
THE STATE OF LOCAL HUMORAL IMMUNITY OF THE ORAL CAVITY IN CHILDREN FROM DIFFERENT REGIONS OF BUKOVINA

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ABSTRACT

Background. Saliva is an important protective factor in the oral cavity that maintains dental health, promotes enamel demineralization, reduces enamel demineralization and provides local humoral protection. Important components of this environment are lysozyme and secretory immunoglobulin A. Their levels depend on individual characteristics, hygiene and nutrition and make it an important marker for assessing the risk of caries.

Aim. To investigate the state of local humoral immunity of the oral cavity in children by determining the levels of lysozyme and sIgA in the oral fluid.

Materials and Methods. To achieve this goal, we examined 215 children aged 6 years living in Bukovyna. We divided them into observation groups depending on the region of residence and the level of caries intensity. The state of local immunity of the oral cavity was determined by the levels of sIgA and lysozyme in the oral fluid. The degree of reliability of the results was statistically assessed.

Results. As a result of immunological studies, it was found that under conditions of varying intensity of carious lesions there is a steady tendency to decrease the concentration of lysozyme in the oral fluid of children. The results are the lowest in children from Vyzhnytsia district. In children of Dniestr district, lysozyme activity is 7.32% higher, and in children of Chernivtsi district – by 15.35% ($p < 0.05$). The content of sIgA in children of the Vyzhnytsia district was (0.29 ± 0.002) $\mu\text{g/l}$, which was 6.45% and 12.12% lower than the values of children of the Dniestr and Chernivtsi districts ($p < 0.05$). A decrease in its concentration in the oral fluid correlates with an unfavourable prognosis of the disease.

Conclusions. Thus, we found that in children with carious lesions there were changes in the system of nonspecific humoral immunity of the oral cavity.

Keywords: children, caries, saliva, lysozyme, immunoglobulin.

Introduction

Saliva is an important protective factor of the oral cavity, which maintains dental health, promotes enamel demineralization, reduces its demineralization and provides local humoral protection [1]. Important components of this environment are lysozyme and secretory immunoglobulin A (sIgA) [2].

Lysozyme destroys bacterial cell walls through enzymatic activity and has a bactericidal effect independently. It creates pores in the bacterial membranes, which leads to their osmotic death and in-

creases the permeability of cells to other antimicrobial molecules [3–5]. These properties make it possible to effectively destroy bacterial biofilms that protect pathogens from the effects of antibacterial drugs. Even with modification of the peptidoglycan structure or loss of the cell wall, bacteria retain sensitivity to the cationic mechanisms of lysozyme. The activity of this enzyme in the oral fluid correlates with the state of local immunity and indicators of antimicrobial protection of the oral cavity.

Secretory immunoglobulin A (sIgA) prevents the adhesion of pathogenic bacteria, such as *Streptococcus mutans*, to tooth enamel. Decreased levels of sIgA are observed in children with carious tooth lesions and are associated with an increase in the number of cariogenic microorganisms. The level of sIgA depends on individual characteris-

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tics, hygiene and nutrition, which makes it an important marker for assessing the risk of caries [4–7].

Monitoring of lysozyme and sIgA allows to effectively assess the state of oral immunity, which determines the relevance of this study.

The **aim** of the study was to investigate the state of local humoral immunity of the oral cavity in children by determining the levels of lysozyme and sIgA in the oral fluid.

Materials and Methods

To achieve this goal, we examined 215 children aged 6 years living in Bukovyna. We divided them into observation groups depending on the region of residence and the level of caries intensity.

The state of local oral immunity was determined by the levels of sIgA and lysozyme in the oral fluid. The studies were conducted at the Educational and Research Laboratory of Bukovinian State Medical University.

Unstimulated oral fluid was collected on an empty stomach by spitting into test tubes. After that, it was centrifuged at 3000 rpm for 15 minutes and the supernatant was collected, which was stored in a freezer at -20°C until the reaction was performed.

