Adherence to Clinical Practice Guidelines on the Management of Acute Gastroenteritis in Children (A cross-sectional observational study)

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Abstract

Acute gastroenteritis (AGE) remains a significant pediatric health issue. This study evaluates adherence to clinical guidelines in the management of AGE in hospitalized children at Alhadba Alkhdra Teaching Hospital, Tripoli, Libya. A cross-sectional observational study of 150 children aged 6 months to 14 years admitted for AGE between January and October 2024. Data on clinical presentation, management, and outcomes were collected and analyzed using SPSS version 25. Descriptive statistics, chi-square tests, and logistic regression were applied. The mean age was (35.3 months). Diarrhea (100%) and Vomiting (98.6%) were the most common symptoms. Mild dehydration was present in (77.3%). Intravenous fluids were administered to (99.3%), while (19.3%) received ORS before admission. Antibiotics were used in (39.3%), significantly associated with positive inflammatory markers ($p < 0.001$). Prolonged hospital stay (>5 days) was linked to complications ($p = 0.008$) and longer symptom duration before admission ($p = 0.004$). Intravenous fluid use adhered to guidelines for moderate/severe dehydration, but Oral Rehydration Solution (ORS) use was suboptimal. Antibiotic administration largely aligned with clinical indications. Early recognition and adherence to guidelines could reduce hospital stay and complications.
Keywords: Acute gastroenteritis, Guideline adherence, Pediatrics, Hospitalization, Antibiotic stewardship.

مدى الالتزام بالإرشادات السريرية في علاج التهاب المعدة والأمعاء الحاد عند الأطفال: دراسة ميدانية مقطعية

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الملخص

تظل الإصابة بالنزلة المعوية الحادة (AGE) من المشكلات الصحية الهامة لدى الأطفال. تهدف هذه الدراسة إلى تقييم مدى الالتزام بالإرشادات السريرية في علاج النزلة المعوية الحادة لدى الأطفال الذين تم ايوائهم داخل مستشفى الهضبة الخضراء التعليمي، طرابلس، ليبيا. وقد أجريت دراسة مقطعية رصدية (وصفية تحليلية) شملت 150 طفلًا تتراوح أعمارهم بين 6 أشهر و14 سنة، أُدخلوا إلى المستشفى بسبب الإصابة بالنزلة المعوية الحادة خلال الفترة من يناير إلى أكتوبر 2024. جُمعت البيانات حول الاعراض السريرية، وأساليب العلاج، والنتائج، وتم تحليل البيانات باستخدام برنامج SPSS الإصدار 25. طُبِّقت الإحصاءات الوصفية، واختبار كاي تربيع، والانحدار اللوجستي.بلغ متوسط العمر (35.3 شهرًا). وكان الإسهال (100%) والقيء (98.6%) أكثر الأعراض شيوعًا. وُجد الجفاف الخفيف لدى (77.3%) من الحالات. تم إعطاء السوائل الوريدية لـ (99.3%)، في حين تلقى (19.3%) من الأطفال محلول الإماهة الفموية قبل الدخول للمستشفى. استُخدمت المضادات الحيوية في (39.3%) من الحالات، وكان استخدامها مرتبطًا بشكل كبير بوجود مؤشرات التهابية إيجابية (0.001 > P). ارتبط طول مدة البقاء في المستشفى (أكثر من 5 أيام) بحدوث المضاعفات (0.008 = p)، وطول مدة الأعراض قبل الدخول (0.004 = p). وكان استخدام السوائل الوريدية متوافقًا مع الإرشادات لعلاج الجفاف المتوسط/الشديد، لكن استخدام محلول الإماهة الفموية كان دون المستوى المطلوب. استخدام المضادات الحيوية كان في الغالب متماشيًا مع المؤشرات السريرية. يمكن للتشخيص المبكر والالتزام بالإرشادات أن يقللا من مدة البقاء في المستشفى والمضاعفات.

الكلمات المفتاحية: التهاب المعدة والأمعاء الحاد، الالتزام بالإرشادات، طب الأطفال، التنويم، ترشيد استخدام المضادات الحيوية.

