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THE COMPARISON OF DIARRHEA INCIDENCE BETWEEN 0-6 MONTHS OLD INFANTS WHO WERE EXCLUSIVELY BREASTFED, NON-EXCLUSIVELY BREASTFED AND GIVEN MILK FORMULA IN CIREBON CITY, INDONESIA

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ABSTRACT

Background: Infant diarrhea is one of the major health issues in Indonesia due to its high incidence and mortality. In 2015, the mortality rate of diarrhea and gastroenteritis in infants under one year in hospitals in Cirebon was 21%. Inappropriate infant feeding practice is one of the risk factors of diarrhea in infants. WHO recommends that every infant should get exclusive breastfeeding during the first 6 months of life and continued breastfeeding until 24 months of age. The aim of this study is to find out the difference in diarrhea incidence between 0-6 months old infants who were exclusively breastfed, non-exclusively breastfed, and given infant milk formula.

Methods: This was an observational study with cross-sectional design. A total of 89 infants aged 0-6 months old were recruited by purposive sampling. The primary data were obtained using questionnaires that were filled by the mother or caregiver of the infants. The data were analyzed using the Chi-Square test and Prevalence Ratio was calculated.

Results: The Chi-Square test showed a significant difference in diarrhea incidence between 0-6 months old infants who were exclusively breastfed, non-exclusively breastfed and infant milk formula ($p=0,028$). Infants who were not breastfed have 4 times higher risk of diarrhea ($PR=4.145$; $CI95\%=1.198-14.400$) compared to infants who were breastfed. Infants who were not exclusively breastfed has 3 times higher risk of diarrhea incidence compared to the infants receiving exclusive breastfeeding ($RP=3.286$; $CI95\%=1.144-9.434$)

Conclusion: Proper breastfeeding practice can decrease diarrhea incidence in infants aged 0-6 months. Mothers should be encouraged to exclusively breastfeed her baby during the first 6 months of life.

Keywords: Diarrhea, breastfeeding, infant milk formula, infant feeding practice

INTRODUCTION

Diarrhea is a condition of abnormal bowel movement, loose or liquid stools with abnormal defecation frequency. Diarrhea in neonates is indicated by defecation frequency more than 4 times. While for infants, diarrhea happens if defecation frequency is more than 3 times [1,2]. Diarrhea in infants has still become an important health problem in developing countries, including Indonesia because of the high incidence and mortality [3]. Inappropriate and late treatment of the diarrhea infant can lead to severe dehydration condition dan cause death [2].

In 2017, the World Health Organization (WHO) stated that diarrhea was the second cause of death in children under 5 years. Every year, there are around 1.7 billion cases of diarrhea with a mortality rate of 525.000 children under 5 years [4]. The high incidence of diarrhea in children under 5 years are

caused by immature immunity so the infectious agents can spread easily [2]. Indonesian Basic Health Research in 2013 reported that the period prevalence rate of diarrhea for all age group is 3,5% and children under 5 years has the highest prevalence of diarrhea. The diarrhea incidence of children under 5 years in West Java is 7,9% and babies under 1 year old is 7% [4].

Infant mortality under one year in hospitals in Cirebon was 21% caused by diarrhea and gastroenteritis. The incidence of acute diarrhea in Cirebon in 2015 was a disease with the highest morbidity (1.90%) of 46,464 total new case visits to community health centers. The incidence of diarrhea in the Kesunean Health Center in Cirebon City in 2016 became the second most common disease after Upper Respiratory Tract Infection (URTI) with 7.4% of cases experienced by infants under one year.

Inappropriate feeding in infants 0-6 months such as formula feeding and early infant food complimentary can be contributing factors of high diarrhea incidence in babies[5]. Infant formula is formulated in order to give an infant nutrition that can fulfill their needs. But the composition of infant formula can not replace breast milk for example the role of maintaining the immune system, bacteriostatic, anti allergic and psychosocial[6]. WHO recommend that every infant should get early initiation of breastfeeding, exclusive breastfeeding during the first 6 months of life and continued breastfeeding until 24 months of age [5]. Indonesian Basic Health Research in 2018 reported that Exclusive breastfeeding coverage in Indonesia is 37.3%, and in West Java is 36% while the target of exclusive breastfeeding is 75% [4]. Breastfeeding is an unequalled way of providing ideal nutrition for babies healthy growth and development. Breast milk is a safe and clean feeding for babies and contains important antibodies, especially in colostrum which is very important for babies immunity [6]. The aim of this research is to find out the differences of diarrhea incidence between 0-6 months old infants who were exclusively breastfed, non-exclusively breastfed and infant milk formula.

