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ACUTE GASTROENTERITIS IN THE PEDIATRIC POPULATION

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Abstract:
Introduction: *In The pediatric age group, acute gastroenteritis is one the most common reason for hospital presentation. They could be caused by viruses, bacteria, parasites, or be allergic of nature, and the severity ranges from mild to life threatening, especially in the developing world with a fatality of 2.5 million children under 5 annually.*
Aim of the work: *In this study, our aim was to review the etiology of acute gastroenteritis, as well as focus on the latest management protocols.*
Methodology: *we conducted this review using a comprehensive search of MEDLINE, PubMed and EMBASE from January 1994 to March 2017. The following search terms were used: acute gastroenteritis, pediatric gastroenteritis, diarrheal disease, pediatric dehydration*
Conclusion: *The most important measure in children with acute gastroenteritis (regardless of etiology) is maintenance of hydration with appropriate water and electrolytes replacements when needed. Close observation of all cases must be maintained to keep hydration and nutrition balanced. Antiemetics are sometimes needed when the vomiting is severe and leading to worsening of the dehydration and preventing oral rehydration therapy. When suspecting an outbreak, it is essential to perform a fecal microbial analysis.*
Keywords: *acute gastroenteritis, pediatric diarrheal diseases*

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INTRODUCTION:

In infants and toddlers, acute gastroenteritis is one of the most common diseases encountered by physicians, with even higher prevalence in developing countries. Causes of acute gastroenteritis can be parasitic, viral, and bacterial. It is characterized by the occurrence of diarrhea that is sometimes associated with vomiting. The importance of acute gastroenteritis come from the fact that it is a significant cause of long-term complications, and can sometimes be fatal, especially in poor areas. In fact, acute gastroenteritis has been found to be one of the commonest causes for hospital admissions in infants and children, although most cases are self-limiting **[1]**.

The World Health Organization (WHO) defined diarrhea as passing 3 or more stools (liquid or loose) daily or passing stools in a more frequent pattern than the individual usually does **[2]**.

Infectious acute gastroenteritis is considered the most likely cause for acute onset diarrhea (whether there is vomiting or not) in a young child. Acute gastroenteritis in infants and children is considered to be a major health issue that has burden on the community and public health. Globally, it is estimated that more than 10.5 million children die annually at an age less than five year; more than twenty percent of these deaths could be attributed to gastroenteritis **[3]**.

METHODOLOGY:

We did a systematic search for acute gastroenteritis in pediatric population using PubMed search engine (http://www.ncbi.nlm.nih.gov/). EMBSE, and Google Scholar search engine (https://scholar.google.com). All relevant studies were retrieved and discussed. We only included full articles. The following search terms were used: acute gastroenteritis, pediatric gastroenteritis, diarrheal disease, pediatric dehydration

The study was approved by the ethical board of King Abdulaziz University.

Etiology

It is estimated that about 70% of acute gastroenteritis cases in children could be attributed to viral agents, making viruses the most important and concerning etiology for gastroenteritis at this age group. More than twenty strains of viruses have been reported to cause acute gastroenteritis. Of these viruses, rotavirus is considered to be the most common agent that causes acute gastroenteritis, with it being responsible for up to 25% of gastroenteritis cases, and 72% of hospitalizations due to gastroenteritis. Interestingly, 100% of children will get at least one attack of gastroenteritis due to rotavirus before they reach 3 years of age. Incidence of rotavirus changes among seasons with being highest at the end of the winter. Infants aged between six months and two years have the highest risk of rotavirus infections **[4]**.

Other than rotavirus, there are several viral agents that are common to cause acute gastroenteritis. These include adenoviruses, caliciviruses, and astroviruses, and they are responsible for up to 31%, 29.3%, and 16% of gastroenteritis leading to hospitalization, respectively. Viral acute gastroenteritis has similar incidence and prevalence in both developed and developing countries **[5]**.

