Original Research Report

TREATMENT OF ACUTE DIARRHEA IN CHILDREN AGED 1–5 YEARS PROVIDED BY DOCTORS IN SURABAYA

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ABSTRACT

Diarrhea is the second leading cause of death among children under five, following pneumonia. Insufficient knowledge of diarrhea and dehydration management may contribute to this high mortality rate. Implementing prompt and effective management and prevention strategies has the potential to decrease morbidity and mortality associated with diarrhea. Therefore, this cross-sectional study aimed to investigate the treatment methods used by doctors for children aged 1–5 suffering from acute diarrhea in Surabaya, Indonesia. Data were collected from doctors in Surabaya using an online form containing case-based questions. Microsoft Excel for Mac version 16.17 (Microsoft Inc., Redmont, WA, USA) was used to process the binary data by calculating frequencies and percentages with a point estimate of 95% confidence interval (CI). A descriptive method was used in the data analysis, and the findings were presented in tables. From a total of 51 respondents who participated in this study, 18 (35.29%) only administered oral rehydration therapy. In addition, 49 respondents (96.08%) prescribed zinc supplementation for ten days, while 10 respondents (19.61%) opted for antibiotics. Interestingly, 49 respondents (96.08%) recommended both breast milk and food for the patients, and nearly all respondents provided guidance to the mother or caregiver of the patient. The findings of this study suggested that the respondents primarily used rehydration therapy to treat children suffering from acute diarrhea with moderate dehydration. However, some respondents still relied on antibiotics despite the available recommendations to use oral rehydration therapy. Nearly all respondents agreed on zinc supplementation, breast milk and food provision, and advice for the mother or caregiver of the patient. While certain aspects of the disease management for diarrhea align with the recommended guidelines, there is room for improvement in promoting the exclusive use of oral rehydration therapy and reducing unnecessary antibiotic prescriptions.

Keywords: Diarrhea; children; guidelines; case-based questionnaire

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Highlights:
1. The focus of this study was on the treatment methods for acute diarrhea, which have not been extensively investigated in the region studied.
2. This study can provide an overview of doctors' adherence to the available guidelines for the treatment of acute diarrhea in children aged 1–5 years in Surabaya, Indonesia.

INTRODUCTION

Diarrhea is one of the leading health problems among pediatric patients worldwide. According to data from the World Health Organization (WHO) in 2017, around 525,000 children died due to diarrhea. This placed diarrhea as the second leading cause of death among children under five, after pneumonia (World Health Organization 2017). Children in developing countries continue to face significant health and survival risks. One of the challenges threatening the health and survival of children is

acute diarrhea, which remains a primary cause of morbidity and mortality (Akuffo et al. 2017). Children under the age of 5 have a higher incidence of acute diarrhea due to their susceptibility to viral infections. Data from the Indonesian Ministry of Health in 2018 revealed that the highest prevalence of diarrhea in Indonesia occurred in the age group of 1–4 years (Minister of Health of the Republic of Indonesia 2019).

The WHO recommends rehydration using low-osmolarity oral rehydration solutions and zinc administration as the first treatments for diarrhea. The recommendations are based on the low cost, safety, and convenience of the treatments for treating diarrhea (World Health Organization 2017). The European guidelines state that oral rehydration with a hypotonic solution is the primary treatment and should be administered as soon as possible. The guidelines also recommend that breastfeeding should not be stopped and that regular feeding without dietary changes should continue (Guarino et al. 2018).

In many countries, oral rehydration solution is the initial remedy for diarrhea. In the United States of America (USA), oral rehydration solution is also recommended as a first-line therapy for diarrhea with mild to moderate dehydration from any cause. (Shane et al. 2017). In India and the Maldives, oral rehydration solution is the first-line therapy for all children with acute diarrhea. Additionally, zinc supplementation is given for 10–14 days to relieve the symptoms and help with the patient's recovery (Bishwakarma 2022, Cherukuri et al. 2022).

