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ORIGINAL ARTICLE
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Etiological Profile, Clinical Characteristics, and Mean Platelet Volume in Children with Acute Gastroenteritis: A Retrospective Cohort Study

Akut Gastroenteritli Çocuklarda Etiyolojik Profil, Klinik Özellikler ve Ortalama Trombosit Hacmi: Retrospektif Bir Kohort Çalışması

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ABSTRACT

Aim: Acute gastroenteritis (AGE) remains a common cause of pediatric morbidity and healthcare use. This study evaluated etiological agents, clinical characteristics, laboratory findings, complications, and the potential role of mean platelet volume (MPV) in children with AGE.

Material and Method: In this retrospective study, 630 children aged 0-17 years who were diagnosed with AGE between January 2013 and December 2019 at a tertiary university hospital were reviewed. Only patients with a confirmed etiological diagnosis and no chronic systemic disease were included. Demographic data, clinical findings, laboratory parameters, stool analyses, treatment characteristics, and complications were analyzed according to etiological groups.

Results: Rotavirus was the most frequently identified pathogen (27.5%), followed by Entamoeba histolytica (24.6%), rotavirus-adenovirus co-infection (21.3%), adenovirus (10.6%), Giardia intestinalis (8.4%), and Clostridioides difficile (7.6%). Cases were most frequent in winter (46.4%). Viral agents predominated in younger children, whereas parasitic infections were more common in older age groups. No complications occurred in 77.0% of patients; seizures (10.8%), intussusception (5.1%), hemolytic uremic syndrome (3.0%), and renal failure (1.7%) were recorded. MPV differed significantly between etiological groups, with the highest values observed in rotavirus-adenovirus co-infections and the lowest values in adenovirus-related AGE (p=0.018). CRP values did not differ significantly among etiological groups.

Conclusion: Rotavirus remained the most common etiological agent of pediatric acute gastroenteritis in this cohort. Although MPV values differed significantly among etiological groups, the observed differences were modest and do not support the use of MPV as an independent diagnostic marker. Nevertheless, MPV may serve as a supportive laboratory parameter when interpreted together with clinical and microbiological findings. Accurate etiological diagnosis remains essential for guiding appropriate treatment decisions and avoiding unnecessary antibiotic use in children with acute gastroenteritis. Further prospective multicenter studies are required to clarify its diagnostic and prognostic value in pediatric acute gastroenteritis.

Keywords: Acute gastroenteritis, rotavirus, adenovirus, mean platelet volume, children, epidemiology

ÖZ

Amaç: Akut gastroenterit (AGE), çocukluk çağında sık görülen ve önemli morbiditeye neden olan enfeksiyöz hastalıklardan biridir. Bu çalışmada akut gastroenteritli çocuklarda etiyolojik etkenlerin, klinik özelliklerin, laboratuvar bulgularının, komplikasyonların ve ortalama trombosit hacminin (MPV) değerlendirilmesi amaçlandı.

Gereç ve Yöntem: Bu retrospektif çalışmada, Ocak 2013-Aralık 2019 tarihleri arasında üçüncü basamak bir üniversite hastanesinde AGE tanısı alan 0-17 yaş arasındaki 630 çocuk incelendi. Etiyolojik tanısı doğrulanmış ve kronik sistemik hastalığı bulunmayan hastalar çalışmaya dahil edildi. Demografik veriler, klinik bulgular, laboratuvar parametreleri, dışkı incelemeleri, tedavi özellikleri ve komplikasyonlar etiyolojik gruplara göre değerlendirildi.

Bulgular: En sık saptanan etken rotavirüs (%27,5) olup, bunu Entamoeba histolytica (%24,6), rotavirüs-adenovirüs koenfeksiyonu (%21,3), adenovirüs (%10,6), Giardia intestinalis (%8,4) ve Clostridioides difficile (%7,6) izledi. Olguların en sık kış mevsiminde görüldüğü belirlendi (%46,4). Viral etkenler küçük yaş gruplarında daha sık görülürken, paraziter enfeksiyonlar daha ileri yaşlarda daha yaygındı. Hastaların %77'sinde komplikasyon gelişmezken, en sık görülen komplikasyon nöbet (%10,8) idi. MPV değerleri etiyolojik gruplar arasında anlamlı farklılık gösterdi (p=0,018). En yüksek MPV değeri rotavirüs-adenovirüs koenfeksiyonlarında, en düşük değer ise adenovirüs enfeksiyonlarında saptandı. C-reaktif protein düzeyleri açısından gruplar arasında anlamlı fark bulunmadı.

