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Konya'da Akut Gastroenterit Tanısı ile Hastaneye Yatırılarak İzlenen Çocukların Demografik Özellikleri

Demographic Characteristics of Children Hospitalized with the Diagnosis of Acute Gastroenteritis in Konya

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ÖZ

GİRİŞ ve AMAÇ: Gastroenterit nedeniyle hastaneye başvuran hastalarda etkeni saptamaya yönelik birçok çalışma yapılmıştır. Ancak hastaneye gastroenterit nedeniyle yatan hastalardaki epidemiyolojik araştırmalar sınırlı sayıdadır. Bu çalışmada; Konya bölgesinde çocuklarda akut gastroenterite neden olan etkenlerin dağılımı ve görülme sıklığının saptanması ve akut gatroenteritli çocukların demografik, klinik ve laboratuar bulgularını değerlendirmeyi amaçladık.

YÖNTEM ve GEREÇLER: Bu çalışmaya Ocak 2015-Ocak 2016 tarihleri arasında hastanemiz Çocuk sağlığı ve hastalıkları servisine akut gastroenterit tanısıyla yatırılarak izlenen, 1 ay-16 yaşlarındaki 412 hasta dahil edildi. Hastaların verileri geriye dönük olarak incelenmiştir. Hastaların yaşı, cinsiyeti, mevsimsel dağılımı, semptomlar, hastanede yatış süresi, hastalığın seyri, akut gastroenteritin tipi, nazokomiyal infeksiyon sıklığı ve komplikasyonlar incelendi.

BULGULAR: 12 aylık çalışma periyodunda çeşitli nedenlerle hastaneye yatan toplam hasta sayısı 3985 iken, %10.33'ünü ishal nedeniyle yatan vakalar oluşturmaktaydı. Hastaların 227'si (%55.1) erkek, 185'i (%44.9) kız idi. Yaş gruplarına göre hastaların dağılımı 0-24 ay arasında 57 hasta (%13.8), 24-60 ay arasında 262 hasta (%63.6), 60 ay üzerinde ise 93 hasta (%22.6) mevcuttu. Yaş grupları ile hastalık grupları arasında karşılaştırıldığında 24-60 ay arasında viral gastroenterit bakımından istatistiksel olarak anlamlı bir fark saptandı (p: 0,001). 231 (%56.1) hastada viral akut gastroenterit, 74 (%17.9) hastada amibiazis, 107 (%26.0) hastada bakteriyel gastroenterit tespit edildi.

TARTIŞMA ve SONUÇ: Çocukluk yaş grubu akut gastroenteritlerinde özellikle viral nedenler rotavirusler akılda tutulmalı; diğer etkenlerin sıklığı gözönünde bulundurularak tanı ve tedavi yaklaşımları planlanmalıdır.

Anahtar Kelimeler: Gastroenterit, Çocuk, Rotavirüs, Komplikasyonlar

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SUMMARY

INTRODUCTION: Many studies have been carried out to detect the causative agents in patients admitted to hospital with gastroenteritis. However, there is a limited number of epidemiological studies in patients hospitalized for gastroenteritis. In this study, we aimed to determine the distribution and incidence of the causative agents of acute gastroenteritis in children in Konya and to evaluate the demographic, clinical and laboratory findings.

METHODS: This study included 412 patients aged 1 month to 16 years who were hospitalized with a diagnosis of gastroenteritis in the Child Health and Diseases Clinic in our hospital between January 2015 and January 2016. The data of the patients were analyzed retrospectively. The age, sex, seasonal distribution, symptoms, duration of hospitalization, course of the disease, type of acute gastroenteritis, incidence of nosocomial infections and complications were examined.

RESULTS: The total number of patients hospitalized for various reasons during the 12-month study period was 3985 and the patients hospitalized for diarrhea constituted 10.33% of it. Two hundred and twenty-seven of the patients were male (55.1%), and 185 (44.9%) were female. There were 57 patients (13.8%) between 0-24 months, 262 patients (63.6%) between 24-60 months and 93 patients (22.6%) over 60 months. When the age groups were compared with the disease groups, there was a statistically significant difference in the incidence of viral gastroenteritis between 24-60 months (p: 0.001). Two hundred and thirty-one (56.1%) patients had acute viral gastroenteritis, 74 (17.9%) patients had amebiasis, and 107 (26.0%) patients had bacterial gastroenteritis.

DISCUSSION and CONCLUSION: Viral agents, especially rotavirus, should be kept in mind in childhood acute gastroenteritis. Diagnosis and treatment approaches should be planned considering the incidence of other agents.

