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# EVALUATION OF A ROTAVIRUS ACUTE GASTROENTERITIS SEVERITY SCORE IN HOSPITALIZED CHILDREN OVER A TEN YEAR PERIOD IN A CLINIC OF INFECTIOUS DISEASES, SKOPJE, R. MACEDONIA

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**Abstract**

Rotavirus infection is the most common viral infection of the gastrointestinal tract in children with the most severe clinical manifestations and rapidly progressive dehydration, especially in infancy and early childhood. Due to its characteristics of high contagiousness and being widespread in both developed countries and developing countries with a still high fatality rate, active prevention of the disease is recognized as the only successful measure for preventing severe forms of the disease. The assessment of the severity of the clinical picture with the corresponding severity scales, Vesikari or Clark, is essential for interpretation of the success of the applied vaccine.

*The purpose of the study:* a ten-year review of the frequency of appearance and laboratory features of Rotavirus Gastroenteritis in Paediatrics at the Infectious Diseases Clinic, Skopje, Macedonia. The goal of the study is to stress the constant presence of infection with severe clinical manifestations and the necessity of the introduction of vaccination

*Materials and Methods:* acute viral gastoenteritis patients were processed, whose clinical presentation indicated mandatory hospitalization. Biochemical laboratory parameters were required for all children, and they were grouped in appropriate severity groups depending on the values of the clinical parameters on the Vesikari and Clark scales. By taking a biochemical laboratory analysis using statistical methods we searched for an answer to whether and to what extent their values are predictive for assessment of the severity of the disease, and how much they influence the values in each of the scales.

*Results:* 1012 children at an average age of 19.51 months, treated from 2003 to 2012, tested with 12 parameters and grouped into scales, showed the existence of a correlation between the scales of 0.8277. Processing our results suggests the use of a modified Vesikari scale for clinical assessment of disease severity, and thus the ability to monitor the effectiveness of vaccination.

**Key words:** rotavirus, scores, vaccination, laboratory biochemical characteristics.

## Introduction

In recent reports on global mortality from infectious diseases, 6 diseases are the cause of 90 percent mortality. Unfortunately, nowadays diarrhoea is still among those top six diseases. Diarrhoeal diseases annually kill approximately 2 million people, mainly children under 5 years of age [1–3].

Poor or inadequate sanitation and unsafe drinking water are the cause of more than 1.5 billion episodes of diarrhoea, mostly from bacterial and parasitic etiology.

Viruses as causes of diarrhoea are frequent in both developed and developing countries [4]. A similar clinical picture and the impossibility of isolating the specific cause, mask

their etiological diversity. There are norovirus, adenovirus, Sapovirusi, Enteroviruses, astroviruses and Bocavirus, but the most common is Rotavirus. It is the most common cause of viral diarrhoea, especially in children. For years it has been recognized as the most common cause of rapid lethal dehydration in infancy and early childhood, with an annual mortality rate up to 500,000 children worldwide [5]. In undeveloped countries, where it is difficult to reach medical help and where children suffer greatly from malnutrition, mortality is the highest. In developed countries since the disease is more present in winter it is correlated with increased risk of its occurrence as a nosocomial pathogen [6–8].

Vaccination is recognised as the only known successful control measure in reducing severe forms of the disease [9–13].

The assessment of the severity of the clinical picture is determined by two scales, the Vezikari – 20 points scale and Clark – 24 points scale [14]. Since the vaccine protects primarily against severe forms of the disease, a strong correlation between the scales is needed in order to determine the effectiveness of the applied vaccine [15–17].

The purpose of study: to display the frequency of appearance and presentation of clinical and laboratory features of rotavirus gastroenteritis in a ten year period in the Paediatric Ward of the Infectious Diseases and Febrile Conditions Clinic, Skopje. The study is an attempt to indicate the persistence of infection with severe clinical manifestations and the need to introduce active prevention which is not anything new, and is already a proven means of prevention applied in many countries around the world.