The guidelines for acute diarrhea in Indonesia are similar to the aforementioned guidelines. The Indonesian Ministry of Health has developed five steps for managing diarrhea in children (*Lima Langkah Tuntaskan Diare*, shortened as LINTAS DIARE), which consist of: (1) administering oral rehydration therapy; (2) providing zinc tablets for ten consecutive days; (3) continuing to provide breast milk and food; (4) selectively using antibiotics; and (5) advising mothers and families (Minister of Health of the Republic of Indonesia 2012).

However, despite the availability of guidelines, doctors' compliance with those instructions is still lacking in many regions. A study conducted at a hospital in Nairobi, Kenya, reported that compliance with clinical guidelines is still relatively low (Shitemi 2018). Another study conducted at a tertiary hospital in western India revealed numerous deviations from the WHO recommendations, including the administration of probiotics, anti-diarrheal medications, antibiotics, and intravenous rehydration. In eastern India, doctors' compliance with diarrhea treatment guidelines for infants under the age of 5 was also low. These deviations occurred frequently, although the WHO recommends the administration of oral rehydration solution and zinc (De et al. 2016, Behera et al. 2021).

Effective management and prevention programs can reduce mortality and morbidity rates associated with diarrhea. Doctors' compliance with the guidelines for diarrhea treatment is crucial for the realization of this idea (Indriyani & Putra 2020). Unfortunately, there is currently no data available on the compliance rate with the LINTAS DIARE guidelines in Indonesia. This research aimed to describe the management of acute diarrhea in children aged 1–5 years in Surabaya, Indonesia, according to the LINTAS DIARE guidelines (Minister of Health of the Republic of Indonesia 2012). The findings of this research would be important in urging further evaluation and control. Aside from that, this study had to be conducted to improve clinical services and research functions on related topics, so that the obtained data could serve as a basis for future research in other regions of Indonesia.

MATERIALS AND METHODS

This article presents a cross-sectional study conducted between September and November 2022 using online case-based questionnaires based on the study by Ke et al. (2012) and distributed to doctors in Surabaya, Indonesia. The research population comprised of 34 general practitioners and 17 pediatricians in Surabaya, Indonesia, who have ever treated acute diarrhea in children aged 1–5 years. The inclusion criteria were general practitioners and pediatricians who treated acute diarrhea in children aged 1–5 years with any degree of dehydration and were willing to complete the questionnaire. Participants with insufficient data who were unable to complete the questionnaire were excluded.

A questionnaire referred to the study by Ke et al. (2012) was created on Google Forms and distributed via WhatsApp to general practitioners and general pediatricians in Surabaya. The questionnaire consisted of two sections, with a total of eight demographic data questions and nine case-based questions. The first section consisted of questions regarding the respondents' willingness to complete the questionnaire, age, gender, level of qualification (general practitioners or general pediatricians), practice location (outpatient clinic, inpatient ward, or emergency unit), the average number of pediatric acute diarrhea patients per day in outpatient clinics and inpatient wards, and whether they routinely treat pediatric patients aged 1–5 years. In the second section of the questionnaire, the respondents were

given a hypothetical scenario, i.e., acute diarrhea with moderate dehydration, according to the guidelines from the (World Health Organization 2013).

The questions should be answered based on the respondents' experiences in handling such cases. One of the questions was regarding the therapy plan they typically provide for patients with moderate dehydration. The presented case involved a 3-year-old child who came to the hospital agitated and fussy. This patient had been experiencing diarrhea for five days with an axillary temperature of 36.5 °C. Furthermore, the patient felt thirsty and wanted to drink a lot. When the pinch test was performed, it showed that the patient had poor skin turgor as the skin returned to its position slowly. After reading the case, the respondents were asked to answer nine questions related to the treatment plan for the case. These questions could be answered with "yes", "no", or "do not know" (World Health Organization 2013). The questionnaire queries are presented within tables in this article.

Data obtained from respondents were processed using Microsoft Excel for Mac, version 16.17 (Microsoft Inc., Redmont, WA, USA). A statistical analysis was performed with a point estimate at 95% confidence interval (CI) to calculate the frequency and percentage of the binary data (Maskey et al. 2019). This data analysis utilized a descriptive method by classifying the data according to the research variables. The tables in this article present the data to demonstrate the comparison of the treatments administered by doctors to acute diarrhea patients with moderate dehydration.

