How to Cite:
Alanazi, H. H. F., Alqarni, A. M. S., Alamri, A. A. H., Alghamd, A. S., Alqahtani, S. F. M., Al-Qahtani, M. M. A., Al-Faridi, S. G., & Altawyan, Y. S. S. (2020). Management of acute diarrhea in children and nursing care interventions: Review article. *International Journal of Health Sciences*, *4*(S1), 442–457. https://doi.org/10.53730/ijhs.v4nS1.15384

Management of acute diarrhea in children and nursing care interventions: Review article

Hamad Huran F Alanazi
KSA, National Guard Health Affairs

Ali Mohammed S Alqarni
KSA, National Guard Health Affairs

Abdullah Abdulqader H Alamri
KSA, National Guard Health Affairs

Abdulaziz Saad Alghamd
KSA, National Guard Health Affairs

Salem Faraj M Alqahtani
KSA, National Guard Health Affairs

Mana Muhammad Abdullah Al-Qahtani
KSA, National Guard Health Affairs

Salman Ghazi Al-Faridi
KSA, National Guard Health Affairs

Yazeed Sulaiman S Altawyan
KSA, National Guard Health Affairs

***Abstract*---Background:** Acute diarrhea in children is a leading cause of morbidity and mortality, particularly in low- and middle-income countries (LMIC). Despite its relatively low mortality in high-income countries (HIC), it remains a significant cause of hospital visits and healthcare burdens. The disease, often caused by viral, bacterial, or parasitic pathogens, presents differently in LMIC and HIC. Effective management, particularly in children under five, is critical to preventing dehydration and other severe complications. **Aim:** This review aims to provide an updated synthesis on the etiology, pathogenesis, clinical management, and nursing interventions for acute diarrhea in children. It seeks to compare practices in both LMIC and HIC settings, focusing on dehydration assessment, fluid therapy,

International Journal of Health Sciences E-ISSN 2550-696X © 2020.
Corresponding email: *akk29337@gmail.com*
Manuscript submitted: 01 Jan 2020, Manuscript revised: 09 Jan 2020, Accepted for publication: 15 Jan 2020

and the role of vaccination in prevention. **Methods:** The review synthesizes recent evidence from clinical studies, guidelines, and expert recommendations on the management of acute diarrhea in children. It includes an analysis of common pathogens, diagnostic methods, dehydration scales, and treatment protocols for both viral and bacterial diarrhea. The focus is on effective interventions, particularly nursing care in the context of hydration management and monitoring. **Results:** The review highlights that viral infections, especially rotavirus and norovirus, are the predominant causes of diarrhea in children. The introduction of rotavirus vaccines has significantly reduced hospitalizations and mortality in countries with widespread vaccination. Diagnostic tools like stool cultures and rapid molecular tests are essential in severe cases, though they are not routinely necessary. Dehydration assessment scales (e.g., WHO, CDS, Gorelick) are crucial in guiding fluid therapy, with varying accuracy depending on the setting. Nursing care plays a central role in managing dehydration and monitoring hydration status. **Conclusion:** Acute diarrhea in children requires prompt and effective management to prevent dehydration and related complications. While viral infections are the most common cause, bacterial and parasitic infections must also be considered. Nursing care interventions, including careful hydration management, are essential in both LMIC and HIC contexts to ensure favorable outcomes.

***Keywords*---**Acute diarrhea, children, dehydration, rotavirus, nursing interventions, gastroenteritis, hydration management, infection prevention.

Introduction

Diarrheal diseases were responsible for over half a million deaths among children under five years of age in 2013 [1, 2]. The majority of these fatalities occurred in low- and middle-income countries (LMIC). In contrast, while the disease is rarely fatal in high-income countries (HIC), it remains a prominent cause of emergency department visits and hospitalizations [3]. The World Health Organization (WHO) defines acute diarrhea as the passage of three or more loose or liquid stools per day, lasting for at least three days but no longer than 14 days [4]. In comparison, the American Academy of Pediatrics (AAP) defines acute gastroenteritis as a diarrheal condition of rapid onset, which may or may not be accompanied by additional symptoms such as nausea, vomiting, fever, or abdominal pain [5]. In the literature examining the impact of diarrheal diseases on children in LMIC, the terms "acute diarrhea" or "diarrheal disease" are typically used, whereas "acute gastroenteritis" is the more commonly employed term in research focused on children in HIC. Despite variations in definitions, all these terms describe the same condition: a gastrointestinal infection caused by pathogens such as rotavirus, norovirus, Salmonella, E. coli, and Campylobacter [6]. This review utilizes the term "diarrhea" to provide a comprehensive overview, acknowledging potential differences in disease manifestations between children in LMIC and HIC,

and aims to update the evidence on acute infectious diarrhea and gastroenteritis in children.

Classifications

The WHO classifies diarrhea into four categories: acute watery diarrhea, acute bloody diarrhea (dysentery), persistent diarrhea, and diarrhea associated with severe malnutrition [4]. This review focuses on the first two categories, which are most prevalent in both LMIC and HIC. Persistent diarrhea, a more complex condition where diarrheal episodes last longer than 14 days without resolution, requires separate discussion and is beyond the scope of this article [4]. Diarrhea in children with severe malnutrition also necessitates specialized management due to the high risk of severe complications, such as electrolyte disturbances, infections, and death, and should follow specific guidelines for managing severe malnutrition [7]. Chronic diarrhea, often used interchangeably with persistent diarrhea, refers to diarrheal episodes that persist for more than four weeks [7]. It typically occurs in children with long-standing diarrhea, not preceded by acute onset, and is associated with genetic, structural, or inflammatory conditions such as cystic fibrosis, inflammatory bowel disease, or short-bowel syndrome. This condition falls outside the scope of the current review.