Sonuç: Bu kohortta çocukluk çağı akut gastroenteritlerinin en sık etkeni rotavirüs olarak bulundu. MPV değerleri etiyolojik gruplar arasında anlamlı farklılık göstermiştir. Ancak bu çalışmada çok değişkenli lojistik regresyon analizi yapılmadığından, bu bulgular MPV'nin bağımsız bir tanısal belirteç olduğunu göstermemektedir. Bu nedenle MPV, bağımsız bir tanısal belirteçten ziyade destekleyici bir laboratuvar parametresi olarak değerlendirilmelidir. Bulguların doğrulanması için prospektif ve çok merkezli çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Akut gastroenterit, rotavirüs, adenovirüs, ortalama trombosit hacmi, çocuk, epidemiyoloji

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INTRODUCTION

Acute gastroenteritis (AGE) is generally defined as an acute reduction in stool consistency and/or an increase in stool frequency, often accompanied by vomiting or fever, with symptoms typically lasting less than 14 days. It remains an important public health problem in childhood and continues to account for substantial morbidity, mortality, and healthcare use worldwide (1,2). According to the World Health Organization, diarrhoeal disease is a leading cause of childhood morbidity and remains the third leading cause of death among children aged 1-59 months (1). Recent Global Burden of Disease estimates also show that diarrhoeal diseases have declined markedly since 1990 but continue to impose a substantial burden, particularly in young children and in settings with limited access to safe water, sanitation, and timely rehydration therapy (2).

AGE is most commonly infectious in origin and is transmitted mainly through the fecal-oral route via contaminated food, water, surfaces, or close contact. Viral pathogens, especially rotavirus and enteric adenovirus, remain major causes of pediatric AGE, although bacterial and parasitic agents also contribute and their relative frequencies vary by geography, season, age, vaccination status, and diagnostic method (3-8). Rotavirus vaccination has substantially reduced severe rotavirus disease and rotavirus-associated hospitalizations in many countries; nevertheless, rotavirus continues to be identified among children with AGE, particularly where vaccine coverage is incomplete or where children are too young or ineligible for vaccination (3-6).

Clinical assessment remains essential because the main treatment priorities are evaluation of hydration status, oral or intravenous rehydration when indicated, correction of electrolyte disturbances, and selective use of antimicrobial therapy. Etiological confirmation can help avoid unnecessary antibiotics, guide infection control measures, and support prognosis (9-11). However, etiological testing is not always immediately available, and clinicians often rely on clinical features and laboratory parameters such as white blood cell count, C-reactive protein (CRP), platelet count, and platelet indices.

Mean platelet volume (MPV) is an inexpensive complete blood count parameter that reflects platelet size and activation. Platelet indices have been investigated in a variety of inflammatory and infectious conditions, including pediatric AGE, but published findings remain inconsistent and limited (12-16). Therefore, this study aimed to evaluate etiological agents and clinical and laboratory differences among children aged 0-17 years with AGE and to assess whether MPV may contribute to the clinical evaluation and follow-up of pediatric AGE.

Despite the extensive literature on pediatric acute gastroenteritis, studies evaluating the relationship between etiological agents and mean platelet volume (MPV) remain limited and have yielded inconsistent results. Furthermore, regional epidemiological data continue to evolve because of changing vaccination coverage, environmental factors, and diagnostic practices. Therefore, the present study aimed to investigate the etiological distribution, clinical characteristics, laboratory findings, complications, and potential role of MPV among children diagnosed with acute gastroenteritis at a tertiary care center

MATERIAL AND METHOD

Ethics statement

Ethical approval was obtained from the Local Institutional Ethics Committee (approval number: 050.01.04, 2017). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Because of the retrospective design, the requirement for informed consent was waived by the ethics committee. This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.

Study design and population

This retrospective cohort study was conducted at a tertiary care university hospital. The medical records of children aged 0–17 years who were evaluated for acute gastroenteritis in the pediatric outpatient clinics, emergency department, or inpatient wards between January 2013 and December 2019 were reviewed. The study therefore included both outpatients and hospitalized patients.

