

Treatment and Management of Diarrhea in Children: A Literature Review

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Abstract: Diarrhea is an endemic disease in Indonesia and also a potential Extraordinary Event (KLB) disease which is often associated with death. Therefore, a literature review regarding the management and management of diarrhea in children is needed to improve the quality of health services. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) is used in writing literature reviews. Using the Sciendirect, Scopus and Pubmed databases covering the years 2011-2022. From several journal searches with the keywords diarrhea, diarrhea management, diarrhea management which were filtered again according to predetermined criteria in the 2011-2022 time period, 9 suitable journals were obtained. These journals discuss five main topics according to the principles of management and management of diarrhea, namely the Ministry of Health's LINTAS Diarrhea program (Five Steps to Overcoming Diarrhea). Management of diarrhea in accordance with recommendations from the Ministry of Health of the Republic of Indonesia and WHO will improve the quality of good services.

Keywords: Diarrhea, The Treatment of Diarrhea, Management of Diarrhea.

INTRODUCTION

Diarrhea is a condition in which you defecate with a liquid stool consistency accompanied by blood or mucus more than 3 times a day. Diarrhea is a common disease in Indonesia and has the potential for an extraordinary event which often causes death (Ministry of Health of the Republic of Indonesia, 2015). Diarrhea is the 13th cause of death in all age groups, 3rd after pneumonia and tuberculosis in the infectious disease group, and the first cause of death in children under five (less than 5 years) (Ministry of Health of the Republic of Indonesia, 2011).

In Indonesia, the trend of diarrhea cases increases every year. Most cases of diarrhea in children under five occur at the age of 6-11 months (21.65%). The number of clinical cases of diarrhea in 33 provinces in Indonesia reached 9%, with an incidence range of 4.2% -18.9% (Basic Health Research, 2013). In 2015, 18 outbreaks of diarrhea spread across 11 provinces and 18 districts/cities, causing 1,213 people to die and 30 people died (CFR 2.47%). The number of people who came to health facilities was estimated at 5,097,247 people, while the number of people who were reported to be treated at health facilities was 4,017,861 people or 74.33% (target 100%) (Ministry of Health of the Republic of Indonesia, 2015).

A survey assessing the quality of children's health services in hospitals throughout Indonesia shows that the quality of children's health services is still below standard (an average of 43% with a range of 28% to 53%). Research results show that the main problems that occur in Indonesia are the use of inappropriate treatment guidelines, unreasonable use of antibiotics, delays in the evaluation process, and lack of supporting care (Sidik et al., 2013).

According to research conducted using the Integrated Management of Childhood Illness (IMCI) approach on sick children, around 1 in 5 children experience serious and



life-threatening illnesses. The child needs immediate appropriate action and management. To achieve MDG'S target 4 to reduce child mortality, it is very important to ensure that the quality of health services in hospitals is included in the good category (Duke et al., 2011).

One of the main causes of death from diarrhea is improper management both at home and in health facilities, according to the Household Health Survey, Mortality Study and Basic Health Research from year to year. Fast and appropriate management is needed so that the death rate due to diarrhea can be reduced (Ministry of Health of the Republic of Indonesia, 2015). As a result of the survey conducted, the percentage of health workers dehydration, how to treat diarrhea without dehydration, and how to treat diarrhea with mild and severe dehydration from 2006 to 2009 is still below 50%. Apart from that, the level of standard diarrhea treatment at Community Health Centers is still low. Excessive use of antibiotics still occurs, and anti-diarrhea is still often given to children suffering from diarrhea, even though it is not recommended. Apart from that, not all ORS is given to diarrhea sufferers (Basic Health Research, 2013).