Etiology and Epidemiology:

Viruses are the predominant cause of diarrhea in children, responsible for approximately 70-90% of cases [8, 9]. Bacterial pathogens, including Shigella, Salmonella, Campylobacter, and enterotoxigenic E. coli (ETEC), account for 10-20% of cases [10]. Anaerobic bacteria, such as *Clostridium difficile*, are known to cause antibiotic-associated diarrhea (AAD), which is a leading cause of illness in hospitalized children and adults [11]. Some studies have explored the role of *Bacteroides fragilis* enterotoxin in childhood diarrhea in LMIC, though this association remains debated since *B. fragilis* can also be found in healthy children [12, 13]. While viruses remain the leading cause in most cases, the relative frequency of viral and bacterial infections differs by context. Viral infections are more common in children from HIC compared to those from LMIC [14]. Parasites contribute to less than 5% of cases, with *Cryptosporidium*, *Giardia*, and *E. histolytica* being the most frequently identified pathogens [15]. Like bacterial infections, parasitic infections are more prevalent in LMIC [10]. Rotavirus was historically the leading cause of viral diarrhea, responsible for many hospitalizations and severe cases. However, following the introduction of rotavirus vaccines (RV), hospitalizations and mortality rates associated with rotavirus have significantly decreased [14, 16, 17]. In countries that have implemented the RV vaccine, norovirus has emerged as the primary cause of moderate to severe diarrhea, as well as traveler's diarrhea and foodborne outbreaks in children under 2 years of age [8, 10, 18].

Pathogenesis:

Enteropathogens typically spread via person-to-person transmission, the fecal-oral route, or through the consumption of contaminated food or water. Incubation periods can vary widely, ranging from as short as 1 hour for toxin-producing

bacteria such as *S. aureus* to up to 7 days for invasive bacteria like *Shigella* [19]. In some cases, incubation periods can extend up to 14 days for pathogens like *Salmonella*, and even weeks or months for certain parasites, such as *E. histolytica* [20]. Diarrhea results from excessive intestinal secretion or impaired absorption of fluids and electrolytes across the intestinal epithelium [21]. Watery diarrhea is often caused by cytolytic microorganisms or toxin-producing bacteria. Viruses induce cytolysis in the intestinal epithelium, leading to inflammation and the release of cytokines, which diminish water absorption and hinder disaccharide digestion. In secretory diarrhea (e.g., caused by *V. cholerae* and ETEC), water and electrolyte secretion is triggered by the activation of adenylate cyclase, which increases intracellular cAMP and/or cGMP levels, resulting in chloride secretion by epithelial cells [21]. Inflammatory diarrhea is caused by pathogens that produce cytotoxins (e.g., *Shigella* and STEC) or invade and disrupt the intestinal epithelium (e.g., *Salmonella*, *Campylobacter*), leading to inflammation, necrosis, and the formation of microabscesses in the epithelium [19].

Clinical Assessment:

An episode of acute watery diarrhea is characterized by the presence of loose or liquid stools, often accompanied by symptoms such as reduced appetite, vomiting, fever, and abdominal pain [22]. The most common etiological agents are viruses (e.g., rotavirus, norovirus, adenovirus) and non-invasive bacteria (e.g., enterotoxigenic Escherichia coli [ETEC], non-typhoidal *Salmonella*, and *Campylobacter*). In rarer cases, the condition may present as dysentery, which involves bloody diarrhea associated with high fever and systemic toxicity, typically caused by pathogens such as *Shigella*, enteroinvasive *E. coli* (EIEC), and certain strains of *Salmonella* and *Campylobacter*. Parasitic infections, such as *Entamoeba histolytica* and *Giardia*, may manifest with explosive diarrhea, mucus or bloody stools, cramping, tenesmus, or malabsorption syndromes [23]. A comprehensive clinical interview should focus on evaluating the stool output and hydration status, inquiring about urine output, the frequency of stools and vomiting episodes, and the volume of fluid and food intake. Other key aspects include the characteristics of the diarrhea (watery, mucus, or bloody), the duration of symptoms, any history of travel to endemic regions, the presence of any immunosuppressive conditions or comorbidities, vaccination status (e.g., rotavirus vaccination), ingestion of medications (such as antibiotics or laxatives), family history of similar manifestations, and documentation of the pre-illness weight [24, 25]. The physical examination should prioritize assessing hydration status. The gold standard for determining dehydration severity is the child's weight loss. However, in the absence of accurate pre-illness weight data, clinical signs of dehydration should be used. Three of the most reliable indicators of dehydration are altered capillary refill time, abnormal skin turgor, and altered respiratory patterns [26]. Since no single sign is sufficient for accurate dehydration assessment, multi-sign dehydration scales are recommended. Among the most widely used scales are the Clinical Dehydration Scale (CDS) [27], the Gorelick scale [28], and the WHO scale [4]. These scale illustrates the signs used for classification. In high-income countries (HIC), the CDS or Gorelick scales are often employed, while in low- and middle-income countries (LMIC), the WHO scale is favored. Nevertheless, the accuracy of these scales is suboptimal. Research suggests that, while none of the scales is highly accurate, the CDS scale may be

the most effective at predicting dehydration in HIC populations [30]. Further investigations into the development of more precise dehydration assessment tools are encouraged.

Laboratory Evaluation:

Routine laboratory testing is not typically necessary. Serum electrolyte levels, renal function, and acid-base status (specifically bicarbonate levels) are helpful only when significantly abnormal, such as in cases of severe dehydration or when electrolyte imbalances are suspected (e.g., seizures or arrhythmias) [24, 26, 31]. Since most diarrheal episodes are self-limiting, identifying a specific enteropathogen does not usually alter the management or natural progression of the disease. However, in some cases, pathogen identification could reduce the indiscriminate use of antibiotics, potentially preventing the development of bacterial resistance and microbiome dysregulation [32].

