**Study on drug utilization pattern of acute gastroenteritis in children aged 1 to 12 years in tertiary care teaching hospital**

**ABSTRACT**

**Background:** Acute gastroenteritis is one of the primary causes of pediatric morbidity in developing countries (AGE). Appropriate drug therapy and supportive care are essential to reducing the disease's severity and consequences. **Objective:** To assess the drug utilization patterns in children aged 1 to 12 years diagnosed with acute gastroenteritis at a tertiary care teaching hospital. **Methods:** This was a prospective observational study conducted from November 2023 to April 2024 in the Pediatric Department of Government Cuddalore Medical College and Hospital. A total of 100 pediatric inpatients aged 1–12 years without comorbid conditions were enrolled after obtaining ethical approval and informed consent. Data on demographics, clinical presentations, prescribed medications, and treatment outcomes were collected and analyzed. **Results:** 59% of the 100 children were male, and 45% of the patients were between the ages of 1 and 3. Zinc and ORS therapy were recommended in 71% and 84% of instances, respectively. Commonly utilized medications were IV fluids (97%), antiemetics (87%), anti-ulcerants (87%). Dextrose Normal Saline (DNS) was the most commonly utilized IV fluid (63.39%). Antibiotics that were most frequently administered were nitroimidazoles (28.15%) and cephalosporins (56.31%). While 34% of patients received monotherapy of antibiotics and 25% of patients received combination therapy of antibiotics. 30% of patients had completely recovered, while 62% of patients exhibited clinically improved. **Conclusions:** The study highlights the value of probiotics, zinc supplements, and ORS as first therapies for pediatric AGE. Depending on how severe the symptoms are, supportive therapy including IV fluids and antibiotics are used. Standard treatment procedures can improve results and encourage responsible drug usage in children's care.

**Keywords:** Acute gastroenteritis, Drug utilization, Pediatric, Antibiotics, Dehydration, Zinc supplementation.

**INTRODUCTION**

Acute gastroenteritis is one of the primary causes of morbidity and mortality among children in low and middle-income countries. Every year, it causes millions of fatalities, mostly in developing nations [1]. AGE is a diarrheal illness that develops quickly and is unrelated to chronic illnesses. Its defining traits include altered consistency or increased frequency of bowel movements. It is essential to develop and market affordable, user-friendly oral rehydration treatments [2].

Symptoms includeVomiting, Abdominal pain or cramps, Diarrhea, [Nausea](https://www.verywellhealth.com/nausea-after-eating-8362669), Fever and Chills, Weakness, Muscle pain, Weight loss, Decreased appetite [3]. Acute gastroenteritis in children is covered in this article, with an emphasis on common infections such as foodborne, antibiotic-associated, and traveler's gastroenteritis [4]. It recommends replacing fluids at home, and for mild to moderate dehydration, commercial ORS solutions are advised. Steer clear of popular home beverages because they have low Na+ and K content and high osmolality.

Acute gastroenteritis in children can be managed outpatiently, but admission must consider risk factors like prematurity, young maternal age, lack of healthcare access, and socio-economic stressors [5]. Clinical indications for hospital management include intractable emesis, poor ORS tolerance, severe dehydration, young age, irritability, uncertain diagnosis, underlying illness, ORS treatment failure, and concerns about adequate care at home by caretakers [6].

Pharmacological therapy includes antimicrobial agents, probiotics, supplemental zinc therapy, and dietary modifications. The systematic process of drug utilization evaluation involves reviewing and improving medication use patterns, giving clinicians feedback, creating optimal use criteria, encouraging appropriate use through interventions and education, and determining appropriate use based on drug interactions, concomitant diseases, and treatment indications.

**MATERIALS AND METHODS**

This prospective observational study was conducted from November 2023 to April 2024 in the Paediatric department of the Government Cuddalore Medical College and Hospital in Chidambaram, India. Around 100 patients of aged 1 to 12 years without any co-morbidities from the inpatient department of pediatrics were included after receiving approval from the institutional ethical committee. The patient’s representative received appropriate counselling before the procedure, and their written parental informed permission was obtained. The socio-demographic information, clinical history, and other required tests were gathered together with their review reports. All of the patients had the necessary laboratory tests performed after being admitted. A vital factor to examine before giving treatment was the electrolytes level. If the patient had severe dehydration, the main treatment will be given following the IV fluids as supportive therapy. Patients received intravenous antibiotics for the respective symptoms like cold, cough, fever. The dose was administered based on the result of anthropometry. Subjects with any other co-morbidities were not allowed to participate in the study. It examines the real- world application of AGE therapy in healthcare settings, identifying areas for optimization and ensuring safe use of ORS therapy, Zinc supplementation and probiotics.

