VARIABLES RELATED TO GINGIVITIS IN CHILDREN WITH PYELONEPHRITIS AND NEPHROTIC SYNDROME

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ABSTRACT

Purpose: The purpose of the research is to be investigated and assessed the significance of variables related to gingivitis in children with diagnosed pyelonephritis and nephrotic syndrome.

Materials and Methods: The subject of the study is represented by participants in the age interval from 0 to 18 years. They are divided into two main groups, namely a group of 92 children with diagnosed pyelonephritis and 24 children with nephrotic syndrome. There is a group of 41 healthy children. Clinical, para-clinical, sociological and statistical methods are implemented in association with the study's aim. The model of the research is based on an investigation of the significance of definite variables: gingival index GI Loe-Silness, level of salivary leucocytes, salivary blood and salivary glucose. In addition to these indicators are recorded some patterns of environmental matter.

Results: Among the participants with the diagnosis of nephrotic syndrome is recorded the maximal value of $GI = 2.04$. A similar maximal value of $GI = 2.00$ corresponds to the group of children with pyelonephritis. In both of the subgroups of children suffering from renal disorders is registered the considerable maximal value of salivary blood equal to 250.00 RBC/ μ l, compared to the maximal value of 50.00 RBC/ μ l for healthy participants. It is ascertained that the variables of salivary blood and salivary leucocytes correspond to the condition of gingivitis in children with diagnosed pyelonephritis and nephrotic syndrome.

Conclusion: A definite impingement of excretory system disorders upon gingiva, especially among children suffering from nephrotic syndrome, is ascertained.

Keywords: salivary variables, gingiva, nephrotic syndrome, pyelonephritis, children,

INTRODUCTION

A combination of factors associated with the clinical manifestation, symptoms, therapy and dietary regime under the condition of established pyelonephritis impinge upon the oral-dental health. Wide spectrum antibiotics of the groups of Penicillins and Cephalosporines, restricted consumption of proteins essential for the process of proper amelogenesis, episodes of febrile and sub-febrile state afflict the qualitative and quantitative characteristics of hard teeth

tissues, as well as periodontal structures [1]. The therapeutic protocol includes the application of diuretics, anti-hypertensive vasodilators, Ca-blockers. There is a strong accent put on the performance of specific dietary regime, with limitation of salty and rich in proteins foods, and compensatory prevalence of consumption of fruits and carbohydrates [2].

On the other hand, nephrotic syndrome is characterized by a high risk for relapses. The disease is initiated predominantly in the condition of infections, intoxications and allergic reactions. Parallel to the reduction of the concentration of calcium into serum is registered an increase of proteins-bound calcium [2]. The proper control of diagnosed nephrotic syndrome is related to the explicit necessity of the application of corticosteroids. Steroid anti-inflammatory drugs cause the effect of aggravation of the pathological alteration of dental and periodontal tissues. Immunosuppressive therapy is indicated in cases of corticosteroid-resistant patients [3]. Not to neglect the fact that the management of the common health disorders of pyelonephritis and nephrotic syndrome are related to frequent hospitalizations of children. Attention and efforts of the patients and their parents are concentrated predominantly upon the control of renal disease. As a consequence, there is a limitation of care addressed to the maintenance of personal oral-dental health [4].

The determination of the degree of gingival inflammation based on quantitative verification of white blood cells into saliva correlates positively to data obtained as a result of the implementation of conventional parameters-tools for registration of periodontal status. Saliva-related assays provide reliable mechanisms for routine control and management of periodontal diseases, especially among children with somatic health disturbances [5]. Researchers definitely ascertain the correlation between salivary leucocytes' concentration and intensity of distribution and severity of gingival inflammatory disease [6]. There are fluctuations of salivary leucocytes' concentration among individuals, as well as circadian variations into an organism. Saliva is saturated with white blood cells predominantly through metabolic exchange with crevicular fluid. Klinkhamer has standardized a methodology for the collection and numbering of leucocytes into the salivary medium. Raeste et al. ascertain the role of leucocytes also in saliva as a marker for

inflammatory process into the oral cavity. In the context of studies performed by other authors, Johan K.M. Aps et al., the condition of gingivitis is associated with an increased level of salivary white blood cells. By means of screening as a reliable and informative tool of investigation has been proved the significance of salivary blood as a considerable indicator for the inflammatory process of gingival tissue [7].