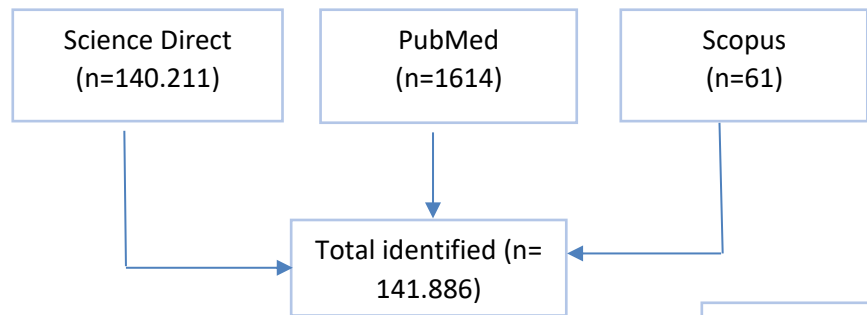
METHODE

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) approach was used in this literature review research, which went through four stages, namely identification, screening, study eligibility and including studies in a systematic review. Prepare journal reports by collecting accredited journal databases via Science Direct, Scopus, and PubMed. The articles entered into the database are journal publications from the last 10 years, and the keywords used in the search are diarrhea, diarrhea management and diarrhea management. The type of research used is all types of journals that discuss the management and management of diarrhea with a publication period of 2011–2022.