Keywords: Gastroenteritis, child, rotavirus, complications

Introductıon:

Acute gastroenteritis is an endemic disease that occurs every year in the world, especially in developed countries. It is ranked in the top three among infection-related deaths in the world. It is more common in developing countries, especially where population is crowded, nutrition is inadequate and unbalanced, and hygienic conditions are impaired. In spite of all protective measures, deaths due to diarrhea exceed two million per year in the world (1). Although acute gastroenteritis occurs in all age groups, it is an important cause of morbidity and mortality in infants and children (2,3).

Bacteria, viruses and parasites are found among the agents that cause infectious gastroenteritis. Among the agents that cause childhood acute gastroenteritis, while viral agents are more common in developed countries, bacterial and parasitic agents are more common in developing countries. Studies have shown that rotavirus is the most common cause of gastroenteritis especially in children between 0-5 years of age, and enteric adenovirus is the second most common pathogen after rotavirus (4).

Geographical region, season, socio-economic conditions, age, immunodeficiency and lifestyle play an important role in the factors determining the causative agent (5). The detection of the agents causing acute gastroenteritis is important in terms of clinical course of the disease, treatment, and precautions to be taken (6). Because of the small and non-modern laboratory conditions in developing countries, diagnosis and surveillance of the majority of bacterial and viral infections that cause diarrhea cannot be performed fully. The agents causing gastroenteritis differ according to the regions. Knowing the possible gastroenteritis agents according to the regions provides accurate diagnosis and effective treatment. Moreover, it will guide for the selection of the optimal antibiotic in cases requiring antimicrobial therapy (7).

Many studies have been carried out to detect the causative agents in patients admitted to hospital with gastroenteritis. However, there is a limited number of epidemiological studies in patients hospitalized for gastroenteritis. In this study, it was aimed to determine the distribution and incidence of viral, bacterial or parasitic infections that cause acute gastroenteritis in children aged 1 month to 16 years in Konya, and to obtain data that provide accurate diagnosis and effective treatment to be a guide for antibiotics selection. We also planned to evaluate the demographic, clinical and laboratory findings of the children with acute gastroenteritis.

Materials and Methods

This study included 412 patients aged 1 month to 16 years who were hospitalized with a diagnosis of gastroenteritis in the Pediatrics Clinic in our hospital between January 2015 and January 2016. The data of the patients were analyzed retrospectively. The age, sex, seasonal distribution, symptoms, duration of hospitalization, course of the disease, type of acute gastroenteritis, incidence of nosocomial infections and complications were examined. Complete blood count, CRP (mg/dL), serum electrolytes, blood glucose, BUN, liver function tests and stool tests were investigated. Complete blood count was performed by an automated blood counting device.Patients with chronic disease, immunodeficiency, malnutrition, and chronic gastroenteritis were excluded from the study. Gastroenteritis with leukocytosis due to other causes were also excluded.

Body temperature was measured with a digital thermometer of our hospital. Body temperature above 37.5°C was considered fever. The findings of dehydration in the patients were recorded by the pediatrician. Acute gastroenteritis was defined as the passage of unusually loose or watery stools at least three times within a 24-hour period and diarrhea, vomiting, fever and other complaints lasting no longer than 14 days. Patients who did not have gastroenteritis when they were hospitalized but developed gastroenteritis three days after the hospitalization for different reasons were considered as a nosocomial infection.

Obtaining Samples: Stool samples were taken from the patients by using sterile containers with screw caps. Immediately after the stool samples were taken, they were examined in terms of bacterial, viral and parasitic agents causing gastroenteritis in our microbiology laboratory.

Detection of Viral Agents: The Rotavirus/Adenovirus Combi Test Kit (Immunochromatographic Assay Kit Rapid Test ROTA-ADENO®, China), which is a solid phase immunochromatographic test, was used in accordance with manufacturer's recommendations for investigation of rotavirus and enteric adenovirus causing gastroenteritis in all samples. Its sensitivity and specificity are 97.3% and 98.3% for rotavirus and 95.6% and 98.3% for enteric adenovirus, respectively.

Detection of Parasitic Agents: Slides which were freshly prepared in 0.85% saline solution and native-lugol from stool samples were examined under a light microscope. Then, cysts and trophozoites were investigated.