1. Introduction

The World Health Organization (WHO) Guide on the Utilization of Core Drug Use Indicators in Health Facilities suggests that measuring adherence to recommended guidelines for common, well-defined health problems is a valuable indicator of quality of care [1]. The fundamental recommendations emphasize oral rehydration therapy (ORT) for children with acute gastroenteritis (AGE) experiencing mild to moderate dehydration, and intravenous rehydration for those with severe dehydration or when ORT fails [2]. However, intravenous rehydration is linked to longer hospital stays, increased return visits, adverse events, higher costs, and pain. Therefore, reducing unnecessary interventions and admissions is crucial to optimizing patient outcomes. Improvements in hygiene in developing countries, along with the introduction of rotavirus vaccination, have reduced the risk of severe gastroenteritis, hospitalization, and death due to rotavirus infection [3, 4]. Since October 2013, rotavirus vaccination has been part of the Libyan national immunization program and is routinely administered during infancy, leading to a documented decrease in the incidence and severity of rotavirus-associated gastroenteritis, although other viral and bacterial pathogens remain common [5]. Adherence to standard clinical guidelines for managing children with AGE is essential to ensure optimal treatment outcomes [6, 7, 8]. This study aims to evaluate the degree of adherence to international clinical practice guidelines in the management of pediatric acute gastroenteritis at Alhadba Alkhdra Teaching Hospital.

The objectives are to describe the clinical presentation, investigations, and management strategies used in hospitalized children with AGE; assess the extent to which these practices align with established guidelines (e.g., WHO, ESPGHAN/ESPID); identify patterns of deviation and factors associated with prolonged hospital stay and treatment variations such as overuse of intravenous fluids or antibiotics; and explore associations between adherence levels and patient outcomes, including length of hospital stay.

2. Methods and Materials

• Study Design and Setting

An observational cross-sectional study was conducted at the Pediatric Department of Alhadba Alkhdra Teaching Hospital, Tripoli, Libya, between January 1 and October 31, 2024. The

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hospital serves as a secondary referral center for pediatric care in the region.

- **Study Population**

The study included children aged 6 months to 14 years who were admitted with a diagnosis of acute gastroenteritis (AGE).

Inclusion criteria were (1) Clinical diagnosis of AGE characterized by vomiting and/or diarrhea. (2) Hospital admission due to failure of outpatient management or signs of dehydration requiring inpatient care.

Exclusion criteria included children with chronic gastrointestinal disorders, immunodeficiency, or incomplete medical records.

- **Data Collection**

Patient data were extracted from hospital medical records using a structured data collection form designed specifically for the study. The following information was collected: demographics, clinical presentation, dehydration severity, laboratory investigations, management, and outcomes.

- **Study Variables**

Primary outcome: Adherence to clinical guidelines in managing AGE (use of ORS, IV fluids, antibiotics per clinical indication).

Secondary outcomes: Complications during hospital stay and prolonged hospitalization (>5 days).

- **Data Collection Tool**

A pre-designed data abstraction sheet was used to extract clinical, laboratory, and management data from patient records. The tool was developed in alignment with the World Health Organization (WHO) and ESPGHAN/ESPID guidelines for AGE management.

- **Statistical Tool**

Statistical analyses were conducted using SPSS version 25 (IBM Corp, Armonk, NY, USA). Analyses included descriptive statistics, chi-square test, Fisher's exact test, and binary logistic regression.

- **Statistical Analysis**

Descriptive statistics were presented as means ± standard deviation (SD), medians, and proportions. The chi-square test and Fisher's exact test were used to compare categorical variables. Logistic regression analysis was performed to identify factors independently associated with prolonged hospital stay. Odds ratios (OR) and 95% confidence intervals (CI) were reported. A p-value of <0.05 was considered statistically significant.

- **Ethical Considerations**

Patient confidentiality was maintained throughout the study.

3. Results

Data from 150 children with acute gastroenteritis were analyzed. Variables included age, gender, symptoms, dehydration severity, lab findings, treatments, length of hospital stay, and complications.

3.1. Descriptive statistics

The study included 150 patients with a (mean age $\pm$ SD months = 35.3 ± 35.4). A (Range: 6–156 months), with median age of 18 months. Males comprised (50.7%) of the sample. Diarrhea was reported in (100%) of patients, (7.3%) from them presented with bloody stool. Vomiting was present in (98.6%) of patients. Symptom duration before admission was less than one day in (42.7%) of cases, while (10.0%) had symptoms for three days or more. Most children (77.3%) were classified with mild isotonic dehydration, (14.0%) with moderate isotonic dehydration, and (6.7%) with severe isotonic dehydration. Hypertonic dehydration was noted in (2.0%) of cases. Stool culture was positive for E. coli in (8.7%) of tested patients. Inflammatory markers were elevated in (32.7%) of patients, all of whom received antibiotic treatment. Pre-hospital ORS use was reported in (19.3%) of patients. Intravenous fluids were administered to (99.3%) of admitted patients, in line with the degree of dehydration. Antibiotics were used in (39.3%) of patients and were significantly associated with positive inflammatory markers ($p < 0.001$). Adjunct treatments included zinc supplementation and probiotics used in (41.3%) of patients. Feeding continued or reintroduced in all patients after stabilization. Secondary lactose intolerance developed in (3.3%) of patients and was managed with a lactose-free formula. Convulsions occurred in (1.3%), and shock was noted in (0.7%) of patient that requiring intensive care intervention. The mean length of hospital stay was (3.8 ± 1.4) days. Prolonged hospitalization (>5 days) occurred in (34.6%) of patients and was significantly associated with the presence of complications ($p = 0.008$) and symptom duration before admission ($p = 0.004$). Post-discharge follow-up confirmed recovery within one week in (96.7%) of patients with no readmissions, and effective resolution of secondary lactose intolerance after six weeks of dietary management (Table 1).