Viral pathogens such as rotavirus and adenovirus can be identified using enzyme immunoassays, which are widely available [23]. Detection of other viruses (e.g., calicivirus) is typically performed using nucleic acid amplification tests, although routine viral identification is not generally recommended. Specific bacterial identification can be achieved through stool cultures or rapid molecular tests using polymerase chain reaction (PCR). While stool cultures are expensive, cover only a limited range of microorganisms, and offer slow results, they are recommended in cases of toxic appearance, high fever (>39°C/102°F), dysentery, immunosuppression, diarrhea lasting longer than 7 days, or travel history to high-risk bacterial infection areas [33, 34, 35]. Rapid molecular tests, such as multiplex assays, can identify a wide array of pathogens (8 to 22) within minutes or hours, making them useful for decision-making in clinical settings. However, due to their high cost and limited availability, these tests are not feasible in LMIC. Some guidelines recommend their use when enteric fever (caused by *Salmonella typhi*) or bacteremia/sepsis is suspected [23]. Recent studies suggest that introducing these rapid tests in LMICs can improve the targeting of antibiotic therapy in children [37]. Nonetheless, there is insufficient evidence to support their routine use. Stool microbiological examination is indicated primarily in cases of suspected parasitic infections, such as diarrhea lasting more than 7 days or a history of travel to endemic areas [35]. Testing for *Clostridium difficile* toxin should be considered when there is a recent history of antibiotic use (within the last 8–12 weeks) to rule out antibiotic-associated diarrhea (AAD) [38]. Routine testing for other anaerobic bacteria, such as *Bacteroides fragilis*, is not recommended [12]. Blood cultures should be obtained in infants under 3 months of age, when sepsis or enteric fever is suspected, or if there is a history of hemolytic anemia or immunosuppression [23]. It is crucial that clinical interpretation of microbiological tests considers the possibility that the presence of microorganisms may not necessarily indicate causality for the disease.

Classification of Dehydration Based on Three Scales:

The classification of hydration status varies according to different scales used for assessing dehydration. The WHO scale, CDS, and Gorelick scales offer different approaches based on clinical signs. For instance, the WHO scale categorizes

dehydration based on signs such as sunken eyes, dry mucous membranes, and the patient's general alertness. The CDS scale assigns numerical scores to assess severity, while the Gorelick scale includes models with four or ten items to classify dehydration severity. In high-income settings, the CDS and Gorelick scales are more commonly utilized, whereas in low-resource settings, the WHO scale is preferred. However, their diagnostic accuracy has been questioned, with studies indicating that none of the scales reliably predicts the severity of dehydration, although the CDS scale may provide the best estimate in high-income countries. Further research is necessary to refine dehydration assessment methods.

Laboratory Evaluation

Laboratory tests are not routinely necessary for most cases. Serum electrolytes, renal function, and acid-base status (particularly bicarbonate levels) are only informative when significantly abnormal. Consequently, such tests should be ordered primarily in instances of severe dehydration or when there is a strong suspicion of electrolyte imbalances, such as in cases of seizures or arrhythmias [24, 26, 31]. Since the majority of diarrheal episodes are self-limiting, identifying the specific enteropathogen does not typically alter the management or prognosis of the condition. However, in certain cases, pathogen identification can help reduce the indiscriminate use of antibiotics, potentially preventing the development of antibiotic resistance and the disruption of the microbiome [32]. Viral pathogens can be identified using conventional enzyme immunoassays for rotavirus and adenovirus, which are readily available [23]. The detection of other viruses, such as calicivirus, may be achieved through nucleic acid amplification tests. However, routine viral identification is not recommended. Specific bacterial detection can be performed using bacterial cultures or rapid molecular tests, such as polymerase chain reaction (PCR). Stool cultures, although useful, are costly, limited in scope, and slow in yielding results, and are therefore not routinely advised. These tests should be reserved for patients with toxic appearance, suspected sepsis, high fever (above 39°C/102°F), dysentery, immunosuppression, prolonged diarrhea (over 7 days), or a history of travel to high-risk bacterial infection regions [23, 33, 34, 35].

Regarding rapid molecular tests, several commercial multiplex assays are available, capable of detecting 8 to 22 pathogens in minutes to hours, making them highly beneficial for clinical decision-making. However, these tests are expensive and not widely accessible, particularly in low- and middle-income countries (LMIC). Some guidelines recommend their use in cases of suspected enteric fever (Salmonella typhi) or bacteremia/sepsis [23]. Recent research indicates that introducing rapid tests in LMIC settings could improve antibiotic stewardship in children [37]. However, there is insufficient evidence to recommend their routine use. Stool microbiological examination is indicated primarily when parasitic infections are suspected, particularly in cases of diarrhea lasting longer than 7 days or when the patient has a history of travel to endemic areas [35]. A Clostridium difficile toxin test should be considered for individuals with recent antibiotic use (within the past 8–12 weeks) to exclude antibiotic-associated diarrhea (AAD) [38]. Routine tests for other anaerobic bacteria, such as Bacteroides fragilis toxin detection, are not recommended [12].

Blood cultures should be collected in infants younger than 3 months, those with suspected sepsis or enteric fever, or in individuals with a history of hemolytic anemia or immunosuppression [23]. It is important to note that clinical interpretation should accompany all microbiological tests, as the presence of a microorganism does not necessarily imply causality.

Fluid Management

Fluid replacement remains the cornerstone of diarrhea management. The World Health Organization (WHO) outlines three management plans based on the patient's hydration status: Plans A, B, and C [4]. Plan A focuses on preventing dehydration and malnutrition, recommending increased fluid intake. Suitable fluids include oral rehydration solutions (ORS), salted drinks, and broths such as vegetable or chicken soups. Commercial electrolyte solutions (CES) are also viable alternatives. Fluids to avoid include carbonated beverages, commercial fruit juices, sweetened drinks, and beverages with laxative or stimulant effects, such as coffee or certain teas [4]. A general guideline is to administer 50–100 mL of fluid per loose stool in children under 2 years, and 100–200 mL in older children [4].