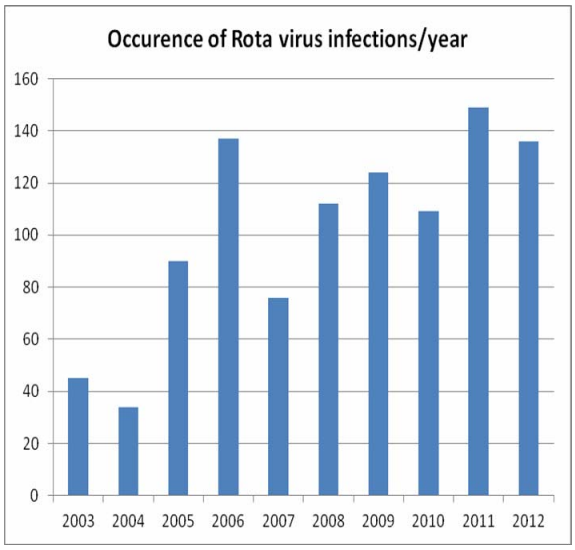
**Materials and Methods**

In our study we processed paediatric cases with acute gastroenteritis with confirmed Rotavirus infection that required hospitallization. Rotavirus etiology was confirmed by a rapid test at the Clinic and the Elisa method at the Institute of Microbiology and Parasitology. The presence of faecal leukocytes was examined at the start of the disease and before confirmation of viral etiology of the disease in all patients. Since in most of the cases faecal leukocytes were negative, they were not taken into further statistical processing as a possible indicator of a mixed or bacterial cause of diarrhoea. Negative leukocytes were merely an additional confirmation of the viral etiology of the disease. All children were admitted to the Ward with their mothers, who took detailed records on the number and quality of the stools, the number of vomitings and the daily fluid intake, which was documented in the records in the history of the disease for each patient.

At admission to hospital, the laboratory biochemical parameters for all children were made: a complete blood count with peripheral smear, CRP, pH, electrolyte status with the values of K and Na, urea, glucose, transaminases ALT and AST. Depending on the values of the clinical parameters, all children were grouped on two scales – Vesikari and Clark – with severity assessment of mild, moderate and severe. By making biochemical laboratory analyses, we were looking for an answer to the question of which of the biochemical parameters at the start of the disease, and to what extent, has a predictive value for the assessment of the course and severity of the disease.

An attempt was also made to test the possible impact of biochemical parameters on the values of both scales in a clinical assessment of disease severity. After grouping all 1012 patients, hospitalized in the period from 2003 to 2012, a correlation of the two scales was made. A modified Vesikari scale was used for inpatients with values up to 11 for mild cases, 12–15 for moderate and 16 to 20 for severe cases of the disease. The Clark scale has values up to 9 for mild, 9 to 16 for moderate and over 16 to 24 for severe cases of Rota virus infection.

## Results




*Graph. 1 – Occurrence of Rotavirus infections/year*

In the ten year review of hospitalized children with confirmed rotavirus infection we observed a consistency of the positive isolates, with an upward trend from 45 patients in 2003 up to a constant number of 120 children after 2007, with a peak of 149 children in 2011. The average age of patients was 19.51 months, with a range from 2 to 96 months, with a median of 18 months, i.e. by far the largest number of children were under the age of two.

We attempted to analyse the biochemical laboratory parameters whose changes are expected in the development of an enterocolitis of viral etiology. The overall analysis of all patients showed the phenomenon that the monitorring of only the mean values does not reflect the real degree of disease severity unless we monitor, in parallel, the range of the single parameters.

Table 1

*Descriptive statistics – summary for all 1012 cases*

| | Age | pH | K | Na | Hb | LE | Ne | Ly | CRP | Urea | Glyc | ALT | AST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average | 19.51 | 7.335 | 4.10 | 138.73 | 113.0 | 10.03 | 0.522 | 0.374 | 15.7 | 2.99 | 4.01 | 30.3 | 49.0 |
| Median | 18 | 7.340 | 4.1 | 138 | 113 | 8.9 | 0.52 | 0.37 | 8 | 2.7 | 3.9 | 26 | 46 |
| Range | 2–96 | 7.003–7.513 | 2.3–7.0 | 125–170 | 10–176 | 1.1–39.3 | 0.08–0.93 | 0.04–0.84 | 0–410 | 0.6–18.9 | 1.5–18.3 | 10–262 | 13–227 |
| Stdev | 13.11 | 0.058 | 0.620 | 4.286 | 14.4 | 4.53 | 0.204 | 0.184 | 27.1 | 1.87 | 1.45 | 21.5 | 19.2 |

The characteristics of the blood smear of the children with rotavirus gastroenteritis was followed by the values of haemoglobin, leukocytes and leucocyte formula in terms of possible dominance of lymphocyte smear. Values of a median haemoglobin of 113 g/l suggests frequent hypochromia in a small population due to expected higher values of reception when haemoconcentration is present due to a different degree of dehydration. Values of leukocytes were from $10.3 \times 10^9$/L, but with the upper limit of the range up to $39.3 \times 10^9$/L due to associated bacterial infections, primarily respiratory, which was not under discussion in this study. Lymphocyte predominance is shown by the mean value of 0.374.