Table 1. Descriptive Characteristics of the Study Population

Variable	Value / Frequency (%)
Demography	
Age (months)	Mean Age = 35.3 ± 35.4 (Range: 6–156)
Gender	Male: 76 (50.7%), Female: 74 (49.3%)

Symptoms	
Diarrhea	Present: 150 (100%)
Vomiting	Present: 145 (96.7%)
Fever	Present: 69 (46%)
Abdominal pain	Present: 12 (8%)
Dehydration severity	
Mild (Isotonic)	116 (77.3%);
Moderate (Isotonic)	21 (14.0%);
Severe (Isotonic)	10 (6.7%)
Hypertonic	3 (2.0%)
Laboratory Findings	
Positive inflammatory marker	49 (32.7%)
Stool Culture	Positive E. coli 13 (8.7%)
Hypernatremia	3 (2.0%)
Treatment measures	
Pre-Hospital Treatment	
ORS Use Before Admission	29 (19.3%)
Antiemetic Use Before Admission	10 (6.7%)
In - Hospital Treatment	
IV Fluids	149 (99.3%)
Antibiotic Use	59 (39.3%)
Zinc +/− Probiotics or Lactose-Free Formula	62 (41.3%)
Continuous Oral Feeding / Reintroduction	150 (100%)
Clinical Outcomes and Complications	
Length of Hospital Stay	
Mean Hospital Stay	3.8 ± 1.4 days
Early Discharge ($\leq$2 days)	24%
Prolonged Stay (>5 days)	34.6%
Complications	5.3%
Lactose intolerance	3.3%,
Convulsions	1.3%
Shock/PICU Admission	0.7%
After discharge Outpatient follow-up	
Attendance,	(100%)
Full recovery,	(96.7%)
Readmission	(0%)

3.2. Statistical Associations (Guideline Adherence Study)

The age distribution was similar between males and females, with no significant differences (χ^2 (2) = 1.558, p = 0.459). Most patients were between 1–5 years of age (54.7%) (Table 2).

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Table 2. Distribution of Age by Gender

Age Group	Females (n=74)	Males (n=76)	Total (N=150)
<1 year	23 (31.1%)	18 (23.7%)	41 (27.3%)
1–5 years	40 (54.1%)	42 (55.3%)	82 (54.7%)
>5 years	11 (14.9%)	16 (21.1%)	27 (18.0%)
p-value	—	—	0.459 (Not Significant)

Children who presented within one day of symptom onset were less likely to have a prolonged hospital stay (20.3%), compared to those who presented after 1–2 days (46.5%) or ≥3 days (46.7%). The association was statistically significant (χ^2 (2) = 11.023, p = 0.004), suggesting that delayed presentation is a predictor of prolonged hospitalization. Complications such as secondary lactose intolerance, convulsions, and shock were significantly associated with longer hospital stays. All patients with lactose intolerance (5/5) and shock (1/1) had prolonged stays. The association was statistically significant (χ^2 (3) = 11.706, p = 0.008), indicating that the presence of complications strongly influenced hospital stay duration. Only one patient (0.7%) required pediatric intensive care unit (PICU) admission, and that patient experienced a prolonged hospital stay. Despite this, the overall association between PICU admission and hospital stay was not statistically significant (χ^2 (1) = 1.842, p = 0.175), likely due to the small number of PICU cases. Complications occurred slightly more in females (6.8%) than males (3.9%), but the difference was not statistically significant (χ^2 (3) = 3.287, p = 0.350). Thus, gender was not a risk factor for complications in this study. (40.5%) of female patients and (30.3%) of male patients experienced prolonged hospitalization (>5 days). However, the difference was not statistically significant (χ^2 (1) = 1.733, p = 0.188). This suggests that gender was not a predictor of prolonged stay in this population (Table 3).

