case of normal salivation rate – 0,31-0,60 ml/min, and in case of hyposalivation – 0,03-0,30 ml/min [4,5,6,7]. Reduced amount of the oral fluid and its increased viscosity result in accumulation of dental deposit affecting the dental resistance to caries [8,9].

### THE AIM

Therefore, the objective of our study was to investigate the indices of rate salivation and viscosity of the oral fluid in children at different age periods with caries and intact teeth.

### MATERIALS AND METHODS

134 children, 7-9 years old, and 89 children, 10-12 years old, studying at Poltava schools were examined. Dental examination was conducted according to the common methods. Caries intensity in all the children was determined by Caries Filling Extraction (CFE) Index, and CFE+cfe.

To determine salivation rate the oral fluid was collected on empty stomach in the morning into sterile calibrated tubes during 5 minutes. Salivation rate (SR) was calculated according to the formula

$$SR = \frac{V}{T}$$

where V- volume of the oral fluid in the tube,  
T- time of collecting oral fluid.

Oral fluid viscosity was determined by Ostwald's viscosimeter according to the formula

$$\eta_x = \eta_0 \cdot \frac{t_x}{t_0}$$

where  $\eta_x$  – viscosity of non-stimulated oral fluid (relative units),

$\eta_0$  – relative water viscosity at the given temperature (relative units),

**Table I.** The index of salivation rate in children with caries of temporary and permanent teeth ( $M \pm m$ )

Age in years	Salivation rate index, ml/min			p
	Mean value	In children with intact teeth	In children with caries (CFE+cf)	
7-9(I)	0,37±0,006 n=134	0,42±0,009 n=39	0,35±0,006 n=95	<0,001
10	0,35±0,014 n=24	0,42±0,029 n=5	0,33±0,013 n=19	<0,05
11	0,36±0,013 n=25	0,44±0,03 n=3	0,36±0,013 n=22	<0,05
$p_{10-11}$	>0,05	>0,05	>0,05	
12	0,37±0,009 n=40	0,41±0,013 n=7	0,37±0,011 n=33	<0,05
$p_{10-12}$	>0,05	>0,05	>0,05	
$p_{11-12}$	>0,05	>0,05	>0,05	
10-12(II)	0,36±0,007 n=89	0,42±0,012 n=15	0,35±0,007 n=74	<0,001
$p_{I-II}$	>0,05	>0,05	>0,05	
Total	0,37±0,004 n=223	0,42±0,007 n=56	0,35±0,005 n=167	<0,001

**Table II.** Viscosity index of the oral fluid in children with caries of temporary and permanent teeth ( $M \pm m$ )

Age in years	Viscosity index of the oral fluid, relative units			p
	Mean value	In children with intact teeth	In children with caries (CFE+cf)	
7-9(I)	1,82±0,03 n=134	1,45±0,02 n=39	1,98±0,03 n=95	<0,001
10	1,90±0,06 n=24	1,52±0,05 n=5	2,01±0,05 n=19	<0,01
11	2,03±0,06 n=25	1,50±0,06 n=3	2,11±0,04 n=22	<0,05
$p_{10-11}$	>0,05	>0,05	>0,05	
12 n=40	1,99±0,05	1,54±0,04 n=7	2,08±0,04 n=33	<0,001
$p_{10-12}$	>0,05	>0,05	>0,05	
$p_{11-12}$	>0,05	>0,05	>0,05	
10-12(II) n=89	1,98±0,03	1,53±0,02 n=15	2,07±0,03 n=74	<0,001
$p_{I-II}$	>0,05	>0,05	>0,05	
Total	1,89±0,02 n=223	1,49±0,02 n=54	2,02±0,02 n=167	<0,001

$\eta_0$  H<sub>2</sub>O with 20° C =  $1 \times 10^{-3}$  Pa·C,  $t_x$  – time of saliva outflow;

$t_0$  – time of water outflow (10).

The results obtained were calculated by variation statistics method. The indices were considered to be reliable with  $p \leq 0,05$ .

## RESULTS

Investigation of salivation rate in children from 7 to 9 years (1<sup>st</sup> period of transitional dentition) conducted earlier did not show a reliable difference of the index available. But

comparison of children with intact teeth and afflicted by caries has found a reliable difference in all the age categories (8). Further investigation of the age periods from 10 to 12 years (2<sup>nd</sup> period of transitional dentition) demonstrated similar tendency in relations of caries and salivation rate (Table I). Therefore, children of the examined ages did not differ in the values of the examined index considering their age. Although a reliable difference of salivation rate was found in children with caries and without it.

