

# Immunological Properties of Oral Fluid in Children with Type 1 Diabetes Mellitus

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**Abstract Purpose of the study.** Conduct an immunological study of oral fluid in children with type 1 diabetes mellitus. **Materials and methods.** The studies were conducted in 35 children aged 7-15 years with type 1 diabetes mellitus. The amount of immunoglobulins (IgG, IgA, sIgA) and interleukins (IL-6) in the oral fluid was determined. **Research results.** Severe dysimmunoglobulinemia of the IgG and IgA classes was revealed, which indicates a massive effect of various antigens on the body, including in the oral cavity in type 1 diabetes in children. A high content of the pro-inflammatory cytokine IL-6 in the oral fluid was revealed. **Conclusions.** In the oral fluid, there is a significant ( $p < 0.05$ ) increase in the levels of immunoglobulins G and A, IL-6, the content of sIgA decreases, while these immunological disorders are most pronounced with a decrease in compensation for the disease.

**Keywords** Diabetes, Oral fluid, Immunoglobulins, Lysozyme, Interleukins

Type 1 diabetes mellitus (DM) is one of the most common nosological forms of endocrine pathology, which has a severe course and manifests mainly in children, adolescents and young people. By the beginning of 2010, 479.6 thousand children with type 1 diabetes were identified in the world, and in 75.8 thousand children, endocrine pathology was diagnosed for the first time (IDF data). [4] According to national registries, over the past ten years in the world, the increase in the prevalence of type 1 diabetes in children was 35.7% (from 59.4 to 80.6 cases per 100 thousand children), in adolescents - 68.9% (from 108.5 to 183.5 cases per 100 thousand adolescent population), with an annual growth rate of about 3%.

Salivary glands are most closely related to the processes in the whole body, the use of oral fluid as a biological object for non-invasive diagnosis of type 1 diabetes in children is promising.

Despite numerous studies, there is no holistic view of the state of local oral immunity in children with type 1 diabetes, depending on the stage of the disease and the age of the child.

Thus, an in-depth study of the dental status and identification of important diagnostic criteria in the oral cavity in type 1 diabetes in children can be of no small importance for the timely establishment of a general diagnosis.

## 1. The Purpose of the Study

Conduct an immunological study of the oral fluid in children with type 1 diabetes mellitus.

## 2. Materials and Research Methods

In the course of the work, a dental examination was carried out on 35 children and adolescents with type 1 diabetes aged 7-15 years (boys-18, girls-17), who were treated at the Republican Specialized Scientific and Practical Medical Center of Endocrinology. All examined were divided into 2 groups: control and patients with type 1 diabetes. The clinical study included the identification of complaints of patients, the collection of anamnesis, visual examination. To study the indicators of specific and non-specific resistance of the oral fluid in patients, samples of unstimulated saliva were taken in the morning on an empty stomach in sterile test tubes. Immunological indicators of oral fluid were evaluated by the concentration of immunoglobulins G, A and secretory sIgA, which were determined by enzyme-linked immunosorbent assay (ELISA) using monoclonal antibodies to human immunoglobulins.

Cytokine system in the oral fluid is widely represented by different types of interleukins, which coordinate numerous interactions between cells of various types and are involved in the regulation of all stages of immune responses. One of the most important cytokines is interleukin-6. The basis for determining the content of cytokines is the method of enzyme-linked immunosorbent assay using peroxidase as an indicator enzyme.

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### 3. Research Results

In type 1 DM, inflammatory-dystrophic changes in the parenchyma of the salivary glands by the type of hyposalivation contribute to the rapid development of infectious and degenerative lesions of the oral mucosa, and a change in the homeostasis of the oral cavity, including the composition of saliva, is also natural. Taking into account the above facts, in the process of work, we conducted a study of the oral fluid of patients with type 1 diabetes with the determination of the content of serum IgG, IgA, sIgA.

According to many researchers, these types of immunoglobulins enter the saliva mainly due to diffusion through the epithelium of the periodontal groove and to a greater extent reflect not so much the state of local immunity as the general one.

We found that in children with type 1 DM, the content of IgG in the oral fluid as a whole was  $0.036 \pm 0.003$  g/l and was significantly higher than in practically healthy children  $0.020 \pm 0.002$  g/l;  $p < 0.001$ .

When analyzing the indicators of the oral fluid of children with varying degrees of pathology compensation, it was noted that the level of IgG content underwent upward changes and took maximum values in the decompensated state of  $0.052 \pm 0.004$  g/l.

In patients with type 1 diabetes, the concentration of IgA, on the contrary, was noticeably lower compared to the data of the control group and amounted to  $0.018 \pm 0.001$  g/l. In the control group, respectively,  $0.039 \pm 0.003$  g/l;  $p < 0.001$ . When evaluating the IgA parameters, we also revealed the fact that in the group of patients with type 1 DM, the lowest values were determined in children with a decompensated form of the disease, the level of the studied immunoglobulin was  $0.014 \pm 0.001$  g/l.

Thus, we revealed a pronounced dysimmunoglobulinemia of the IgG and IgA classes, which indicates a massive effect of various antigens on the body, including in the oral cavity in type 1 diabetes in children.

The researchers note that the leading role in the local immunity of the oral cavity belongs to secretory immunoglobulin A, which is resistant to the destructive effects of saliva enzymes due to the inclusion of a secretory component synthesized by epithelial cells into its structure. In patients with type 1 DM, in general, a low content of sIgA in the oral fluid was registered compared to practically healthy children, its values were  $0.38 \pm 0.03$  g/l. At the same time, in the control group, the concentration of sIgA was  $0.495 \pm 0.04$  g/l ( $p < 0.001$ ).

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In patients with type 1 diabetes, an increase in the level of pro-inflammatory cytokine IL-6 in the oral fluid  $27.46 \pm 2.56$  pg/ml;  $p < 0.05$  compared with healthy children ( $20.33 \pm 1.44$ ;  $p < 0.001$ ). It was revealed that in the stage of decompensation the content of salivary IL-6 reached the highest values and

amounted to  $47.3 \pm 3.5$  pg/ml;  $p < 0.05$  and decreased as the pathology compensation increased.

Consequently, in children with type 1 diabetes, a high content of pro-inflammatory cytokine IL-6. Violation of the compensation of the underlying disease is accompanied by an increase in the level of this cytokine, which contributes to the exacerbation of chronic and chronicization of acute inflammatory processes in the oral cavity.

### 4. Conclusions

In children with type 1 diabetes, there are also significant disturbances in the system of local protection of the oral cavity in the form of an increase in the content of class G immunoglobulins ( $0.036 \pm 0.003$  g/l) against the background of a decrease in the concentration of immunoglobulin A, secretory immunoglobulin A. Decrease in compensation for the disease and increase in the area damage to the pancreas in this pathology is accompanied by more pronounced immunological changes, namely, in the stage of decompensation, lower levels of IgA ( $0.018 \pm 0.001$  g/l), sIgA ( $0.38 \pm 0.03$  g/l) in the oral fluid at high IgG level. This fact indicates a decrease in the level of anti-infective protection of the oral cavity, which must be taken into account when developing a reasonable therapy for children with this pathology.

Thus, in the oral fluid there is a significant ( $p < 0.05$ ) increase in the levels of immunoglobulins G and A, IL-6, the content of sIgA decreases, while these immunological disorders are most pronounced with a decrease in compensation for the disease.

The data obtained on the imbalance of general immunity factors can be considered as a trigger for the addition of concomitant infections, which in most cases are severe and often lead to impaired compensation of the underlying disease.

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