Table 3. Factors Associated with Prolonged Hospital Stay

Variable	Chi-square (df)	p-value	Significant?
Complications	11.71 (3)	0.008	Yes
Symptom duration before admission	11.02 (2)	0.004	Yes
PICU Admission	1.84 (1)	0.175	No
Gender	1.73 (1)	0.188	No

There was a very strong and highly significant association between the presence of elevated inflammatory markers and the use of antibiotics (χ^2 (1) = 112.242, p < 0.001). All patients with positive markers (49/49) received antibiotics, while (90.1%) of those with negative markers did not. This indicates excellent adherence to guideline-based antibiotic prescribing (Table 4).

Antibiotic use did not significantly differ between males (32.9%) and females (45.9%) (χ^2 (1) = 2.676, p = 0.102). This suggests gender did not influence antibiotic prescribing.

Table 4. Associated between positive inflammatory markers and Antibiotic Use

Variable	Chi-square (df)	p-value	Significant?
Inflammatory marker	112.24 (1)	<0.001	Yes
Gender	2.68 (1)	0.102	No

3.3. Multivariate Analysis (Logistic Regression): Predictors of Prolonged Hospital Stay

A binary logistic regression model was used to identify predictors of prolonged hospital stay (>5 days) among children hospitalized with acute gastroenteritis. The outcome variable was hospital stay duration, dichotomized as >5 days versus ≤5 days. Independent variables included the presence of complications, symptom duration before admission, and gender. Inflammatory marker status was excluded due to lack of association (Table 5).

Table 5. Multivariate Analysis (Logistic Regression): Predictors of Prolonged Hospital Stay

Variable	Odds Ratio (OR)	95% Confidence Interval (approx.)	p-value	Significant predictor
Complication (Yes vs. No)	14.6	2.5 – 83.9	0.008	Yes
Symptom Duration (1–2 days vs. <1 day)	3.3	1.5 – 7.5	0.004	Yes
Symptom Duration (≥3 days vs. <1 day)	3.4	0.9 – 12.5	0.060	Yes
Gender (Female vs. Male)	1.56	0.8 – 3.0	0.188	No

The analysis showed that the presence of clinical complications and delayed presentation beyond one day were independently associated with prolonged hospitalization. Gender was not a significant predictor (Figure 1).
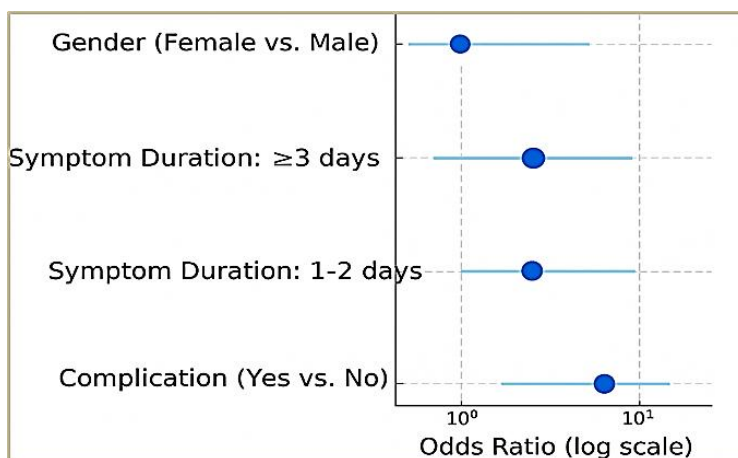

Figure 1: Multivariate Analysis (Logistic Regression): Predictors of Prolonged Hospital Stay

3.4. Key Scientific Insights
- Delayed presentation and clinical complications significantly increase the risk of prolonged hospitalization.
- Antibiotic use was highly appropriate and correlated with objective inflammatory markers.
- Gender and age had no significant impact on clinical outcomes or treatment practices.

4. Discussion
Generally, Acute Gastroenteritis (AGE) was defined as the passage of three or more loose or watery stools in a 24-hour period, with or without vomiting, and lasting less than 14 days [9, 10, and 11]. Factors affect adherence to treatment recommendations guidelines incudes skill and practices of healthcare providers; Parental education, socioeconomic status; Availability of resources, hospital policies, healthcare infrastructure; cultural beliefs and practices can influence healthcare-seeking behaviors and adherence to treatment recommendations [6, 12, 13]. The World Health Organization goals of acute gastroenteritis treatment include preventing dehydration, treating dehydration when it occurs, and reducing duration and severity of symptoms, as well intravenous rehydration