The plaque-induced gingival disorder is characterized by a high rate of distribution worldwide. Qualitative and quantitative traits of pathogenic bacteria into dental plaque correlate to the inflammatory and immune responses of the macro-organism host. The diagnosis of plaque-induced gingivitis is corresponding to the clinical manifestation of symptoms of edema, hyperemia, provoked bleeding of gingiva ascertained by bleeding on probing test, or spontaneous bleeding [8]. Symptoms of the disease can be modified by genetic factors, alimentary insufficiencies, fluctuations of hormones, common health disorders, drugs [9]. Parallel to local predisposing factors for gingival inflammation, common health related variables can also have an impact on its progression and severity [10].

The purpose of the research is to be investigated and assessed the significance of variables related to gingivitis in children with diagnosed pyelonephritis and nephrotic syndrome.

MATERIALS AND METHODS:

The subject of the study is represented by participants in the age interval from 0 to 18 years. They are divided into two main groups, namely a group of children with diagnosed pyelonephritis and nephrotic syndrome and a group of healthy children. The patients are separated into two subgroups. One of the subgroups includes a number of 92 children who are suffering from pyelonephritis. The other subgroup concerns a number of 24 children with diagnosed nephrotic syndrome. The healthy participants of the study account for the number of 41 children. The distribution of the participants in age groups based on the common health status is represented in Graph 1. The study has been approved by the Ethics Committee at the Medical University-Varna. A parent or guardian of each participant in the study has signed informed consent. The clinical dental examination was performed at the Department of Pediatrics at the University Hospital "St. Marina"- Varna with single usage sets of instruments and at the University Dental Medicine Center at the Faculty of Dental Medicine, Medical University-Varna. The examined data were collected for a period of approximately one year.

Graph 1. Distribution of the Participants in Age Groups

In the research is applied a combination of methods. Clinical methods, epidemiological studies of dft and DMFT indices, para-clinical, sociological and statistical methods are implemented in association with the aim of the study.

Clinical methods

The individual registration of the gingival health status of all the participants was performed by the application of the Gingival Index GI Loe-Silness. With figures from 0 to 3 was assessed the degree of gingival inflammation,

which was based on records of the gingival tissue contacting to the vestibular, palatal/ lingual, medial and distal surfaces of all the representative teeth namely: 16, 22, 24, 36, 42, 44. In children with primary dentition, the representative teeth are respectively: 55, 62, 64, 75, 82, 84. In participants with mixed dentition, instead of the representative missing teeth and teeth in a state of eruption are examined the medially located teeth. The figure of 0 corresponds to healthy gingiva, with no clinical findings of edema and bleeding. Figure 1 is used for registration of a

slight degree of gingival inflammation, clinically manifested with edema, without bleeding. Figure 2 is equivalent to a moderate extent of gingivitis, characterized by edematous marginal gingiva and interdental papillae and provoked bleeding. Figure 3 is indicative of the severe degree of gingival inflammation accompanied by edematous marginal gingiva and interdental papillae and spontaneous bleeding. Concerning each participant, the sum of all the figures is divided into the number of all the examined surfaces, namely 24. As a result, it is obtained the individual average value of the gingival index GI Loe-Silness.

By application of the plaque index, PLI Silness-Loe is assessed the level of dental plaque accumulation on teeth surfaces. The quantity of plaque is evaluated by running a periodontal probe with an atraumatic round-shaped edge across the gingival margin. By usage of the figures from 0 to 3 are recorded plaque deposits on the vestibular, palatal/lingual, medial and distal surfaces of the representative teeth: 16, 22, 24, 36, 42 and 44. In children with primary dentition, the representative teeth are respectively: 55, 62, 64, 75, 82, 84. In participants with mixed dentition, instead of the representative missing teeth and teeth in a state of eruption are examined the medially located teeth. The following criteria are implemented for scoring the thickness of dental plaque: figure 0 corresponds to the absence of dental plaque on the top of the probe; with figure 1 is identified plaque visible on the point of the probe; figure 2 illustrates the thin-to-moderate amount of dental plaque on the gingival margin, which is visible by a naked eye; intensive accumulation of dental plaque which covers the niche between the gingival margin and the adjacent tooth surface is recorded by the figure 3. The total sum of the values which depict the deposits of dental plaque on the indicated surfaces of the Ramfjord teeth of each of the participants in the study is divided to the total number of his/her examined teeth surfaces (totally 24), which results in the average individual rate of the plaque index PLI Silness-Loe.

A dental check-up is performed for each participant in the study. All the present teeth in the pre-functional and functional eruptive phase are recorded. The objects of the examination are the teeth affected by caries (D- permanent, decayed teeth; d-primary decayed teeth), extracted teeth as a consequence of complicated carious process (M- permanent extracted teeth; missing primary teeth are not recoded based on the process of physiological exchange), filled teeth (F- filled permanent teeth; f- filled primary teeth).