METHODS

This was a Cross Sectional observational study conducted during December 2018 until February 2019 with 89 infants 0-6 months old who attended Monthly Maternal and Child Health Service of Kesunean Community Health Center, Cirebon City, West Java, Indonesia. The samples were collected by purposive sampling technique and the sample size was calculated using the Isaac and Michael table. The mother or caregiver of babies was given a questionnaire to collect the data about infant diarrhea incidence and feeding practices. The questionnaire was adapted and validated from the correlation between exclusive breastfeeding and the incidence of diarrhea and risk factors in infants aged 6-12 months in the village of Bendungan, Cilegon in 2010 by Istianingrum Yurilla[7]. The feeding practice was divided into three groups: exclusively breastfed, non-exclusively breastfed and infant milk formula. The inclusion criteria were babies 0-6 month old in Kesunean health center. The exclusion criteria were babies with Rotavirus immunization history.

SPSS version 24 for windows was used to analyse the data. Analysis of Chi-square test and prevalence ratio with 95% confidence interval were used to test the hypotheses. Chi square test was used to analyze the comparison of the incidence of diarrhea in infants 0-6 months with nutrition between infants who were given exclusive breastfeeding, non-exclusive breastfeeding and formula milk. Prevalence ratio test with 95% confidence interval was used to find out the odds of diarrhea incidence between the groups of infant feeding practice.

Diarrheal Incidence

Diarrheal incidence is defined as the incidence of diarrhea event that experienced by the infant during their life. Diarrhea in neonates is indicated by defecation frequency more than 4 times. While for infants, diarrhea happens if defecation frequency is more than 3 times. Diarrheal frequency is categorized into never and ever.

Infant Feeding Practices

The infant Feeding Practice is categorized into exclusive breastfed, non-exclusive breastfed and infant milk formula. Exclusively breastfed refers to infant only get breastfed without adding and or replacing with other foods or drinks except vitamins or drugs. Non-exclusive breast fed refers to infant get breastfed with the addition of formula milk or other foods. Infant milk formula refers to infant only get milk that formulated for infants without breast fed or other foods.

Ethical clearance approval No. 50/EC/FK/XI/2018 was obtained from Ethical Committee of the faculty of Medicine Swadaya Gunung Jati University on 19th November 2018. The mother of the baby explained about this study, purpose and confidence. If the respondent allows then sign on the informed consent sheet.

RESULTS

Characteristic of respondents

Most of the babies in this study were >2-3 months old (21.3%), followed by >1-2 months old (20.2%), >3-4 months old, >4-5 months old, and >5-6 months old (15.7%) and 0-1 months old (11.2%) There was also more male than female infants with 47 males (52.8%) and 42 females (47.2%). Most of the mothers were housewife (89.9%) and as a worker (10.1%).

Table 1. Characteristics of Respondents

Characteristics	Amount (n)	Percentages (%)
Age of infants		
0-1 months old	10	11.2
>1-2 months old	18	20.2
>2-3 months old	19	21.3
>3-4 months old	14	15.7
>4-5 months old	14	15.7
>5-6 months old	14	15.7
Gender of infants		
Female	42	47.2
Male	47	52.8
Mother's Job		
Housewife	80	89.9
Worker	9	10.1

Univariate analysis

The most of the babies were exclusively breastfed (59.6%), followed by non- exclusively breastfed (25.8%) and infant milk formula (14.6%). About 21.3% of the babies ever experienced diarrhea.

