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Impact of Complementary Foods and Environmental Sanitation on the Incidence of Diarrhea in Children aged 6-24 Months in Sidoarjo, Indonesia

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ABSTRACT

Diarrhea is a watery or liquid defecate three or more times per day which can be caused by inadequate complementary feeding and inadequate environmental sanitation. The purpose of this study was to explain the correlation giving complementary food and environmental sanitation with the incidence of diarrhea in children aged 6-24 months in Kedungkendo Village, Candi Sub-district, Sidoarjo District. Method: This descriptive cross-sectional study. The sample size was 109 mothers who had children aged 6-24 months used simple random sampling. The independent variable in this study was the giving complementary feeding (the first age of giving complementary feeding and the type of giving complementary feeding) and environmental sanitation (clean water facilities, toilet facilities, garbage facilities). The dependent variable was the incidence of diarrhea. Data obtained from questionnaires and observations then analyzed using the chi-square statistical test. Result: The first age of giving complementary food and the type of complementary feeding was no correlation with the incidence of diarrhea (p=0.395; p=0.214). However, there was a significant relationship between clean water facilities (p = 0.001), latrine facilities (p = 0.001), and garbage facilities (p = 0.006) with diarrhea incidence. Discussion: Adequate environmental sanitation can prevent the incidence of diarrhea, although giving complementary food is not correlate to the incidence of diarrhea, but it is very important to provide adequate complementary feeding to children aged 6-24 months to prevent diarrhea.

Keywords: complementary food, environmental sanitation, diarrhea, children aged 6-24 months.

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INTRODUCTION

Diarrhea cases show high rates of mortality and morbidity and are the most common cause of morbidity in children, especially children under 5 years of age in Indonesia [1]. Diarrhea causes the death of as many as 480,000 children each year in the world [2]. Prolonged diarrhea leading to severe malnutrition can develop and result in impaired physical and intellectual development. This can occur when there is a restriction in growth in a vulnerable period of brain development [3]. Giving complementary foods less than 6 months and mothers giving types of complementary foods that are not age-appropriate are more susceptible to diarrhea due to incomplete digestion. Providing complementary foods for less than 6 months increases the child's exposure to various types of infections including diarrhea through food and water. The type of complementary breastfeeding that is not age-appropriate causes the child's digestive system to become malabsorption because some digestive enzymes are found at a much lower concentration than adults so that it is easy for children to get diarrhea [4]. Environmental sanitation in the form of clean water facilities, latrines, and bad trash cans are very detrimental to children because bacteria and viruses are easily spread in the environment and can spread to individuals including children so that diarrhea occurs in the child's immature digestion [5].

When viewed from the mortality and morbidity rates, Basic Health Research shows the prevalence of diarrhea incidence in Indonesia in infants (29 days-11 months) is 16.5%, the prevalence of diarrhea in children under five (1-4 years) is 16, 7%. The most common cause of death in infants (aged 29 days-11 months) was diarrhea at 31.4%, the most common cause of death among children under five (aged 12-59 months) was diarrhea at 25.2% [6]. Candi Subdistrict is a district with the highest incidence of diarrhea in infants and toddlers in Sidoarjo. Diarrhea in Candi District in 2016 amounted to 1417 infants and toddlers, then an increase in 2017 as many as 1455 babies and toddlers. Kedungkendo Village is a village with the highest incidence of diarrhea in children aged 6-24 months in Candi District.

Based on Lawrence Green's theory, a person's health is influenced by two main factors, namely behavior causes and environmental factors (non behavior causes) [7]. Diarrhea is caused by behavioral causes, namely giving complementary foods that are not correct for age and type because the intestinal transport mechanism related to absorption and removal of fluids and electrolytes has not been fully developed, has little capacity for detoxification and also the child's digestive system is easily malabsorption [8]. Diarrhea is caused by environmental factors (non behavior causes), namely poor environmental sanitation which causes bacteria and viruses to easily enter the child's body. Unclean water is one of the causes of diarrhea in children. Unclean feces disposal facilities and uncovered trash cans can be a source of the spread of disease-causing bacteria among the household environment [9].