Plan B is recommended for children with mild to moderate dehydration [4, 5, 23, 24]. This plan utilizes oral rehydration therapy (ORT), with multiple systematic reviews demonstrating no significant difference between ORT and intravenous rehydration in non-severe dehydration regarding treatment failure, dysnatremia, total fluid intake, or weight gain [39, 40, 41]. Moreover, ORT (or nasogastric rehydration) reduces hospitalization duration by 1.2 days compared to intravenous therapy. ORT is not only quicker and safer to initiate but also more cost-effective than intravenous rehydration [42, 43, 44]. Therefore, ORT should be the first-line treatment, with intravenous therapy reserved for cases where ORT fails. Plan B involves fluid replacement based on the degree of dehydration. The WHO recommends administering 75 mL/kg of ORS orally, continuously until dehydration signs resolve (approximately 2–4 hours). The preferred ORS for this plan is low-osmolarity oral rehydration solution (L-ORS). L-ORS (sodium 90 mEq/L, osmolarity 245 mOsm/L) has been shown to significantly reduce stool output and vomiting compared to the standard oral rehydration solution (S-ORS) (sodium 90 mEq/L, osmolarity 311 mOsm/L) without increasing the risk of hyponatremia [45]. There is insufficient evidence to support the use of other types of ORS (e.g., polymer-based ORS) for Plan B [46]. In children from high-income countries (HIC), evidence suggests that half-strength apple juice may serve as an alternative to L-ORS for mild dehydration. A study by Freedman et al. found fewer treatment failures with half-strength apple juice (sodium 0 mEq/L, osmolarity 365 mOsm/L) compared to CES (sodium 45 mEq/L, osmolarity 250 mOsm/L) [47]. This may be due to the more palatable taste of apple juice, which encourages children to accept it when they refuse S-ORS, L-ORS, or CES. However, this approach may not be applicable in other contexts, such as in LMIC or among children with high sodium losses, as solutions without sodium may increase the risk of dangerous hyponatremia. Further research is required to confirm or refute this alternative.

Plan C is recommended for patients with severe dehydration, shock, or those who cannot tolerate ORT due to factors such as persistent vomiting, ileus, severe abdominal distension, unconsciousness, or worsening dehydration despite ORT [4, 5, 24, 25]. This plan involves rapid intravenous rehydration within 6 hours for infants and 3 hours for older children [4]. The optimal solution for intravenous rehydration is still debated. WHO and the American Academy of Pediatrics (AAP) recommend Ringer's lactate, while other guidelines suggest using 0.9% saline [24, 35]. A Cochrane review is underway to compare the effectiveness of 0.9% saline versus balanced solutions (those with reduced chloride and additional cations such as potassium, calcium, or magnesium, and anions like lactate, acetate, or gluconate, which metabolize to bicarbonate) [49]. Some studies suggest that 0.9% saline, when compared to balanced solutions like Ringer's lactate, can lead to metabolic acidosis and hyperchloremia in various clinical conditions [50]. Until further evidence emerges, 0.9% saline should be reserved for bolus therapy in hypovolemic shock cases. The duration of rehydration therapy remains contentious, with two major approaches: rapid rehydration (fluid replacement within 3–6 hours) versus standard rehydration (12–24 hours). Systematic reviews comparing these approaches have shown similar results in terms of rehydration success, discharge times from the emergency department (ED), and the resolution of electrolyte disturbances [51, 52]. Consequently, rapid rehydration is generally preferred for Plan C in both LMIC [24] and HIC [4]. The subcutaneous (hypodermoclysis) route has been explored as an alternative to intravenous rehydration, particularly in cases where venous access is difficult. Two single-arm studies suggest that recombinant human hyaluronidase-facilitated subcutaneous (rHFSC) rehydration may be a viable option for children. However, these studies had limitations, including lack of control groups and small sample sizes. A randomized controlled trial (RCT) on non-severe dehydration indicated that rHFSC was non-inferior to intravenous rehydration and easier to administer [55]. Further evidence is needed to confirm its broader applicability, with an ongoing systematic review in progress [56].

Dietary Management:

Dietary management is crucial in preventing nutritional damage in children with diarrhea. The WHO recommends that infants, especially those who are breastfed, should continue feeding unless they are severely dehydrated. Older children should continue regular feeding, with frequent, small meals being more tolerable than large, infrequent ones. A systematic review found no significant difference in rehydration outcomes between early (within 12 hours) and delayed feeding after rehydration [57]. The use of lactose-free milk formula is debated; while some studies show slight benefits in reducing diarrhea duration, evidence is of low quality, particularly in low- and middle-income countries (LMICs), and diluted milk is harmful [58, 59, 60].

Antidiarrheals:

Various interventions for diarrhea have been studied, but many are not recommended in guidelines. Probiotics, such as *Saccharomyces boulardii* and *Lactobacillus reuteri*, have shown moderate benefits in reducing diarrhea duration but with varying results across studies [61-65]. Smectite, a medicinal clay, has

demonstrated a reduction in diarrhea duration, though evidence quality is low. Zinc supplementation is effective in reducing diarrhea duration and recurrence, especially in LMICs. Loperamide is effective for adults but contraindicated in children under 2 due to serious side effects . Other treatments, such as gelatin tannate and multiple micronutrients, show minimal or no effect. Ondansetron is the only proven effective antiemetic for controlling vomiting in children, reducing hospitalizations and intravenous rehydration needs, though it may increase diarrhea episodes. Other antiemetics, like dexamethasone and metoclopramide, are not as effective. Antibiotics are not routinely recommended for diarrhea due to potential complications but are indicated for specific infections like Shigella and cholera. Empirical treatments include quinolones and macrolides, but caution is advised due to side effects. Preventive measures for diarrhea include safe drinking water, sanitation, hygiene, and rotavirus vaccination, which has significantly reduced the incidence of rotavirus in Africa [10, 17]. Other vaccines, such as for cholera and typhoid, are recommended for high-risk populations [23].