Patients with an etiologically confirmed diagnosis of acute gastroenteritis and without a chronic underlying systemic disease were included. Patients with incomplete medical records, chronic systemic diseases, or no confirmed etiological diagnosis were excluded. A total of 630 children who met the eligibility criteria were included in the final analysis.

Data collection

Demographic characteristics, including age and sex, were recorded. Clinical findings, including fever, vomiting, dehydration, hospitalization, treatment approaches, antibiotic and probiotic use, and complications, were obtained from the hospital information system and patient files. Complications recorded during the disease episode included seizures, intussusception, hemolytic uremic syndrome, renal failure, and other less frequent events.

Etiological evaluation

Stool samples were evaluated for viral agents (rotavirus and adenovirus), parasitic agents (Entamoeba histolytica and Giardia intestinalis), and bacterial agents (Clostridioides difficile). Etiological diagnosis was based on antigen detection tests, microscopic examination, and culture or toxin-based methods routinely used by the institutional microbiology laboratory during the study period.

Laboratory analysis

Complete blood count parameters, including white blood cell count, neutrophil count, lymphocyte count, platelet count, and mean platelet volume (MPV), as well as serum C-reactive protein (CRP) levels, were retrieved from the hospital records. Stool samples were examined by direct microscopy and tested for rotavirus, adenovirus, and Entamoeba histolytica. Stool culture results and Clostridioides difficile toxin A/B test results, when available, were also reviewed. Only laboratory findings obtained during the acute episode of gastroenteritis were included in the analysis.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was used to assess normality. Continuous variables were expressed as mean+/-standard deviation or median (minimum-maximum), as appropriate. Categorical variables were presented as number and percentage. For comparisons between groups, the independent-samples t-test or one-way analysis of variance was used for normally distributed variables, and the Mann-Whitney U test or Kruskal-Wallis test was used for non-normally distributed variables. The chi-square test was used for categorical variables. Post hoc analyses were performed with Tukey or Dunn tests where appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Patient characteristics

A total of 630 children with microbiologically confirmed acute gastroenteritis were included in the study. The mean age was 74.39 ± 53.17 months, and the median age was 59 months (range, 1–216 months). There were 347 (55.1%) boys and 283 (44.9%) girls. According to age groups, 111 (17.6%) were neonates/infants, 257 (40.9%) were preschool children, 168 (26.6%) were school-age children, and 94 (14.9%) were adolescents in **Table 1**. Overall, 42.5% of the patients required hospitalization.

Table 1. Baseline Characteristics of the Study Population

Characteristic	Value
Total number of patients	630
Age, months (mean ± SD)	74.39 ± 53.17
Age, months (median, range)	59 (1–216)
Male, n (%)	347 (55.1)
Female, n (%)	283 (44.9)
Age groups, n (%)	
Neonates/Infants, n (%)	111 (17.6)
Preschool children, n (%)	257 (40.9)
School-age children, n (%)	168 (26.6)
Adolescents, n (%)	94 (14.9)
Hospitalized patients, n (%)	268 (42.5)

Abbreviations: n, number of patients; SD: standard deviation

Treatment Characteristics

Information on antibiotic use was available for 625 patients. Among these, 170 (27.2%) received antibiotic therapy, whereas 455 (72.8%) did not receive antibiotics.

Etiological Distribution

Rotavirus was the most frequently identified etiological agent, accounting for 173 (27.5%) of all cases. This was followed by Entamoeba histolytica in 155 (24.6%) patients, rotavirus–adenovirus co-infection in 134 (21.3%), adenovirus in 67 (10.6%), Giardia intestinalis in 53 (8.4%), and Clostridioides difficile in 48 (7.6%) patients (**Table 2**, **Figure 1**).

