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CHILD FEEDING PRACTICE, SANITATION HYGIENE, AND OTHER FACTORS OF DIARRHEA IN CHILDREN AGED 6-23 MONTHS IN INDONESIA: ANALYSIS OF IDHS 2017

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ABSTRACT

Diarrhea remains one of the major contributors of under five children mortality worldwide. IDHS 2017 data show that 6-23 month-old children have the highest diarrhea prevalence. The objective of this research is to analyze the association of child feeding practices (early initiation of breastfeeding, continued breastfeeding, bottle feeding, MDD, MMF, MAD); sanitation hygiene (source of drinking water, treatment of drinking water, toilet facility, handwashing facility); healthcare utilization factors (immunization status, vitamin A in the last 6 months); and socio-demographic factors (maternal age, maternal education, maternal working status, economic status, residence) with diarrhea incidence in 6-23 month-old children in Indonesia. This cross-sectional study included a total of 4,030 children aged 6-23 months from IDHS 2017. Chi-square test and multiple logistic regression were applied to analyze factors associated with diarrhea. It was found that the prevalence of diarrhea was 19.8% in 2017. Bivariate analysis shows that diarrhea was significantly associated with continued breastfeeding, bottle feeding, toilet facility, source of drinking water, maternal age, economic status, and place of residence. Furthermore, multivariate analysis results in some variables have a statistically significant association with diarrhea, which are the use of bottle feeding, non-improved toilet facility, maternal age 15-29 years, and low maternal education. The dominant factor associated with diarrhea was toilet facility (OR=1.500, 95% CI 1.262-1.784). Healthy latrines utilization, cleaning baby bottle properly, and enhancing health education for mothers are pivotal to prevent diarrhea and maintain children's health at 6-23 months.

Kata Kunci:
diare,
praktik pemberian makan anak,
higiene sanitasi,
anak 6-23 bulan

ABSTRAK

Diare menjadi salah satu faktor utama penyebab kematian balita di dunia. Berdasarkan data SDKI 2017, usia anak 6-23 bulan merupakan prevalensi tertinggi kejadian diare. Tujuan dari penelitian ini adalah menganalisis hubungan antara faktor praktik pemberian makan anak (inisiasi menyusui dini, melanjutkan pemberian ASI, penggunaan botol dot, MDD, MMF, MAD); faktor higiene sanitasi (sumber air minum, perlakuan air minum, fasilitas jamban, fasilitas cuci tangan); faktor pemanfaatan layanan kesehatan (status imunisasi, pemberian vitamin A 6 bulan terakhir); dan faktor sosiodemografi (usia ibu, pendidikan ibu, status bekerja ibu, status ekonomi, tempat tinggal) terhadap diare anak 6-23 bulan di Indonesia. Penelitian dengan metode cross sectional ini menggunakan data sekunder dari 4.030 anak 6-23 bulan pada SDKI 2017. Analisis dengan uji Chi-square dan regresi logistik ganda diterapkan untuk mengetahui faktor yang berhubungan dengan diare. Diketahui bahwa prevalensi diare anak 6-23 bulan di Indonesia adalah sebesar 19.8% pada tahun 2017. Analisis bivariat memberikan hasil bahwa melanjutkan pemberian ASI, penggunaan botol dot, fasilitas jamban, sumber air minum, usia ibu, status ekonomi, dan daerah tempat tinggal memiliki hubungan signifikan dengan diare. Analisis multivariat menampakkan bahwa variabel yang memiliki hubungan bermakna dengan diare adalah penggunaan botol dot, fasilitas jamban tidak layak, usia ibu 15-29 tahun, dan level pendidikan ibu rendah. Faktor dominan yang berhubungan signifikan dengan diare adalah fasilitas toilet (OR=1,500, 95% CI 1,262-1,784). Penggunaan jamban sehat, mencuci botol dot dengan benar, dan meningkatkan edukasi kesehatan bagi ibu penting untuk mencegah diare dan menjaga kesehatan anak usia 6-23 bulan.