All the average values of salivation rate were within the norm, that is, they corresponded to the normal salivation. It is indicative of the fact that in every particular case

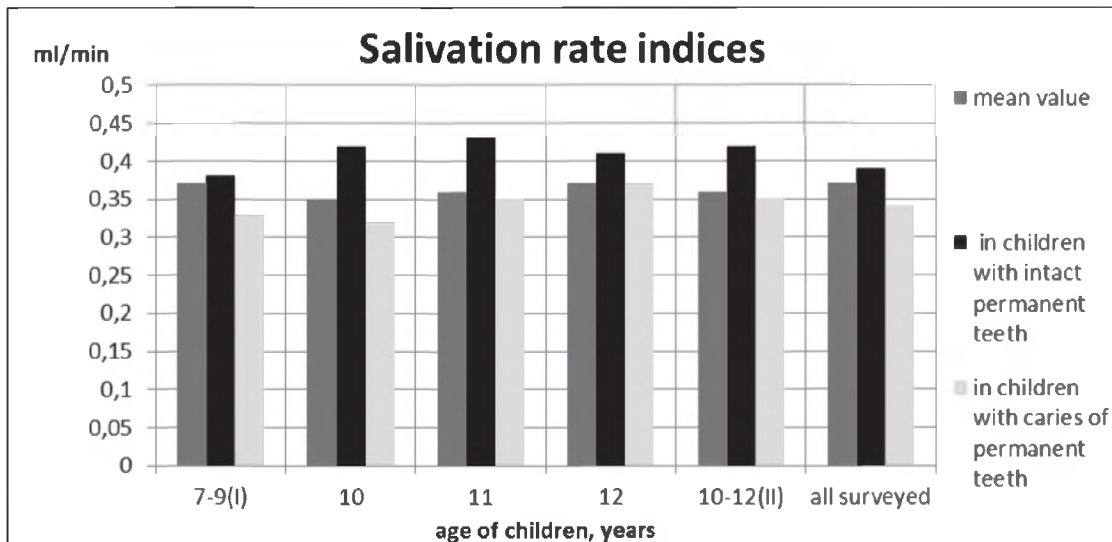


Fig. 1. Salivation rate index in children with caries of permanent teeth ( $M \pm m$ )

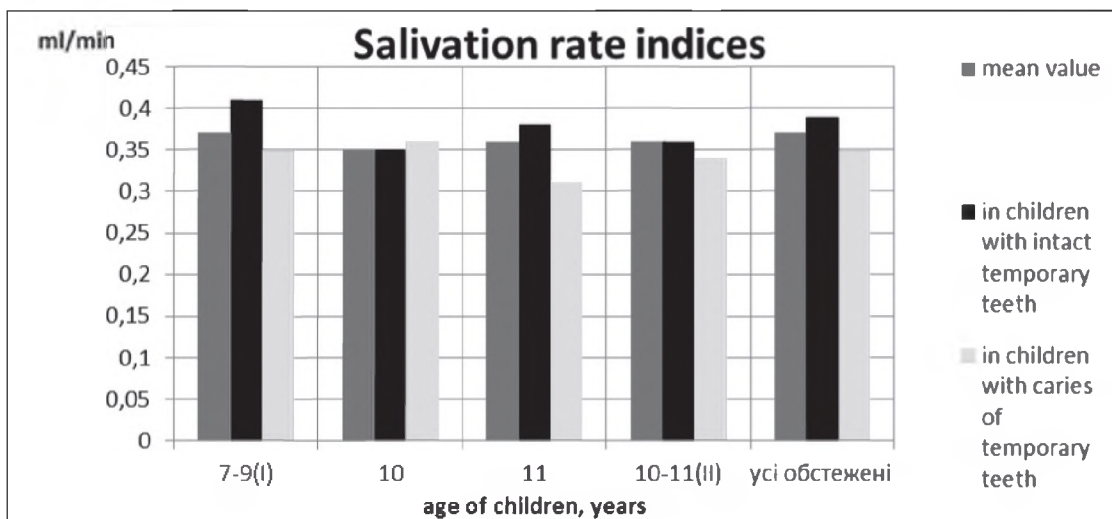


Fig. 2. Salivation rate index in children with caries of temporary teeth ( $M \pm m$ )

during examination of a patient this index should be paid attention to, since its decrease is a risk factor promoting occurrence of caries in children, especially during the first years after eruption of teeth, when active processes of enamel mineralization continue, it is not mature and possesses low caries resistance.

Examination of salivation rate in children considering caries of temporary and permanent teeth (separately) has found a tendency similar to that of children with a combined lesion of temporary and permanent teeth. Thus, children with caries had reliably lower indices of salivation rate than children with intact teeth. In all the groups of observation mean values were within the normal salivation rate (Fig. 1, 2).

Oral fluid viscosity is an important index to predict caries in children. Increased viscosity promotes a great amount of dental deposits provoking focal demineralization. Examination of viscosity index of the oral fluid in children of different ages did not find age differences, but it differs

greatly in children with caries and without it (Table II).

In children with caries of temporary and permanent teeth viscosity index of the oral fluid is reliably higher than in children with intact teeth at all the examined age periods. It considers those children having caries of temporary or permanent teeth. Thus, in spite of the fact what teeth are afflicted (temporary or permanent, or both) viscosity is always higher in children with caries than in those without it (Fig.3, 4).