Detection of Bacterial Agents: After all the stool samples were examined macroscopically without waiting, they were examined microscopically in terms of the presence of leukocyte and erythrocyte. The presence of 5 or more leukocytes per each area was evaluated as leukocyte-positive in the stool at a high-dry magnification (x40 objective or x400 magnification). Samples with leukocytes found in the stools, fever, negative viral antigen tests, or diarrhea with bloody-mucus, were cultured for the presence of; *Salmonella* spp., *Shigella* spp. and *Campylobacter jejuni*. The culture samples that were supplied to the Beyhekim State Hospital microbiology laboratory were examined when convenient by a microbiology resident.The patients were classified into three groups according to the types of acute gastroenteritis: viral gastroenteritis (Group 1), parasitic gastroenteritis (Group 2), and bacterial gastroenteritis (Group 3). They were categorized as 0-24 months, 25-60 months,> 60 months according to the age groups. The study was approved by the Ethics Committee of Selcuk University.

Statistical Analysis : Descriptive data were expressed as mean±standard deviation. The Kolmogorov-Smirnov and Shapiro-Wilk normality tests were performed to determine whether the data were normally distributed. Parametric data were analyzed by the Student's **t**-test and non-parametric data were analyzed by the Chi-square and Mann-Whitney U tests. The Kruskal-Wallis test was used to compare the groups. The p-value <0.05 was considered to be statistically significant. Spearman's Correlation Coefficient was used for correlation analysis. SPSS 15.0 computer software package program (SPSS Inc, Chicago, Illinois, United States of America) was used for statistical analysis of the data obtained in the study.

Results

The total number of the patients hospitalized for various reasons during the 12-month study period was 3985, and the patients hospitalized for diarrhea constituted 10.33% of it. Two-hundred twenty-seven of the patients (55.1%) were male and 185 (44.9%) were female. The demographic characteristics of our patients are summarized in Table 1. There was no statistically significant difference between the groups in terms of gender (p:0.760). The mean age of our patients was

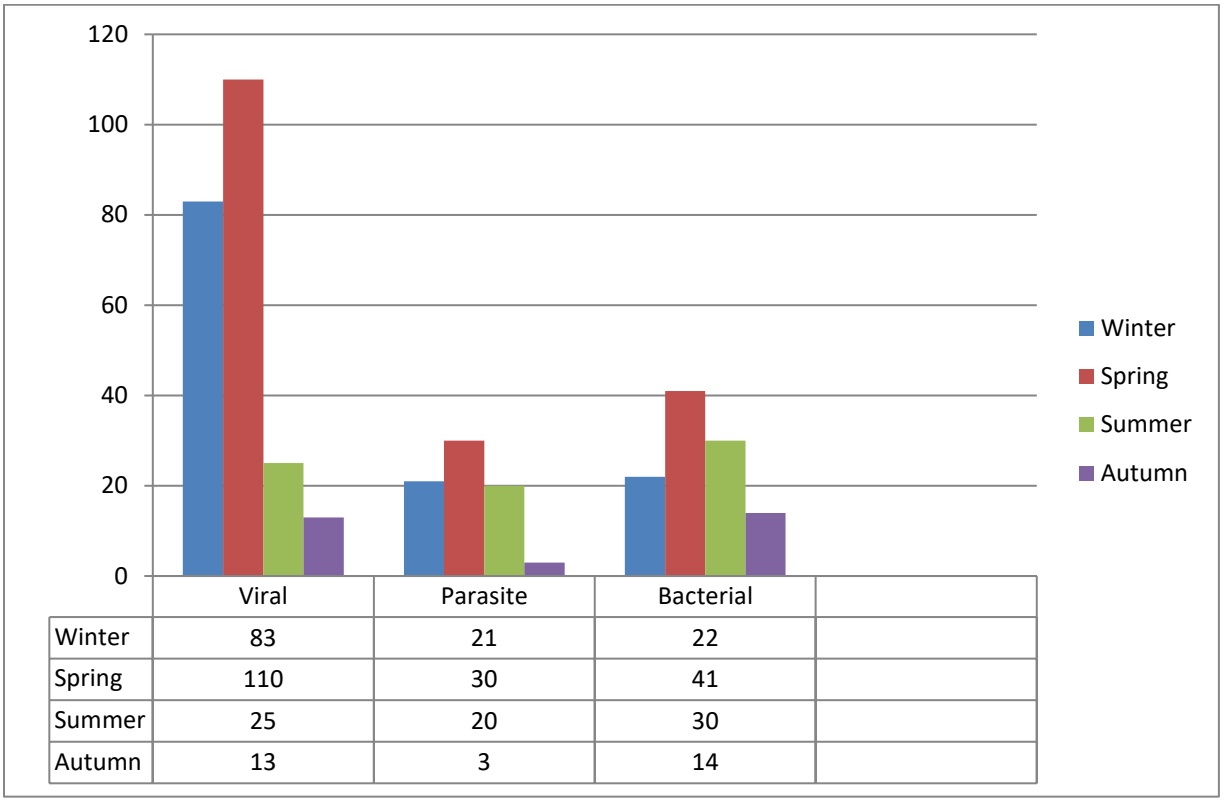
48.00±29.72 months. There were 57 patients (13.8%) between 0-24 months, 262 patients (63.6%) between 24-60 months and 93 patients (22.6%) over 60 months according to age groups. When the age groups were compared with the disease groups, there was a statistically significant difference in the incidence of viral gastroenteritis between 24-60 months (Table 1).