Under the existence of bacterial coinfections in children with Rotavirus diarrhoea, very often nosocomialy gained at the departments of pulmonary infections, were obtained with CRP values ranging from 0 to 400 iu/ml. The mean value of C reactive protein of 15.7 iu/ml suggests the presence of inflammation during viral infection of the intestine.

From the degradation products, as the most important indicator in the acute phase of the disease, the values of urea were analysed. The values of transaminases were also monitored in all children which showed the rise to the upper limit of the referent values.

In order to check the existence of correlations between biochemical variables and the two scores (Vesikari and Clark), factor analysis was performed on these data, which revealed the Correlation matrix (Pearson (n)) presented in Table 2. A high correlation was obtained for Ly and Ne, and for ALT and AST, which is not directly related to the Rotavirus infection. No significant correlation could be found between the biochemical and clinical parameters (scores).

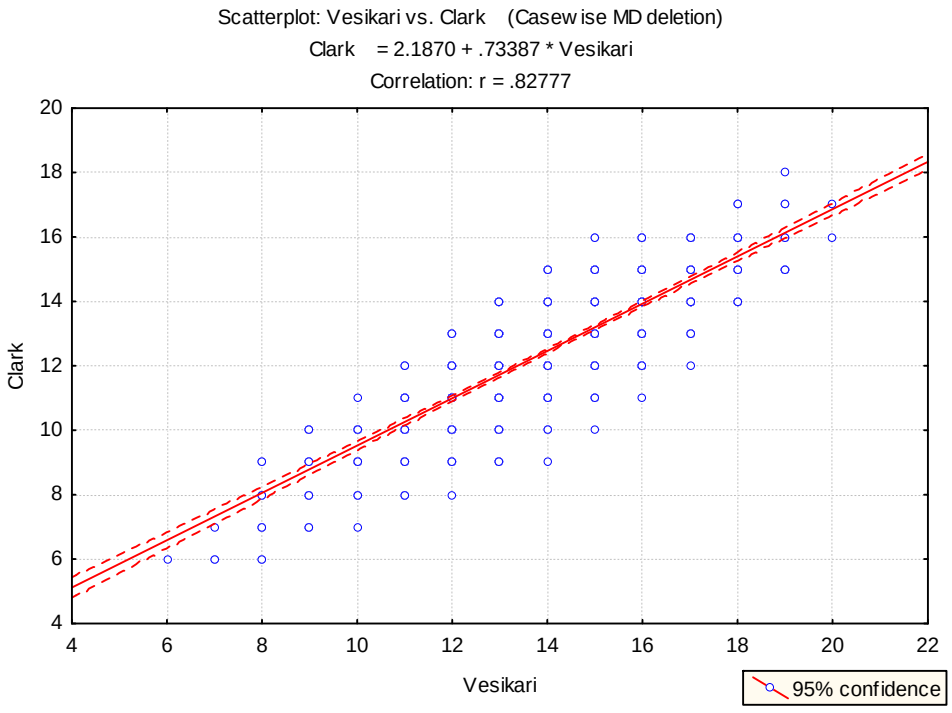
Table 2

*Correlation matrix (Pearson (n)) obtained by factor analysis of the biochemical data and the Vesikari and Clark score*

| Variables | pH | K | Na | Hb | LE | Ne | Ly | CRP | Urea | Glyc | ALT | AST | Vesikari | Clark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | **1** | | | | | | | | | | | | | |
| K | 0.077 | **1** | | | | | | | | | | | | |
| Na | -0.207 | 0.117 | **1** | | | | | | | | | | | |
| Hb | -0.098 | -0.013 | -0.021 | **1** | | | | | | | | | | |
| LE | -0.168 | 0.097 | 0.008 | 0.292 | **1** | | | | | | | | | |
| Ne | -0.070 | -0.069 | -0.196 | 0.277 | -0.008 | **1** | | | | | | | | |
| Ly | 0.026 | 0.041 | 0.220 | -0.314 | -0.017 | **-0.970** | **1** | | | | | | | |
| CRP | 0.075 | 0.006 | -0.159 | 0.144 | -0.039 | 0.131 | -0.152 | **1** | | | | | | |
| Urea | -0.309 | -0.061 | 0.179 | 0.147 | 0.036 | 0.274 | -0.269 | -0.077 | **1** | | | | | |
| Glyc | -0.019 | 0.012 | 0.162 | 0.001 | 0.049 | 0.075 | -0.075 | -0.023 | 0.452 | **1** | | | | |
| ALT | -0.071 | -0.057 | -0.030 | 0.081 | 0.004 | 0.113 | -0.080 | -0.007 | 0.018 | -0.115 | **1** | | | |
| AST | -0.033 | -0.051 | -0.103 | 0.044 | -0.065 | 0.007 | 0.029 | -0.066 | -0.060 | -0.228 | **0.725** | **1** | | |
| Vesikari | -0.233 | -0.108 | -0.004 | -0.002 | -0.015 | -0.002 | 0.034 | 0.065 | 0.057 | -0.088 | 0.107 | 0.133 | **1** | |
| Clark | -0.311 | -0.107 | 0.047 | 0.071 | 0.087 | 0.053 | -0.031 | 0.056 | 0.059 | -0.127 | 0.156 | 0.121 | **0.828** | **1** |