Table 2. Etiological Distribution of Acute Gastroenteritis

Etiological agent	n	%
Rotavirus	173	27.5
E. histolytica	155	24.6
Rotavirus + adenovirus	134	21.3
Adenovirus	67	10.6
Giardia intestinalis	53	8.4
Clostridioides difficile	48	7.6
Total	630	100.0

n: number of patients; %: percentage

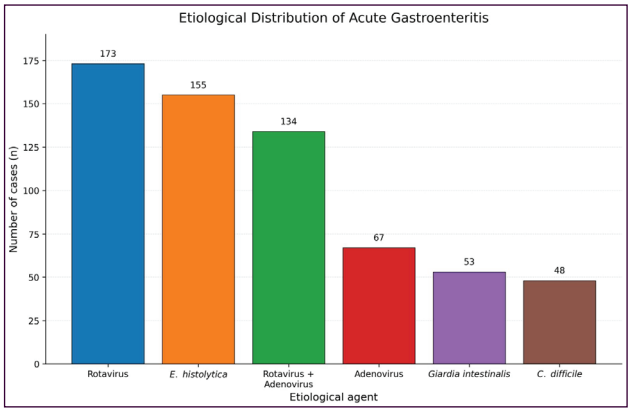

Figure 1. Etiological distribution of acute gastroenteritis. Rotavirus was the most common pathogen, followed by E. histolytica and rotavirus-adenovirus co-infection.

Seasonal distribution

Seasonal distribution is summarized in **Table 3**. AGE cases were most frequent in winter (46.4%), followed by summer (28.2%), spring (14.6%), and autumn (10.6%). Viral infections were predominantly observed during winter months, whereas parasitic infections increased during warmer seasons.

Table 3. Seasonal Distribution of Cases

Season	n	%
Winter	292	46.4
Spring	92	14.6
Summer	178	28.2
Autumn	68	10.6
Total	630	100.0

n: number of patients; %: percentage

Age-related distribution

Viral agents were more frequently observed in younger children, whereas parasitic infections were more common in older age groups. This age-related distribution differed significantly between etiological groups ($p<0.05$).

Laboratory findings

Laboratory findings according to etiological agents are shown in **Table 4**. MPV differed significantly among etiological groups ($p=0.018$). The highest MPV values were observed in patients with rotavirus–adenovirus co-infection, whereas the lowest values were observed in patients with adenovirus infection. No inference regarding an independent association between MPV and etiological diagnosis can be made based on these findings alone. CRP levels did not differ significantly among etiological groups ($p>0.05$). Other hematological parameters, including white blood cell and platelet counts, showed variability but did not demonstrate consistent diagnostic superiority.

Table 4. Mean Platelet Volume (MPV) Values According to Etiological Agents

Etiological Agent	MPV (fL) Mean± SD
Rotavirus	7.54±2.20
Adenovirus	7.19±1.89
Giardia intestinalis	7.57±1.67
Clostridioides difficile	7.71±1.37
Entamoeba histolytica	7.83±5.83
Rotavirus & Adenovirus	7.85±1.87
p-value	0.018

MPV, mean platelet volume, SD: standard deviation, fL: femtoliter

Complications

Complications are shown in **Table 5**. No complications were observed in 77.0% of patients. Among patients with complications, seizures were the most common (10.8%), followed by intussusception (5.1%), hemolytic uremic syndrome (3.0%), and renal failure (1.7%). Other complications were rare (1.4%).

Table 5. Complications Observed in Patients

Complication	n	%
None	485	77.0
Seizures	68	10.8
Intussusception	32	5.1
Hemolytic uremic syndrome	19	3.0
Renal failure	11	1.7
Others	9	1.4

n: number of patients; %: percentage

DISCUSSION

In this retrospective cohort of 630 children with etiologically confirmed AGE, rotavirus was the most frequently identified pathogen, followed by E. histolytica and rotavirus-adenovirus co-infection. The predominance of rotavirus is consistent with many pediatric studies showing that viral agents remain common causes of AGE, especially in younger children and during colder months (3-8,17-21). A recent Turkish study evaluating stool samples from children with suspected AGE between 2020 and 2023 similarly found rotavirus more frequently than enteric adenovirus and emphasized early viral diagnosis to reduce unnecessary antibiotic use (21). The hospitalization rate in our cohort was relatively high, probably reflecting the tertiary care setting of our institution. In addition, although viral pathogens predominated, antibiotic therapy was administered to a proportion of patients, highlighting the importance of accurate etiological diagnosis to reduce unnecessary antibiotic use.