RESULTS

There were 51 respondents, consisting of general practitioners and general pediatricians who provide treatment for acute diarrhea in children aged 1–5 years in Surabaya. Table 1 displays the general characteristics of the respondents. Most respondents, as many as 29 (57%), were younger than 40 years old. Women made up the largest proportion of the respondents, accounting for 35 (69%) participants. The level of qualification for most respondents was general practitioner, with 34 (67%) respondents. A total of 27 (52%) respondents worked in outpatient clinics. Of the respondents, 37 (73%) reported that they had been treating up to ten cases of acute diarrhea in children.

Table 2 shows the respondents' responses to the questions regarding acute diarrhea treatment. In answering the case-based questionnaire, only 18 (35.3%) respondents would provide oral rehydration therapy solely, while 14 (27.5%) would provide intravenous rehydration therapy, and 19 (37.2%) would provide both oral and intravenous rehydration therapy. In addition to oral rehydration, 49 (96.1%) respondents would provide zinc supplementation for 10 days. However, 10 (19.6%) respondents would still administer antibiotic treatment for acute diarrhea.

Almost all participants would advise continuing breast milk and food provision and not stopping them until diarrhea improved. They would also provide education to mothers and caregivers on how to administer oral rehydration and zinc supplementation, educate mothers and caregivers on breast milk or food provision, and explain the signs that a child should be taken to a medical professional immediately.

Table 1. General characteristics of the respondents.

Characteristics	Frequency (n)	Percentage (%)
Age		
<40 years	29	57
≥40 years	22	43
Sex		
Male	16	31
Female	35	69
Qualification level		
General practitioners	34	67
General pediatricians	17	33
Practice location		
Inpatient ward	12	24
Outpatient clinic	27	52
Emergency unit	12	24
Number of pediatric patients with acute diarrhea each day		
0–10 patients	37	73
11–20 patients	13	25
>20 patients	1	2

Although the majority of respondents would choose rehydration therapy and zinc administration to treat acute diarrhea, some would also prescribe antibiotics. As shown in Table 3, four respondents who would administer antibiotics chose cotrimoxazole for cases of acute diarrhea with mild to moderate dehydration. One respondent chose two antibiotics, i.e., cotrimoxazole and cefixime.

Table 2. Responses to the questionnaire regarding cases of acute diarrhea with moderate dehydration.

Questions	Yes (%)	No (%)	Do not know (%)
Oral rehydration therapy only	18 (35.3)	33 (64.7)	0 (0)
Intravenous rehydration therapy only	14 (27.5)	37 (72.5)	0 (0)
Both oral and intravenous rehydration therapy	19 (37.2)	32 (62.8)	0 (0)
Zinc administration for 10 days	49 (96.1)	2 (3.9)	0 (0)
Antibiotic administration	10 (19.6)	40 (78.4)	0 (0)
Continuation of breast milk and food provision	49 (96.1)	0 (0)	2 (3.9)
Advising not to stop breast milk and food provision until diarrhea improves	0 (0)	49 (96.1)	2 (3.9)
Educating the mother and caregiver about how to administer oral rehydration salt and zinc	51 (100)	0 (0)	0 (0)
Educating the mother and caregiver about breast milk or food provision	50 (98.0)	1 (2)	0 (0)
Explaining the signs that the child should be taken immediately to a health professional	51 (100)	0 (0)	0 (0)

Table 3. Types of antibiotics frequently prescribed by the respondents for cases of acute diarrhea with mild to moderate dehydration.