On the other hand, considerable correlation (0.828) was obtained between the two scores (Graph 2), which might be expected from their definition, but still reveals differences between them and implies the need for harmonization.

The most striking differences could be attributed to relatively subjective assessment of the degree of dehydration and assessment of the state of consciousness as other parameters are objective and numerically defined strictly by their frequency during the day.




*Graph. 2 – Scatterplot: Vesikari vs Clark (Casewise MD deletion)*

Table 3

*Grouping of samples according to severity defined by the two scores*

| | Vesikari *n*(cases) | Range | % | Clark *n*(cases) | Range | % |
|---|---|---|---|---|---|---|
| Total | 1012 | 0–20 | | 1012 | 0–24 | |
| Severe | 243 | 16–20 | **24.0** | 7 | 17–24 | **0.7** |
| Medium | 659 | 12–15 | **65.1** | 975 | 9–16 | **96.3** |
| Mild | 110 | 0–11 | **10.9** | 30 | 0–8 | **3.0** |

It is interesting to point out the low percent of severe cases according to the Clark score (0.7%) in spite of the higher range of values (17–24) compared to 24% of severe cases according to the Vesikari score with a smaller range (16–20), which again brings the attention back to the definition of the scores and implies the necessity for some kind of integration of the essential clinical parameters into a unique criterion/score for assessment of the severity of the patient condition.

As for the importance and correlation of the biochemical parameters to the severity of the condition defined by the Vesikari and Clark scores, one-way analysis of variance (ANOVA) using the Student-Newman-Keuls multiple comparisons test was performed on the biochemical data (12 parameters) of the patients divided into three groups according to each of the two scores. For three parameters only: pH, potassium concentration (k) and urea concentration, signifycant differences were found between the groups defined according to the severity of the condition.

The results obtained (Table 4) suggest that severe cases (group 1, pH-1) defined according to both scores significantly differ from the other two groups (pH-2 and pH-3) in the pH value, i.e. variation among means from group 1 is significantly greater than other values expected by chance whereas no significant differences in the pH values were observed for the medium and mild cases. The average, median and standard deviations of the values of pH in all groups are given in Table 5.

Significant differences between the three groups (K-1, K-2 and K-3) according to the Vesikari score were found in the values for the concentration of potassium, which on the other hand was not found for the three groups defined according to the Clark score. This finding again can be attributed to the difference in the definition of the scores and the low number of severe cases according to the Clark score.

Urea concentration was found as a significantly different parameter in the group of severe cases (urea-1) according to the Clark score, which was not the case for the Vesikari groups.

Table 4

*Results of the Student-Newman-Keuls multiple comparisons test performed on the biochemical data grouped into 3 groups according to severity criteria defined by the two scores (Vesikari and Clark score)*

| **Vesicari score groups* comparison** | | | | **Clark score groups* comparison** | | | |
|---|---|---|---|---|---|---|---|
| Comparison | Difference | q | P value | Comparison | Difference | q | P value |
| **pH-1 vs pH-3** | -0.02725 | 5.176 | P < 0.001 | **pH-1 vs pH-3** | -0.08986 | 4.803 | P < 0.01 |
| **pH-1 vs pH-2** | -0.02646 | 8.000 | P < 0.001 | **pH-1 vs pH-2** | -0.06850 | 4.115 | P < 0.01 |
| pH-2 vs pH-3 | -0.0007887 | 0.1648 | ns P > 0.05 | pH-2 vs pH-3 | -0.02136 | 2.432 | ns P > 0.05 |
| **K-1 vs K-3** | -0.3580 | 7.010 | P < 0.001 | K-1 vs K-3 | -0.4543 | 2.473 | ns P > 0.05 |
| **K-1 vs K-2** | -0.1345 | 4.058 | P < 0.01 | K-1 vs K-2 | -0.2059 | --- | ns P > 0.05 |
| **K-2 vs K-3** | -0.2235 | 4.875 | P < 0.001 | K-2 vs K-3 | -0.2483 | --- | ns P > 0.05 |
| urea-3 vs urea-2 | -0.1283 | 0.9220 | ns P > 0.05 | **urea-3 vs urea-1** | -3.395 | 5.768 | P < 0.001 |
| urea-3 vs urea-1 | -0.1066 | --- | ns P > 0.05 | urea-3 vs urea-2 | -0.1361 | 0.5497 | ns P > 0.05 |
| urea-1 vs urea-2 | -0.02170 | --- | ns P > 0.05 | **urea-2 vs urea-1** | -3.259 | 6.063 | P < 0.001 |