Epidemiological indices of DMFT and dft

The epidemiological indices of DMFT and dft concern the epidemiology of the carious process in permanent and primary teeth. These indices provide information for the percentage ratio of caries and its consequences' affected permanent and primary teeth out of all the examined permanent and primary teeth. Both of the indicators are calculated for each of the participants in the study. The sum of all the decayed, filled and extracted as a result of a complication of carious process permanent teeth of a child is divided to the total number of the examined permanent teeth, and the value is multiplied by 100 to get the per-

centage level of the DMFT index. The sum of all the decayed and filled primary teeth is divided into the total number of the examined primary teeth of a child. The obtained value is multiplied by 100 to get the percentage level of the dft index.

Para-clinical method

A colorimetric method was implemented for the registration of the levels of salivary leucocytes, salivary blood and salivary glucose. For the purpose of the assay were collected samples of non-stimulated mixed saliva. The time of collection of all the salivary samples was standardized. In order to be minimized the effect of the circadian rhythm of salivary secretion, the samples of all the participants were collected during the interval between 9.00 and 12.00 o'clock a.m. All the children were instructed not to consume foods or drinks for a period of 2 hours before the procedure. Salivary samples served as a medium in which we have moistened the individual participants' strips of indicator paper. After 2 minutes of contact with the saliva and based on the scale of alteration of the color of the indicator papers, the levels of salivary leucocytes, salivary blood and salivary glucose were evaluated for each participant. The obtained results among the participants with diagnosed nephrotic syndrome and pyelonephritis were compared between each other, as well as with the data of these indicators concerning the group of healthy children.

Sociological method

In addition to these indicators, by the application of an enquiry individually addressed to a parent or guardian of each of the children included in the study, were recorded some traits of environmental matter, respectively frequency of tooth brushing and frequency of dental visits of children.

Statistical methods

The descriptive analysis is related to the evaluation and calculation of the parameter of the average value (mean). The average value of n number of values is represented as a sum of all the recorded values of a definite parameter divided into their number of n. The indicator of the average value is the most widely applied measure of central tendency. The median is the value that is located at the middle position of the statistical order or the value of the case, which separates all the values of the investigated variable into two equal parts. Similar to the average value, the median always exists and is unique for each group of data [11].

The dispersion analysis ANOVA (Analysis of Variance) is a statistical method applied for the purpose of investigation of hypotheses of equality among more than two means of different variables under the condition of a fixed level of significance for a definite multitude of comparisons. By implementation of that method is assessed if the influence of a factor-cause or a group of factors- causes is statistically significant or not. The dispersion analysis belongs to the methods for evaluation of relations and interactions. This method is definitely applicable when the meanings of the indication- factor are represented on a slight scale (usually the nominal one), and the meanings of the indication- result are on the strong scale, with fig-

ure expression. It allows being examined interrelations among phenomena or variables, for testing hypotheses for differences between two or more dispersions, without elevation of the error of first order. The procedure of checking the null hypothesis (H_0) versus the alternative one (H_1) concerns a dispersion analysis of the rates of the dependent variable. The probability of the state of the plausibility of H_0 is identified as a level of significance and is determined by the p value. In the context of medical studies, the evaluation of a result as statistically significant is related to $p < 0.05$. This corresponds to the rejection of H_0 and acceptance of H_1 [11].

In our study, the null hypothesis H_0 declares that the factor common health status of the examined partici-

pants (children with diagnosed pyelonephritis, children with the diagnosis of nephrotic syndrome and healthy children) does not exercise a statistically significant influence upon the results-related variables. According to the alternative hypothesis H_1 , the same factor of the common health status of the participants in the study does exercise a statistically significant influence upon the results-related variables.

The model of the research is based on the investigation of the significance of definite variables: gingival index GI Loe-Silness, plaque index Silness-Loe, level of salivary leucocytes, level of salivary blood and level of salivary glucose, oral hygiene cares, frequency of dental visits of the children. (Figure 1)

Fig. 1. Indicators in Association with the Gingival Health State in Children with Renal Disorders

RESULTS:

There are no children with diagnosed nephrotic syndrome from 0 to 5 years of age without established gingival inflammation or with a mild degree of gingivitis. A percentage ratio of 48.17% of the participants from 0 to 5 years of age with the diagnosis of pyelonephritis is characterized by healthy gingiva. No symptoms of gingivitis are recorded among 14.30% of the healthy controls from 0 to 5 years of age. A mild degree of gingivitis is registered in a total percentage ratio of 22.23% of the participants from 0 to 5 years suffering from pyelonephritis. Among a percentage ratio of 7.42% of them is recorded $GI=1$. There are no healthy children in the same age interval with an established GI value that amounts to 1. An equal percentage ratio of 7.14% of the healthy controls concerns the distribution of mild gingivitis in that group with different values of GI index, respectively $GI=0.14$, $GI=0.45$, $GI=0.68$, $GI=0.73$, $GI=0.86$. (Graph 2)

