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Review Article

Causes, clinical assessment and management of paediatric bloody diarrhoea

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ABSTRACT

Despite being easily preventable and treatable, diarrhoea continues to be a serious public health problem in impoverished and emerging countries. It is a typical sign of gastrointestinal issues brought on by numerous pathogens, including bacteria, viruses, and protozoa. Particularly in developing nations it is of great concern as it is associated with considerable mortality and morbidity in children. Despite the decline in mortality rate, it is still the second leading cause of mortality among children under five years of age. Bloody diarrhoea is characterized by intestinal inflammation, particularly of the colon, stomach pain, and severe diarrhoea with blood or mucus in the faeces. It is also referred as dysentery. Among the bacteria and parasites that cause dysentery include *Entamoeba histolytica, Shigella, Campylobacter, Salmonella, Schistosoma mansoni*, and *Campylobacter*. The most common cause of this disease is *Shigella*. The purpose of this research is to review the available information about causes, clinical assessment and management of paediatric bloody diarrhoea. Stool culture is a standard diagnostic measure. Digestive issues and nutritional inadequacies are more frequent in children with bloody diarrhoea. Bloody diarrhoea often lasts longer and is more problematic than watery diarrhoea. It has a high percentage of case fatalities and adversely impacts a child's growth. Rehydration therapy shall be started immediately to prevent dehydration associated complications and fatalities. Treatment with fluoroquinolones as first-line medications, beta-lactams and cephalosporins as second-line medications is recommended. Further clinical research is however needed to define the clinical efficacy of available treatment and management strategies.

Keywords: Bloody, Diarrhoea, Children, Treatment

INTRODUCTION

Diarrhoea remains a significant public health issue in underdeveloped and developing nations despite the fact that it can be averted and treated with straightforward techniques. It is a common symptom of gastrointestinal illnesses caused by many different pathogens, such as bacteria, viruses, and protozoa. Although diarrheal

fatalities among children under 5 years have significantly decreased globally from 1.2 million in 2000 to 0.5 million in 2016, it is still the second major source of under-five mortality internationally. Diarrhoea is further categorized into four clinical types; acute watery diarrhoea, which includes cholera, acute bloody diarrhoea, which is also referred as dysentery, chronic diarrhoea, and diarrhoea with severe malnutrition. Bloody diarrhoea is any episode of diarrhoea where the loose or watery faeces is clearly crimson in colour. Children who have bloody diarrhoea are more likely to have digestive problems and dietary deficiencies. Compared to watery diarrhoea, bloody diarrhoea lasts longer and is typically more problematic. It has a high case fatality rate and significantly affects the child's growth. As per statistics, there is visible blood in the stools in close to 10% of all diarrheal episodes worldwide.[1,2]

Intestinal inflammation, generally of the colon, causes dysentery, which is defined as invasive diarrhoea with visible blood in one or more stools. This intestinal inflammation frequently causes the passage of bloody mucoid faeces. Worldwide, young children are susceptible to dysentery, which disproportionately has a negative impact on those living in developing nations and is frequently linked to increased morbidity and mortality rates. Abdominal cramps, fever, and tenesmus are additional typical symptoms that vary in severity based on the bacteria that are causing the disease. Children who have the condition may suffer from protein-losing enteropathy and poor catch-up development patterns for up to a year following infection. Bloody diarrhoea has also been recorded in infections with amoebiasis, *Campylobacter enteritis, Salmonella enteritis, enteroinvasive Escherichia coli (E. coli),* and *enterohaemorrhagic E. coli*, however *Shigella* is the one most frequently identified cause of dysentery. Shigellosis can be described as 10-20% of enteric infections on average, and 50% of instances of dysentery in young children.[3]

Acute bloody diarrhoea shall always be considered as a medical emergency. The causes are typically known and are generally treatable. Even though there are many different potential causes of acute bloody diarrhoea, infectious considerations are critical and should always come first when evaluating such individuals. The purpose of the history, assessment and laboratory tests should aim to speed up the diagnosing process. The skilful therapy of patients with acute bloody diarrhoea revolves around carefully selecting tests and imaging, avoiding unnecessary diagnostic efforts, and providing supportive care while waiting for a definitive diagnosis.[4] Clinical improvement begins after 48 hours of efficient antibiotic therapy, which reduces the likelihood of fatal complications and shortens the time that patients will experience their symptoms as well as removing *Shigella* from the stool. By reducing faecal carriage from roughly 4 weeks to 3 days, reduces illness transmission, resulting in considerable improvements to public health.[5,6]

The most reliable method for determining the etiology of diarrhoea caused by enterobacteria, including *Shigella* infection, is still conventional bacterial stool culture. In this era of rising antimicrobial resistance, the stool culture enables for the determination of antibiotic susceptibility, which is vital.[7] The physician can evaluate the degree of dehydration and choose the best course of treatment with the aid of an accurate clinical evaluation. Laboratory tests including the measurement of serum electrolytes and blood urea nitrogen may be useful in specific circumstances. If a child has bloody diarrhoea or if a strange cause is suspected, such as *E. coli* or *Cryptosporidium*, stool investigations are recommended. Oral rehydration solutions that are physiologically balanced can be used to treat the majority of children with gastroenteritis. Initial treatment may involve intravenous boluses of isotonic saline or Ringer's lactate in children who are hypovolemic, sluggish, and thought to be more than 5% dehydrated.[8] The purpose of this research is to review the available information about causes, clinical assessment and management of paediatric bloody diarrhoea.