On the other hand, up to 20% of acute gastroenteritis cases could be attributed to bacterial causes, with *Campylobacter* species, *Yersina* species, *Salmonella* species, and *Shigella* species, being the most common. Another major bacterial agent of acute gastroenteritis is *Vibrio cholerae* which has higher incidence in poor countries with poor hygiene. Among protozoal agents that cause acute gastroenteritis, *Giardia lamblia* is considered to be the most common. However, it is more associated with chronic persistent diarrhea rather than acute diarrhea. Other protozoal agent that also causes acute gastroenteritis includes *Entamoeba histolytica* and *Cryptosporidium* species. The incidence of acute gastroenteritis due to parasitic infections and *Escherichia coli* are relatively higher in developing and poor countries than developed industrialized countries. This can be an important indication that although improved hygiene will not decrease acute gastroenteritis caused by viruses, it will decrease cases caused by parasites and protozoa **[6]**.

Treatment

Rehydration Therapy

The most important and serious complication of gastroenteritis in children is dehydration. Any child who has gastroenteritis complicated by moderate or severe dehydration must be closely monitored and treated. When dealing with infants younger than 18 months, even mild conditions require close observation, with immediate treatment if the condition worsens. In their most recent guidelines, the WHO recommended the use of oral rehydration therapy as a first line management when replacing electrolytes and fluids in children with gastroenteritis complicated by mild to moderate dehydration. When oral rehydration therapy fails, intravenous rehydration is indicated. Otherwise, intravenous rehydration is only indicated in cases of severe

dehydration **[7]**. **World Health Organization First Steps for Managing an Outbreak of Acute Diarrhea Geneva: WHO; 2004Available from:** http://www.who.int/topics/cholera/publications/en/first_steps.pdf Accessed April 8, 2013.

When treating any case of gastroenteritis, the most essential aspect is to maintain electrolytes and water balance. Treatment should be adjusted based on electrolytes in the blood, water content of the body, and water demand, which is calculated using the weight of the infant. Different types of ORS are currently available for treating different cases of dehydration. Recent treatments have also included probiotics to maintain the balance of flora within intestines. Infants must be closely monitored to observe their hydration and nutrition status. 16856044.

Infants and children who have gastroenteritis complicated by moderate to severe dehydration, gastroenteritis suspected to be cause by EHEC, gastroenteritis complicated by bloody diarrhea, or gastroenteritis complicated by systemic manifestations, must be immediately hospitalized. When administrating oral rehydration therapy, milk should be temporarily stopped. It is preferred usually to use an oral solution that has low osmolarity and sodium to prevent the occurrence of hypernatremia. To avoid vomiting, oral solutions are usually administrated gradually and in small amounts. In cases of severe vomiting or inability to drink, nasogastric tube could be considered. When all these measures fail to correct dehydration, intravenous fluid administration is indicated along with electrolytes solutions **[8]**.

Anti-secretory Drugs

The use of racecadotril in children and infants was first introduced in 1999 in France, from where it spread to be currently used in most countries in Europe. This drug, which belongs to the family of antisecretory drugs, will act peripherally to inhibit enkephalinase. This will lead to a significant decrease in electrolytes and water hypersecretion from the intestines by selectively stimulating delta receptors and reducing cAMP intracellular concentrations. The final result is significant decline in intestinal secretion of water and electrolytes with maintaining intestinal motility. In addition, effects of racecadotril are only present if there is intestinal hypersecretion, with no effects when intestinal secretion is normal. Recent studies have started to recommend the use of racecadotril with oral rehydration therapy when treating watery diarrhea. A recently published systematic review and meta-analysis has studies the efficacy of racecadotril when used with oral rehydration therapy and compared it to oral rehydration therapy alone. This meta-analysis included nine clinical trails with a total number of 1,348 children and infants aged less than 15 years, with adjustment for age in the analysis. It has been found that using racecadotril have led to significant reduction of diarrhea duration (P<.001). no difference in side effects was found between all study groups. Therefore, the results of this study concluded that racecadotril should be used as an adjuvant therapy to oral rehydration therapy in children with moderate to severe dehydration. Safety profile of racecadotril has also been well studied in children large studies. However, the main setback in using racecadotril is its high costs, making it not always cost-effective, despite being affective and safe **[9; 10]**.

