ROLE OF FLUID RESUSCITATION AND SUPPORTIVE MANAGEMENT OF DIARRHEA

ABSTRACT

The pediatric population is sensitive in every aspect. There are several parts of their bodies that need extreme levels of care and support until these children have reached a mature age. Similarly, there are several aspects of health that require immediate and urgent intervention, particularly in the pediatric population for better care and management. The reason behind this is the delicate and sensitive nature of the children's health. Compromising any aspect of pediatric care might lead to severe consequences, which could be life-threatening too. Therefore, it is in the best interest of both the parents of the children and the physicians to be vigilant about the affected children's symptoms just so they do not miss out on any important signs that could be transient or short-lived. Diarrhea is among the pediatric conditions that can very easily take a turn for the worse if it is not managed appropriately. Diarrhea can lead to severe consequences, including death in children, especially the malnourished ones. Diarrhea results in the excessive excretion of water, and electrolytes including sodium, potassium, bicarbonate, and zinc through watery stools. Dehydration ensues when these losses are not sufficiently replenished, leading to deficits in both water and electrolytes. The extent of dehydration is categorized based on symptoms and signs that mirror the quantity of fluid expelled. Depending upon these extents and degrees of dehydration, performing immediate resuscitation measures might be necessary. On the brighter side, these fluid resuscitative measures might be the only interventions required to stop the child's progression further towards a severe form of the disease. This review is based on

this fact only, and it revolves around the importance of performing fluid resuscitation and other elementary-level supportive measures that might be the only shot at saving the life of the child if done at an early stage. Thai review will help take action under the right circumstances if such a case arises in the clinical setting.

Keywords: diarrhea, pediatrics, degree of dehydration, fluid resuscitation, fluid and electrolyte imbalance, malnutrition.

INTRODUCTION

When it comes to defining diseases in the context of pediatric populations, there are several definitions that have already been proposed. Diarrhea is also among those diseases that have been aimed to be defined in various different ways, all targeting a different approach each time. However, for the purpose of ease, a general definition has been used as the reference for this study.

It is a well-known fact that diarrhea itself along with other related diseases continues to exert a significant toll on the health of pediatric populations worldwide. This fact is regardless of the location, for it does not depend on whether it is of more common occurrence in a developed country or an underdeveloped one. (1)

The prevalence of diarrhea is closely linked to the availability of public sanitation, access to clean water, and the quality of medical care, with a noticeable inverse relationship. (2)Consequently, it is unsurprising that in developing regions, the incidence of diarrheal disease can be notably high, reaching up to 10 episodes per child per year among those under the age of 5. In these areas, the cumulative mortality can soar to between 3 and 5 million deaths annually.(3)

In contrast, developed countries like the United States experience a markedly lower incidence, reaching up to approximately 1–2 episodes per year and mortality reaching around 400–500 deaths annually from diarrheal diseases.(4) Nevertheless, these nations still bear a substantial burden on their healthcare systems due to pediatric diarrhea. Approximately 20% of all pediatric ambulatory visits and 10% of all inpatient hospital admissions for children under 3 years of age are attributed to the assessment and treatment of these conditions and their related complications.(5)

Acute diarrhea stands as the most common gastrointestinal ailment and a primary contributor to childhood dehydration. It is characterized by the abrupt onset of three or more loose or watery bowel movements daily, typically lasting for seven to 10 days, with a maximum duration of 14 days. (6)The leading causes of acute diarrhea are gastrointestinal infections, both viral and bacterial, with occasional instances of foodborne intoxications and other contributing factors.(7)

Diarrhea tends to be more prevalent among infants aged 6 to 11 months, a period coinciding with the introduction of complementary foods into their diets. (8)Several factors contribute to this susceptibility, including a decrease in maternal antibodies, limited active immunity in infants, consumption of contaminated foods, the transition to crawling and walking, and direct exposure to human or animal feces. (9)

Malnutrition is a well-recognized leading cause of mortality in children. Conversely, children suffering from malnutrition are at a heightened risk of experiencing diarrhea, as malnutrition weakens the immune system, leading to infections that, in turn, perpetuate a cycle of recurrent diarrhea.(10)

History And Evaluation

During the physical and clinical assessment of a child with diarrhea, obtaining a thorough feeding history is of utmost importance. (11)