Table 1: Demographic characteristics of patients participating in the study

	Viral	Parasite	Bacterial	P
Gender				
• **Female**	105 (56.8%)	35 (18.9%)	45 (24.3%)	0.760
• **Male**	126 (55.5%)	39 (17.2%)	62 (27.3%)	
The average age (month)	40.95±21.98	57.08±32.91	57.06±37.19	**0.001**
Age Groups				
• **0-24 month**	38 (66.7%)	5 (8.8%)	14 (24.6%)	
• **24-60 month**	160 (61.1%)	44 (16.8%)	58 (22.1%)	**0.001**
• **>60 month**	33 (35.5%)	25 (26.9%)	35 (37.6%)	
Seasonal distribution				
• **Winter**	83 (65.9%)	21 (16.7%)	22 (17.5%)	
• **Spring**	110 (60.8%)	30 (16.6%)	41 (22.7%)	**0.001**
• **Summer**	25 (33.3%)	20 (26.7%)	30 (40.0%)	
• **Autumn**	13 (43.3%)	3 (10.0%)	14 (46.7%)	
Symptom				
• **Vomiting**	203(55.9%)	64(17.4%)	96 (26.4%)	0.794
• **Fever**	72 (61.5%)	21(17.9%)	24 (20.5%)	0.254
• **Abdominal pain**	61 (48.4%)	27(21.4%)	38 (30.2%)	0.114
Duration of hospitalization (day)	3.71±2.02	3.34±1.78	3.24±1.54	0.156

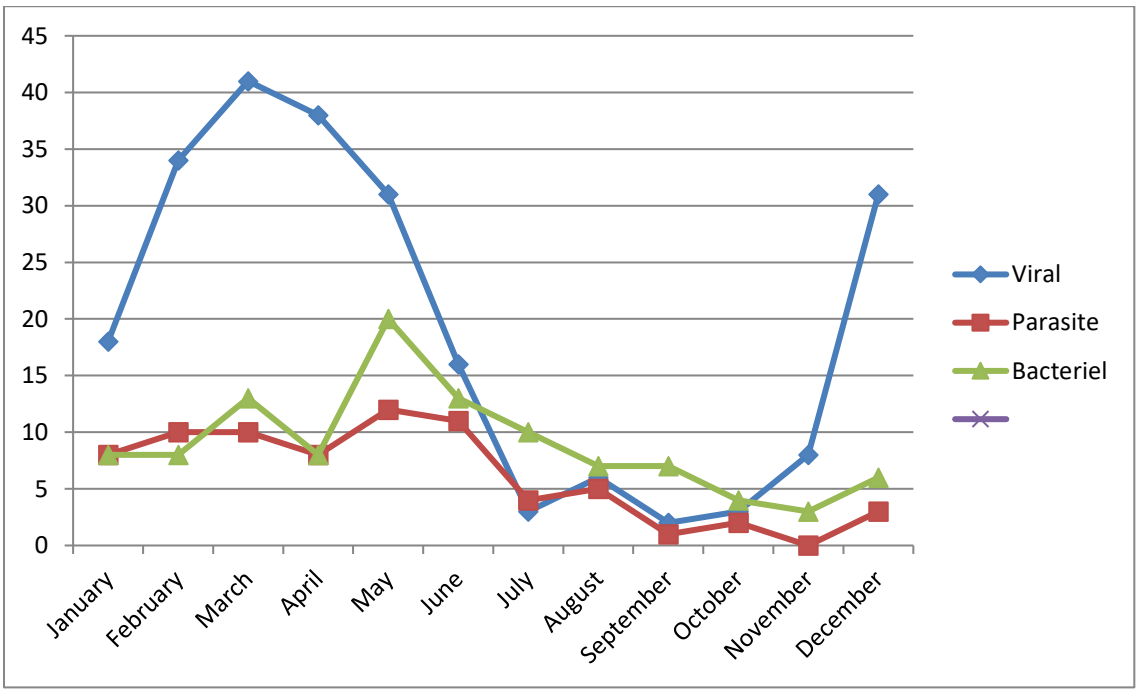
Two hundred and thirty-one (56.1%) patients had acute viral gastroenteritis, 74 (17.9%) patients had amebiasis and 107 (26.0%) patients had bacterial gastroenteritis. There was a statistically significant difference between the groups in terms of the mean age (Table 1). All (100%) patients complained of diarrhea when they were admitted to the hospital. Three hundred and sixty-three (88.1%) patients had vomiting, 126 (30.6%) patients had abdominal pain and 117 (28.4%) patients had fever. There was no statistically significant difference between the groups in terms of the symptoms ($p>0.05$).