recommended for the patients who do not respond to oral rehydration therapy and patients with severe dehydration. Prevention of acute gastroenteritis recommended with sanitation interventions and rotavirus universal immunization [14]. Urea, electrolytes, creatinine, and glucose levels should ordered if intravenous rehydration would likely be needed [15, 16]. Serum sodium levels can confirm the presence of hypernatremic dehydration, which should suspected if the patient is jittery or has hypertonia, hyperreflexia, seizures, drowsiness, or coma. Recent evidence suggests that clinical pathway tools/algorithms also help increase the use of oral rehydration solution and decrease the use of intravenous fluids and the length of hospital stay [17, 18]. By means of mild to moderate dehydration can managed at home, with oral rehydration therapy as the mainstay of treatment. As oral rehydration is as effective as intravenous rehydration in preventing hospitalization and return visits [19]. Microbiological investigation generally not indicated in AGE, unless antibiotic therapy is considered. There are two potential reasons for deciding on the use of antibiotic therapy in AGE "clinical conditions and host-related risk factors". Bacterial pathogens occasionally spread systemically, especially in infant and toddler. Children with bacterial gastroenteritis are more likely to have high fever, bloody diarrhea, abdominal pain، and central nervous system involvement. Children with suspected or confirmed sepsis, demonstrated by blood culture or by an increase in inflammation markers, including C-reactive protein or neutrophilic leukocytosis should receive antibiotics once fecal samples have been obtained. Empirical Antibiotics considered in those with prolonged (>7 days) or bloody diarrhoea, in septic or toxic children, in case of an outbreak or if the child has recently been abroad and for cases with highly suspected or confirmed bacterial or parasitic etiology and in immunocompromised children [20, 21, 22]. The most common bacterial agent is Escherichia coli or Shigella dysenteries may cause severe bloody diarrhoea, which may complicated by hemolytic uremic syndrome [23]. The WHO recommends zinc supplementation during acute diarrhea based on studies conducted primarily in countries where children are likely to be zinc deficient [10]. Oral administration of zinc and early Refeeding with an age-appropriate diet are recommended in all clinical guidelines, as it given at the onset of symptoms decreases the duration and severity of acute diarrhoea [10, 24]. Administration of probiotic strains may considered in children admitted with AGE

to reduce the Length of Hospital Stay (insufficient consistent evidence for strong recommendation) [10]. Lactose intolerance is a common complication of viral gastroenteritis because of damage to enterocytes containing lactase enzyme. Lactose intolerance is usually self-limiting, however If persists, a lactose-free formula is recommended for four to six weeks [25].

5. Conclusion

Our study evaluated the real-world application of clinical guidelines in the management of acute gastroenteritis (AGE) in children and identified both areas of adherence and deviation. The protective effect of routine rotavirus vaccination may have contributed to limiting disease severity, resulting in the absence of ICU admissions and a relatively mild presentation in most cases. However, the data indicate that although ICU admission was rare, more than half of the patients experienced prolonged hospitalization, which was associated with delayed presentation and the occurrence of clinical complications. While antibiotic prescribing practices were generally consistent with guideline-based recommendations, the underutilization of Oral Rehydration Solution (ORS), the excessive reliance on intravenous therapy, and the overuse of diagnostic tests reveal gaps in adherence to clinical practice standards.

The findings highlight the need to strengthen parental education regarding the early symptoms and signs of dehydration and the importance of timely medical care, particularly in younger children with AGE, to reduce hospital burden; to promote the continued use and accessibility of ORS at the household and primary care levels to minimize unnecessary interventions, shorten hospital stays, and reduce costs; to reinforce adherence to WHO clinical management guidelines among healthcare workers in both outpatient and inpatient settings; to continue supporting national rotavirus vaccination coverage to further reduce the severity and complications of AGE; and to maintain post-discharge follow-up protocols to ensure full recovery and detect delayed complications.

6. Strengths and Limitations

This study possesses several strengths that enhance its scientific value. First, it is based on real-world data collected from Pediatric department, in General Hospital, providing insights into actual management practices and patient outcomes. Second, the study focuses on meaningful clinical outcomes such as early discharge,

prolonged hospital stay, and complications, which are directly relevant to clinical care. Third, the inclusion of WHO-based dehydration classifications and analysis of rehydration strategies allows alignment with global standards. In addition, statistical analysis was performed using appropriate methods (Chi-square tests), and significant associations were clearly interpreted. Into the bargain, the study fills a regional gap by contributing data from a population not frequently represented in the global literature.

However, the study also has limitations as the study was conducted in a single center, which may affect the generalizability of the findings to other regions or healthcare settings. Furthermore, Potential confounding factors such as caregiver knowledge were not assessed. Finally, the study included only hospitalized patients and excluded outpatient cases, potentially skewing the results toward more severe illness.

7. Acknowledgments

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