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INTRODUCTION

Diarrhea is a high-risk health problem for young children. Diarrhea is one of the major contributors of mortality and morbidity in children under five worldwide (1). A multi-country analysis showed that a higher diarrhea burden before the first two years of life is related with a higher frequency of stunting at two years of age (2). Diarrhea's prevalence in children under five in Indonesia based on the diagnosis of health workers increased significantly from 2.4% in 2013 to 11% in 2018 (3). Moreover, based on Indonesia Demographic and Health Survey (IDHS) 2017 report, 14% of children under five had diarrhea in the two weeks before the survey, where the highest prevalence of diarrhea was in 6-23 month-old children, with range 19-20% (4).

Children's diarrhea is associated with several risk factors. The child feeding practices associated with diarrhea are early breastfeeding initiation, continued breastfeeding, bottle feeding, and complementary feeding practices (5–7). Child feeding practices are an important aspect for 6-23 month-old children, where this period is the peak time for growth disorders, micronutrient deficiencies, and infectious diseases (8). Sanitation hygiene factors associated with diarrhea are drinking water source, treatment of drinking water, toilet facility, and handwashing behavior (9–11). Health care utilization factors associated with diarrhea are immunization status and vitamin A supplementation (12,13). Besides, socio-demographic characteristics associated with diarrhea are maternal age, maternal education, maternal working status, wealth index, and residence (13).

Based on the description above, it is known that diarrhea's prevalence in Indonesia peaks in 6-23 month-old children, and previous studies shows that there are several factors related to children's diarrhea. Therefore, this study aims to analyze the association between child feeding practices, sanitation hygiene, healthcare utilization, and socio-demographic factors with diarrhea incidence in 6-23 month-old children in Indonesia using secondary data from IDHS 2017.

METHODS

This cross-sectional study used secondary data from the Indonesia Demographic and Health Survey (IDHS) 2017. IDHS is managed by Indonesian stakeholders such as Central Bureau of Statistics, National Population and Family Planning Board, and Indonesian Ministry of Health with support from Inner City Fund (ICF) International, which was done in all provinces in Indonesia from July-September 2017. A total number of 49,627 women from 15 to 49 years old were successfully interviewed after applying two-stage stratified cluster sampling, which subsequently resulted in 5,367 children aged 6-23 months.

Finally, the total sample of 4,030 Indonesian children aged 6-23 months was used for this research after calculating the minimum sample size using two proportion hypothesis tests, then applying the inclusion and exclusion criteria, and cleaning data. The inclusion criteria of this research were biological children, last-born children, and mothers and children living together. Meanwhile, the exclusion criteria were twin birth and children with incomplete data regarding the variables to be studied.

The analysis was carried out on the variables in univariate analysis, bivariate analysis with chi-square test, and multivariate analysis with multiple logistic regression. Variables with $p<\alpha$ ($p<0.05$) in bivariate analysis mark a significant association between independent and dependent variables. Then, bivariate selection was done to determine what variables could continue to multivariate analysis (variables with $p<0.25$). The result of multivariate analysis then shows the dominant factors associated with diarrhea, as seen from OR and p value ($p<0.05$).

Diarrhea was the dependent variable in this research. Diarrhea is defined as three or more loose or watery stools in 24 hours, reported by the mother in the last two weeks before the survey (14). Besides, there are four groups of independent variables, namely child feeding practices (early initiation of breastfeeding, continued breastfeeding, bottle feeding, minimum dietary diversity (MDD), minimum meal frequency (MMF), minimum acceptable diet (MAD)); sanitation hygiene

(source of drinking water, treatment of drinking water, toilet facility, handwashing facility); health care utilization (immunization status, vitamin A in the last six (6) months); and socio-demographic factors (maternal age, maternal education, maternal working status, economic status, residence).

This research has attained ethical approval from the Research and Community Engagement Ethical Committee, Faculty of Public Health, Universitas Indonesia No. 95/UN2.F10.D11/PPM.00.02/2021.

RESULT

Univariate Analysis

The univariate analysis result is shown in Table 1. Diarrhea's prevalence in 6-23 month-old children in Indonesia 2017 was 19.8%. Based on child feeding practices, most of them had early initiation of breastfeeding (60.8%), continued breastfeeding (73.6%), not using bottle feeding (63.2%), fulfilled MDD (52.6%), and fulfilled MMF (74.9%), but only a small proportion fulfilled MAD (41.3%).