Nursing Care Interventions:

Effective nursing care for children with diarrhea involves a multi-faceted approach aimed at preventing dehydration, managing symptoms, and addressing underlying causes. Nurses play a pivotal role in monitoring hydration status, providing appropriate interventions, and educating families about prevention and care strategies.

1. Monitoring Fluid and Electrolyte Balance: One of the primary nursing interventions is the careful assessment and management of fluid and electrolyte imbalances. Nurses should monitor for signs of dehydration, including changes in skin turgor, mucous membranes, urine output, and vital signs. Regular weight checks and observation for tachycardia, hypotension, or lethargy are essential. Nurses can administer oral rehydration solutions (ORS) to replace lost fluids and electrolytes, following recommended protocols for the volume and frequency of administration based on the severity of dehydration [5]. For more severe cases, intravenous fluids may be required, and the nurse must ensure correct placement and function of the IV.

2. Promoting Nutritional Support: In addition to fluid management, maintaining nutrition is crucial. Nurses should encourage continued feeding in infants, especially breastfeeding, as per WHO recommendations [56]. For older children, offering frequent, small meals that are easy to digest can help maintain nutrition while managing diarrhea. In cases of lactose intolerance or sensitivity, lactose-free formulas or appropriate substitutions should be used. Nurses should educate parents and caregivers about the importance of maintaining feeding during episodes of diarrhea to promote healing and prevent further nutritional decline.

3. Symptom Management: Nurses are responsible for managing symptoms like vomiting and abdominal pain. Administering antiemetics, such as ondansetron, can be crucial in reducing vomiting and preventing further dehydration [84]. Pain management may include administering age-appropriate pain relief and comfort measures, such as abdominal massage or warmth.

4. Infection Control and Prevention: Hand hygiene and sanitation are key aspects of nursing interventions, as diarrhea in children can often be caused by infectious agents. Nurses should educate families about proper handwashing, safe food handling, and sanitation practices to reduce the spread of infection. Additionally, vaccination education, particularly for rotavirus, cholera, and typhoid, is critical in preventing future episodes of diarrhea [17].

Conclusion

Acute diarrhea in children remains a major public health concern, particularly in low- and middle-income countries (LMIC), where it accounts for a significant number of hospitalizations and deaths. The majority of cases are caused by viral infections, with rotavirus historically being the leading pathogen. However, following the introduction of rotavirus vaccines, there has been a significant reduction in hospitalizations and fatalities. Norovirus has since emerged as the leading cause of viral diarrhea, especially in high-income countries (HIC), and is responsible for outbreaks in young children and travelers. Management of acute diarrhea primarily revolves around preventing dehydration, the most common and dangerous complication of the condition. Several dehydration scales, including the WHO scale, Clinical Dehydration Scale (CDS), and Gorelick scale, are used to assess hydration status and guide the administration of fluids. While the scales vary in their diagnostic accuracy, they are indispensable tools in clinical practice, particularly in resource-limited settings. Dehydration can be classified into mild, moderate, and severe stages, with severe dehydration requiring urgent intervention through oral rehydration therapy (ORT) or intravenous fluids in severe cases. Nursing care plays a vital role in the management of acute diarrhea, with nurses being responsible for the early identification of dehydration, accurate assessment of fluid status, and administration of rehydration therapies. Close monitoring of vital signs, urine output, and stool characteristics are essential components of care. Additionally, nurses are key in educating caregivers about the importance of fluid replenishment and proper hygiene practices to prevent further infections. While most episodes of diarrhea are self-limiting and resolve within a few days, severe cases caused by bacterial pathogens or parasites may require targeted treatment with antibiotics or antiparasitic. However, the indiscriminate use of antibiotics must be avoided to prevent resistance. Nursing interventions also include monitoring for signs of severe infections or complications, such as toxic appearance or dysentery, which may necessitate further diagnostic testing and specialized care. Overall, effective nursing interventions and appropriate management strategies are crucial in reducing the burden of acute diarrhea in children and preventing adverse outcomes.

References

1. Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? Lancet. 2003;361(9376):2226–34.
2. Liu L, Oza S, Hogan D, Perin J, Rudan I, Lawn JE, et al. Global, regional, and national causes of child mortality in 2000–13, with projections to inform post-2015 priorities: an updated systematic analysis. Lancet. 2015;385(9966):430–40.