These findings are consistent with recent studies from Türkiye, which also reported that viral pathogens, particularly rotavirus, remain the predominant cause of pediatric acute gastroenteritis and emphasized the importance of timely etiological diagnosis for appropriate patient management (22-23).

The seasonal pattern observed in this study was compatible with the known epidemiology of viral gastroenteritis. Nearly half of the cases occurred in winter, and viral agents predominated in younger children. By contrast, parasitic infections were more common in older age groups and were relatively more frequent during warmer seasons. Regional differences in sanitation, water exposure, childcare attendance, diagnostic methods, and healthcare-seeking behavior may explain variations between studies (7,8,18-24).

MPV differed significantly according to etiology, with the highest values observed in rotavirus–adenovirus co-infections and the lowest values in adenovirus infections. Although statistically significant differences were observed among etiological groups, the present study was not designed to determine

whether MPV is independently associated with any specific etiological agent. Therefore, these findings should be interpreted as descriptive comparisons between groups rather than evidence of an independent association. Accordingly, MPV should be regarded as a supportive laboratory parameter rather than an independent diagnostic marker for determining the etiology of acute gastroenteritis in children. Recent pediatric studies have also demonstrated significant differences in MPV and other readily available hematological indices among children with different etiologies of acute gastroenteritis, supporting their potential role as complementary laboratory parameters (22).

CRP did not differ significantly between etiological groups. This finding supports the concept that conventional inflammatory markers have limited discriminatory value in many children with AGE, particularly when viral disease predominates (9-11). Clinical evaluation, hydration assessment, stool testing in selected patients, and careful interpretation of laboratory findings remain necessary for appropriate management. Current pediatric AGE management emphasizes oral rehydration therapy for most children, intravenous fluids for severe dehydration or failed oral rehydration, continued feeding, and selective antimicrobial therapy based on suspected or confirmed bacterial or parasitic infection (9-11,25).

The majority of patients had an uncomplicated course. However, seizures, intussusception, hemolytic uremic syndrome, and renal failure were recorded. These complications underline the need for close monitoring in children with severe dehydration, neurologic symptoms, bloody diarrhea, persistent vomiting, renal dysfunction, or systemic toxicity. The relatively high hospitalization rate in this study may be explained by the tertiary referral setting and by the inclusion of patients with confirmed etiological diagnoses, who may represent a more clinically selected group than children managed in primary care.

This study has several limitations. First, its retrospective design may have resulted in incomplete data collection and limited control over timing of laboratory tests. Second, it was conducted in a single tertiary center, which may limit generalizability. Third, molecular multiplex testing was not uniformly available throughout the study period, and some viral or bacterial agents, including norovirus, astrovirus, sapovirus, Campylobacter, Salmonella, and Shigella, may have been underdetected. Finally, MPV was analyzed using routinely collected complete blood count data; therefore, preanalytical variation could not be fully excluded.

Despite these limitations, the study provides useful regional data on the etiological distribution and clinical course of pediatric AGE and suggests that MPV may be a supportive, rather than definitive, laboratory marker. Prospective multicenter studies using standardized molecular diagnostics and predefined laboratory sampling intervals are needed to clarify the clinical utility of MPV in pediatric AGE.

Although MPV differed significantly among etiological groups, the magnitude of the observed difference was relatively small. Therefore, MPV alone is unlikely to provide sufficient discriminatory power for routine etiological diagnosis. Nevertheless, as an inexpensive and readily available parameter obtained from routine complete blood counts, MPV may provide additional information regarding the inflammatory response in children with acute gastroenteritis.

CONCLUSION

Rotavirus remained the most common etiological agent of pediatric acute gastroenteritis in this cohort. Although MPV values differed significantly among etiological groups, the observed differences were modest and do not support the use of MPV as an independent diagnostic marker. Nevertheless, MPV may serve as a supportive laboratory parameter when interpreted together with clinical and microbiological findings . Accurate etiological diagnosis remains essential for guiding appropriate treatment decisions and avoiding unnecessary antibiotic use in children with acute gastroenteritis. Further prospective multicenter studies are required to clarify its diagnostic and prognostic value in pediatric acute gastroenteritis.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study was approved by Selçuk University Non-interventional Clinical Research Ethics Committee (Date: 22.11.2017; Decision no: 2017/339).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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