All the examined children from 0 to 5 years of age with diagnosed nephrotic syndrome are characterized by a

moderate degree of gingivitis. An equal percentage ratio of 25% concerns the distribution of these GI values: $GI=1.27$, $GI=1.5$, $GI=1.59$, $GI=1.68$. The greatest percentage ratio of 11.1% of the children from 0 to 5 years of age with pyelonephritis is with recorded $GI=1.23$. The greatest percentage ratio of 14.3% of the healthy representatives from 0 to 5 years of age is with registered $GI=1.18$. The established GI values among the participants with pyelonephritis vary between 1.14 and the highest recorded value in that age interval $GI=1.73$. The registered GI values among the healthy controls vary between the lowest GI value established in that age interval, $GI=1.05$ and $GI=1.45$. (Graph 3)

There are no children from 6 to 12 years of age suffering from nephrotic syndrome without gingival inflammation. A percentage ratio of only 6.25% of the participants with diagnosed nephrotic syndrome and mixed dentition is characterized by a mild degree of gingivitis, with a recorded $GI=0.91$. A percentage ratio of 12.50% of the representatives with pyelonephritis is with no established

Graph 2. Distribution of GI Values among Children from 0 to 5 Years without or with Mild Gingivitis

Graph 3. Distribution of GI Values among Children from 0 to 5 Years with Moderate Gingivitis

Graph 4. Distribution of GI Values among Children from 6 to 12 Years without or with Mild Gingivitis

symptoms of gingivitis. Among the healthy controls in that age interval, a percentage ratio of 13.10% of them are without gingivitis. The highest GI value corresponding to mild gingivitis GI=1.00 characterizes a percentage ratio of 6.25% of the children with pyelonephritis and a percentage ratio of 4.35% of the healthy controls. (Graph 4)

The predominant percentage ratio of 93.75% of the participants from 6 to 12 years of age and the diagnosis of nephrotic syndrome are characterized with a moderate degree of gingivitis. The recorded GI values among these children vary from GI=1.09 to GI=2.04. The highest percentage ratio of 8.35% of the representatives with mixed dentition and diagnosed pyelonephritis is characterized with GI value equal to 1.55. Among these children is recorded

variation of the GI values from 1.05 to 2.00. The highest percentage ratio of 17.3% of the healthy controls concerns the GI value that amounts to 1.18. Among the healthy representatives of the study with mixed dentition are registered GI values in the interval between 1.09 and 1.68. (Graph 5)

Two equal percentage ratios of 5.88% of the participants from 13 to 18 years of age and diagnosed pyelonephritis are characterized with a mild degree of gingivitis with recorded GI values GI=0.77 and GI=0.95. Among one-half of the healthy children with permanent dentition is established mild gingival inflammation, with corresponding GI values GI=0.32 and GI=0.97. (Graph 6)

Graph 5. Distribution of Children from 6 to 12 Years with Moderate Gingivitis

Graph 6. Distribution of Children from 13 to 18 Years with Mild Gingivitis

Graph 7. Distribution of Children from 13 to 18 Years with Moderate Gingivitis

Among all the examined participants with permanent dentition suffering from nephrotic syndrome is established moderate degree of gingivitis. These children are characterized with GI values which vary from 1.64 to 1.91. The highest recorded GI value among all the representatives between 13 and 18 years of age, GI=1.91, concerns 25% of the patients with nephrotic syndrome and a percentage ratio of 5.88% of the children with pyelonephritis. The same percentage ratio of 5.88% of the representatives with pyelonephritis and permanent dentition is with the lowest established value of GI=1.05. One-half of the healthy controls from 13 to 18 years of age is with recorded GI values equal respectively to 1.5 and 1.63. (Graph 7)

Among the patients with pyelonephritis from 0 to 5 years of age, the highest established value of salivary blood equal to 250.00 RBC/ μ l concerns a percentage ratio of 7.41%. With the recorded value of salivary blood of 50.00 RBC/ μ l are characterized a percentage ratio of 75.00% of the patients with nephrotic syndrome and half of the healthy controls with primary dentition. There have been established similar percentage ratios of the participants from 0 to 5 years of age with diagnosed nephrotic syndrome, pyelonephritis and healthy controls with a recorded value of salivary blood equal to 10.00 RBC/ μ l. Among the participants from 6 to 12 years of age with diagnosed nephrotic syndrome are recorded equal percentage ratios of