## CONCLUSIONS

Therefore, our investigations of physical indices of the oral fluid in children of 7-9 and 10-12 years of age did not find their reliable difference considering the child's age. Meanwhile the indices of salivation rate and oral fluid viscosity in children with caries and without it were found to differ much. That is, the course of carious process in children is associated with reduced salivation rate and increased



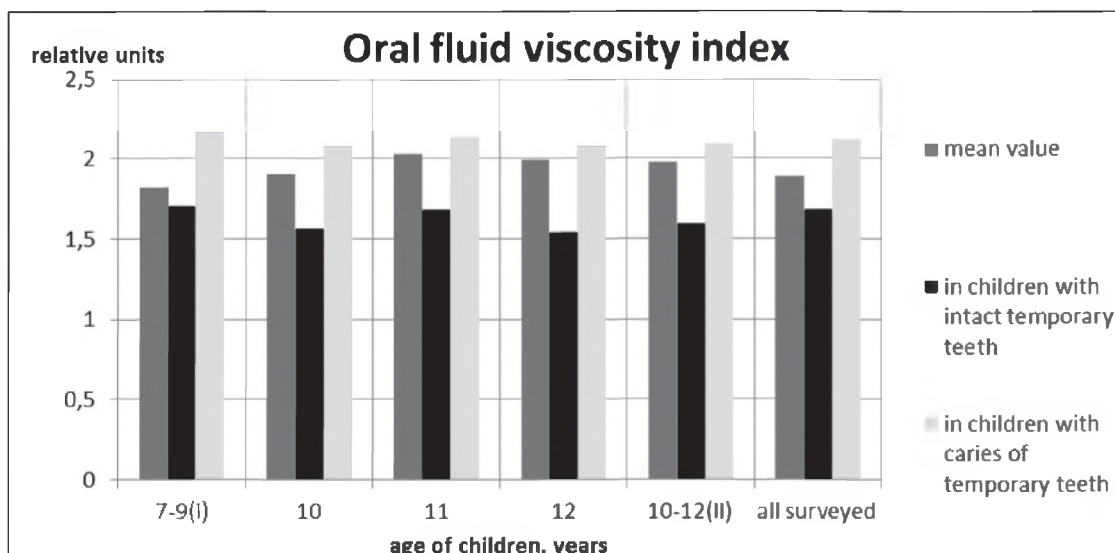


Fig. 3. Oral fluid viscosity index in children with caries of permanent teeth ( $M \pm m$ )

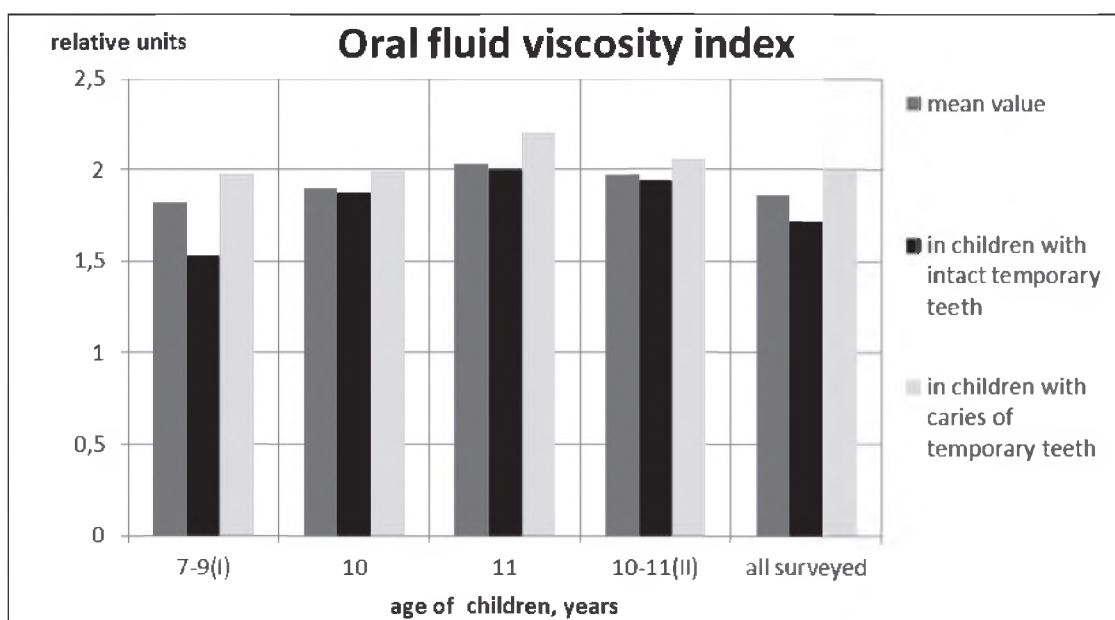


Fig. 4. Oral fluid viscosity index in children with caries of temporary teeth ( $M \pm m$ )

index of the oral fluid viscosity, which in its turn deteriorates hygienic state of the oral cavity enabling to activate the activity of dental deposit microflora and its effect on enamel demineralization followed by occurrence of carious defect of temporary and especially permanent teeth recently erupted and poorly mineralized.

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