Mothers must provide complementary foods to children according to their age, which is after the child is 6 months old. Complementary food given should be gradual according to age [10], and this is also influenced by family support and information from media exposure [11]. The suitable types of complementary food are crushed food for children aged 6-9 months, soft food for children aged 9-12 months, and solid food for children aged 12-24 months [12]. The provision of clean water and always

maintaining clean water are things that must be considered in daily life as a form of community prevention against environment-based diseases such as diarrhea. The availability of feces disposal and keeping the latrine clean are essential. The provision of closed and undamaged trash cans plays an important role in preventing diarrhea in children [13]. The purpose of this study was to analyze the relationship between complementary feeding and environmental sanitation with the incidence of diarrhea in children aged 6-24 months in Kedungkendo Village, Candi District, Sidoarjo Regency.

METHODS

This descriptive cross-sectional study was conducted between May-June 2019. The sample was 109 mothers. The population in this study was mothers who have children aged 6-24 months who live in Kedungkendo Village, Sidoarjo, Indonesia. The sample of this study was 109 mothers that met the inclusion criteria. The inclusion criteria involved the mothers who live in their own house or on a contract, do not live in a place that uses public toilets. Data collection has been done by visiting respondents' houses.

The data collection tool was a questionnaire regarding sociodemographic characteristics. The sociodemographic characteristics questions were concerning the mother age, children's age, education, occupation, and the number of children. The questionnaires were developed by the researchers using items based on the Health Belief Model Theory. While preparing the questionnaire contents, the researchers were assisted by two experienced nurses in the field of pediatric nursing. Before analyzing the data, the questionnaires were tested for validity and reliability to the 15 mothers who have attended the Integrated Health Service Post (Posyandu) at the Community Health Center in Sidoarjo.

Chi-square values were used to determine the correlation between first age given complementary feeding, types of complementary feeding, clean water facilities, latrine facilities, garbage facilities with the incidence of diarrhea. Descriptive statistics including frequencies and percentages were used to describe sociodemographic characteristics, first age given complementary feeding, types of complementary feeding, clean water facilities, latrine facilities, garbage facilities, and incidence of diarrhea. In all statistical analyses, *P*-value < 0.05 so it meant that it was considered significant. All of the data were analyzed using SPSS software[14]. This study has passed the review and certification of the Ethical Agreement with no. 1445 - KEPK issued by the Faculty of Nursing University of Airlangga.

RESULT

The demographic data of respondents in Table 1 shows the age of the mother, the age of the child, education, occupation, and the number of children. Most of the mothers aged 26-35 years (66, 60.6%). The most recent mother's education was SMA (57, 52.3%). The majority of respondents were housewives (72, 66.1%). Half of the respondents had 2 children (54, 49.6%). And the majority of children who are being given complementary foods are aged 12-24 months (74, 67.9%).

Table 1 Demographic Characteristics of Respondent (N=109)

Characteristics	N	(%)
Child age		
6-8 month	18	(16.5)
9-11 month	17	(16.5)
12-24 month	74	(67.9)
Mother age		
17-25 years	21	(19.2)
26-35 years	66	(60.6)
36-45 years	20	(18.4)
46-55 years	2	(1.8)
Education		
No education	2	1,8
Elementary school	2	(1.8)
Junior high school	11	(10.1)
Senior high school	57	(52.3)
High education	37	(34)
Occupation		
Housewife	72	(66.1)
Private employee	26	(23.8)
Entrepreneur	6	(5.5)
Government employee	5	(4.6)
Number of Children		
1	36	(33)
2	54	(49.6)
>2	19	(17.4)

Table 2 Correlation between first age given complementary feeding, types of complementary feeding, clean water facilities, latrine facilities, garbage facilities, and incidence of diarrhea.