3. Schnadower D, Finkelstein Y, Freedman SB. Ondansetron and probiotics in the management of pediatric acute gastroenteritis in developed countries. Curr Opin Gastroenterol. 2015;31(1):1–6. https://doi.org/10.1097/mog.0000000000000132.
4. World Health Organization, editor. The treatment of diarrhoea: a manual for physicians and other senior health workers. In: World Health Organization. Geneva; 2005.
5. American Academy of Pediatrics A. Practice parameter: the management of acute gastroenteritis in young children. Pediatrics. 1996;97(3):424–35.
6. Guerrant RL, Hughes JM, Lima NL, Crane J. Diarrhea in developed and developing countries: magnitude, special settings, and etiologies. Rev Infect Dis. 1990;12(Supplement 1):S41–50. https://doi.org/10.1093/clinids/12.Supplement_1.S41.
7. Giannattasio A, Guarino A, Lo VA. Management of children with prolonged diarrhea. F1000Res. 2016;5:F1000 Faculty Rev-206. https://doi.org/10.12688/f1000research.7469.1.
8. Bányai K, Estes MK, Martella V, Parashar UD. Viral gastroenteritis. Lancet. 2018;392(10142):175–86.
9. Cherry JD, Harrison GJ, Kaplan SL, Hotez PJ, Steinbach WJ. Feigin and Cherry's textbook of pediatric infectious diseases: Elsevier; 2018.
10. Operario DJ, Platts-Mills JA, Nadan S, Page N, Seheri M, Mphahlele J, et al. Etiology of severe acute watery diarrhea in children in the global rotavirus surveillance network using quantitative polymerase chain reaction. J Infect Dis. 2017;216(2):220–7.
11. Kim J, Smathers SA, Prasad P, Leckerman KH, Coffin S, Zaoutis T. Epidemiological features of Clostridium difficile-associated disease among inpatients at children's hospitals in the United States, 2001–2006. Pediatrics. 2008;122(6):1266–70. https://doi.org/10.1542/peds.2008-0469.
12. Akhi MT, Seifi SJ, Asgharzadeh M, Rezaee MA, Oskuei SA, Pirzadeh T, et al. Role of enterotoxigenic *Bacteroides fragilis* in children less than 5 years of age with diarrhea in Tabriz, Iran. Jundishapur J Microbiol. 2016;9(6):e32163.
13. Ramamurthy D, Pazhani GP, Sarkar A, Nandy RK, Rajendran K, Sur D, et al. Case-control study on the role of enterotoxigenic Bacteroides fragilis as a cause of diarrhea among children in Kolkata. India PloS One. 2013;8(4):e60622. https://doi.org/10.1371/journal.pone.0060622.
14. Riera-Montes M, O'ryan M, Verstraeten T. Norovirus and rotavirus disease severity in children: systematic review and meta-analysis. Pediatr Infect Dis J. 2018;37(6):501–5.
15. Das JK, Duggan C, Bhutta ZA. Persistent diarrhea in children in developing countries. In: Textbook of pediatric gastroenterology, hepatology and nutrition: Springer; 2016. p. 195–202.
16. Riera-Montes M, Cattaert T, Verstraeten T. Rotavirus vaccination may reduce acute gastroenteritis rates across all age groups in England. Value Health. 2017;20(9):A780.
17. Aliabadi N, Antoni S, Mwenda JM, Weldegebriel G, Biey JN, Cheikh D, et al. Global impact of rotavirus vaccine introduction on rotavirus hospitalisations among children under 5 years of age, 2008–16: findings from the Global Rotavirus Surveillance Network. Lancet Glob Health. 2019;7(7):e893–903.
18. Hassan E, Baldridge MT. Norovirus encounters in the gut: multifaceted interactions and disease outcomes. Mucosal Immunol. 2019:1–9.

19. Kliegman R, Stanton B, St. Geme JW, Schor NF, Behrman RE, Nelson WE. Nelson textbook of pediatrics. 2018.
20. Long SS, Brady MT, Jackson MA, Kimberlin DW. Red book 2018: report of the committee on infectious diseases: American Academy of Pediatrics; 2018.
21. Thiagarajah JR, Donowitz M, Verkman AS. Secretory diarrhoea: mechanisms and emerging therapies. Nat Rev Gastroenterol Hepatol. 2015;12(8):446–57.
22. Bresee JS, Duggan C, Glass RI, King CK. Managing acute gastroenteritis among children; oral rehydration, maintenance, and nutritional therapy. 2003.
23. Shane AL, Mody RK, Crump JA, Tarr PI, Steiner TS, Kotloff K et al. 2017 Infectious Diseases Society of America clinical practice guidelines for the diagnosis and management of infectious diarrhea. Clin Infect Dis 2017;65(12):e45-e80.
24. Guarino A, Ashkenazi S, Gendrel D, Vecchio AL, Shamir R, Szajewska H. European Society for Pediatric Gastroenterology, Hepatology, and Nutrition/European Society for Pediatric Infectious Diseases evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. J Pediatr Gastroenterol Nutr. 2014;59(1):132–52.
25. Centers for Disease Control and Prevention. Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy. Pediatrics. 2004;114(2):507.
26. Steiner MJ, DeWalt DA, Byerley JS. Is this child dehydrated? Jama. 2004;291(22):2746–54.
27. Friedman JN, Goldman RD, Srivastava R, Parkin PC. Development of a clinical dehydration scale for use in children between 1 and 36 months of age. J Pediatr. 2004;145(2):201–7. https://doi.org/10.1016/j.jpeds.2004.05.035.
28. Gorelick MH, Shaw KN, Murphy KO. Validity and reliability of clinical signs in the diagnosis of dehydration in children. Pediatrics. 1997;99(5):e6-e.
29. Freedman SB, Vandermeer B, Milne A, Hartling L, Johnson D, Black K, et al. Diagnosing clinically significant dehydration in children with acute gastroenteritis using noninvasive methods: a meta-analysis. J Pediatr. 2015;166(4):908–16 e6.
30. Falszewska A, Szajewska H, Dziechciarz P. Diagnostic accuracy of three clinical dehydration scales: a systematic review. Arch Dis Child. 2018;103(4):383–8. https://doi.org/10.1136/archdischild-2017-313762.
31. Pruvost I, Dubos F, Aurel M, Hue V, Martinot A. Valeur des données anamnestiques, cliniques et biologiques pour le diagnostic de déshydratation par diarrhée aiguë chez l'enfant de moins de 5 ans. Presse Med. 2008;37(4):600–9.
32. Lynch SV, Ng SC, Shanahan F, Tilg H. Translating the gut microbiome: ready for the clinic? Nat Rev Gastroenterol Hepatol. 2019:1–6.
33. Churgay CA, Aftab Z. Gastroenteritis in children: Part II. Prevention and management. Am Fam Physician. 2012;85(11):1066–70.
34. Lo Vecchio A, Vandenplas Y, Benninga M, Broekaert I, Falconer J, Gottrand F, et al. An international consensus report on a new algorithm for the management of infant diarrhoea. Acta Paediatr. 2016;105(8):e384–e9.
35. Women's NCCf, Health Cs. Diarrhoea and vomiting caused by gastroenteritis: diagnosis, assessment and management in children younger than 5 years. 2009.