*group 1 – severe, group 2 – medium, group 3 – mild cases

Table 5

*Average, median and standard deviations of the measured values for pH, potassium (K) and urea concentration in the groups classified according to the severity of the two scores (Vesikari and Clark)*

| | | **pH** | | **K** | | **urea** | |
|---|---|---|---|---|---|---|---|
| Group 1, severe | | Vesikari | Clark | Vesikari | Clark | Vesikari | Clark |
| Average | | 7.315 | 7.266 | 3.97 | 3.89 | 2.99 | 6.23 |
| Median | | 7.320 | 7.276 | 4.0 | 3.8 | 2.5 | 4.000 |
| Stdev | | 0.067 | 0.146 | 0.681 | 0.426 | 2.28 | 5.706 |
| Group 2, medium | | | | | | | |
| Average | | 7.341 | 7.335 | 4.127 | 4.09 | 3.009 | 2.974 |
| Median | | 7.343 | 7.340 | 4.200 | 4.1 | 2.700 | 2.700 |
| Stdev | | 0.053 | 0.057 | 0.592 | 0.618 | 1.760 | 1.831 |
| Group 3, mild | | | | | | | |
| Average | | 7.342 | 7.356 | 4.33 | 4.34 | 2.881 | 2.838 |
| Median | | 7.340 | 7.344 | 4.4 | 4.5 | 2.600 | 2.600 |
| Stdev | | 0.049 | 0.053 | 0.592 | 0.669 | 1.863 | 1.158 |

Table 6

*Descriptive statistics – VESIKARI, group 1 – severe, group 2 – medium, group 3 – mild cases*

| | | pH | K | Na | Hb | LE | Ne | Ly | CRP | Urea | Glyc | ALT | AST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| vk. podatoci, Gr. 1 | 243 | 204 | 234 | 234 | 243 | 243 | 242 | 242 | 115 | 236 | 239 | 142 | 142 |
| Average | | 7.31 | 3.97 | 138.64 | 112.5 | 9.74 | 0.541 | 0.363 | 17.3 | 2.99 | 4.06 | 29.5 | 50.6 |
| Median | | 7.320 | 4.0 | 138 | 112 | 8.9 | 0.53 | 0.36 | 9 | 2.5 | 3.9 | 26 | 46 |
| Min | | 7.003 | 2.3 | 125 | 77 | 1.1 | 0.11 | 0.05 | 0 | 1.0 | 1.5 | 10 | 16 |
| Max | | 7.460 | 6.1 | 163 | 162 | 35.9 | 0.93 | 0.80 | 210 | 18.9 | 18.3 | 135 | 210 |
| Stdev | | 0.067 | 0.681 | 5.107 | 14.2 | 4.51 | 0.202 | 0.184 | 25.9 | 2.28 | 1.46 | 17.2 | 22.3 |
| vk. podatoci, Gr. 2 | 659 | 525 | 634 | 634 | 659 | 658 | 658 | 658 | 283 | 627 | 624 | 360 | 360 |
| Average | | 7.341 | 4.127 | 138.731 | 113.049 | 10.142 | 0.519 | 0.376 | 15.279 | 3.009 | 4.002 | 30.576 | 48.288 |
| Median | | 7.343 | 4.200 | 138.000 | 113.000 | 9.000 | 0.520 | 0.370 | 8.000 | 2.700 | 3.900 | 26.000 | 46.000 |
| Min | | 7.040 | 2.600 | 127.000 | 10.000 | 2.200 | 0.080 | 0.040 | 0.000 | 0.600 | 1.500 | 10.000 | 13.000 |
| Max | | 7.513 | 7.000 | 170.000 | 176.000 | 39.300 | 0.930 | 0.840 | 410.000 | 13.300 | 18.300 | 262.000 | 227.000 |
| Stdev | | 0.053 | 0.592 | 4.062 | 14.704 | 4.552 | 0.206 | 0.185 | 28.354 | 1.760 | 1.489 | 22.802 | 18.029 |
| vk. podatoci, Gr. 3 | 110 | 81 | 104 | 104 | 110 | 110 | 110 | 110 | 46 | 106 | 106 | 58 | 58 |
| Average | | 7.342 | 4.330 | 138.942 | 112.991 | 9.887 | 0.492 | 0.396 | 20.217 | 2.881 | 4.279 | 28.966 | 47.534 |
| Median | | 7.340 | 4.400 | 139.000 | 112.000 | 8.700 | 0.515 | 0.390 | 7.000 | 2.600 | 4.100 | 22.500 | 46.500 |
| Min | | 7.209 | 2.900 | 131.000 | 77.000 | 2.900 | 0.130 | 0.050 | 1.000 | 1.000 | 1.500 | 10.000 | 16.000 |
| Max | | 7.460 | 5.600 | 148.000 | 147.000 | 36.500 | 0.860 | 0.800 | 410.000 | 13.300 | 18.300 | 144.000 | 105.000 |
| Stdev | | 0.049 | 0.592 | 3.081 | 12.953 | 4.829 | 0.181 | 0.167 | 60.490 | 1.863 | 2.186 | 23.646 | 17.620 |