LITERATURE SEARCH

This study is based on a comprehensive literature search conducted on September 23, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about causes, clinical assessment and management of paediatric bloody diarrhoea. There were no restrictions on date, language, participant age, or type of publication.

DISCUSSION

Urgent referral to a paediatric gastroenterologist is necessary for severe bloody diarrhoea as a higher chance of not responding to medical treatment, development into toxic megacolon, and developing colonic perforation is linked to severe colitis. Early referral might lower these risks. Children require professional care for signs of deterioration because severe disease typically responds well to intravenous corticosteroids or ciclosporin. Emergency colectomy may save a life in some circumstances. Children rarely experience bloody diarrhoea, but when they do, it could be a sign of a dangerous illness. The non-specialist should be knowledgeable about the possible causes, first treatment, and specialist referral criteria. Regardless of age, inflammatory bowel disease is more common in children who are older than 1 year. Young infants are most prone to get non-specific allergic colitis. About 75% of children with ulcerative colitis and 25% of those with Crohn's disease present with bloody diarrhoea as a symptom. If a

child has less than six stools per day and is not systemically ill or has an acute abdomen, they may be handled in primary care. The presence of fever, tachycardia, pallor, and shock are indicators of a systemic disease. Child with persistent or recurring bloody diarrheal or other gastrointestinal symptoms, weight loss, or slow growth may have inflammatory bowel disease.[9]

Causes and clinical assessment

Salmonella, Shigella, Yersinia, and *E. coli* all produce the Shiga toxin, and *Campylobacter, E. coli* O157:H7, and other Shiga toxin-producing *E coli* are the most common causes of infectious community-acquired acute bloody diarrhoea. Due to its dangerous nature, *E. coli* O157:H7 is the most significant pathogen to take into account while examining patients of any age.[4] Most episodes are caused by bacterial infections and parasite infestations. In young infants, milk allergy is a frequent cause. Older children are more likely to have chronic inflammatory bowel disease.[10] In developing and underdeveloped countries, the majority of cases of bloody diarrhoea occur in young children and are brought on by an intestinal illness brought on by invasive bacteria. Less than 3% of occurrences of bloody diarrhoea are attributable to nonbacterial infections. Children run the risk of invasive bacterial illnesses due to poor sanitation, overcrowding, tainted food, and usage of the public water system.[1]

Before submitting specimens for laboratory analysis, a systematic approach to the evaluation of diarrheal disease entails documenting disease characteristics defining nature of onset, frequency, duration, and qualitative description of stool, followed by patient and family history including patient characteristics, activities, diet, medication, travel history, family and community contacts, and hospitalizations, and performing a comprehensive physical examination. For bacteriologic tests, diarrheal stool samples collected during the acute stage of the illness are advised. The colour, size, consistency, and presence of blood and leukocytes in the stool should all be checked. The detection of faecal leukocytes in faeces under a microscope is a quick, easy, and effective test for acute infectious diarrhoea. For identifying cytotoxic strains of *E. coli* O157, the 4-methylumbellifery1-β-d-glucuronide assay, sorbitol-fermentation testing, and agglutination in *E. coli* O157 antiserum are helpful tests.[11] Patients with severe or protracted diarrhoea, those exhibiting indications of an invasive disease, or those whose medical history suggests that their digestive disease may develop problems should have a bacterial stool culture performed. For patients who exhibit any of the following symptoms, the American college of gastroenterology advises a routine stool culture: severe or chronic diarrhoea, temperature greater than 38.5°C, bloody diarrhoea, or the presence of stool leukocytes, lactoferrin, or occult blood.[12]

Ardissino et al recommended that patients of bloody diarrhoea shall be screened for Shiga toxin gene and to detect renal complications as soon as feasible haemoglobinuria is suggested with the urine dipstick.[13] Mckee et al concluded in his study that at the time of presentation, D-dimer concentrations have insufficient sensitivity or specificity to distinguish between children with a Shiga toxin producing *E .coli* infection and those who had any other cause of bloody diarrhoea. D-dimer concentrations, on the other hand, might be able to separate infants with bloody diarrhoea with an infectious etiology from those with any other cause.[14] Many clinicians argue that laboratory tests, such as blood chemical analyses, are typically not required to evaluate children who have acute diarrhoea. However, in young children and infants high risk populations for dehydration serum urea and bicarbonate levels can be used to predict the severity of dehydration. Authors further imply that blood gases could be used alone or in conjunction with clinical evaluation to help determine how dehydrated children who are presenting with acute gastroenteritis.[15]