36. Binnicker MJ. Multiplex molecular panels for diagnosis of gastrointestinal infection: performance, result interpretation, and cost-effectiveness. J Clin Microbiol. 2015;53(12):3723–8.
37. Pernica JM, Steenhoff AP, Mokomane M, Moorad B, Lechiile K, Smieja M, et al. Rapid enteric testing to permit targeted antimicrobial therapy, with and without Lactobacillus reuteri probiotics, for paediatric acute diarrhoeal disease in Botswana: a pilot, randomized, factorial, controlled trial. PLoS One. 2017;12(10):e0185177. https://doi.org/10.1371/journal.pone.0185177.
38. McDonald LC, Gerding DN, Johnson S, Bakken JS, Carroll KC, Coffin SE, et al. Clinical practice guidelines for Clostridium difficile infection in adults and children: 2017 update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA). Clin Infect Dis. 2018;66(7):e1–e48.
39. Hartling L, Bellemare S, Wiebe N, Russell KF, Klassen TP, Craig WR. Oral versus intravenous rehydration for treating dehydration due to gastroenteritis in children. Cochrane Database Syst Rev. 2006;3.
40. Bellemare S, Hartling L, Wiebe N, Russell K, Craig WR, McConnell D, et al. Oral rehydration versus intravenous therapy for treating dehydration due to gastroenteritis in children: a meta-analysis of randomised controlled trials. BMC Med. 2004;2(1):11.
41. Fonseca BK, Holdgate A, Craig JC. Enteral vs intravenous rehydration therapy for children with gastroenteritis: a meta-analysis of randomized controlled trials. Arch Pediatr Adolesc Med. 2004;158(5):483–90.
42. Mejía A, Atehortua SC, Sierra JM, Mejía ME, Ramírez C, Florez ID. Costs of oral and nasogastric rehydration compared to intravenous rehydration in children under 5 years of age with diarrhea in Colombia. Rev Salud Publica (Bogota). 2017;19(1):17–23.
43. Pershad J. A systematic data review of the cost of rehydration therapy. Appl Health Econ Health Policy. 2010;8(3):203–14. https://doi.org/10.2165/11534500-000000000-00000.
44. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009;6(7):e1000097.
45. Hahn S, Kim Y, Garner P. Reduced osmolarity oral rehydration solution for treating dehydration caused by acute diarrhoea in children. Cochrane Database Syst Rev. 2002;1:CD002847. https://doi.org/10.1002/14651858.CD002847.
46. Gregorio GV, Gonzales MLM, Dans LF, Martinez EG. Polymer-based oral rehydration solution for treating acute watery diarrhoea. Cochrane Database Syst Rev. 2016;12:CD006519. https://doi.org/10.1002/14651858.CD006519.pub3.
47. Freedman SB, Willan AR, Boutis K, Schuh S. Effect of dilute apple juice and preferred fluids vs electrolyte maintenance solution on treatment failure among children with mild gastroenteritis: a randomized clinical trial. JAMA. 2016;315(18):1966–74. https://doi.org/10.1001/jama.2016.5352.
48. American Academy of Pediatrics. Practice parameter: the management of acute gastroenteritis in young children. American Academy of Pediatrics. Provisional Committee on Quality Improvement, Subcommittee on Acute Gastroenteritis. Pediatrics. 1996;97(3):424–35.

49. Florez ID. Balanced solutions vs. 0.9% saline for children with acute diarrhoea and severe dehydration [title]. In: Cochrane Infectious Diseases Group. 2019. https://www.cochrane.org/title/balanced-solutions-vs-09-saline-children-acute-diarrhoea-and-severe-dehydration.
50. Antequera Martín AM, Barea Mendoza JA, Muriel A, Sáez I, Chico-Fernández M, Estrada-Lorenzo JM, et al. Buffered solutions versus 0.9% saline for resuscitation in critically ill adults and children. Cochrane Database Syst Rev. 2019;(7). https://doi.org/10.1002/14651858.CD012247.pub2.
51. Toaimah FHS, Mohammad HMF. Rapid intravenous rehydration therapy in children with acute gastroenteritis: a systematic review. Pediatr Emerg Care. 2016;32(2):131–5.
52. Iro M, Sell T, Brown N, Maitland K. Rapid intravenous rehydration of children with acute gastroenteritis and dehydration: a systematic review and meta-analysis. BMC Pediatr. 2018;18(1):44.
53. Allen CH, Etzwiler LS, Miller MK, Maher G, Mace S, Hostetler MA, et al. Recombinant human hyaluronidase-enabled subcutaneous pediatric rehydration. Pediatrics. 2009;124(5):e858–e67.
54. Zubairi H, Nelson BD, Tulshian P, Fredricks K, Altawil Z, Mireles S, et al. Hyaluronidase-assisted resuscitation in Kenya for severely dehydrated children. Pediatr Emerg Care. 2019;35(10):692–5.
55. Spandorfer PR. Subcutaneous rehydration: updating a traditional technique. Pediatr Emerg Care. 2011;27(3):230–6.
56. Saganski GF, de Souza Freire MH. Safety and effectiveness of hypodermoclysis compared to intravenous fluid infusion for rehydrating children with mild to moderate dehydration: a systematic review protocol. JBI Database System Rev Implement Rep. 2019;17(7):1270–6.
57. Gregorio GV, Dans LF, Silvestre MA. Early versus delayed refeeding for children with acute diarrhoea. Cochrane Database Syst Rev. 2011;7.
58. Gaffey MF, Wazny K, Bassani DG, Bhutta ZA. Dietary management of childhood diarrhea in low-and middle-income countries: a systematic review. BMC Public Health. 2013;13(S3):S17.
59. MacGillivray S, Fahey T, McGuire W. Lactose avoidance for young children with acute diarrhoea. Cochrane Database Syst Rev. 2013;10.
60. Florez ID, Veroniki A-A, Al Khalifah R, Yepes-Nuñez JJ, Sierra JM, Vernooij RW, et al. Comparative effectiveness and safety of interventions for acute diarrhea and gastroenteritis in children: a systematic review and network meta-analysis. PLoS One. 2018;13(12):e0207701.
61. Cremon C, Barbaro MR, Ventura M, Barbara G. Pre- and probiotic overview. Curr Opin Pharmacol. 2018;43:87–92. https://doi.org/10.1016/j.coph.2018.08.010.
62. Allen SJ, Martinez EG, Gregorio GV, Dans LF. Probiotics for treating acute infectious diarrhoea. Cochrane Database Syst Rev. 2010;11.
63. Feizizadeh S, Salehi-Abargouei A, Akbari V. Efficacy and safety of Saccharomyces boulardii for acute diarrhea. Pediatrics. 2014;134(1):e176–e91.
64. Dinleyici EC, Eren M, Ozen M, Yargic ZA, Vandenplas Y. Effectiveness and safety of Saccharomyces boulardii for acute infectious diarrhea. Expert Opin Biol Ther. 2012;12(4):395–410. https://doi.org/10.1517/14712598.2012.664129.