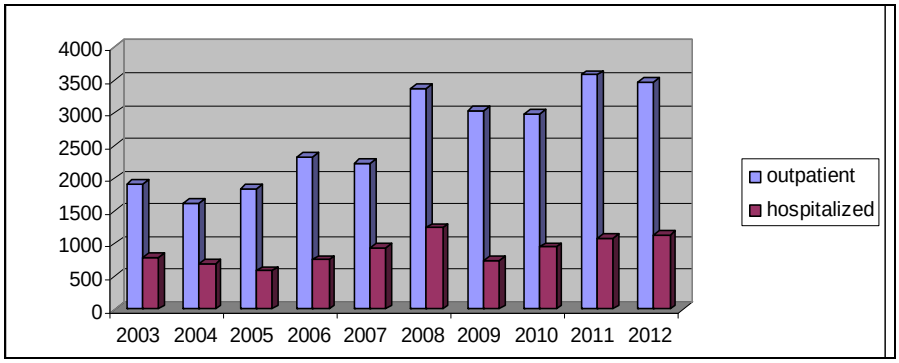
Table 7

*Descriptive statistics – CLARK, group 1 – severe, group 2 – medium, group 3 – mild*

| | | pH | K | Na | Hb | LE | Ne | Ly | CRP | Urea | Glyc | ALT | AST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| vk. podatoci | 7 | 6 | 7 | 7 | 7 | 6 | 7 | 7 | 5 | 6 | 7 | 5 | 5 |
| Average | | 7.27 | 3.89 | 139.14 | 115.00 | 9.28 | 0.63 | 0.28 | 10.80 | 6.23 | 4.31 | 26.20 | 35.20 |
| Median | | 7.276 | 3.800 | 138.000 | 110.000 | 7.300 | 0.570 | 0.280 | 12.000 | 4.000 | 4.400 | 27.000 | 37.000 |
| Min | | 7.003 | 3.200 | 133.000 | 99.000 | 3.900 | 0.320 | 0.070 | 7.000 | 1.500 | 3.100 | 23.000 | 29.000 |
| Max | | 7.439 | 4.500 | 148.000 | 140.000 | 20.100 | 0.900 | 0.570 | 12.000 | 16.600 | 5.200 | 28.000 | 41.000 |
| Stdev | | 0.146 | 0.426 | 5.178 | 14.754 | 5.784 | 0.218 | 0.180 | 2.168 | 5.706 | 0.667 | 2.168 | 5.020 |
| vk. podatoci | 975 | 782 | 935 | 935 | 975 | 974 | 973 | 973 | 429 | 934 | 932 | 540 | 540 |
| Average | | 7.335 | 4.092 | 138.716 | 112.886 | 10.045 | 0.523 | 0.374 | 15.865 | 2.974 | 4.008 | 30.431 | 49.098 |
| Median | | 7.340 | 4.100 | 138.000 | 113.000 | 8.900 | 0.520 | 0.370 | 8.000 | 2.700 | 3.900 | 26.000 | 46.000 |
| Min | | 7.040 | 2.300 | 125.000 | 10.000 | 1.100 | 0.080 | 0.040 | 0.000 | 0.600 | 1.500 | 10.000 | 13.000 |
| Max | | 7.513 | 7.000 | 170.000 | 176.000 | 39.300 | 0.930 | 0.840 | 410.000 | 18.900 | 18.300 | 262.000 | 227.000 |
| Stdev | | 0.057 | 0.618 | 4.316 | 14.584 | 4.555 | 0.204 | 0.184 | 27.511 | 1.831 | 1.469 | 21.548 | 19.282 |
| vk. podatoci | 30 | 22 | 30 | 30 | 30 | 30 | 30 | 30 | 10 | 29 | 30 | 15 | 15 |
| Average | | 7.356 | 4.340 | 139.167 | 114.600 | 9.630 | 0.484 | 0.405 | 13.200 | 2.838 | 3.880 | 25.400 | 49.133 |
| Median | | 7.344 | 4.500 | 139.000 | 114.000 | 9.400 | 0.510 | 0.390 | 6.000 | 2.600 | 3.900 | 20.000 | 45.000 |
| Min | | 7.250 | 3.200 | 132.000 | 99.000 | 2.900 | 0.130 | 0.050 | 2.000 | 1.000 | 1.500 | 10.000 | 25.000 |
| Max | | 7.450 | 5.600 | 145.000 | 133.000 | 17.900 | 0.860 | 0.770 | 45.000 | 5.200 | 6.500 | 106.000 | 86.000 |
| Stdev | | 0.053 | 0.669 | 3.030 | 7.925 | 3.439 | 0.183 | 0.179 | 15.761 | 1.158 | 1.035 | 23.637 | 17.250 |