Antibiotics	Frequency (%)
Cotrimoxazole	4 (7.8)
Amoxicillin	2 (3.9)
Cefixime	2 (3.9)
Metronidazole	2 (3.9)
Nifuroxazide	1 (1.9)

DISCUSSION

In this study, many respondents still provided therapies other than oral rehydration therapy. The majority of the respondents combined oral rehydration therapy with intravenous rehydration therapy. The WHO stated that treating diarrhea aims to prevent dehydration, manage dehydration, prevent malnutrition, and reduce the severity, duration, and likelihood of future episodes (World Health Organization 2013). In the LINTAS DIARE guidelines, treatment plan B is given to patients with acute diarrhea and mild to moderate dehydration. However, fluid administration using oral rehydration therapy is prioritized (Minister of Health of the Republic of Indonesia 2012).

Many guidelines state that intravenous rehydration should only be administered in exceptional circumstances. Intravenous rehydration can be beneficial in cases of shock, severe dehydration, dehydration with an altered state of consciousness or severe acidosis, persistent vomiting, and severe abdominal distension and ileus (Minister of Health of the Republic of Indonesia 2012, World Health Organization 2013, Shane et al. 2017). The guidelines in Europe, America, India, and the Maldives recommended only oral rehydration therapy using low-osmolarity oral rehydration solutions for acute diarrhea with moderate dehydration. Although intravenous rehydration has been used for a long time, it is recommended only for cases of acute diarrhea (Guarino et al. 2014, Bishwakarma 2022, Cherukuri et al. 2022). When the patient is hydrated and conscious, intravenous rehydration should be stopped immediately and replaced with oral rehydration. Intravenous rehydration should be avoided in severely malnourished patients (Guarino et al. 2014, Brandt et al. 2015).

The findings of this study were comparable to those of a study by Adiba et al. (2022) at a tertiary hospital in Surabaya, which revealed that mild and moderate were the most prevalent degrees of dehydration. However, the most common method of rehydration used was intravenous rehydration. Intravenous fluids are so common in hospitals that it is easy to overlook the signs of patients who require them (Toaimah & Mohammad 2016, Gawronska et al. 2022). Many doctors prefer intravenous rehydration because oral rehydration therapy requires more time. In oral rehydration therapy, the patient requires an extended stay in the emergency unit, while the staff requires longer working time. The fact that some respondents in a study worked in the emergency unit and inpatient ward made them prefer intravenous rehydration in the emergency unit (Gawronska et al. 2022).

Intravenous fluids have the advantage of being able to be administered directly into the bloodstream. Therefore, time delays that can occur with oral rehydration procedures can be eliminated (Gawronska et al. 2022). Another reason that leads to the widespread use of intravenous rehydration is a fault in the initial assessment of the patient's dehydration degree. Determining the initial evaluation of dehydration degree is therefore critical

in deciding its therapy (Abdul-Mumin et al. 2019). The results of this study are identical to those of the study by Ozuah et al. (2002), in which many doctors did not solely use oral rehydration therapy for cases of moderate dehydration in acute diarrhea, with only 15.3% of participants using oral rehydration therapy. The study reported several reasons that drive this trend, including patient refusal to drink fluids, vomiting as the primary symptom, inability to urinate, presence of ketonuria, parental concerns about dehydration, crowded emergency units, and increased urine specific gravity.

This study showed that 49 respondents would administer zinc for 10 days, but there were still some who would not provide it. Previous studies researched the effect of zinc supplementation on diarrhea and found that it has a preventive and long-term impact. Taking 10–20 mg of zinc daily for 10–14 days can help reduce the severity of diarrhea and prevent future occurrences for up to 2–3 months after the supplementation period. This aligns with the recommendations on diarrhea treatment by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) that the administration of oral rehydration salts and zinc for 10–14 days, with 20 mg of zinc daily for children with acute diarrhea and 10 mg for infants under 6 months. Zinc can be given in the form of chewable zinc tablets or by dissolving it in one spoonful of boiled water or breast milk (Kassa et al. 2022).