It was observed that the patients were hospitalized more in the spring and winter months. There was a statistically significant difference between the groups in terms of the seasons (p:0.001). The distribution of the patients participating in the study according to the seasons and months is shown in Figur 1 and 2.



	Viral	Parasite	Bacterial	
Winter	83	21	22	
Spring	110	30	41	
Summer	25	20	30	
Autumn	13	3	14	

Figur 1: The distribution of the patients participating in the study according to the seasons



Figur 2: The distribution of the patients participating in the study according to the months

When they were hospitalized, 39 (9.46%) patients had severe dehydration and 246 (59.70%) patients had moderate dehydration. Four (0.97%) patients had hypernatremia (sodium>145 mEq/L) and 47 (11.40%) patients had hyponatremia (sodium<132 mmol/L). Seventeen (4.12%) patients had prerenal insufficiency (BUN> 42 mg/dL). Two hundred and twenty-two (53.88%) patients had elevated AST levels and 44 (10.67%) patients had elevated ALT levels. When the mean AST and ALT levels were compared between the groups, there was a statistically significant difference between the patients with viral gastroenteritis (p:0.001). One hundred and fifty-one (36.65%) patients with rotavirus gastroenteritis had elevated AST levels and 32 (7.76%) patients with rotavirus gastroenteritis had elevated ALT levels. Five patients had seizures associated with rotavirus gastroenteritis. Thirteen (3.15%) patients had neutropenia.

The mean length of hospital stay in the patients was 3.52±1.87 days. No statistically significant difference was found between the girls and boys in terms of the mean length of hospital stay (p:0.420). The mean length of hospital stay was 3.71±2.02 days, 3.34±1.78 days and 3.24±1.54 days in the groups, respectively. There was no statistically significant difference between the groups in terms of the mean length of hospital stay (p:0.165). There was a statistically significant difference in the group over 60 months compared to other age groups in terms of the mean length of hospital stay (p:0.046).

Complete blood count, electrolyte levels, renal and liver functions and CRP levels were investigated. The laboratory data of our patients are shown in Table 2. There was a statistically significant difference between the groups in terms of MCV value, platelet count, CRP level, BUN level, creatinine level, and AST and ALT levels. When mean CRP levels were compared between the groups, there was a statistically significant difference in the patients with bacterial gastroenteritis (p:0.001). There was no statistically significant difference between the groups in terms of WBC count, hemoglobin level, hematocrit level, neutrophil count, lymphocyte count, and Na, K, and Ca levels. There was a statistically significant difference between the age groups in terms of WBC count, hemoglobin level, MCV value, platelet count, neutrophil count, lymphocyte count, CRP level, BUN level, creatinine level, K and Ca levels, and AST and ALT levels. There was no statistically significant difference between the age groups in terms of Na level and hematocrit level. The laboratory results according to the age groups are shown in Table 3. When the mean length of hospital stay in the patients was compared with BUN

and creatinine levels, Na and K levels, and AST level, there was no statistically significant difference according to the correlation test. However, there was a statistically significant correlation between the mean length of hospital stay and platelet count, neutrophil count, lymphocyte count, ALT level (p:0.004, r:141, p:0.020, r:114, p:0.001, r:215, p:0.006, r:135, respectively).