43.75% corresponding to the values of salivary blood of 250.00 RBC/ μ l and 50.00 RBC/ μ l. There are no children with mixed dentition suffering from nephrotic syndrome with 0.00 RBC/ μ l in saliva. In parallel, a percentage ratio of 34.78% of the healthy participants and a percentage ratio of 20.84% of the representatives with diagnosed pyelonephritis in the age interval between 6 and 12 years are without any registered amount of salivary blood. There are no healthy controls with mixed dentition with the maximal value of salivary blood that amounts to 250.00 RBC/ μ l. More than one-half of the patients with pyelonephritis, namely 52.94%, and one-fourth of the representatives suffering from nephrotic syndrome with permanent dentition are characterized by the greatest established value of salivary blood, 250.00 RBC/ μ l. A percentage ratio of 0.00% of the healthy controls from 13 to 18 years of age are characterized by the maximal level of salivary blood. The value of salivary blood that amounts to 50.00 RBC/ μ l concerns three-fourths of the patients with nephrotic syndrome, a percentage ratio of 29.41% of those with pyelonephritis and one-half of the healthy representatives with permanent dentition. One-half of the children without common health disorders and a percentage ratio of 5.88% of the participants with pyelonephritis from 13 to 18 years of age are with no recorded salivary blood. (Graph 8)

Graph 8. Distribution of the Participants from 0 to 18 Years Based on Salivary Blood

Graph 9. Distribution of the Participants from 0 to 18 Years Based on Salivary Leucocytes

A percentage ratio of 44.45% of the participants from 0 to 5 years of age with diagnosed pyelonephritis and one-fourth of the patients with nephrotic syndrome with primary dentition are characterized by no recorded salivary leucocytes. Among a percentage ratio of 3.70% of the representatives with pyelonephritis of the same age interval is established the maximal level of salivary leucocytes equal to 500.00 WBC/μl. Among one-half of the patients with nephrotic syndrome and among a percentage ratio of 28.57% of the healthy controls with primary dentition is

registered a level of salivary leucocytes equal to 100.00 WBC/μl. One-fourth of the patients with nephrotic syndrome and a percentage ratio of 35.71% of the healthy children are characterized with the established level of 75.00 WBC/μl. Similar percentage ratios of the patients with pyelonephritis and nephrotic syndrome with mixed dentition, respectively 10.41% and 12.50%, are with the registered greatest value of salivary leucocytes f 500.00 WBC/μl. There are no healthy children with mixed dentition characterized with the highest recorded level of the same indi-

cator in saliva. The greatest percentage ratio of the participants with diagnosed nephrotic syndrome and mixed dentition, namely 68.75%, is with a recorded level of salivary leucocytes equal to 100.00 WBC/ μ l. There are no children suffering from nephrotic syndrome from 6 to 12 years of age without any leucocytes level recorded in saliva. In comparison, a percentage ratio of 30.43% of the healthy controls and 12.50% of the patients with pyelonephritis with mixed dentition are characterized by the absence of salivary leucocytes, namely 0.00 WBC/ μ l. Among a percentage ratio of 23.53% of the participants with pyelonephritis from 13 to 18 years of age is recorded the greatest

value of salivary leucocytes equal to 500.00 WBC/ μ l. One-half of the patients with nephrotic syndrome and permanent dentition are with a registered level of salivary leucocytes of 100.00 WBC/ μ l. A percentage ratio of 50.00% of the healthy controls is with a recorded level of salivary leucocytes equal to 75.00 WBC/ μ l. Only a percentage ratio of 5.88% of the representatives with diagnosed pyelonephritis from 13 to 18 years of age is characterized by the absence of leucocytes in saliva. None of the participants with nephrotic syndrome and healthy controls from 13 to 18 years of age is without any established level of salivary leucocytes. (Graph 9)

Graph 10. Distribution of the Participants from 0 to 18 Years Based on Salivary Glucose