Management

Overall, pro-absorptive, anti-secretory, anti-motility, and anti-inflammatory therapies are used to treat diarrhoea with or without blood. Oral rehydration salts or parenteral rehydration treatment are used to restore lost fluids in the clinical management of diarrhoea to prevent or treat dehydration. Only in specific clinical circumstances is drug treatment in diarrhoea necessary, even when episodes of bloody diarrhoea occur. Both oral and intravenous rehydration therapy can directly prevent diarrhoea-related dehydration fatalities. Antibiotics can be helpful in some cases of acute bacterial diarrhoea, but they should only be administered sparingly to prevent pathogen resistance and opportunistic infections. Regardless of the type of diarrhoea, the world health organization advises routine therapy with 20 mg of zinc per day for 10 days for all children. Children under age of 6 months should get 10 mg every day for 10 days.[16]

For *Shigella* gastroenteritis with culture-proven or even suspected symptoms, antibiotic treatment is always advised. Since humans are *Shigella*'s only host, antibiotic therapy for the disease aims to both alleviate symptoms and eradicate the source of infection. The rise of microorganisms resistant to ampicillin, trimethoprim-sulfamethoxazole, and tetracycline complicates the efficient treatment of shigellosis. The world health organization advises using ciprofloxacin as the first-line medication and treating any instances of blood in the stools with antibiotics. Pivmecillinam, azithromycin, and ceftriaxone are substitutes. Although resistance rates have been on the rise recently, this advice has been reaffirmed. In situations of severe dysenteric diarrhoea, empiric medication should be started while awaiting the findings of a microbiological investigation.[17]

Antimicrobial therapy is vital in underdeveloped nations because prolonged diarrheal episodes like dysentery can

harm children's nutritional status and growth. A major global concern is emergence of multidrug-resistant *Shigella* species, which are resistant to more than 2 first-line antibiotics, such as ciprofloxacin, co-trimoxazole, and ampicillin. For severe infections brought on by multidrug-resistant strains, ceftriaxone is regarded as the best treatment. On other hand, when multidrug-resistant strains appear to lower disease morbidity, azithromycin is utilized as an empirical therapy for severe dysentery prior to sensitivity and culture tests. Since some bacteria develop resistance to antibiotics, choice of medications should take into consideration. Therapy with ceftriaxone, ciprofloxacin/pivmecillinam for bacterial pathogens has resulted in a 99% decrease in mortality rate of diarrhoea; antibiotic susceptibility tests may even be necessary before treatment. However, carbonated beverages and fruit juices should be avoided in this condition because they can further worsen a child's health.[18]

Traa et al suggested in his study that if a child has had a full course of treatment with one of these antibiotics and the disease-causing bacteria is responsive to the antibiotic, the bacteria isolated from a stool sample of a child with dysentery seldom relapses. Reducing a child's risk of bacteriological relapse is advantageous because it decreases the possibility of further bouts of dysentery in that child and the possibility of transmission to others.[19] Strategies for treating *Shigella* infections that do not cause dysentery may lower mortality from diarrhoea. Antibiotic treatment of high-risk groups of children without diarrhoea may be a useful addition to the present recommendations because a variety of antibiotics have proven effectiveness in treating children with dysentery and *Shigella* infections.[20]

Williams and Berkley stated in their study that the use of fluoroquinolones as first-line medications, beta-lactams and cephalosporins as second-line medications is supported by current World health organization guidelines; there is no compelling evidence to change this approach. In areas where the rate of ciprofloxacin non-susceptibility is known to be high, azithromycin is appropriate as a second-line therapy. Additionally, evidence suggests that azithromycin is less dangerous for the heart than other macrolide antibiotics. Cefixime is another good option, but its usage should be balanced against the threat of the spread of extended-spectrum-lactamase-producing pathogens.[21] Despite posing a substantial burden in developing and underdeveloped countries studies present in literature regarding paediatric bloody diarrhoea are scarce and limited. Further research shall focus on the clinical application of therapeutic guidelines and management of bloody diarrhoea in children so the outcomes of the efficacy of various treatment options are studied.

CONCLUSION

Physicians shall critically assess children presenting with bloody diarrhoea and distinguish it from other disorders. Laboratory investigations and treatment shall be started immediately as early diagnosis and prompt management can prevent development of complications also hand hygiene should be encouraged among parents and children for the prevention of disease.

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