Table 2: Laboratory data of patients participating in the study

	Grup 1	**Grup 2**	**Grup 3**	**P**
WBC	10.21±3.90	11.88±5.67	11.32±4.78	0.068
Hemoglobin	12.14±1.18	12.46±1.46	12.31±1.52	0.146
Hemotocrit	36.30±3.12	37.04±3.83	36.45±3.66	0.316
MCV	73.38±4.77	74.87±5.11	74.92±6.50	**0.001**
Platelet	376.57±123.97	371.25±128.98	344.92±115.13	**0.033**
Neutrophil	5.35±3.38	6.74±5.42	6.62±4.94	0.144
Lymphocyte	3.78±2.63	3.82±2.98	3.49±2.38	0.495
CRP	9.62±14.45	16.92±26.10	48.45±60.35	**0.001**
Urea	24.33±12.05	23.93±10.77	19.86±9.47	**0.002**
Creatinine	47±0.11	49±0.12	0.50±0.12	**0.006**
Na	135.35±3.39	135.23±2.73	135.14±2.83	0.931
K	4.22±0.49	4.30±0.61	4.11±0.58	0.110
Ca	9.71±0.52	9.74±0.55	9.68±0.53	0.717
AST	47.00±18.66	42.42±19.61	39.13±21.20	**0.001**
ALT	26.77±19.07	20.88±15.11	22.04±16.58	**0.001**

Table 3: Laboratory results according to age groups of patients

	0-24 month	**25-60 month**	**>60 month**	**P**
WBC	12.20±4.07	10.36±4.34	11.20±5.14	**0.013**
Hemoglobin	11.59 ±1.42	11.59±1.17	13.42±1.24	**0.001**
Hemotocrit	34.36±3.51	35.958±2.79	39.224±3.31	0.139
MCV	75.48±7.02	72.84±5.00	76.56±3.99	**0.001**
Platelet count	424.98±125.64	374.21±130.20	312.90±69.38	**0.001**
Neutrophil	5.00±3.83	5.25±3.71	8.40±5.08	**0.001**
Lymphocyte	5.82±3.10	3.93±2.49	1.80±0.99	**0.001**
CRP	19.18±24.19	19.64±32.37	9.73±51.96	**0.001**
Urea	19.47±16.58	22.56±10.32	26.82±9.08	**0.001**
Creatinine	0.45±0.11	0.45±0.09	0.57±0.12	**0.001**
Na	136.07±4.33	136.07±2.86	136.07±2.95	0.730
K	4.42±0.80	4.19±0.46	4.11±0.53	**0.002**
Ca	9.96±0.62	9.68±0.52	9.63±0.45	**0.001**
AST	48.84±23.08	46.05±19.63	35.84±15.29	**0.001**
ALT	27.25±19.18	25.68±19.64	19.41±9.73	**0.007**

Two hundred and fourteen (51.9%) patients with acute viral gastroenteritis were positive for rotavirus antigen, and 27 (6.6%) patients with acute viral gastroenteritis were positive for adenovirus antigen. Ten (2.4%) patients with acute viral gastroenteritis were positive for both rotavirus and adenovirus antigens. One hundred and eighteen (55.1%) of the patients who had rotavirus antigen in the stool samples were male, and 96 (44.9%) were female. No statistically significant difference was found between the girls and boys in terms of rotavirus positivity (p:0.980). 85.55% (n:183) of rotavirus antigen-positive stool samples were detected in the children under 5 years. There was a statistically significant difference in the children aged 0-24 and 24-60 months compared to the children over 60 months in terms of viral gastroenteritis (Table 1).

When rotavirus-antigen positivity was evaluated according to the seasons, it was lowest in the summer and autumn months and it was highest in February, March and May. When the distribution of the patients was examined according to the seasons, 47.66% (n:102) of the patients with rotavirus infection were detected in the spring months and 36.44% (n:78) of the patients with rotavirus infection were detected in the winter months.

Seventeen (63.0%) of the patients who had adenovirus antigen in the stool samples were male and 10 (37.0%) were female. No statistically significant difference was found between the girls and boys in terms of adenovirus positivity ($p>0.05$). It was found that 10 (2.4%) patients were positive for both rotavirus and adenovirus antigens.

When adenovirus-antigen positivity was evaluated according to the seasons, it was lowest in the summer and autumn months and it was highest in March and April. When the distribution of the patients was examined according to the seasons, 59.25% (n:16) of the patients with adenovirus infection were detected in the spring months.

In stool cultures obtained from the patients with acute bacterial gastroenteritis, 5 patients had E. coli, 3 patients had C. jejuni, 1 patient had S. typhimurium, and 1 patient had Shigella.

57 (13.8%) patients developed secondary infection. Forty (70.2%) of these were viral gastroenteritis, 8 (14.0%) were amebic gastroenteritis and 9 (15.8%) were bacterial gastroenteritis. There was a statistically significant difference between the groups in terms of the development of secondary infection (p:0.01).