Table 2. Infant Feeding Practice and Diarrhea Incidence

Variable	Amount (n)	Percentages (%)
Infant Feeding Practice		
Exclusive breastfed	53	59.6
Infant milk formula	13	14.6
Non-exclusive breastfed	23	25.8
Diarrhea Incidence		
Never diarrhea	70	78.7
Ever diarrhea	19	21.3

Bivariate analysis

The comparison of diarrhea incidence between babies who were exclusively breastfed, non- exclusively breastfed and infant milk formula was analyzed by Chi-square test using significance level $p < 0.05$.

Table 3. The Comparison of Diarrhea Incidence Between the Groups of Infant Feeding Practice

Infant Feeding Practice	Diarrhea Incidence						P-Value
	Never diarrhea	%	Ever diarrhea	%	Total	%	
Infant milk formula	7	53.8	6	46.2	13	100	0.028
Non-exclusive breastfeeding	17	73.9	6	26.1	23	100	
Exclusive breastfeeding	46	86.8	7	13.2	53	100	
Total	70	78.7	19	21.3	89	100	

Chi-square test analysis showed significant differences of diarrhea incidence between the three groups ($p=0.028$). The highest diarrhea incidence was in the group of babies who got infant milk formula (46.2%). The lowest diarrhea incidence was in the group of babies who got exclusive breastfeeding (86.8%).

Table 4. The Prevalence Ratio of Diarrhea Incidence Between the Groups of Infant Feeding Practice

No		Diarrhea Incidence			RP	95% CI for Exp(B)	
		Never diarrhea	Ever diarrhea	Total		Lower	Uper
1.	Non-exclusive breastfeeding	17	6	23	2.319	0.682	7.889
	Exclusive breastfeeding	46	7	53			
	Total	63	13	76			
2.	Infant milk formula	7	6	13	5.633	1.461	21.718
	Exclusive breastfeeding	46	7	53			
	Total	53	13	66			
3.	Infant milk formula	7	6	13	2.429	0.579	10.185
	Non-exclusive breastfeeding	17	6	23			
	Total	24	12	36			

Table 4. shows that the babies who got non-exclusive breastfeeding has 2 times higher risk of diarrhea incidence compared to the babies who got exclusive breastfeeding (RP=2.319). Babies who got infant milk formula has 5 times higher risk of diarrhea incidence compared to the babies who got exclusive breastfeeding (RP=5.633). Babies who got infant milk formula has 2 times higher risk of diarrhea incidence compared to the babies who got non-exclusive breastfeeding (RP=2.429).

The Table 5 below show the prevalence ratio of the group of babies who never got breastfeeding (infant milk formula) and babies who got breastfeeding, either exclusively or not.

Table 5. The Prevalence Ratio of Diarrhea Incidence Between the Babies Who Never Got Breastfeeding and Got Breastfeeding

	Diarrhea Incidence			RP	95% CI for Exp(B)	
	Never diarrhea	Ever diarrhea	Total		Lower	Uper
Never got breastfeeding	7	6	13	4.154	1.198	14.400
Got breastfeeding	63	13	76			
Total	70	19	89			

Babies who never got breastfeeding have 4 times higher risk of diarrhea incidence compared to the babies who got breastfeeding, either exclusively or not (RP=4.154).

The Table 6 below show the prevalence ratio of the group of babies who got exclusive breastfeeding and babies who not exclusive breastfeeding (non- exclusive breastfeeding and infant milk formula) .

Table 6. The Prevalence Ratio of Diarrhea Incidence Between the Babies Who Not Exclusive Breastfeeding and Exclusive Breastfeeding

	Diarrhea Incidence			RP	95% CI for Exp(B)	
	Never diarrhea	Ever diarrhea	Total		Lower	Uper
Not exclusive breastfeeding	12	24	36	3.286	1.144	9.434
Exclusive breastfeeding	7	46	53			
Total	19	70	89			

Babies who not exclusive breastfeeding have 3 times higher risk of diarrhea incidence compared to the babies who got exclusive breastfeeding (RP=3.286).

DISCUSSION

Diarrhea in infants is often caused by infection because babies are born with an imperfect immune state [2,5]. Breast milk can protect babies from infections that cause diarrhea. This is because breast milk contains immunological and bioactive components that work to provide passive immune defense from the mother to the baby[6].