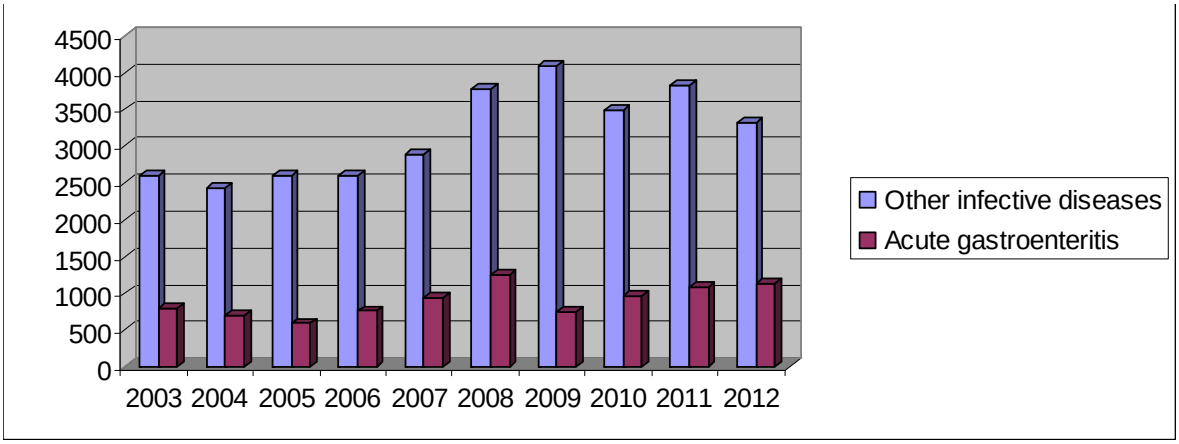
## Discussion

In our state, gastrointestinal infections are constantly present. In the last ten years there has been a constant increase in the number of patients treated in the Infectious Diseases Clinic from 1920 cases in 2003 to 3479 examined patients with reference diagnosis of acute gastroenteritis in 2013.




*Graph. 3 – No of patients with acute gastroenteritis: outpatient and hospitalized*

The importance of this problem is indicated by the ratio of the total number of hospitalized patients with infectious diseases and the number hospitalized with acute gastroenteritis in one year. Namely, one-third of the total of 3317 hospitalizations last year were due to gastrointestinal infections. If we also count the patients with a defined diagnosis of specific intestinal infection – such as salmonellosis, shigellosis, and others – we get a real number of the unfortunately permanent, very large number of patients with infection of the gastrointestinal tract requiring hospital treatment.




*Graph. 4 – No of hospitalizations with acute gastroenteritis vs other infective diseases*

In this study we present the number of inpatients with Rotavirus diarrhoea only in the paediatric ward of the Infectious Diseases and Febrile Conditions Clinic, which is onlya relative number compared to the actual incidence of infection as the dominant viral pathogen primarily in children. Knowing that only 2 to 10 percent of Rotaviral diarrhoea cases require hospital treatment, the number of 1012 children over a ten year period is a minimum of 10,000 children infected with the Rotavirus alone in the population that gravitates towards our institution. It is necessary to note that we did not have a lethal outcome because the children who had Rotavirus infection, high comorbidity and a bad course were not treated in this study (2 cases). That was because the enteral infection was not the direct cause of the poor prognosis.