The concentration of sIgA was determined using the simple radial diffusion method in agar according to G. Mancini. The content of lysozyme in oral fluid samples was determined using the

method of Gorin G. in the modification of Levitsky A.P. and Zhigina O.O.

The degree of reliability of the results obtained was statistically assessed in the case of normal distribution of both samples by the Student-Fisher test, in other cases – by the Wilcoxon U test for independent samples and the Wilcoxon T test for dependent samples.

Results and Discussion

As a result of immunological studies, it was found that under conditions of different intensity of caries lesions there is a steady tendency to decrease the concentration of lysozyme in the oral fluid of children: from (34.90 ± 1.71) units/l – under conditions of low, to (30.05 ± 1.68) units/l – under conditions of high intensity, ($p < 0.05$) (Fig. 1).

Children in the Vyzhnytsia district have the lowest results. In children of Dniestr district, lysozyme activity is 7.32% higher, and in children of Chernivtsi district – 15.35% ($p < 0.05$). We believe that such results are associated with a decrease in the function of the specific protective barrier of the oral cavity, which protects the macroorganism from the damaging effects of pathogenic and opportunistic microorganisms. The content of sIgA in children of the Vyzhnytsia district was (0.29 ± 0.002) $\mu\text{g/l}$, which was 6.45% and 12.12% lower than the values of children of the Dniester and Chernivtsi districts ($p < 0.05$) (Fig. 2).

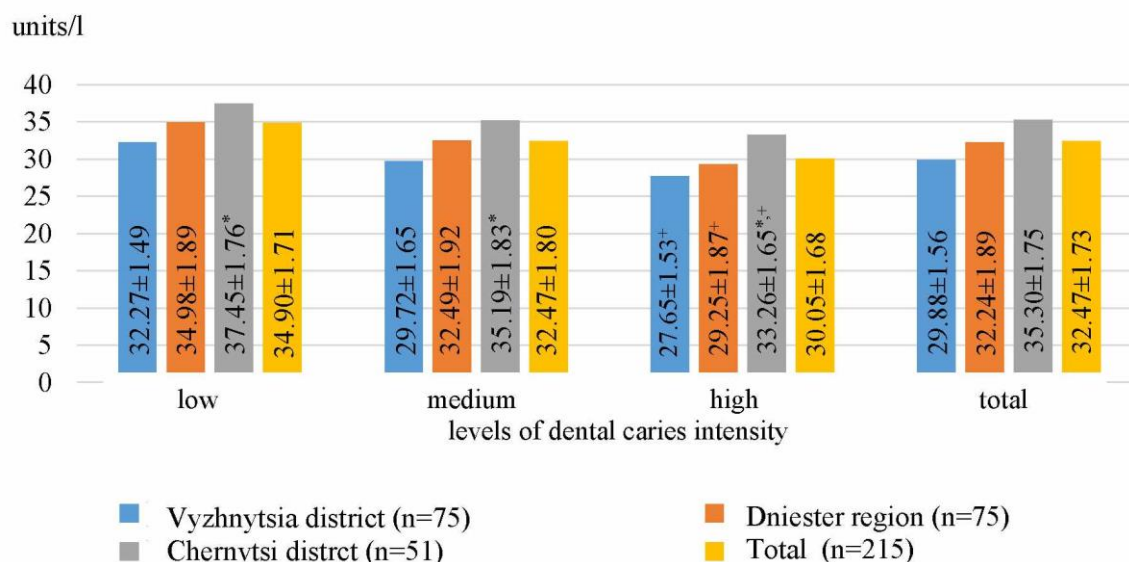


Fig. 1. Lysozyme levels in the oral fluid of children living in Bukovyna ($M \pm m$)

Notes: * – difference between the values of children from Vyzhnytsia and Dniester, Chernivtsi districts is significant ($p < 0.05$);

** – difference between the values of children from Dniester and Chernivtsi districts is significant ($p < 0.05$);

+ – difference between children with low and medium, high levels of dental caries intensity, significant ($p < 0.05$);

++ – difference between children with medium and high levels of dental caries intensity, significant ($p < 0.05$).