Discussion

Acute gastroenteritis is among the most common diseases in the world, especially in developing countries. It is one of the diseases that maintain their importance today in terms of public health (8). Acute gastroenteritis is common in developing countries, usually in children under 5 years of age. It has higher morbidity and mortality rates especially in children under 2 years of age (9). It is known that the incidence of infectious gastroenteritis, which is common in infancy and early childhood, peaks between 6 months to 18 months and that children under 3 years of age experience one-to-two separate episodes of diarrhea per year (9). It is reported that diarrheal diseases are responsible for 8.4% of child deaths between 0-14 years in our country (10). The distribution of ages of our patients ranged from 0 to 16 years. In parallel to the studies conducted, it was found that acute gastroenteritis was more frequent in the first 5 years when the hospitalized patients wer examined according to age groups. In our study, the total number of the patients hospitalized for various reasons during the 12-month study period was 3985, and the patients hospitalized for diarrhea constituted 10.33% of it.

30-65% of the causative agents can be determined in patients presenting with acute gastroenteritis (11). In a study conducted in Denmark, it was reported that the causative agent of diarrhea could be detected in 54% of the patients who were admitted to polyclinic due to diarrhea (12). However, the exact incidence of acute gastroenteritis and the distribution of the causative agents are not known precisely because all of patients with acute gastroenteritis do not apply to hospital and it is not recommended to investigate the causative agent by taking stool samples from every patient who is admitted to hospital (2,9).

It is known that viruses play an important role in the etiology of infectious diarrhea and that rotaviruses are responsible for 11-71% of viral gastroenteritis cases (7). In our study, when the causative agents of acute gastroenteritis were examined, it was seen that 56.1% were viral pathogens, 17.9% were parasitic pathogens and 26.0% were bacterial pathogens.

The incidence of rotavirus gastroenteritis in different parts of Turkey has been reported as 10-30%. In studies conducted in a region with a low socioeconomic level in Ankara, the incidence of rotavirus was found to be 29% and 22.7%, respectively (13,14). In studies carried out in various regions of Turkey, rotavirus positivity was found to be 39.8% in Izmir, 21% in Malatya, 25.7% in Kahramanmaras, 29.1% in Ankara and 32% in Istanbul, respectively (4,15-18). In our study, 51.9% of 412 children with acute diarrhea had rotavirus infection. It is noteworthy that 85.55% (n:183) of the patients who were positive for rotavirus antigen in stool samples were under 5 years of age.

It has been reported that enteric adenoviruses were responsible for 3-15% of childhood acute gastroenteritis (19). Akıncı et al. reported that adenovirus positivity was 14.9% in 307 children with acute gastroenteritis between 0-14 years. Gul et al. reported that adenovirus positivity was 4.7% in 148 children with acute gastroenteritis between 0-5 years (4). In our study, adenovirus was detected in 6.6% of the patients with acute gastroenteritis. Moreover, 2.4% of the patients with acute gastroenteritis were positive for both rotavirus and adenovirus antigens.

G. intestinalis and E. histolytica continue to be a problem in patients with diarrhea in our country. In studies conducted in various countries, it has been reported that the incidence of parasitic agents in acute gastroenteritis varies between 2% and 25% depending on age group, climate and environmental hygiene (19). It has been reported that the incidence of G. intestinalis varies between 4.7% and 17% in studies performed in different regions of our country (20). In our study, as a result of parasitological examination of stool samples taken from 412 patients with acute gastroenteritis, it was determined that 17.9% of the patients had parasitic infection. It was observed that the incidence of parasitic agents was low in children under 24 months and the increase with age was statistically significant.

Bacterial diarrhea is seen mostly in the summer months in Turkey and in countries with similar climatic conditions. In general, inadequate hygiene conditions, drinking water sources, sewerage systems and low socio-economic status lead to bacterial diarrhea. In our study, bacterial agents were present in 26.0% of the patients with acute gastroenteritis. It has been reported that the incidence of Campylobacter varies between 1% and 13% in acute bacterial gastroenteritis in our country. Moreover, it was reported in many studies that it was isolated at higher rates than Salmonella and Shigella species (21). Tas et al. reported that Campylobacter was isolated in 3.5% of 200 patients with diarrhea (22). Ongen et al. reported that Campylobacter was isolated in 1.2% of 6835 patients with diarrhea (23). In our study, Campylobacter was detected in 2.8% of the patients. Our results were consistent with the results of other studies conducted in our country.

Acute gastroenteritis is an extensive clinical disease which ranges from vomiting and mild, short-term diarrhea to fluid loss, dehydration and severe gastroenteritis. Vomiting, diarrhea and dehydration are more common in rotavirus gastroenteritis. In a study performed by Coffin et al., they showed that vomiting, fever and diarrhea were more associated with rotavirus gastroenteritis (24). However, we did not found any difference in terms of symptoms in our study.