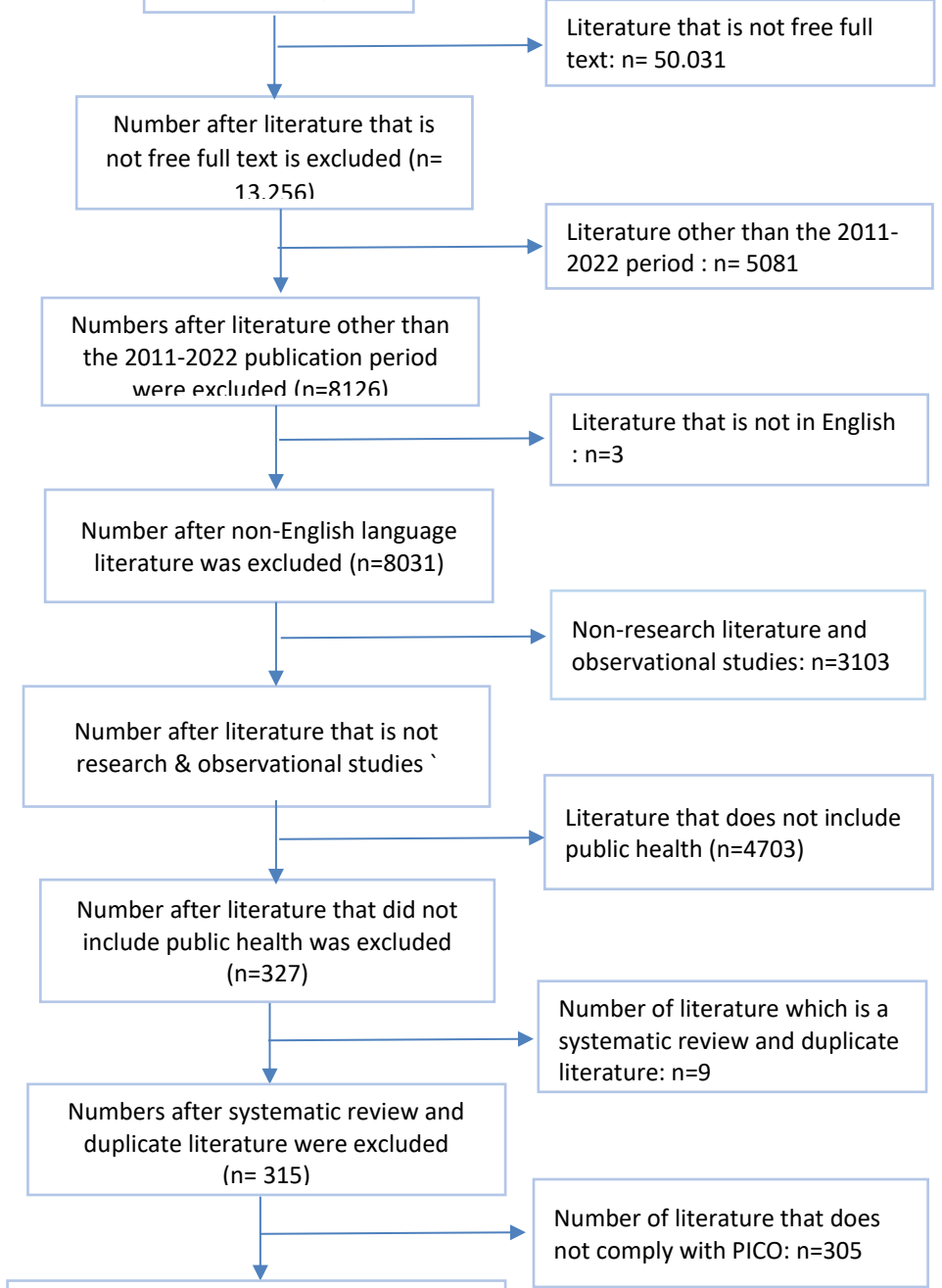
RESULTS

Based on the results of a literature search using the keywords diarrhea, diarrhea management, diarrhea management, screening was carried out again according to predetermined inclusion criteria and the publication time period 2011–2022, until 9 journals were found that were suitable for further review. The results of the critical review of the articles in this research were then extracted to provide a brief review using a table containing the author's name, article title, country of research, and research results.

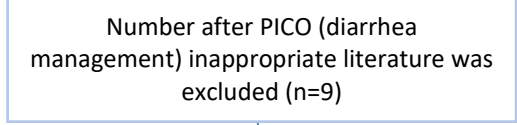
Identification



Screening



Eligibility



Include

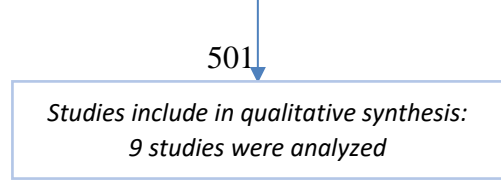


Table 1. Literature search results

No	Author	Article Title	Country	Implementation
1.	Khivev et al, 2017	Effects of rhubarb syrup on dysenteric diarrhea in children: a randomized, double-blind, placebo-controlled trial	Iran	- 150 children aged between 12-72 months with suspected Shigella intervention and control groups, each for 5 days. Additionally, standard antibiotic treatment (ceftriaxone for the first 3 days and cefixime syrup for the next 2 days) was administered to both groups. The mean duration of fever and diarrhea in the R. ribes group was significantly lower than that in the placebo group (P = 0.016 and 0.001, respectively). In addition, patients in the R. ribes group showed a shorter duration of need for antipyretics and a shorter duration of abdominal pain (P = 0.012 and 0.001, respectively). However, there was no significant difference between the two groups regarding microscopic stool analysis. Additionally, no side effects have been reported. R. ribes syrup can be recommended as a complementary treatment for children with Shigella dysentery.
2.	(Patro-Gołąb et al., 2015)	Yogurt For Treating Acute Gastroenteritis In Children: Systematic Review And Meta-Analysis	Israel	- Four RCTs (n = 448) of generally low methodological quality were all conducted in hospital settings. Compared with placebo/no intervention, yogurt consumption had no significant effect on stool volume. Data on the effect of yogurt consumption on the duration of diarrhea and stool frequency are inconsistent. The likelihood of treatment success (or failure) was similar in both groups. Compared with placebo, the length of stay was shorter in children who received yogurt, but the difference was borderline