Factors	Incidence of diarrhea				*P**	OR*
	Yes		No			
	n	(%)	N	(%)		
First age given complementary feeding						
<6 month	17	(15.6)	27	(24.8)	0.395	
≥6 month	20	(18.3)	45	(41.3)		
Types of complementary feeding						
Wrong	8	(7.3)	9	(8.3)	0.214	
Right	29	(26.6)	63	(57.8)		
Clean water facilities						
Less	20	(18.3)	16	(14.7)	0.001	4.118
Good	17	(15.6)	56	(51.4)		
Latrine facilities						
Less	25	(22.9)	16	(14.7)	0.001	7.292
Good	12	(11)	56	(51.4)		
Garbage facilities						

Less	29	(26.6)	37	(34)	0.006	3.429
Good	8	(7.3)	35	(32.1)		

** chi-square*

DISCUSSION

The results showed no relationship between the first age of complementary feeding and the incidence of diarrhea in children aged 6-24 months. There are many factors of diarrhea in children aged 6-24 months in the practice of complementary feeding in addition to the first age of complementary feeding, namely frequency, variety, and hygiene of complementary feeding [15]. The lower frequency of complementary feeding will protect the immune system against diarrheal infections. A variety of complementary foods is associated with an increased risk of diarrhea in children. Adequate nutrition during infancy is important because the period from birth to two years of age is a "critical window" for the promotion of optimal growth and behavioral development. The non-variation of complementary foods compromises the immune function and predisposes to diarrheal infections. Specific nutrients (such as Vitamin A, iron, and zinc) are required for optimal immune response, and deficiency in one or more of these reduces immune function and provides opportunities for infectious agents of diarrheal diseases. Food preparation, storage, and feeding are common sources of bacterial contamination that causes diarrhea [16]. Poor hygiene practices in food preparation and poor food storage practices contribute to food contamination. Hygienic behavior associated with the practice of feeding is not washing hands before feeding children increases the incidence of diarrhea in children. In Probowati's research, it was stated that the mother's knowledge influenced the role attainment of mothers in providing complementary foods so that there was an increase in baby weight for 6-12 months [17].

There is no relationship between types of complementary breastfeeding and the incidence of diarrhea in children aged 6-24 months in line with Afriyanti's research that there is no relationship between types of complementary breastfeeding and the incidence of diarrhea in the Mangkang Health Center Work Area [18]. The practice of complementary feeding is not only a type of complementary feeding that can cause diarrhea but also the frequency, variety, and hygiene of complementary feeding [19]. When babies don't absorb enough nutrients to meet their energy and growth needs or maintain a healthy immune system. Babies can no longer maintain natural body capacities, fight diarrheal infections, and recover from diarrheal diseases. Microbial contamination in food is a major cause of diarrhea in children. If you often experience diarrhea, the child's growth and development will experience disruption as in Rosmala's research stated that Appropriate complementary foods are part of the gold standard in the prevention of underweight children aged 25-60 months [20]. Mother's knowledge is needed in giving various types of complementary breastfeeding because the type of complementary breastfeeding also affects the incidence of anemia for babies 6-24 months, as Irawan's research shows that babies who are given complementary foods at home are at risk of developing and developmental disorders compared to babies who are given commercial complementary foods [21].

Most of the infectious germs that cause diarrhea are transmitted via fecal orally. These germs can be transmitted when they enter the mouth through food, drink, or objects contaminated with feces, for example, fingers, food containers, or food-drink containers that are washed with contaminated water. The provision of clean water must be considered in everyday life as a form of prevention of children against environmentally-based diseases such as diarrhea disease [22].. The results showed that clean water facilities did not meet the requirements and had a higher risk of experiencing diarrhea as much as 4.118 times compared to fulfilling clean water facilities. The researcher observed the respondents' clean water facilities with the criteria that the water facilities were colorless and odorless. The majority of water facilities in Kedungkendo Village use well water, it is very easy for the water to become cloudy, so the water supply must be cleaned more frequently. The contamination of dirty water causes water sources to be contaminated and unhygienic so that it can affect water quality physically and microbiologically. Various germs or germs that can live in turbid and / or smelly water sources are one of the causes of diarrhea in children in Kedungkendo Village.