**RESULTS**

In this study, 100 pediatric patients diagnosed with AGE were included. Among them, 59% were male children and 41% were female children (Figure 1). The majority of the patients belonged to the age group of 1-3 years (45%), followed by 29% in the 3-6 years age group and 26% in the 6-12 years age group (Table 1). In terms of previous hospitalization, 43% of patients had a history of previous hospitalization. Immunization history revealed that 91 patients were immunized up to their age. The average duration of hospital stay was 2.43 days.

**FIGURE 1: GENDERWISE DISTRIBUTION**

**TABLE 1: AGE GROUP WISE DISTRIBUTION**

|  |  |  |
| --- | --- | --- |
| **AGE GROUP** | **NO. OF PATIENTS** | **PERCENTAGE** |
| 1-3 YEARS (TODDLER) | 45 | 45% |
| 3-6 YEARS (PRE SCHOOL) | 29 | 29% |
| 6-12 YEARS (SCHOOL) | 26 | 26% |

**PRESCRIPTION PATTERN OF DRUGS BASED ON CLASS:**

 The commonly prescribed class of drugs were IV fluids (97%), antiemetics (87%), anti-ulcerants (87%) followed by ORS therapy (84%), antipyretics (79%), probiotics (67%), zinc (71%) and antibiotics (63%).

**FIGURE 2: PRESCRIBED DRUG CLASS**

**PRESCRIPTION OF IV FLUIDS:**

Among the IV fluids, commonly prescribed IV fluids were DNS (63.29%) followed by RL (25.89%) and NS (10.7%).

**TABLE 2: IV FLUIDS DISTRIBUTION**

|  |  |  |
| --- | --- | --- |
| **TYPE OF IV FLUIDS** | **NO. OF TIMES PRESCRIBED** | **PERCENTAGE** |
| NORMAL SALINE | 12 | 10.7% |
| DEXTROSE NORMAL SALINE | 71 | 63.39% |
| RINGER LACTATE | 29 | 25.89% |
| TOTAL | 112 | 100% |

**ANTIBIOTICS:**

Cephalosporins (56.31%) and nitroimidazoles (28.15%) were highly prescribed groups among the antibiotics followed by tetracyclines (4.85%), fluroquinolones (3.88%), macrolides (3.88%) whereas aminoglycosides (2.91%) were prescribed to lesser extent.

**TABLE 4: DISTRIBUTION OF ANTIBIOTICS**

|  |  |  |  |
| --- | --- | --- | --- |
| **CATEGORY** | **DRUG NAME** | **NO. OF TIMES PRESCRIBED** | **PERCENTAGE** |
| CEPHALOSPORINS | Ceftriaxone  | 58 | 56.31% |
| Cefotaxime  |
| Cefixime  |
| NITROIMIDAZOLES | Metronidazole  | 29 | 28.15% |
| FLUOROQUINOLONES | Ciprofloxacin  | 4 | 3.88% |
| Norfloxacin  |
| Olfloxacin  |
| MACROLIDES | Azithromycin  | 4 | 3.88% |
| AMINOGLYCOSIDES | Gentamicin  | 3 | 2.91% |
| Amikacin  |
| TETRACYCLINES | Doxycycline | 5 | 4.85% |
| TOTAL |  | 103 | 100% |

**NUMBER OF ANTIBIOTICS PRESCRIBED:**

This graph shows, 34% of patients received monotherapy of antibiotics and 25% of patients received combination therapy of antibiotics.

**TABLE 5: DISTRIBUTION OF THE NUMBER OF ANTIBIOTICS PRESCRIBED**

|  |  |  |
| --- | --- | --- |
| **NO. OF ANTIBIOTICS** | **NO. OF ENCOUNTERS** | **PERCENTAGE** |
| 0 | 36 | 36% |
| 1 | 34 | 34% |
| 2 | 25 | 25% |
| 3 | 2 | 2% |
| 4 | 2 | 2% |
| 5 | 1 | 1% |

**PATIENT OUTCOME:**

Based on the study, about 62% of patient’s conditions were relieved and 30% of patient’s conditions were cured and 8% were referred to higher centre for treatment.