				significant. Total weight gain increased for those treated with yogurt.
3.	Maragkou daki et al., 2018)	Efficacy Of An Oral Rehydration Solution Enriched With Lactobacillus Reuteri DSM 17938 And Zinc In The Management Of Acute Diarrhoea In Infants: A Randomized, Double-Blind, Placebo-Controlled Trial	Yunani	- In this study, ORS supplemented with Lactobacillus and zinc showed a reduction in the severity of diarrhea on the second day ($p < 0.001$) after starting treatment in a group of well-nourished, non-hospitalized infants and toddlers with acute diarrhea.
4.	Sillah, Hsin-Jung, HoM. Sc.aJane C-J. ChaoPh.D, 2013	The use of oral rehydration salt in managing children under 5 y old with diarrhea in the Gambia: Knowledge, attitude, and practice	Gambia	- Mothers with education had significantly higher knowledge (14.7 versus 14.2) and attitude scores (6.6 versus 6.1) in diarrhea management. However, this study found that the rate of use of oral rehydration was 4% in children with diarrhea. Multiple linear regression analysis revealed that maternal age was positively associated with diarrhea management practices ($\beta = 0.061$) and KAP score ($\beta = 0.102$). The number of children in the family is positively correlated with the mother's attitude score ($\beta = 0.408$). Socioeconomic status is positively related to attitudes ($\beta = 0.549$), practices ($\beta = 0.841$), and KAP scores ($\beta = 1.887$).
5.	(Aggarwal et al., 2014)	Lactobacillus GG For Treatment Of Acute Childhood Diarrhoea: A	India	- The intervention group received Lactobacillus GG, administered as a single capsule containing 100 billion colonies forming per day for 5 days. The contents of the capsule are dissolved in milk and administered

		n Open Labelled, Randomized Controlled Trial		<p>with a spoon. All research subjects were asked to provide stool samples in a container, rotavirus was tested using ELISA. Children were monitored for the amount of loose stools, stool consistency and timing of loose stools (every 6 hours of the day). Children are also monitored for side effects such as fever, vomiting, abdominal pain and hypersensitivity reactions such as rash.</p> <ul style="list-style-type: none"> - The mean duration of diarrhea was significantly ($P < 0.0001$) lower at approximately 18 hours in children receiving Lactobacillus GG compared with the control group. There was also a rapid improvement ($P < 0.001$) in stool consistency around 6 hours in children receiving Lactobacillus GG with the control group.
6.	(Bastola et al., 2017)	A Randomized Open Label Comparative Clinical Study Of A Probiotic Against A Symbiotic In The Treatment Of Acute Diarrhoea In Children	Nepal	<ul style="list-style-type: none"> - The frequency of diarrhea decreased from 9.03 on day 1 to 0.81 on day 3 in group B, compared with 10.1 on day 1 to 6.24 on day 3 in group A. When comparing the two groups on day 3, group A produced a statistically significant reduction in diarrhea frequency. Similarly, there was a statistically significant reduction in the duration of diarrhea for comparing Group A with Group B. The mean duration of diarrhea was 36.2 hours in Group B, compared with 72.6 hours in Group A. Adverse events were mild and did not seriously detrimental.
7.	(Lamberti et al., 2013)	Oral Zinc Supplementation For The Treatment Of Acute Diarrhea In Children: A Systematic Review And Meta-Analysis	USA	<ul style="list-style-type: none"> - Benefits of therapeutic zinc supplementation for diarrhea in children under five years in low- and middle-income countries. The effects of zinc treatment, which included reductions in episode duration, stool output, stool frequency and length of hospital stay, were consistent across studies of Chinese and non-Chinese and non-specific and rotavirus diarrhea. These results suggest that zinc therapy for diarrhea is largely beneficial. The results of a large

				<p>number of Chinese trials in rotavirus diarrhea are a substantial addition to the global evidence base as there have been no non-Chinese trials.</p> <ul style="list-style-type: none"> - However, evidence from China suggests that therapeutic zinc supplementation reduces the duration and severity of rotavirus episodes. Because rotavirus is the leading cause of severe acute diarrhea worldwide and is likely the leading cause of diarrheal deaths.
8.	Setti, 2018	Low lactose in the nutritional management of diarrhea: Case reports from India	India	<ul style="list-style-type: none"> - In addition to usual care, lactose avoidance is recommended by doctors to treat diarrhea in children. Lactose is essential for growth and development in children. There is a paucity of data from India on the use of low lactose diets in infants with diarrhea. This article presents case reports from India of four infants with diarrhea who were managed with a low lactose formula to maintain energy and nutrient intake without avoiding lactose completely.
9.	(Liu et al., 2017)	Acupoint Herbal Patching At Shenque (CV8) As An Adjunctive Therapy For Acute Diarrhea In Children: A Systematic Review And Meta-Analysis	China	<ul style="list-style-type: none"> - Eligible studies involving 3560 children with acute diarrhea were included. All RCTs were generally of methodological quality. Compared with conventional treatment which includes symptomatic treatment (fluid supplementation, nutritional management, adsorbents, probiotics, et al.) and anti-infective therapy (antibiotics or antiviral drugs), herbal acupuncture in Shenque as an adjuvant therapy reduces the mean duration of diarrhea (MD = -36.49h, 95% confidence interval -47.50 to -25.49) and decreased risk of treatment failure (RR = 0.21, 95% confidence interval 0.17 to 0.27) in the 72 hours after treatment was started without reporting serious side effects.