This study showed there was a significant difference between infants 0-6 months who were given exclusively breast-fed, non-exclusive breastfed, and infant milk formula with the incidence of diarrhea. This finding were associated with the Maki research in 2017 with a significant difference between exclusive breastfeeding and formula milk on the incidence of diarrhea in infants aged 6-12 months in the Ranotana Weru health center areas with the Mann-Whitney test with p value = 0.010 [8]. The

difference with this study was respondents aged 6-12 months and did not observe non-exclusive breastfeeding variables.

Infant formula has no content that plays a role in body immunity, such as sIgA (*secretory immunoglobulin A*) that have a role in the protection of the digestive tract mucosa which can inhibit the proliferation of pathogens in the gastrointestinal tract [6], and formula milk does not contain *lactase* which is intended to increase lactose intolerance which causes feces or stool to be more fluid [2,9]. Based on the results showed that the chance of diarrhea in infants from 0-6 months who were only given by infant milk formula was 4 times greater than breastfed, was 5 times more at risk of diarrhea than those given exclusive breast-fed and 2 times at higher risk for diarrhea than those with non-exclusively breast-fed. A similar finding was also observed in a study in Community Health Center Teupin Raya Regency, Pidiebahwa, the incidence of diarrhea in infants aged of 0-6 months who were given by infant milk formula was 3 times more at risk than not given formula milk with Odds Ratio of 3.667 (CI = 1.52-11.00) [10].

World Health Organization (WHO) recommends that the for a mom must give exclusive breastfeeding until the babies 6 months old and complementary feeding begins at 6 months of the age[5]. This is because the digestive system of infants less than 6 months old is still not yet mature and digestive enzymes such as stomach acid (*HCl*), *amylase*, *maltase*, *sukrase*, and *lipase* have not worked perfectly so that it can cause diarrhea [2,11,12]. The results showed that infants who were given non-exclusive breastfeeding were 2 times is higher got risk for diarrhea compared to those who were given exclusively breast-fed. Associated with the Sentan's research in 2018 with exclusive breast-fed related significantly to reporting in the work areas of Banjarangkan II of Health Center in Klungkung Regency with the chi square test $p = 0.005$ was obtained, while non-exclusive breastfed status increased until 4 times from 0-6 months with OR = 4.129 (CI = 1.542-11.05) [13].

The results showed that infants from 0-6 months who weren't given non-exclusive breastfed and infant milk formula had a 3 times higher got the risk of diarrhea than those given exclusive breastfeeding. This is in accordance with Banerjee's 2019 study that exclusive breastfeeding greatly reduced the incidence of diarrhea in the city of Kolkata, India with an Odds Ratio of 0.12 (CI = 0.03-0.4) [14]. Supported by Hanieh's research in 2015 in the North Vietnam stated that Exclusive breastfeeding reduced the odds of inpatient admission for diarrheal illness by more than 60% (OR 0.37, 95% CI 0.15 to 0.88) [15]. In addition breast milk contains lactoferrin which increases bactericidal activity sIgA against causative bacteria such as *Escherichia coli* and some *Salmonella*. The mucin content in the breast milk can also inhibit the adhesion of *Escherichia coli* and rotavirus [6,16].

The limitation of this study was only analyzed infant feeding practice, it did not consider other risk factors for diarrhea, such as the habit of washing caregivers' hands, cleaning milk bottles and cutlery, and water used to thin formula milk. For the future studies can used consider other factors that cause diarrhea, such as the habit of washing caregivers' hands, cleaning milk bottles and cutlery, and water used to dissolve formula milk.

CONCLUSION

Exclusively breastfed, non-exclusively breastfed and infant milk formula showed a significantly differences with diarrhea incidence 0-6 months old infants. Breastfeeding practice can decrease diarrhea incidence in 0-6 months old infants. The mother is encouraged to breastfeed her baby exclusively during the first 6 months of life. The Primary Health Care improve public promotion and education activities regarding importance of exclusive breastfeeding to decrease diarrhea incidence in infants 0-6 months old.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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