Additionally, healthcare providers should inquire about several crucial aspects, including the frequency of stools, the duration of diarrhea, the presence of blood in stools, any reports of recent cholera outbreaks in the area, recent antibiotic or other drug treatments, and any instances of an infant crying accompanied by pallor.(12)

During the examination, it is vital to carefully observe for signs of dehydration, which can range from mild to severe. These signs encompass restlessness or irritability, lethargy or a reduced level of consciousness, sunken eyes, delayed skin pinch response, and variations in drinking behavior, such as excessive thirst or eagerness to drink, or conversely, poor or inability to drink. Other important elements to assess include the presence of blood in stools, indications of severe malnutrition, the presence of an abdominal mass, and any abdominal distension.(13)

It is worth noting that routine stool microscopy or culture is generally unnecessary for children with non-bloody diarrhea, streamlining the diagnostic process and enabling more focused care.

Assessing Degree Of Dehydration:

Before starting any sort of treatment or management plan, it is essential that the physician routinely carry out some tests that will help them assess the degree of dehydration in the affected child. This part is important because depending on the degree of dehydration, different management plans are decided and implemented on the child.(14)

Table 1 :Here is an overview of the classification and types of management that are done in each type of diarrhea

Classification	**Signs And Symptoms**	**Management**
Severe Dehydration	Two or more of the following signs:	Manage as per the protocol of severe diarrhea (aggressive

	• Extreme levels of weakness, lethargy, or unconsciousness • Eyes that are sunken • The child is either unable to eat or drinks very poorly • Skin pinch test is positive (takes more than 2 seconds to go back)	fluid rehydration)
Some Dehydration	Two or more of the following signs: • Extreme levels of restlessness or irritability present • Eyes that are sunken • Child is thirsty and drinks eagerly when offered water • Skin pinch test is positive (skin goes back slowly)	• Start fluids and food for immediate management • Once in-hospital/in-clinic treatment has been given, advise the mother to go home and return if the signs continue • Schedule a follow-up in 5 days if the child's condition does not improve
No Dehydration	Not enough signs to classify it as dehydration	

The management plan of the affected child would then be influenced by these factors. In the case of severe dehydration, it is advised to immediately start fluid resuscitation to prevent any further complications from ensuing.

THE ROLE OF IMMEDIATE FLUID RESUSCITATION IN MANAGING CHILDREN WITH DIARRHEA

As has already been highlighted before, the role of immediate fluid resuscitation in the management of diarrhea is very important. It has a very vital role in managing the early signs and symptoms of diarrhea. If done within the appropriate time period, then it could very easily lead to the control of symptoms in the affected children.

However, if it is not managed, then diarrhea could very soon take a turn for the worse. This is due to the hypovolemia linked to diarrhea. It stands as the second most common cause of mortality in children under the age of 5. This condition involves a decrease in intracellular fluid volume and is primarily attributed to the loss of sodium and water.(15)

For this reason, it is important to explore the role of fluid resuscitation, also popularly known as Oral Rehydration Therapy or ORT in managing diarrhea.

Oral rehydration therapy is a groundbreaking approach that was introduced in the 1960s. Ever since then, it has become the gold standard for managing fluid loss resulting from acute diarrhea. This therapy relies on an oral rehydration solution (ORS) consisting of an iso-osmolar glucose-electrolyte blend containing base and citrate. ORS is administered to address dehydration and metabolic acidosis, effectively reducing the incidence of associated health complications and fatalities.(16)

Despite its proven effectiveness, the utilization of ORS has faced challenges over the past three decades, with usage rates remaining stagnant or low in many regions globally. According to a UNICEF monograph from 2009, the overall utilization of ORS was reported to be only 33% in developing countries. This statistic raises concerns about the potential for increased child mortality resulting from diarrhea in areas where ORS adoption remains limited.(17)

Oral rehydration therapy (ORT) has emerged as the preferred method for addressing the depletion of fluids and electrolytes that often occurs as a result of gastroenteritis-induced diarrhea in children experiencing mild to moderate dehydration. This therapeutic approach has proven to be highly effective in the management of hypovolemia associated with gastroenteritis, and it is applicable irrespective of the patient's age, the specific causative agent responsible for the condition, or the initial levels of sodium in the body.(18)

