



COMPARISON OF THE INCIDENCE OF ACUTE WATERY DIARRHEA IN CHILDREN AGED 0-12 YEARS WITH EXCLUSIVE BREASTFEEDING AND INFANT FORMULA MILK

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Abstract

Background: This study aimed to compare the incidence of acute watery diarrhea in children aged 0-12 years between exclusive breastfeeding compared to formula milk and diarrhea incidence in Borong Regional Public Hospital, Indonesia. **Method:** This was a cross-sectional design study with a sample size of 60 infants. Information was obtained through interviews and medical record when admission. Univariate data were presented in distribution frequency table form and bivariate analysis data were analyzed by using Mann-Whitney test. **Results:** The incidence of diarrhea in children aged 0-12 years was dominated by children who consumed formula milk (68.3%) from the total study sample. The results also found that there was a nonsignificant difference between exclusive breastfeeding compared to infant formula milk and the incidence of diarrhea in infants under 1 year of age. **Conclusion:** The incidence of diarrhea was lower among infants with exclusive breastfeeding compared to infants with formula milk, although the difference is insignificant.

Keywords: outcome, microbiota, newborn

INTRODUCTION:

Particularly in less developed countries, diarrheal illness affects children regularly. Poor feeding practices, such as the early introduction of supplemental feeding and poor hygiene, are usually implicated. Understanding the link between eating habits and diarrhea is crucial for properly preventing and treating illness in children.¹

Probiotics and bioactive compounds found in human breast milk have been shown to offer protection, hasten the maturity of the neonatal intestinal mucosa, and support systemic immunity. One of the best therapies to prevent baby diarrhea is exclusive breastfeeding (EBF). Globally, it is predicted that EBF administered during the first six

months of life may prevent 2.5 million instances of gastrointestinal infections (GI).²

The best feeding strategy for newborns is generally accepted to be breastfeeding, which offers several health advantages to both the mother and the child. Direct breastfeeding, which is the practice of providing a newborn with only breast milk and no other food or liquid, is crucial throughout the first six months of life. However, the practice of exclusive breastfeeding still encounters difficulties despite the benefits that are known to exist. It has been discovered that a mother's decision to give her baby formula milk instead of exclusively breastfeeding is influenced by factors like maternal education, healthcare provider support, and formula milk marketing.³

A study that was published in the Jurnal Ilmiah Kesehatan Diagnosis found a link between formula feeding and the likelihood of newborns developing diarrhea. According to the study, infants who are exclusively breastfed had a lower risk of developing diarrhea than those who are provided formula milk. This is so that bacteria that can cause diarrhea don't thrive, which is why formula milk preparation and hygiene are necessary.⁴

Therefore, it's critical to comprehend how feeding habits affect a baby's likelihood of developing diarrhea. If direct breastfeeding is not possible, it is crucial to recognize if formula feeding is totally prohibited or if it is a viable option. The purpose of this study was to examine the connection between infants' incidence of diarrhea with either exclusive breastfeeding or formula milk.

METHOD:

This study was carried out at the Borong Regional Public Hospital in the Indonesian province of East Nusa Tenggara. The number of newborns in the sample was 60. Infants younger than 12 months old who were admitted to Borong Regional Public Hospital meet the inclusion criteria. Infants with serious illnesses or chronic diarrhea, infants with low birth weights, and infants

whose previous pregnancies were less than 37 weeks are all excluded. Acute diarrhea is a condition marked by recurrent, more than three times per day, liquid-containment bowel movements that last fewer than 14 days. Exclusive breastfeeding refers to nursing only from the mother's breast, without additional food or liquids.

Information was gathered from the patient's medical record. Data was collected from January to July 2023. The infants' feeding habits, such as whether they were solely breastfed or given formula milk, as well as whether they experienced diarrhea, were determined from their medical records. Frequency distribution tables are used to present univariate data, and the chi square test is used to perform bivariate data analysis. Bivariate data analysis is carried out using the chi square test, and univariate data are presented as frequency distribution tables. The statistical program SPSS 23.0 was used to conduct the data analysis.

RESULTS:

The results of this study showed that the incidence of watery diarrhea in children mostly occurred in the average child aged 6 years as shown in Table 1. The sex distribution in this study was also not too much different (Male: 32 subjects, Female: 28 subjects) as attached to Table 2.

	N	Minimum	Maximum	Mean	Std. Deviation
Age	60	1	12	6.78	3.655
Valid N (listwise)	60				

Table 1. Descriptive Statistics

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Female	28	46.7	46.7	46.7
Male	32	53.3	53.3	100.0
Total	60	100.0	100.0	

Table 2. Gender Distribution

In Table 3, it can be seen that the incidence of diarrhea in children aged 0-12 years is dominated by infants who consume formula milk (68.3% in infants who consume formula milk). Based on these data, a statistical analysis test was carried out with the Mann-

Whitney test and obtained a value of $p = 0.144$. The p value is <0.05 so that it can be stated that there is insignificant difference in the incidence of watery diarrhea in children aged 0-12 years who consume breast milk or formula milk (Table 4).