65. Urbańska M, Gieruszczak-Białek D, Szajewska H. Systematic review with meta-analysis: Lactobacillus reuteri DSM 17938 for diarrhoeal diseases in children. Aliment Pharmacol Ther. 2016;43(10):1025–34.

الملخص:

الخلفية: يُعد الإسهال الحاد في الأطفال أحد الأسباب الرئيسية للممراضة والوفيات، خاصة في البلدان ذات الدخل المنخفض والمتوسط (LMIC). على الرغم من انخفاض معدل الوفيات نسبياً في البلدان ذات الدخل المرتفع(HIC) ، إلا أنه لا يزال سبباً مهماً للزيارات الطبية وأعباء الرعاية الصحية. يحدث المرض، الذي تسببه غالباً مسببات الأمراض الفيروسية أو البكتيرية أو الطفيلية، بشكل مختلف في البلدان ذات الدخل المنخفض والمتوسط مقارنة بالبلدان ذات الدخل المرتفع. إن الإدارة الفعالة، خاصة للأطفال تحت سن الخامسة، أمر بالغ الأهمية للوقاية من الجفاف والمضاعفات الشديدة الأخرى.

الهدف: تهدف هذه المراجعة إلى تقديم تلخيص محدث حول الأسباب المرضية، والعوامل المسببة، والإدارة السريرية، وتدخلات التمريض للإسهال الحاد في الأطفال. كما تسعى لمقارنة الممارسات في بيئات البلدان ذات الدخل المنخفض والمتوسط والبلدان ذات الدخل المرتفع، مع التركيز على تقييم الجفاف، والعلاج بالسوائل، ودور التطعيم في الوقاية.

الطرق: تقوم المراجعة بتلخيص الأدلة الحديثة من الدراسات السريرية، والإرشادات، وتوصيات الخبراء حول إدارة الإسهال الحاد في الأطفال. وتشمل تحليلاً للمسببات الشائعة، وطرق التشخيص، ومقاييس الجفاف، وبروتوكولات العلاج لكل من الإسهال الفيروسي والبكتيري. التركيز يكون على التدخلات الفعالة، وخاصة الرعاية التمريضية في سياق إدارة الميوعة والمراقبة .

النتائج: تسلط المراجعة الضوء على أن العدوى الفيروسية، وخاصة فيروس الروتا وفيروس النوروفيروس، هي الأسباب الرئيسية للإسهال في الأطفال. وقد أدى إدخال لقاحات فيروس الروتا إلى تقليل كبير في حالات الاستشفاء والوفيات في البلدان التي تتوفر فيها اللقاحات على نطاق واسع. تعتبر أدوات التشخيص مثل زرع البراز والاختبارات الجزيئية السريعة ضرورية في الحالات الشديدة، على الرغم من أنها ليست ضرورية بشكل روتيني. تُعد موازين تقييم الجفاف) مثل منظمة الصحة العالمية، CDS، غورليك (حاسمة في توجيه العلاج بالسوائل، مع اختلاف دقتها حسب السياق. تلعب الرعاية التمريضية دوراً مركزياً في إدارة الجفاف ومراقبة حالة الترطيب.

الخاتمة: يتطلب الإسهال الحاد في الأطفال إدارة سريعة وفعالة للوقاية من الجفاف والمضاعفات المرتبطة به. على الرغم من أن العدوى الفيروسية هي السبب الأكثر شيوعاً، يجب أيضاً أخذ العدوى البكتيرية والطفيلية في الاعتبار. تدخلات الرعاية التمريضية، بما في ذلك إدارة الترطيب بعناية، أساسية في كل من البلدان ذات الدخل المنخفض والمتوسط والبلدان ذات الدخل المرتفع لضمان نتائج إيجابية.

الكلمات الرئيسية: الإسهال الحاد، الأطفال، الجفاف، فيروس الروتا، تدخلات التمريض، التهاب المعدة والأمعاء، إدارة الترطيب، الوقاية من العدوى.