Antiemetics

Recently, a published study examined diagnoses where ondansetron could be helpful an effective if used. They studied children aged between 3 months and 18 years in the emergency medicine for a duration of two years. Any patient who was in the emergency department for any cause other than gastroenteritis or vomiting was classified as 'non-gastroenteritis'. Authors compared gastroenteritis group with non-gastroenteritis group (which consisted 38% of included patients and were older than patients in gastroenteritis group). When studying the non-gastroenteritis group, most common diagnoses encountered were fever in 15% of them, abdominal pain or tenderness in 13% of them, concussions and head injuries in 7% of them, pharyngitis in 6% of them, viral infections in 6% of them, migraine attacks in 5% of them, and otitis media in 5% of them. This study was the first study to assess the use of ondansetron in diseases and pathologies other than gastroenteritis **[11]**.

In another review of literature that included several clinical trials testing antiemetics and their efficacy for treating vomiting in gastroenteritis in children aged less than 18 years, authors concluded that 58% of patients who received intravenous antiemetics showed significant improvement of vomiting, while only 17% who received placebo showed improved status (P = 0.039). Authors concluded that intravenous ondansetron and metoclopramide led to significant improvement in vomiting, and thus less rates of severe rehydration that requires intravenous therapy and hospital admission **[12]**.

However, despite its effects on improving vomiting, it is still not clear whether ondansetron worsens

diarrhea or not. In fact, previous trails have reported significantly increased rates of side effects following its use. Several Cochrane systematic reviews and meta-analyses have reported higher diarrhea rates following the use of ondansetron. According to the WHO guidelines, dexamethasone and ondansetron are considered the best drugs used in preventing nausea and vomiting, thus are the first choice when needed **[13]**.

Zinc supplements

In guidelines, the WHO recommend giving zinc supplements to all children who present with an acute gastroenteritis attack as soon as possible. Doses of zinc supplements are as following:

- Infants who are younger than six months are recommended to receive 10 mg of zinc supplements per day for ten days.
- Children who are aged older than six months but younger than five years are recommended to receive 20 mg of zinc supplements per day for ten days.

This protocol was found to reduce the severity of diarrhea and decrease the recurrence of diarrhea following zinc intake **[14]**.

Antibiotic therapy

The main treatment for acute gastroenteritis is rehydration. Other treatments include the treatment that targets diarrhea using diosmectite or probiotics. These previously mentioned lines of treatment must always be considered regardless of the cause of the disease. On the other hand, the use of antibiotics is not generally recommended and can sometimes be associated with more harm than benefits, especially in children. However, there are certain cases where antibiotics must be considered. To consider antibiotics in the treatment of acute gastroenteritis in children, certain criteria regarding host-related factors, clinical conditions, and the setting should be met. If all criteria for antibiotics treatment are met, microbiological investigations must be obtained before initiation of therapy. After samples have already been collected, empiric treatment could be started before results are available **[15]**. In mild cases that require oral treatment, metronidazole and co-trimoxazole could be used. Rifaximin and Azithromycin could also be considered in some cases, especially if there is colitis. More severe cases, or patients who show systemic manifestations are recommended to take Ceftriaxone, metronidazole, and ciprofloxacin. When dealing with younger infants, children who have a chronic disease, or children who show signs of toxicity, systemic infections should be considered, and this will necessitate the use of systemic antibiotics. The choice between oral or intravenous therapy will depend on the severity of the disease. In some cases where symptoms are mild, it is accepted to observe the patient and wait for microbiology results without giving empiric treatment. One important indication of antibiotics is traveler's diarrhea, where spread of infection is considered a major issue **[16]**.

CONCLUSION:

Acute gastroenteritis remains to be a significant health issue in infants and children and continues to be one of the most common causes of morbidity and mortality in this age group around the world. It is estimated that over 2.5 million children younger than five years die from gastroenteritis every year, especially in poor and developing countries. Viral infections are responsible for most cases of gastroenteritis in children. These cases are usually self-limited and does not require specific therapy. The most important measure in children with acute gastroenteritis (regardless of etiology) is maintenance of hydration with appropriate water and electrolytes replacements when needed. Close observation of all cases must be maintained to keep hydration and nutrition balanced. Antiemetics are sometimes needed when the vomiting is severe and leading to worsening of the dehydration and preventing oral rehydration therapy. When suspecting an outbreak, it is essential to perform a fecal microbial analysis.

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