Among one-half of the participants suffering from nephrotic syndrome from 0 to 5 years of age is established the greatest value of salivary glucose of 250.00 mg/dl. None of the patients with pyelonephritis and healthy children with primary dentition is characterized by the maximal value of salivary glucose. In parallel, all the healthy controls and a percentage ratio of 96.30% of the patients with pyelonephritis from 0 to 5 years of age are characterized by the absence of that marker in saliva. All the representatives with diagnosed nephrotic syndrome and healthy children with mixed dentition are with no records of glucose in saliva. Among a percentage ratio of 95.84% of the representatives with pyelonephritis of the same age interval is registered absence of salivary glucose. Equal percentage ratios of 2.08% of the patients with pyelonephritis and mixed dentition are characterized with salivary glucose values of 100.00 mg/dl and 50.00 mg/dl. Among one-fourth of the participants with diagnosed nephrotic syndrome from 13 to 18 years of age is re-

corded the maximal level of salivary glucose of 250.00 mg/dl. Another one-fourth of these participants suffering from nephrotic syndrome and with permanent dentition are characterized by the registered value of salivary glucose that amounts to 50.00 mg/dl. Among all the healthy participants, a percentage ratio of 94.12% of the children with pyelonephritis and one-half of the representatives with nephrotic syndrome and permanent dentition is established the absence of the parameter of glucose in saliva. (Graph 10)

Based on the descriptive analysis, healthy children are characterized by the lowest average value of salivary blood, namely 24.15 RBC/ μ l. In comparison, among the participants with diagnosed pyelonephritis has been recorded an average value of 73.48 RBC/ μ l of that salivary indicator. The highest average value of 111.67 RBC/ μ l has been recorded into the group of participants with the diagnosis of nephrotic syndrome. The median value of 50 RBC/ μ l has been equal for the representatives of both of the groups with

renal diseases. Healthy children have been characterized by a median value of 10 RBC/ μ l. Among the participants with the diagnosis of pyelonephritis and the nephrotic syndrome has been recorded the considerable maximal value of 250 RBC/ μ l, compared to the maximal value of 50 RBC/ μ l for healthy controls. In parallel to the minimal value of 0 RBC/ μ l for the patients with pyelonephritis and healthy children, the participants with the diagnosis of the nephrotic syndrome have been characterized with a minimal level of 10 RBC/ μ l.

Into the group of healthy children has been registered the lowest average value of salivary leucocytes, namely 52.44 WBC/ μ l. The highest average value of salivary leucocytes, respectively 118.75 WBC/ μ l, has been recorded among patients suffering from nephrotic syndrome. The average value of 104.62 WBC/ μ l has been established among children with diagnosed pyelonephritis. The maximal value of salivary leucocytes, equal to 500 WBC/ μ l, has been ascertained in both of the groups of children with kidney diseases. In parallel, the group of healthy controls is characterized with maximal value of the same marker equal to 100 WBC/ μ l. Among the healthy children has been registered the lowest median of salivary leucocytes that amounts to 25.00 WBC/ μ l. In comparison, the median value of 75.00 WBC/ μ l concerned the group of patients with diagnosed pyelonephritis. The median value of 100.00 WBC/ μ l has been recorded in the group of children suffering from nephrotic syndrome.

In the context of a descriptive analysis of salivary glucose into the three groups of participants, we have established that the average value of salivary glucose among children suffering from nephrotic syndrome has been approximately ten times greater than the average value of the same index into the group of patients with pyelonephritis, respectively 33.33 mg/dl and 3.8 mg/dl. The maximal value of salivary glucose among the representatives of the study with diagnosed nephrotic syndrome (250 mg/dl) has been 2.5 times higher compared to the maximal value of that parameter in the group of children with pyelonephritis (100 mg/dl). All the recorded descriptive variables of average value, median, minimal value and maximal value have amounted to 0 into the group of healthy controls. In our investigation, we have established that the level of salivary glucose was considerably higher in children with diagnosed nephrotic syndrome compared to the participants with pyelonephritis. In parallel, among children without common health disorders has been recorded lack of salivary glucose. There has been established a definite interrelation between the condition of an excretory system disorder and salivary glucose rate.

We have performed a descriptive analysis of the Gingival Index Loe-Silness /GI/ in children with kidney disorders and healthy children. Among the three investigated groups of participants in the study, the highest average value of GI has been established among children with diagnosed nephrotic syndrome, respectively 1.5892. Children with the diagnosis of pyelonephritis and healthy children have been characterized with similar levels of that parameter, namely GI=0.9299 and GI=0.908. The highest median of GI (GI=1.64) has been recorded in the group of children suffering from nephrotic syndrome. Among these patients included in the research has been registered the greatest rate of mini-

mal value of GI equal to 0.91, compared to the level of 0.00 ascertained into the groups of children suffering from pyelonephritis and healthy controls. Both of the groups of children with renal disorders have been marked by a similar maximal value of GI. A maximal value of GI=2.04 has characterized children with nephrotic syndrome. In the group of children with pyelonephritis has been recorded a maximal value of GI=2.00 was. Among the healthy children, the maximal level of GI amounts to 1.68.