**FIGURE 3: DISTRIBUTION BASED ON PATIENT OUTCOME**

**WHO CORE DRUG USE INDICATORS:**

Among 100 prescriptions, the average number of drugs per prescription was 8.17. The percentage of drugs prescribed by generic name was 66.58%. The percentage of encounters with an antibiotic prescribed was 63%. The percentage of encounters with an injection prescribed was 100%. The percentage of drugs prescribed from NLEM (2022) was 89.9% (735).

**DISCUSSION**

Acute gastroenteritis, characterized by sudden onset of diarrhea with or without vomiting is one of the most common infectious diseases of childhood. In this study, male children (59%) were more prone to AGE than female children (41%). 45 percent of the patients were in the 1–3 age range. This demographic profile presents the findings from the study by Begum N et al (2023) [8]. From the above study, 43% of patients had a history of previous hospitalization. Among 100 patients, 91 patients were immunized up to their age. Oral rehydration solution, zinc supplementation, and probiotics play a major role in the treatment of AGE. The drug utilization analysis showed that IV fluids were the most commonly prescribed drug, followed by antiemetics and anti-ulcerants. ORS therapy was administered in 84% of prescriptions and zinc supplements were given to 71 patients.

IV fluids and antibiotic therapy were predominantly given to patients as supportive treatment. Among the IV fluids prescribed, DNS was commonly prescribed compared to NS and RL. About 63% of patients received the antibiotics with the most commonly prescribed class being cephalosporin, which is similar to a study conducted by Bhaveshaikh N et al (2017) [9]. Antibiotic combination therapy was administered to 25% of patients, while monotherapy was administered to 34% of patients (11). The majority of patients received prescriptions for two or more antibiotics, with a maximum of five medicines being utilized. Antibiotic prescriptions averaged 1.03 per prescription. The average duration of hospital stay was approximately 2 ½ days. In this study, 62% of the patient's conditions were improved and relieved and 30% of the patients were completely cured.

The average number of medications per prescription, as determined by the WHO core drug use indicators, was 8.17, indicating an alarming level of polypharmacy which is similar to Panchal JR et al (10). Although hospitalized pediatric patients with acute gastroenteritis who need supportive care are likely to exhibit some degree of polypharmacy, this average is higher than the WHO-recommended range of 1.6 to 1.8, raising the possibility of overprescribing. 66.58% of medications were administered under generic names, which is rather good but less than the optimal level of 100%. Encouraging generic prescriptions is essential for rational and effective medication use. 63% of encounters resulted in the prescription of antibiotics, which may be indicative of empirical treatment procedures in suspected bacterial illnesses. But for a disease like gastroenteritis that typically gets better on its own, this number is noticeably high and has to be reviewed in order to avoid excessive antibiotic exposure and the possible development of antibiotic resistance. Due to the inpatient setting and the requirement for rehydration therapy, it is expected that every patient (100%) receives at least one injectable medicine, mostly IV fluids. However, in order to prevent unnecessary invasive procedures, it is important to make sure that injections are used appropriately.

In conclusion, 89.9% of the medications administered were listed on the National List of Essential Medicines (NLEM) 2022, demonstrating a generally high level of adherence to the standards for essential medicines and rational prescription practices. (7)

**CONCLUSION**

Guidelines stress bowel rest, dietary adjustments, and hydration or rehydration. To provide the electrolytes and glucose, the WHO recommends rehydrating using water that contains sodium bicarbonate, glucose, and salt. Treating acute gastroenteritis primarily involves oral rehydration. When there is clear evidence that probiotics are effective in lowering the severity and duration of symptoms, they may be used as an active treatment for diarrhea. Oral zinc supplementation is a simple and effective therapeutic plan for treating acute diarrhea. Zinc supplementation for gastroenteritis in children is a safe and effective measure to reduce illness and complications. Zinc supplementation is therefore an effective treatment for acute gastroenteritis, according to this study. IV rehydration is done with a lactated Ringer's solution or normal saline is an effective treatment of acute gastroenteritis. Antibiotics are considered in certain situations which may also reduce the severity and duration, even the prevention of some complications like the spread of infection. In conclusion, oral rehydration solution, zinc supplementation, and probiotics play a major role in the treatment of children with acute gastroenteritis. Antibiotics and IV fluid play a supporting role in the management of acute gastroenteritis in children.

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