The most common cause of hospitalization and mortality in children with acute diarrhea is dehydration (25). In our study, 39 (9.46%) patients had severe dehydration and 246 (59.70%) patients had moderate dehydration. The lower dehydration rate in our patients and the absence of death can be explained by the fact that the socio-economic levels of the families who were admitted to our hospital were high and therefore especially young children with diarrhea were brought to the hospital in early periods.

Examination of serum electrolyte levels is not recommended in all of acute diarrheal patients (26). Serum electrolyte levels are recommended to be analyzed if there is severe dehydration, if the number of vomiting and defecation is higher and the patient has a history of taking hypotonic or hypertonic fluid (27). However, in a study performed by Yılmaz et al. in our country, it was found that the degree of dehydration correlated positively and negatively with serum urea and bicarbonate values, respectively; however, no such correlation was found with electrolyte levels (28). In this study, hypernatremia was also detected in the patients with mild dehydration. However, since biochemical

abnormalities detected in patients with dehydration improve with standard therapy, electrolyte monitoring is recommended for the above indications. In our study, 4 patients had hypernatremia and 47 patients had hyponatremia.

The seasonal distribution of viral infections from acute gastroenteritis is well known. In various studies conducted in patients with rotavirus gastroenteritis in our country and in the world, it has been reported that this infection typically begins in early autumn and continues until the beginning of spring and also is seen during the winter months in Europe (29). In our country, which has a temperate climate, its incidence begins to increase at the beginning of October and ends in May (10). It is seen more frequently during the winter and spring months. In studies conducted in our country, it was reported that rotavirus infection was most frequently seen in March (14.8%-20.1%) and this was followed by January (14.4%-20.6%) (30). In this study, in accordance with our country's data, it was observed that the incidence of rotavirus gastroenteritis began to increase in the autumn months and peaked in February, March and May. In our study, 47.66% (n:102) of the patients with rotavirus infection were detected in the spring months and 36.44% (n:78) of the patients with rotavirus infection were detected in the winter months. It was seen that all patients with acute gastroenteritis were hospitalized mostly in the spring and winter months.

Rotavirus can cause hepatitis, nephritis, pneumonia, exanthema, DIC and neurological complications (such as encephalitis, cerebellitis and convulsion) in addition to dehydration (31). Some authors have reported that serum transaminase levels increased in some patients with rotavirus gastroenteritis (32). In a study of Kovacs et al., they found that 60% of patients had elevated AST levels and 72% of patients had elevated ALT levels (32). In our study, 151 (36.65%) patients with rotavirus gastroenteritis had elevated AST levels and 32 (7.76%) patients with rotavirus gastroenteritis had elevated ALT levels. 5 patients had seizures associated with rotavirus gastroenteritis.

Besides the clinical presentation of rotavirus infection is more severe than other causative agents of diarrhea, the duration of hospitalization is higher. The disease limits itself in 4-8 days. Chen et al. found that the mean length of hospital stay was 5 days for both rotavirus and adenovirus infections (33). In our study, there was no statistically significant difference between the groups in terms of the mean length of hospital stay.

There is a limited number of studies on the relationship between infectious diarrhea and neutropenia in children (34). Greenberg et al. found that 10% of children hospitalized due to rotavirus gastroenteritis had neutropenia (34). In a study of Dalgic et al., it was found that 2.54% of patients with rotavirus gastroenteritis had neutropenia (35). In our study, 3.15% of the patients had neutropenia.

Rotavirus is transmitted mainly by the fecal-oral route and is highly contagious. The contagiousness of the patients begins shortly before the onset of symptoms and continues until 8-12 days later. Because incubation period is 1-3 days; rotavirus positivities, which are detected three days after the hospitalization, are considered as a nosocomial infection (36). Yasa et al. reported that 42% of 73 children with gastroenteritis had a nosocomial infection (37). In our study, this rate was determined

as 13.8% and is lower compared to other studies. The reason for this is that our hospital gives a great importance on cleaning measures.

Consequently, patients hospitalized due to acute diarrhea and dehydration remain a problem in countries where the infant mortality rate is high, which is the case in our country. As in our study, the majority of children hospitalized due to acute gastroenteritis have viral gastroenteritis. The most important component of diarrhea treatment is the detection and treatment of dehydration. Rapid and reliable detection of viral antigens would prevent unnecessary antibiotic use.

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