DISCUSSION

The results of diarrhea management in different countries are very different. The Ministry of Health in 2018 established the principle of LINTAS Diare (Five Steps to Solve Diarrhea), which consists of:

Giving Oral Rehydration Therapy

Oral Rehydration Therapy has become an important component in the treatment of diarrhea in Indonesia. Patients are given low osmolarity Oral Rehydration Therapy if they have diarrhea. If household water such as starch water, vegetable broth, or boiled water is not available, the patient is given low osmolarity ORS. New low osmolarity ORS, which can reduce nausea and vomiting, is currently available on the market. To replace lost fluids, People who suffer from diarrhea can use ORS. Sufferers must be immediately taken to hospital to receive fluids through an IV if they cannot drink. The degree of dehydration determines the administration of ORS (WHO, 2009).

The study conducted by Maragkoudaki et al. (2018) found that ORS supplemented with Lactobacillus and zinc reduced the severity of diarrhea on the second day after starting treatment in the well-nourished group, babies who were not in hospital, and toddlers with acute diarrhea ($p < 0.001$).

Giving Zinc

The body needs lots of micronutrients, one of which is zinc. Zinc has the ability to inhibit the enzyme INOS (inducible nitric oxide synthase), which increases during diarrhea and causes intestinal epithelial hypersecretion. Zinc is also responsible for the epithelialization of the intestinal wall, which undergoes morphological and functional damage during diarrhea (WHO, 2009).

In research conducted by Lamberti et al. in 2013, it was found that giving zinc during diarrhea could reduce the duration and intensity of diarrhea, frequency of defecation, stool volume, and recurrence of diarrhea in the following three months. These results indicate that zinc therapy in children with diarrhea is mostly beneficial. The results of numerous trials conducted in China on rotavirus diarrhea are a major addition to the global evidence base as no trials have been conducted outside China. However, evidence from China suggests that zinc supplementation reduces the duration and intensity of rotavirus episodes. Because rotavirus is the main cause of severe acute diarrhea and is likely the main cause of diarrheal deaths worldwide.

Zinc tablets dissolve within 30 seconds. Even though the diarrhea has stopped, zinc continues to be given for ten days. The way to give zinc tablets to children with diarrhea is as follows: dissolve the tablet in 1 tablespoon of boiled water or breast milk. Once dissolved, give the tablet to a child who has diarrhea (WHO, 2009).

Breastfeeding and Food

The aim of feeding during diarrhea is to ensure that the person suffering from it, especially children, gets the necessary nutrition to stay strong and grow and to prevent weight loss. Children who are still breastfed should be breastfed more often. Children who drink formula milk should also be breastfed more often than usual. Children aged six months or older, including babies receiving solid foods, should be given smaller portions of easily digestible foods more frequently. According to Setti (2018), supplementary feeding is continued for two weeks after the diarrhea ends to help restore body weight.

Giving antibiotics for certain indications

It is not recommended to use antibiotics regularly because the number of bacteria that cause diarrhea in toddlers is very small. Antibiotics are only useful for people who have diarrhea with blood, which is usually caused by shigellosis, and who are concerned about cholera (WHO, 2009).

In research conducted by Khivev et al. in 2017 on the use of *R. ribes* syrup as an additional treatment for shigellosis in dysentery children, it was found that the duration of fever and diarrhea in the *R. ribes* group was significantly shorter than in the placebo group ($P = 0.016$ and 0.001). In addition, patients in the *R. ribes* group required antipyretics for a shorter period. However, when looking at microscopic feces, there was no significant difference between the two groups. There are no reports of side effects either. Children suffering from *Shigella* dysentery can be given *R. ribes* syrup as an additional medication.