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Breastfeeding	19	31.7	31.7	31.7
Formula Milk	41	68.3	68.3	100.0
Total	60	100.0	100.0	

Table 3. Feeding Practice

	Age
Mann-Whitney U	298.000
Wilcoxon W	1159.000
Z	-1.462
Asymp. Sig. (2-tailed)	.144

Table 4. Test Statistics

DISCUSSION:

Health outcomes for children are influenced by the mother's diet during pregnancy and the baby's diet throughout infancy. The child's gut microbiome,

which is the primary site of postnatal immune activation, is connected to both health and sickness in children. Breastfeeding, as opposed to formula feeding, has been shown to increase some taxa (i.e., a group of related organisms,

such as those of a species, genus, class, etc.), such as *Bifidobacterium* spp., in the gut.¹⁸

The World Health Organization (WHO) suggests that a baby should only be breastfed for the first six months of his or her life. The effects of early nutrition on health have been thoroughly researched. Breastmilk or infant formula are not the only sources of nutrition at any other stage of life. For instance, breastfeeding has been associated with a reduced risk of obesity and atopy in the long run, as well as a reduced risk of infection in the newborn period. A child's needs for macro- and micronutrients can be met by infant formula, but there are still a lot of bioactive compounds in human milk that have not been added to the formula. Several of these components, including as proteins and oligosaccharides, partially enter the large intestine undigested and thereby affect the developing lower-gut microbiota.²³

The preventive effects of breastfeeding against diarrhea incidence, prevalence, hospitalizations, diarrhea mortality, and all-cause mortality have been well documented, according to a systematic review. The results of random effects meta-analyses of the eighteen studies that were included showed that different levels of breastfeeding exposure conferred varying degrees of protection, with the greatest protection being conferred by exclusive breastfeeding among infants 0–5 months of age and by any breastfeeding among infants and young children 6–23 months of age. In particular, compared to exclusive breastfeeding among infants 0–5 months of age (RR: 10.52) and to any breastfeeding among children ages 6–23 months (RR: 2.18), not breastfeeding was associated with an elevated risk of diarrhea mortality.¹⁵

Breastfeeding improves a child's chances of survival in the near term and is positively linked to long-term gains in human capital, such as better results on

intelligence tests, higher academic accomplishment, and higher earnings. The quantity of long-chain polyunsaturated fatty acids in breast milk, which are crucial for brain growth and development, may play a role in these long-term advantages. In addition to promoting maternal connection, breastfeeding may also aid in the growth of the child. The advantages of breastfeeding for one's physical and mental development support its promotion and may have significant economic and social effects.⁸

According to a study from Indonesia, there is a substantial correlation between the occurrence of diarrhea in Indonesia and infants aged 0 to 6 months who are not exclusively breastfed. Infants who do not receive exclusive breastfeeding are 2.12 times more likely to experience diarrhea than infants who do.⁶ Infants aged 0 to 6 months who were exclusively breastfed, partially breastfed, or fed infant milk formula displayed significantly different diarrhea incidence rates. Infants 0–6 months old who are breastfed get less diarrhea. The first six months of a baby's existence should be spent solely on breastfeeding, the mother is urged. To reduce infants' occurrence of diarrhea between 0 and 6 months old, the Primary Health Care sector improves public education and promotion campaigns.¹⁰

In the current study, babies less than 6 months had an average rate of exclusive breastfeeding of 87.6%, and EBF was strongly linked to a lower risk of childhood diseases. EBF reduced the likelihood of illness in the previous two weeks accompanied by fever, cough, and diarrhea. Potential confounders have no effect on these correlations. Our research, which is the first to look at the connection between exclusive breastfeeding and childhood diseases in Ethiopia, adds to the body of knowledge already available.¹¹

The composition of the gut microbiota may be influenced by nutrition. Infants who are formula-fed are more likely to have *Bacteroides* and *Clostridium perfringens* than breast-fed newborns are to have *Bifidobacteria* and *Clostridium difficile*. Penders et al. looked at 100 vaginally delivered, full-term babies who had not received any antibiotics. Compared to formula-fed newborns, breast-fed infants had lower intestinal concentrations of *Clostridium difficile* ($p=0.03$) and *E. coli* ($p=0.004$).²⁰

The article selected as a source for this work is a selection of articles from the years 2018 through 2022 that have been sorted according to the inclusion criteria. Formula feeding and diarrhea are strongly correlated or associated. Infants who are fed formula have a higher chance of developing diarrhea and have a higher frequency of diarrheal episodes. Infants are more likely to get diarrhea if formula milk is served in an improper or unclean manner.¹⁷

