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Evaluation of some biochemical parameters of pediatric patients hospitalized for rotavirus in Şırnak Province: A retrospective review

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Abstract

Rotavirus gastroenteritis is an important cause of worldwide morbidity and mortality in infants and children. The main cause of mortality is dehydration due to fluid loss and malnutrition. This study aims to examine the guiding parameters of uric acid and creatinine levels in the detection of dehydration and fluid deficit and inpatient management in cases of rotavirus gastroenteritis. Children who applied to Şırnak State Hospital, Pediatrics Polyclinics, children (6 months-18 years old) whose faecal samples were sent to the laboratory by the research pediatrician considering the diagnosis of rotavirus and whose microbiological examinations were confirmed by immunochromatographic methods (6 months-18 years old), were included in the study by scanning the system. When positive patients were evaluated, the mean age for serum uric acid was 1.06 ± 1.53 and the mean age for serum creatinine was 1.10 ± 1.37 . The median value was 3.75 mg/dL in negative patients with serum uric acid levels, and 5.25 mg/dL in positive patients, which was statistically significant ($p < 0.01$). The median value of serum creatinine level was 0.41 mg/dL in negative patients and 0.43 mg/dL in positive patients, which was statistically significant ($p < 0.05$). With this study carried out in Şırnak province, we think that children in the region are severely affected by the rotavirus and face severe dehydration. Therefore, we think that all parameters affected by rotavirus should be evaluated according to regions and parents should be educated about the importance of rotavirus vaccine in the prevention of rotavirus gastroenteritis.

Key words: Rotavirus, uric acid, creatinine, child

Introduction

In many parts of the world, acute gastroenteritis is a significant cause of illness and mortality in newborns and young children. Each year, diarrhoea claims the lives of some 500.000 newborns and young children worldwide [1]. A rotavirus infection causes a wide range of clinical symptoms that, following an incubation period of 1-4 days, can develop into severe gastroenteritis with fever, vomiting, and watery diarrhoea. Among viral infections, it is the one that most frequently results in severe gastroenteritis.

This picture is more harsh, especially in young children under the age of two. Babies between the ages of 6 and 24 months are typically infected. According to reports, children between the ages of 0 and 24 months are the ones who are diagnosed the most commonly [2-4]. Worldwide reports of rotavirus infections in children under the age of five totalled 114 million in 2003. Around the world in 2013, rotavirus was thought to be responsible for 200.000 pediatric fatalities [5]. Rotavirus are double-stranded RNA (dsRNA)-containing, 11-segmented, non-enveloped viruses. At the ends of the villi in the small intestine,

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Rotavirus binds to enteroendocrine cells and non-dividing enterocytes and multiplies in these cells [6]. According to reports, the components needed for rotavirus infection and reproduction are present in these cell types, which is why the virus chooses to attach to them [7]. Unlike gastroenteritis, which is brought on by bacterial pathogens, rotavirus infections result in non-bloody diarrhoea that is only mildly inflammatory and relatively short-lived [8]. Around the world, acute gastroenteritis in young children is commonly caused by the rotavirus. The majority of young children worldwide under the age of five are susceptible to rotavirus infection [9]. According to epidemiological research, rotaviruses account for between 35% and 50% of hospitalizations in young children and infants and are a significant contributor to severe infantile diarrhoea [10,11]. According to research done in Turkey, rotavirus is the root cause of 15-40% of diarrhoea noticed in children under the age of 5 [2]. Dehydration brought on by fluid loss and malnutrition is the key factor contributing to rotavirus-related death. One of the main therapy objectives is to correct the fluid deficit. Dehydration lowers the glomerular filtration rate (GFR) and decreases blood supply to the kidneys [12,13]. As a result, uric acid and creatinine levels are expected to increase. However, in our literature review, it has been reported that serum uric acid levels increase in positive patients, while creatinine levels decrease [14]. Therefore, prerenal acute renal failure may develop if dehydration is detected late or if adequate fluid replacement is not performed. The aim of this study was to determine uric acid and creatinine levels, to determine dehydration and fluid deficit, and to guide inpatient treatment in patients with rotavirus gastroenteritis.

Material and Methods

The Ethics Committee of a State University gave its approval to the study (decision number 2022/106, date: 21.09.2022). Our study included children (6 months-18 years old) who applied to Şirnak State Hospital, Pediatrics Polyclinics between July 2020 and June 2022, whose faecal samples were sent to the laboratory by the research paediatrician considering the diagnosis of rotavirus, and whose microbiological examinations were confirmed by immunochromatographic methods (6 months to 18 years of age). was done. Measurements were measured in Abbott ARCHITECT c8000 device. Creatinine was determined by the alkaline picrate method and serum uric acid was determined by the uricase colometric method. In this study, in which we examined each parameter separately, 164 patients for uric acid and 460 patients for creatinine parameters were included in the study. Age, gender, detection of rotavirus and biochemical parameters of the patients were evaluated retrospectively. Patients

with positive rotavirus antigens were compared statistically with patients without rotavirus (negative group).

Statistical analysis

Data were statistically analyzed using the SPSS 21.0 package application. Data were reported as median [min-max value], percentage for qualitative data, and median (IQR, Inter Quantifier Ratio, 25%-75%) for non-normally distributed data. In data analysis, the Kolmogorov-Smirnov and Shapiro-Wilk normality tests were used to determine the distribution of continuous variables. The Mann-Whitney U test was performed to ascertain the association between the paired groups because the data were not normally distributed. In descriptive statistics, frequency distributions, numbers, medians, minimum and maximum values were provided. A p value of <0.05 was considered significant.