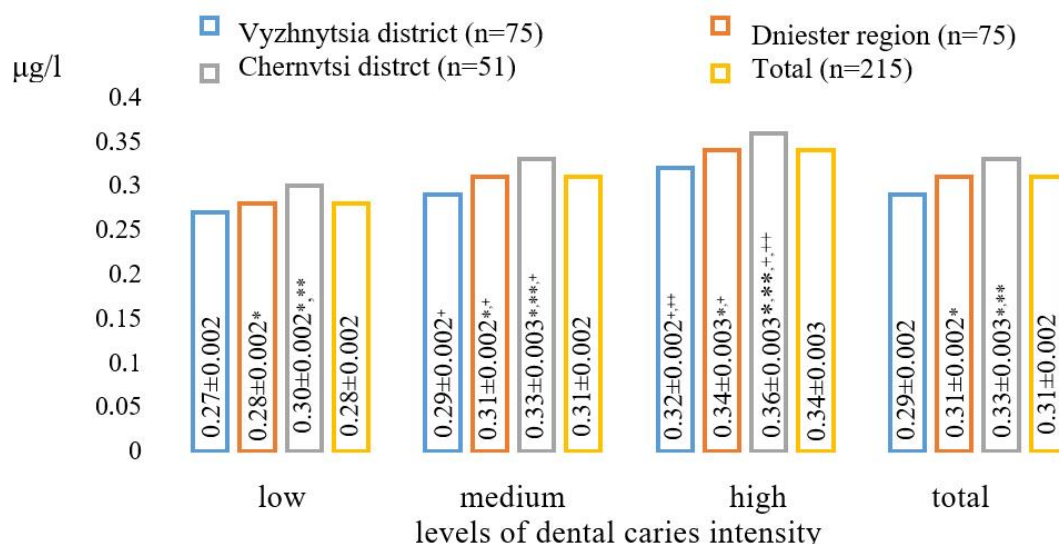


Fig. 2. Levels of sIgA in the oral fluid of children living in Bukovyna ($M \pm m$)

Notes: * – difference between the values of children from Vyzhnytsia and Dniester, Chernivtsi districts is significant ($p < 0.05$);

** – difference between the values of children from Dniester and Chernivtsi districts is significant ($p < 0.05$);

+ – difference between children with low and medium, high levels of dental caries intensity, significant ($p < 0.05$);

++ – difference between children with medium and high levels of dental caries intensity, significant ($p < 0.05$).

A decrease in its concentration in the oral fluid correlates with an unfavourable prognosis of the disease: the highest level of sIgA in the oral fluid was determined at high caries intensity and ranged from (0.32 ± 0.002) to (0.36 ± 0.003) $\mu\text{g/l}$ ($p < 0.05$). At medium and high levels of caries intensity, a significant decrease in the content of sIgA in the oral fluid of children was observed, which is due to the insufficiency of the function of nonspecific humoral defence at the local level.

Conclusions

Thus, we found that in children with carious lesions there were changes in the system of non-specific humoral immunity of the oral cavity. The indicators were probably worse in conditions of high intensity of caries, which correlated with the condition of the hard tissues of the teeth. Imbalance in the humoral immunity system and a de-

crease in the local protective capabilities of the oral cavity create suitable conditions for the development or aggravation of a cariogenic situation.

DECLARATIONS:

Disclosure Statement

The authors have no potential conflicts of interest to disclosure, including specific financial interests, relationships, and/or affiliations relevant to the subject matter or materials included.

Statement of Ethics

The authors have no ethical conflicts to disclosure.

Data Transparency

The data can be requested from the authors.

Funding Sources

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Consent for publication

All authors give their consent to publication.

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