Based on the descriptive analysis of the Plaque Index PLI Silness-Loe has been established that the children with diagnosed nephrotic syndrome are characterized with the highest mean of that indicator equal to 1.8500. Smaller is the level of that parameter among the healthy representatives and the participants with pyelonephritis, respectively 1.3300 and 1.2835. The median value of PLI equal to 1.8400 is higher compared to its level among the children without common health disorders and patients with pyelonephritis, namely 1.3600 and 1.3400. The participants in the study who suffer from the nephrotic syndrome are characterized by the highest maximal value of PLI (2.68) compared to the children with diagnosed pyelonephritis and healthy controls, respectively 2.36 and 2.14. The recorded minimal value of PLI among the representatives with the nephrotic syndrome that amounts to 1.32 is considerably higher compared to the minimal rate of that index established among the healthy participants and children with the renal disorder of pyelonephritis namely 0.14 and 0.00.

In the context of the descriptive analysis has been established that the mean of the indicator of the number of carious lesions is highest among the children suffering from nephrotic syndrome, 8.21, compared to the rate of that variable among the participants with the diagnosis of pyelonephritis and healthy representatives, respectively 5.59 and 4.85. The means of the epidemiological indices dft and DMFT are highest among the patients with nephrotic syndrome, namely 0.4042 and 0.2358. The means of the index of DMFT among the children with diagnosed pyelonephritis and healthy representatives are respectively 0.2043 and 0.1366. The means of the index of dft among the participants with pyelonephritis and healthy controls are respectively 0.2920 and 0.3620. The mean of the parameter of dft is higher among the children without common health disorders than among those with established pyelonephritis related to the greater number of treated and filled primary teeth.

In the context of the multifactorial dispersion analysis (n-way ANOVA) have been compared the means (average values) of the investigated results'-related variables, respectively: GI, PLI, number of carious lesions among all the representatives of the three groups of participants in the study. For both of the indicators, GI and PLI has been established a level of significance $p=0.000$ ($p<0.05$). The null hypothesis H_0 is rejected. The factor common health status of all of the examined children exercises statistically significant influence upon the results'-related variables of GI and PLI. Regarding the parameter number of carious lesions $p=0.007<0.05$. The null hypothesis H_0 is rejected. The factor common health status of all of the examined children exercises statistically significant influence upon the results'-related variable of the number of carious lesions.

By analysis of the influence of the factor common

health status upon the variables of GI, PLI and number of carious lesions in both of the groups of participants with pyelonephritis and nephrotic syndrome have been established definite levels of $p < 0.05$. For the indicator number of carious lesions has been recorded a value of $p = 0.009$, respectively $p < 0.05$. For both of the variables of GI and PLI has been registered $p = 0.000$ ($p < 0.05$). Therefore, by comparison of both of these groups of children with renal disorders is confirmed that the factor common health status exercises statistically significant influence on the results'-related variables of GI, PLI and number of carious lesions.

The influence of the factor common health status on the parameters of GI, PLI and number of carious lesions has also been assessed by comparison of both of the investigated groups of children suffering from nephrotic syndrome and children without common health disorders. Regarding the parameter of the number of carious lesions has been established a p value equal to 0.001 ($p < 0.05$). Both of the indicators of GI and PLI have been characterized by a p value that amounts to 0.000 ($p < 0.05$). Considering both of these groups has been ascertained that the factor common health status exercises statistically significant influence on the three of the variables, namely: number of carious lesions, GI and PLI.

Taking into consideration the fact that the plaque induced gingivitis is etiologically associated with dental plaque in its pathological quantity and quality characteristics, its proper control by means of oral hygiene cares correlates to the adequate management of that oral health disorder. Graph 11 is illustrated the distribution of the participants in the study regarding the frequency of tooth brushing.

Both of the groups of participants with renal disorders are characterized by a similar percentage ratio of children who brush their teeth every morning and evening. A percentage ratio of 32.61% of the representatives with pyelonephritis and 37.50% of those with nephrotic syndrome

perform regular tooth brushing. In comparison, approximately two times higher is the percentage ratio of the healthy children, respectively 75.60% of them, who brush their teeth twice per day. In parallel, there are no healthy participants who have never brushed their teeth till the moment. A percentage ratio of 4.35% of the children with pyelonephritis has never brushed the teeth till the moment. Among the patients suffering from nephrotic syndrome, the percentage ratio of children who have never performed oral hygiene procedures of tooth brushing, namely 12.50% of all of them, is 2.87-times higher than among the participants with pyelonephritis. Sustainable habits of irregular tooth brushing demonstrate a percentage ratio of 23.91% of the patients with pyelonephritis and 16.67% of these with nephrotic syndrome. At the same time, the percentage ratio of healthy children who rarely brush their teeth, namely 7.32% of them, is considerably smaller. (Graph 11)