Limitations of the study

The most important limitation of our study is that the living conditions and demographic data of the cases included in the study could not be obtained precisely because it was a retrospective study. On the other hand, the fact that it is not known whether the patients are currently taking any drug treatment is another important limitation. The limited data reported on the subject and the low number of patients in our region are among the limitations of the study.

Results

Gender distribution and mean age according to the groups are given in Table 1. Each parameter in the table was taken from the automation system separately. Looking at the gender distribution according to the table, 56.2% of the uric acid in the negative group consisted of boys and 43.6% of them were girls. In the positive group, 55.9% were boys and 44.1% were girls. In the negative group of the creatinine parameter, 56.4% were boys and 43.6% were girls. In the positive group, 59.7% were boys and 40.3% were girls. When the mean age was evaluated according to the table, it was determined as 2.17±3.34 in the uric acid parameter negative group and 1.06±1.53 in the positive group. Creatinine parameter was found to be 1.81±2.81 in the negative group and 1.10±1.37 in the positive group.

Evaluation of Uric Acid and creatinine parameters is given in Table 2. According to the table, the median value of the negative group of uric acid was 3.75 mg/dL, and the median value of the positive group was 5.25 mg/dL, which was statistically significant (p<0.01) (Table 2). The median value of the creatinine negative group was 0.41 mg/dL, and the median value of the positive group was 0.43 (p<0.05) (Table 2).

Table 1. Gender distribution and average age of the parameters by groups

	Negative			Positive		
	Gender		Age	Gender		Age
	Male n (%)	Female n (%)	Mean±SD	Male n (%)	Female n (%)	Mean±SD
Serum uric acid (mg/dL)	73 (56.2)	57 (43.8)	2.17±3.34	19 (55.9)	15 (44.1)	1.06±1.53
Serum creatinine (mg/dL)	216 (56.4)	167 (43.6)	1.81±2.81	46 (59.7)	31 (40.3)	1.10±1.37

SD: standard deviation

Table 2. Evaluation of uric acid and creatine parameters

		N	Median	Min-Max	IQR	P value
Serum uric acid (mg/dL)	Negative	130	3.75	1.6-7.1	1.9	p<0.01
	Positive	34	5.25	2.2-7.8	2.0	
Serum creatinine (mg/dL)	Negative	383	0.41	0.28-0.58	0.08	p<0.05
	Positive	77	0.43	0.33-0.55	0.06	

IQR: interquartile range, Data are given as median and minimum-maximum

Discussion

Rotavirus was among the first viruses identified as important causes of viral gastroenteritis, especially in children aged 6 months to 2 years [15]. Extensive research has identified Rotavirus as the most important viral cause of severe gastroenteritis in children worldwiden [15,16]. It has been reported [17]. The aim of this study was to evaluate the uric acid and creatinine parameters in patients with rotavirus gastroenteritis, one of the most common viral infections. It has been reported that 70% of rotavirus diarrheas in Turkey are seen in children under the age of two [18]. As in the literature, it was observed that the mean of the positive groups of both parameters was less than 2 years old in our study (Table 1). Many infectious agents cause gastroenteritis, and while increasing protective measures can reduce gastroenteritis due to parasites and bacteria, the frequency of viral gastroenteritis has not been reduced [19]. It is important to suspect a possible factor in the diagnosis and to perform specific tests for it, since there are no laboratory tests that can detect all gastroenteritis agents [20]. Palumbo et al. reported that elevated serum uric acid levels were observed in 13/302 (4.3%) patients with rotavirus infection, while only 1/82 (1.2%) of rotavirus-negative children had serum uric acid levels [21]. In our study, we found a median value of 5.25 mg/dL in the positive group and 3.75 mg/dL in the negative group. As in the literature, it was found to be higher and statistically significant in the positive group in our study (p<0.01) (Table 2). It may be due to elevated serum uric acid levels, increased or decreased renal excretion, or another lesser-known cause of the disease, hyperuricemia after rotavirus infection. Asena et al. in a study they conducted, they stated that they did not find the mean creatinine 0.43 mg/dL in the negative group and 0.43 mg/dL in the positive group to be statistically significant [3]. In our study, we found a median value of 0.41 mg/dL in the creatinine negative group and 0.43 mg/dL in the positive group, and we found it statistically significant (p<0.05) (Table 2). We think that the change associated with the severity of dehydration is the reason for this.

Conclusion

Infectious gastroenteritis in children under the age of five is frequently brought on by the rotavirus, particularly in those under the age of two. Rotavirus is linked to substantial morbidity in industrialized nations and mortality in underdeveloped nations. Dehydration, electrolyte imbalances, acid-base imbalances, and other biochemical problems are only a few of the many clinical manifestations of rotavirus gastroenteritis. This study evaluated

how the rotavirus affects serum levels of creatinine and uric acid. With this study conducted in the province of Şırnak, we believe that children in the area are extremely dehydrated and impacted by the rotavirus. Parents, in our opinion, should be informed of the value of the rotavirus vaccine in preventing rotavirus gastroenteritis and the assessment of all.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

The Ethics Committee of a State University gave its approval to the study (decision number 2022/106, date: 21.09.2022).

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