Recent studies suggest that zinc supplementation should be given to malnourished or zinc-deficient children between the ages of 6 months and 5 years who live in developing countries or areas where the prevalence of mild to severe zinc deficiency is high (Shane et al. 2017, Guarino et al. 2018). However, zinc is ineffective in children under 6 months, regardless of their nutritional status. Although zinc supplementation does not decrease stool volume considerably, it was related to a significant reduction in diarrhea duration and the likelihood of diarrhea lasting more than seven days (Guarino et al. 2014). Zinc can increase the body's immune system, thus preventing the risk of recurrent diarrhea for 2–3 months after the child recovers from diarrhea. According to a report spanning 18 years by the WHO, the benefits of zinc as a diarrhea treatment include reducing diarrhea prevalence by 34%, reducing acute diarrhea duration by 20%, reducing persistent diarrhea duration by 24%, and reducing therapy failure or death due to persistent diarrhea by 42% (Minister of Health of the Republic of Indonesia 2012). Some respondents would not provide zinc due to their fear of possible side effects. These side effects were found to occur more often in children and infants who were given zinc compared to those who were not. The most common side effect of zinc administration is vomiting (Shane et al. 2017). The other adverse effects may include stomach trouble, heartburn, nausea, fever, sore throat, mouth sores, weakness, and fatigue. These adverse effects can be burdensome for children suffering from diarrhea as well as for their parents (Kassa et al. 2022).

In this study, 10 respondents would still prescribe antibiotics in the case-based questionnaire. Antibiotics should not be needed routinely for acute diarrhea, even if bacteria are suspected of causing the condition, because most cases of acute diarrhea are self-limiting within a few days. Inappropriate antibiotic use can prolong diarrhea duration due to intestinal microflora dysregulation (Minister of Health of the Republic of Indonesia 2012, Guarino et al. 2018). Children are susceptible to viral infections such as the common cold, influenza, ear infections, and diarrhea. The most common cause of diarrhea in children is infection by viruses, specifically rotavirus and norovirus. Therefore, antibiotic treatment is unnecessary for most diarrhea cases (Sudarmo et al. 2015, Athiyyah et al. 2019). This is more prevalent in countries that are still developing. The overuse of antibiotics to treat diarrhea is a leading cause of rising rates of antibiotic resistance in developing countries (Kassa et al. 2022).

Antibiotic therapy can be considered for children under 3 years old with underlying chronic conditions (such as sickle cell anemia or immunodeficiency). It can also be considered for children with specific pathogenic infections (such as dysentery or cholera) (Guarino et al. 2018). A study conducted at a tertiary hospital in Surabaya showed a higher use of antibiotics for patients with diarrhea than in other hospitals. This is due to the high prevalence of comorbid infections among the patients that necessitate antibiotic therapy (Jordan et al. 2020). However, the fact that some respondents would still prescribe antibiotics indicated a lack of confidence in oral rehydration therapy and proper training in diarrhea management (Behera et al. 2021). This study's results showed that cotrimoxazole was the most commonly prescribed antibiotic medication. Cotrimoxazole is a sulfa antibiotic that inhibits bacterial growth so that the body's immune system can strengthen (Church et al. 2015).

Strength and limitations

This study may offer a general description of acute diarrhea treatment in children and the adherence of doctors to the available guidelines. This subject has not received sufficient attention from researchers in the area. However, this study only covered doctors in Surabaya, Indonesia, so further studies can be conducted on a larger scale and using more diverse and numerous scenarios.

CONCLUSION

This study revealed that many doctors did not exclusively rely on oral rehydration therapy, and antibiotics were still being prescribed despite the absence of indications for their use. It is crucial to emphasize the importance of doctors to adhere more closely to the available guidelines regarding the administration of rehydration therapy for children suffering from acute diarrhea with moderate dehydration. However, nearly all doctors agreed on zinc supplementation, breast milk and food provision, and advice for the mother or caregiver of the patient.

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Conflict of interest

None.

Ethical consideration

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia (No. 130/EC/KEPK/FKUA/2022 dated 23/7/2023).

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Author contribution

AFA, IRI, and NF conceptualized and designed this study. IRI collected, analyzed, and interpreted the data, as well as drafted the manuscript. AFA and NF procured the statistical expertise, critically revised the manuscript for important intellectual content, and gave the final approval. AFA also interpreted the data, supplied the research materials and patients, and provided funding for this study. NF provided administrative, technical, and logistic support.

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