This investigation makes it obvious how crucial breastfeeding techniques are to a baby's survival. Beyond its role in lowering exposure to tainted food, which may have contributed to the great protection against diarrhea deaths, exclusive breastfeeding's involvement in the prevention of infectious diseases is highlighted by the decrease in ARI mortality.¹³ According to the reviewed studies, nursing is a key strategy for preventing and defending against diarrhea in young children. The findings imply that this approach is crucial to lowering post-neonatal mortality and the hospitalization rate for pediatric diarrheal illnesses.¹⁴

It can be said that there was a connection between infants' incidence of diarrhea and exclusive breastfeeding. The incidence of diarrhea decreases the longer the baby is exclusively breastfed. The majority of mothers were found to be housewives and less educated, according to the survey. Therefore, it is preferable if

the nurse increases the activity of dispensing health information on lactation or exclusive breastfeeding to pregnant women, especially those who are low educated and housewives, and that all parties support the mother for the success of breastfeeding⁷.

While bottle-feeding was linked to a higher risk of ARI in Ethiopian children, EIBF and EBF were protective against ARI and diarrhea. Diarrhea was less likely to occur in babies who were primarily breastfed. Our study implies that in order to lessen the incidence of ARI and diarrhea among Ethiopian children, community- and facility-based interventions that focus on improved IYCF practices should be prioritized and scaled up.⁵

The metabolism may be affected by early diet long after childhood, even into maturity. The majority of infants also drink some formula, even though breast milk is the best source of nutrients for them. Infant formula can still narrow the difference between neonates who are nursed and those who are fed formula, despite clear advances. The reduction of protein content, modification of the lipid matrix, and addition of prebiotics, probiotics, and synbiotics are highlighted as improvements to metabolic health.¹⁹

Infants who took the baby formula exhibited gut microbiota compositions that were more similar to those of breastfed infants in terms of richness and variety, as well as greater levels of calprotectin, compared to infants who consumed the Standard formula. Furthermore, we discovered that the primary bacterial metabolic pathways of the BF and baby formula groups were more similar to those of the STD formula group. This shows that adopting the novel infant formula in the future may alter the gut microbiota's makeup, resulting in a healthier intestinal microbiome.²¹

A follow-up study by Innova 2020 revealed that both the infant formula and the BF formula had a similar effect on the

fecal microbiota, in silico metabolic pathways, and several biochemical indicators related to immunity after a year. The addition of novel compounds to initial recipes is a developing area of inquiry that should always be assessed by randomized clinical trials. Future intervention research should focus on the microbiological processes by which nutrition affects the development of the gut during the first year of life and beyond.²²

Resuming meals as soon as feasible can reduce intestinal osmotic pressure brought on by infections, reduce the length of diarrhea, and improve children's nutritional status (evidence level A). A diet free of lactose can also reduce the length of diarrhea in children (evidence level B). After receiving oral or IV rehydration during an acute diarrheal episode, you should as soon as possible start eating again. Give an age-appropriate diet, let breastfed newborns and young children continue to nurse, and suggest low-lactose or lactose-free formula for those receiving formula milk. For older kids, there are no dietary restrictions; they can eat cereals, meat, yogurt, fruits, and vegetables. Making sure there are enough calories is the key goal. Supplementing with nutrition is advised after healing. Monosaccharide-rich foods should be avoided, including carbonated beverages, jellies, canned juices, sweets, and other sugary beverages. Foods high in fat should also be avoided.¹⁶

Millions of people's lives could be improved through breastfeeding on a global scale. The lifelong health effects of breastfeeding are significantly improved. The ideal time to start breastfeeding is within the first hour after birth, and it should be done exclusively for at least six months before stopping. Mother-infant dyads need multiple tiers of assistance, from policymakers to health professionals to community leaders to their direct family members, in order to meet global breastfeeding targets.⁹

The annual cost to the healthcare system from mothers who did not breastfeed in accordance with recommendations was calculated at US\$118 million. The average cost of the healthcare system and out-of-pocket expenses were \$11.37 and \$3.85, respectively. This cost is made up of US\$29.98 million in non-medical patient charges and US\$88.64 million in provider costs. The Indonesian government must make investments in breastfeeding protection, promotion, and support because it might save the country's healthcare system a lot of money if mothers don't breastfeed as recommended. As shown by earlier studies, in order to fully comprehend the economic effects of not breastfeeding in accordance with advice, it is also necessary to take into consideration the long-term costs associated with cognitive impairments.¹²

This recent study found that the incidence of diarrhea in infants is especially prevalent in infants who consume formula milk. This supports previous studies that found that breast milk is one of the protective factors against the incidence of diarrhea. The statistical results of this study showed insignificant difference which can be caused by the lack of research samples, so that a larger research sample is needed in future studies. In addition, other factors that can cause diarrhea in infants cannot be ignored, such as hygiene factors, socioeconomic status, maternal education and immune status of each infant played an important role.

CONCLUSION:

There is an insignificant difference in the incidence of diarrhea between infants who consumed formula milk or breast milk. However, in presentation, the incidence of diarrhea is dominated by children who consumed formula milk.

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