Among 25.00 % of patients with pyelonephritis has not been registered any frequency of dental visits yet. Approximately one half, namely 45.65%, of children suffering from pyelonephritis sought dental care only in an emergency. Prophylactic check-ups twice per year performed only 15.22 % of the participants with pyelonephritis. It has been established that 50.00 % of the patients with diagnosed nephrotic syndrome have never visited a dental medicine doctor till the time of the performance of the investigation. Only emergency visits by the dentist performed 29.17% of all the representatives of the group. A small ratio of all the participants with pyelonephritis, respectively 12.50%, has gone to regular prophylactic check-ups twice per year. In comparison, the prevailing ratio of healthy controls, namely 65.85% of all the children without common diseases, has taken part in regular check-ups every 6 months. Only 17.07% of all healthy children sought dental care only in an emergency. With no dental visits till the moment has been characterized a ratio of 4.88% of the healthy controls. (Graph 12)

Graph 11. Distribution of the Participants Based on the Frequency of Tooth Brushing

Graph 12. Regularity of Dental Visits of Children with and without Renal Disorders

DISCUSSION

There have been performed profound investigations on the role of salivary leucocytes for the control of periodontal diseases [5]. Some researchers accentuate the established regular interrelation between the increased level of white blood cells into saliva and the inflammation of gingival tissue. These authors do not establish regular interrelation between the concentration of salivary leucocytes and epidemiological indexes for tooth decay. According to other researchers, the concentration of salivary leucocytes is associated with the intensity of gingival inflammatory disorders and tooth decay [6].

Scientific literature sources accentuate the significance of regular and adequate, age-related oral hygiene procedures as an essential prerequisite for proper oral-dental health, respectively, proper gingival health. The fluctuations of maintenance of proper individual oral hygiene state have an impact on the dynamics of gingival tissue inflammation [12].

The unsatisfactory level of oral hygiene related to a significant degree of plaque accumulation upon teeth surfaces, especially on teeth affected by carious lesions, induces and sustains the state of gingival inflammation. The interrelations between carious lesions and plaque-induced gingivitis are associated with the management of enamel irresistibility to cariogenic predisposing factors. Enamel resistance to tooth decay attacks is under the impact of a great variety of factors: genetic information coded into the DNA structure, inclination to self-assessment and attitude towards individual health, a personal initiative for seeking professional health care, degree of emergency of required therapy, common health disorders, including chronic diseases or such with a definite tendency for chronification, application of medicines with the adverse effect of a decrease of enamel and gingival resistance towards inflammatory processes affecting the common health status of the individual [12, 13].

The efficiency of motivation programs correlates to the frequency of dental visits of children [14, 15]. Our results concerning the regularity of dental visits of children accentuate the interrelation between low or no frequency of dental visits till the moment and risk for initiation or progression of

gingival inflammation. The educational qualification of parents and their attitude to the necessity of strict performance of regular prophylactic care for children also exercise an influence upon the gingival health status of children [16].

Some investigations ascertain the interrelation between increased salivary glucose and the endocrine disorder of diabetes. Researchers have recorded that the concentration of salivary glucose is higher in diabetic patients compared to clinically healthy people. The regular interrelation between the glucose concentration into saliva and blood has been established among diabetic patients and healthy people based on a test for glucose tolerance into the medium of the oral cavity. In comparison to healthy controls, the degree of the relative increase of salivary glucose is higher among people suffering from diabetes [17, 18].

The role of parents, especially of children with renal disorders, has been definitely determined as a key factor of motivation for the optimization of individual oral health [19, 20].

CONCLUSIONS:

Based on the dispersion statistical analysis has been established that the factor of the common health status of the participants in the study exercises statistically significant influence on the results'-related variables of GI, PLI and number of carious lesions.

A definite impingement of excretory system disorders of pyelonephritis and nephrotic syndrome upon gingiva, especially among children suffering from nephrotic syndrome, is ascertained.

It has been established that the indicator of salivary blood correlates to the state of gingival inflammation in children suffering from pyelonephritis and nephrotic syndrome.

The marker of salivary leucocytes associates with gingival inflammation in children with diagnosed nephrotic syndrome and pyelonephritis.

The significance of the gingival index GI Loe-Silness as a clinical indicator for gingival inflammation has been ascertained.

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