Knowing the financial parameters for the cost of absence from work of parents due to child care at home and the cost of hospital treatment of these rapidly dehydrating and often urgent situations, that require appropriate biochemical laboratory investigations (primarily pH, K, urea), and appropriate etiological confirmation, the introduction of active prevention of this disease in our community should be considered.

Since the success of vaccination is estimated by the success in preventing severe forms of the disease, we made an attempt to test the two scales for clinical assessment of disease severity, used so far in the world, in order to find the optimal scale for monitoring of applied active prophylaxis.

The analysis of biochemical laboratory parameters and their impact on the values of scores of both scales, Vesikari and Clark, confirmed that the values of pH and potassium significantly affect, i.e. are different, in appropriate severity groups of the Vesikari scale. Analyzing of all 12 parameters in the Clark scale showed that values of urea and pH are significantly different among the severity groups in the scale.

Our results over a 10 year period show a high correlation between the scales (0.82777), but based on 12 tested variables of laboratory biochemical parameters and value scales, our suggestion is to use the modified Vesikari 20 point scale for hospitalized patients with Rotavirus infection with mandatory request for the

pH values, electrolytes and urea, for laboratory confirmation of the severity of the disease. This could open up the possibility of introduction of one of the vaccines licensed and widely used in the western world, Rotarix and Rotateq.

In 2007 *The Lancet* identified the report on the success of the vaccination of all types of Rotavirus infection, as Papers of the Year [18, 19]. Recent reports from the U.S. suggest an up to 86 percent reduction in the necessity for hospitalization with Rotavirus infection after implementation of the vaccine [20]. It is also important to mention the reduction in the number of infections among adults as a secondary response to vaccination conducted in infants [21, 22].

In conclusion we would like to emphasize once again the main features of rotavirus infection: on the one hand it is a highly contagious disease, with an incidence is difficult to control only by improvement of hygiene and sanitary measures, while on the other hand it is a severe dehydrating disease with possible extra intestinal manifestations (pneumonia, exanthema, neuropsychiatry manifestations) [23–26]. Since the disease is preventable, we consider that the way to reduce its presence in our community is to introduce active prevention in early infancy. For successful monitoring of vaccination we tested scales and parameters that affect their values.

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Резиме

## ЕВАЛУАЦИЈА НА ТЕЖИНСКИТЕ СКОРОВИ НА РОТА ВИРУСНАТА ИНФЕКЦИЈА ВО ДЕСЕГОДИШНИОТ ПЕРИОД КАЈ ХОСПИТАЛИЗИРАНИ ДЕЦА НА КЛИНИКАТА ЗА ИНФЕКТИВНИ БОЛЕСТИ И ФЕБРИЛНИ СОСТОЈБИ, СКОПЈЕ, Р. МАКЕДОНИЈА

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Ротавирусната инфекција е најзастапена вирусна инфекција на гастроинтестиналниот тракт во детската возраст со најтешки клинички манифестации и брзо прогредирачка дехидратација, пред сè во доенечката и во раната детска возраст. Поради своите карактеристики на висока контагиозност со широка распространетост и во развиените земји и во земјите во развој, и сè уште висок леталитет, активната превенција на болеста се препознава како единствена успешна мера за превенирање на тешките форми на болеста. Проценката на тежината на клиничката слика со соодветните тежински скали, Весикари и Кларк, е неопходна во толкување на успешноста на применетата вакцина.

*Цел на трудот:* Десетгодишен приказ на зачестеноста и лабораториските карактеристики на ротавирусниот гастроентерит на детскиот оддел на Клиниката за инфективни болести. Трудот укажува на постојана присутност на инфекцијата со тешки клинички манифестации и потреба од воведување на вакцинација.

*Материјал и метод:* Обработени се акутни вирусни гастоентерити чија клиничка презентација индицира задолжителна хоспитализација. Кај сите деца беа барани лабораториско биохемиски параметри, и сите беа, зависно од вредностите на клиничките параметри на Весикари и Кларковата скала, групирани во соодветни тежински групи. Со земањето на лабораториско биохемиските анализи со статистички методи се бараше одговор дали и во колкава мера имаат предикција за проценка на тежината на клиничката слика, односно во колкава мера влијаат на вредностите во секоја од скалите.

*Резултати:* 1012 деца на возраст од 19,51 месеци се лекувани од 2003 до 2012 година, тестирани се со 12 параметри, групирани во скали со приказ на постоење на корелација помеѓу скалите од 0,8277.

Обработка на нашите резултати сугерира употреба на модифицирана Весикари скала во клиничката процена на тежината на болеста, а со тоа и можност за следење на успешноста од вакцинацијата.

**Клучни зборови:** ротавирус, резултати, вакцинација, лабораториски биохемиски параметри.