A latrine is a building used for disposal and collection of human feces which is often called a toilet or toilet, with or without a toilet and equipped with a means of collecting feces so that the prevention of causes or spreaders of disease and polluting the residential environment can be realized. Healthy latrines are latrines that meet the requirements including clean, odorless, dirt not touched by insects or rats, not polluting the surrounding soil, equipped with protective walls and roofs, waterproof floors and adequate space, water, soap, and cleaning tools available. A latrine that meets the health requirements can reduce germ contamination so that diarrhea in children can be prevented [23]. The availability of healthy latrines is the ownership of a gooseneck latrine by a family and maintaining the cleanliness of the latrine. The use of latrines has a large impact on reducing the risk of diarrhea disease in children, but well-functioning latrines are cleaned regularly. Toilets prevent the contamination of water sources around them, clean toilets also do not invite germs that can transmit diarrhea to children.

The results showed that the latrine facilities did not meet the requirements for a greater risk of experiencing diarrhea as much as 7,292 times compared to the latrine facilities that met the requirements. One of the important contributors to the high prevalence of diarrhea in children, one of which is the environmental factor of poor sanitation, and and and unclean latrines. All mothers in Kedungkendo Village have gooseneck type family toilets and all family members use the family latrine when defecating. Gooseneck latrine (latrine swan) is a type of latrine that meets health requirements. However, having a gooseneck latrine is not enough. A sanitary latrine is also a latrine that meets health requirements. Lack of sanitation, such as inadequate latrines, which causes germs such as Escherichia coli and rotavirus to spread more easily so that children can develop diarrhea [24], such as the results of Lubis's research that Escherichia coli, Klebsiella pneumonia, and Staphylococcus aureus (skin commensal) found on Equipment and hands of the food-handlers cause Foodborne Disease [25].

A clean home environment, one of which is an adequate trash can, is important to prevent the spread of diarrheal

diseases [2], [26]. Waste management is very important to prevent disease transmission, which is transmitted through disease vectors such as microorganisms, flies, mice, and others. Garbage is something that comes from human activities that are unused, unused, disliked, or something that is thrown away, and does not happen by itself [27]. The trash can that is used must meet the requirements, namely that the construction must be strong and not easily leaked, have a lid, and can be easily opened without dirtying the hands, the appropriate size so that it is easily transported by one person. Adequate litter in the home environment reduces an attractive source of vectors causing childhood diarrhea [28].

The results showed that the trash bin facilities did not meet the requirements and had a higher risk of experiencing diarrhea as much as 3,429 times compared to the facilities for the trash bins that met the requirements. The existence of garbage can also disturb health because garbage is a source of disease transmission [29]. Garbage is also an ideal place for nests and breeding grounds for disease vectors, so it is important to pay attention to the requirements for adequate trash cans. Trash that does not meet health requirements can make it a good place for the breeding of insects and microorganisms, insects as carriers for pathogenic microorganisms that can spread everywhere so that it becomes a risk of diarrhea in children. Garbage bin facilities and water quality need to be considered because it not only has a direct impact on health but also has a long-term impact on climate change [30].

Researchers observed the respondents' trash cans with the criteria of closed and non-leaking trash cans. The disposal and processing of waste in Kedungkendo Village are different, first, some women pay a garbage man to collect and collect garbage to the final disposal site, second, some mothers burn rubbish when the garbage is full, third some mothers pile garbage in a garbage pile. Based on the research results, most mothers in Kedungkendo Village have inadequate trash bins. The majority of mothers in Kedungkendo Village have open dumpsites. Garbage cans that are open carelessly can be a good place for the reproduction of vectors and microorganisms that can cause diarrhea diseases for children aged 6-24 months in Kedungkendo Village. Good sanitation hygiene and health care contribute to healthy family security, and that must be considered and worrisome are opened-household sewerage (SPAL) and opened-trash bin [31].

CONCLUSION

The provision of complementary foods, whether the age the baby is first given, or the type of complementary foods, do not correlate with the incidence of diarrhea in children aged 6-24 months. Factors that correlate with the incidence of diarrhea in children aged 6-24 months are environmental sanitation, including water quality, latrine facilities, and garbage facilities.

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