Additionally, anti-diarrhea medications should not be given to children suffering from diarrhea as they have been proven to be of no benefit. If you have very severe vomiting, you should not use anti-emetic medication. Apart from causing dangerous and potentially fatal side effects, these drugs do not help children become healthier or reduce dehydration. If diarrhea caused by parasites (such as amoeba or giardia) is found, anti-protozoal drugs are used.

Providing Education.

According to the Ministry of Health of the Republic of Indonesia (2011), mothers or caregivers who are close to toddlers should be given advice on how to provide fluids and medication at home, as well as when to take toddlers back to health workers. These include symptoms such as more frequent diarrhea, repeated vomiting, fever, bloody stools, extreme thirst, not getting better within three days, and lack of eating or drinking.

According to research conducted by Sillah et al. (2013), mothers who knew how to manage diarrhea had significantly greater abilities (14.7 vs 14.2) and better attitude scores (6.6 vs 6.1). So, one of the important things to do is teach the mother or main caregiver of the child.

CONCLUSION

Management of diarrhea in accordance with recommendations from the Ministry of Health of the Republic of Indonesia and WHO will improve service quality and harmony. To improve the quality of treatment of diarrhea in children in Indonesia, the knowledge and skills of nurses must continue to be improved.

REFERENCES

- Aggarwal, S., Upadhyay, A., Shah, D., Teotia, N., Agarwal, A., Jaiswal, V., 2014. *Lactobacillus GG* for treatment of acute childhood diarrhoea: An open labelled, randomized controlled trial. *Indian J. Med. Res.*139: 379–385.
- Bastola, R., Bastola, B.S., Gurung, R., Ghimire, J.J., 2017. A Randomized Open Label Comparative Clinical Study Of A Probiotic Against A Symbiotic In The Treatment Of Acute Diarrhea In Children. *Int. J. Sci. Technol. Res.*6: 1–3.
- Duke, T., Subhi, R., Kelly, J., Gray, A., 2011. Improving quality of hospital care for children.
- Ministry of Health of the Republic of Indonesia. 2011. Diarrhea Control in Indonesia.
- Ministry of Health of the Republic of Indonesia. 2015. Indonesian Health Profile.

- Lamberti, L.M., Walker, C.L.F., Chan, K.Y., Jian, W.Y., Black, R.E., 2013. Oral zinc supplementation for the treatment of acute diarrhea in children: A systematic review and meta-analysis. *Nutrients*5: 4715–4740. doi:10.3390/nu5114715
- Liu, Z., Yao, K. yu, Wang, H. ru, Li, Y. le, Li, M. ling, Liu, J. ping, Zhai, S. qing, 2017. Acupoint herbal patching at Shenque (CV8) as an adjunctive therapy for acute diarrhea in children: A systematic review and meta-analysis. *Eur. J. Integr. Med.*10: 25–37. doi:10.1016/j.eujim.2017.01.009
- Maragkoudaki, M., Chouliaras, G., Moutafi, A., Thomas, A., Orfanakou, A., Papadopoulou, A., 2018. Efficacy of an oral rehydration solution enriched with *Lactobacillus reuteri* DSM 17938 and Zinc in the management of acute diarrhoea in infants: A randomized, double-blind, placebo-controlled trial. *Nutrients*10. doi:10.3390/nu10091189
- Patro-Gołąb, B., Shamir, R., Szajewska, H., 2015. Yogurt for treating acute gastroenteritis in children: Systematic review and meta-analysis. *Clin. Nutr.*34: 818–824. doi:10.1016/j.clnu.2014.09.004
- Sidik, N.A., Lazuardi, L., Agung, F.H., Pritasari, K., Roespandi, H., Setiawan, T., 2013. Assessment of the quality of hospital care for children in Indonesia 18: 407–415. doi:10.1111/tmi.12061
- WHO. (2009). *Pocket book: Child Health services in hospitals: Guidelines for first-level referral hospitals in districts/cities*, Jakarta.