A key aspect of this treatment involves the use of an oral rehydration solution (ORS) with reduced osmolarity, typically measuring 250 mOsm/L or less. Such ORS solutions have received approval from the World Health Organization (WHO). Research has shown that these solutions can substantially reduce the frequency of diarrhea episodes, alleviate vomiting, and decrease the need for intravenous (IV) rehydration therapy, making them an essential component of the management of gastroenteritis-related dehydration in children. (19)

PRESCRIBING ORAL REHYDRATION SOLUTION (ORS) FOR DIFFERENT DEGREES OF DIARRHEA

Depending upon the extent of dehydration in children, there are different recommendations for prescribing oral rehydration therapy. A brief overview of this therapy is summarized as under:

For Mild To Moderate Dehydration:

Patients with relatively mild water loss may be suitable candidates for home-based care, where they can receive instruction on oral fluid replacement techniques as needed. However, individuals with a higher degree of dehydration are better served by being monitored in a medical setting. (10)

During the rehydration phase, patients are administered liquid therapy using oral rehydration solution (ORS) at a rate of 50 to 100 ml/kg every 4 hours. Additional ORS is provided to

compensate for the ongoing loss of fluids through the digestive system, whether due to stool or vomiting. Healthcare providers regularly assess the patient's hydration status and adjust fluid replacement accordingly. (20)

Following the replacement phase, the maintenance phase begins. This involves initiating nutrition and fluids, while ORT continues to address ongoing gastrointestinal fluid losses.

The patient's hydration status, diarrhea, vomiting, and the amount of fluid excreted per hour are continually evaluated to determine the necessary fluid replacement for the subsequent hour.

For Severe Diarrhea:

In cases of severe dehydration, defined as a volume loss exceeding 10%, a different treatment protocol is followed. The rehydration phase for very severe dehydration is considered a medical emergency and necessitates intravenous (IV) treatment, with a rapid administration of 20 ml/kg of isotonic saline. (21)

As the patient's clinical condition stabilizes and their level of consciousness returns to normal, the treatment can transition to ORS. ORS is administered at a volume of 100 ml/kg body weight every 4 hours, or 25 ml/kg if preferred. Hourly assessments are conducted to evaluate the patient's hydration status, monitor diarrhea and vomiting, and determine the necessary fluid replacement for the subsequent hour. (22)

Once the repletion phase is successfully completed, the maintenance phase begins, which includes the initiation of nutrition and fluids while continuing ORT to compensate for ongoing gastrointestinal losses.

EFFECT OF EARLY ORAL FLUID REHYDRATION THERAPY IN CHILDREN WITH DIARRHEA

In a systematic review conducted by Freedman and colleagues, it was found that the use of Oral Rehydration Therapy (ORT) was associated with shorter hospital stays when compared to Intravenous (IV) therapy. However, there was a higher risk of developing paralytic ileus in patients treated with ORT as opposed to those receiving IV therapy. It is worth noting that phlebitis, a condition characterized by inflammation of the veins, was more common in the IV therapy group.

Despite these findings, the simplicity and noninvasiveness of ORT make it the preferred choice for treating mild to moderate cases of diarrhea. This underscores the practical advantages of ORT, even though there are some associated risks when compared to IV therapy. (23)

On the other hand, there have been notable advancements, particularly involving the adoption of rapid Oral Rehydration Therapy (ORT), which involves administering fluids over a 4-hour period. In situations where rapid ORT proves ineffective, healthcare providers may consider Intravenous (IV) or rapid IV therapy with a solution containing 0.9% NaCl at a rate of 20 ml/kg/h for a duration of 2 to 4 hours. Additionally, ORT is continued alongside IV therapy. (24)

CONCLUSION

Acute diarrhea is one of those illnesses that could take a turn for the worse if they are not treated effectively and immediately. Unfortunately, these are some of the prevalent issues in the pediatric population all around the world. Because it takes a turn for the worse earlier than expected in children, it is better to come up with guidelines and recommendations that enforce

the employment of aggressive rehydration or treatment to manage the child's symptoms effectively.

Oral Rehydration Therapy (ORT) is one of the most prevalent and talked-about treatments among the first-line treatment plans for diarrhea that has been widely accepted all over the world. It helps prevent complications and further deterioration of the patient's condition that might already be in jeopardy due to the extent and degree of dehydration.

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