Based on sanitation hygiene factors, most of the children had improved drinking water sources (89.5%), boiled drinking water (73.2%), had improved toilet facilities (74%), and had water and soap in handwashing facilities (92.2%). Based on healthcare utilization, most children had complete immunization according to age (55.5%) and were given vitamin A supplementation in the last six (6) months (76.8%). Socio-demographic factors showed that some of the children had mothers aged 15-29 years (49.8%), mothers with secondary or higher education (77.5%), unemployed mothers (59.2%), and low economic status (44,3%). Some children live in rural (50%) and the rest in urban (50%).

Bivariate Analysis

Bivariate analysis was carried out for each independent variable and the dependent variable, which is diarrhea. The results of bivariate analysis are given in Table 2. Bivariate analysis with Chi-square test showed that the variables which had a significant association with diarrhea (p value <0.05) were continued breastfeeding, bottle feeding, source of drinking water, toilet facility, maternal age, economic status, and residence.

Table 1. Distribution of Diarrhea Incidence, Child Feeding Practices, Sanitation Hygiene, Health Care Utilization, and Socio-Demographic Factors in 6-23 Month-old Children in Indonesia, 2017

Variables	n	%
Diarrhea		
Yes	799	19.8
No	3231	80.2
Child Feeding Practices		
Early Initiation of Breastfeeding		
No	1581	39.2
Yes	2449	60.8
Continued Breastfeeding		
No	1063	26.4
Yes	2967	73.6
Bottle Feeding		
Yes	1485	36.8
No	2545	63.2
Minimum Dietary Diversity (MDD)		
Not Fulfilled	1910	47.4
Fulfilled	2120	52.6
Minimum Meal Frequency (MMF)		
Not Fulfilled	1010	25.1
Fulfilled	3020	74.9
Minimum Acceptable Diet (MAD)		
Not Fulfilled	2366	58.7
Fulfilled	1664	41.3

Variables	n	%
Sanitation Hygiene Factors		
Source of Drinking Water		
Not Improved	424	10.5
Improved	3606	89.5
Treatment of Drinking Water		
Not boiled/other methods (excluding bottled water)	1079	26.8
Boiled (including bottled water)	2951	73.2
Toilet Facility		
Not Improved	1048	26
Improved	2982	74
Handwashing Facility		
No water and/or soap available	316	7.8
Water and soap available	3714	92.2
Health Care Utilization Factors		
Immunization Status		
Incomplete according to age	1792	44.5
Complete according to age	2238	55.5
Vitamin A in the Last 6 Months		
No	936	23.2
Yes	3094	76.8
Socio-demographic Factors		
Maternal Age (years)		
15-29	2007	49.8
30-49	2023	50.2
Maternal Education		
Primary or lower	908	22.5
Secondary or higher	3122	77.5
Maternal Working Status		
Employed	1643	40.8
Unemployed	2387	59.2
Economic Status		
Low	1784	44.3
Middle	767	19
High	1479	36.7
Residence		
Rural	2013	50
Urban	2017	50

Table 2. Bivariate Analysis of Factors Associated with Diarrhea in 6-23 Month-old Children in Indonesia, 2017

Variables	Diarrhea				OR (95% CI)	p value
	Yes		No			
	n	%	n	%		
Child Feeding Practices						
Early Initiation of Breastfeeding						
No	326	20.6	1255	79.4	1.085	0.330
Yes	473	19.3	1976	80.7	(0.927-1.271)	
Continued Breastfeeding						
No	239	22.5	824	77.5	1.247	0.013*
Yes	560	18.9	2407	81.1	(1.051-1.479)	

Variables	Diarrhea				OR (95% CI)	p value
	Yes		No			
	n	%	n	%		
Bottle Feeding						
Yes	326	22	1159	78	1.232 (1.052-1.444)	0.011*
No	473	18.6	2072	81.4		
Minimum Dietary Diversity (MDD)						
Not Fulfilled	380	19.9	1530	80.1	1.008 (0.863-1.177)	0.948
Fulfilled	419	19.8	1701	80.2		
Minimum Meal Frequency (MMF)						
Not Fulfilled	202	20	808	80	1.015 (0.849-1.213)	0.909
Fulfilled	597	19.8	2423	80.2		
Minimum Acceptable Diet (MAD)						
Not Fulfilled	476	20.1	1890	79.9	1.046 (0.893-1.224)	0.607
Fulfilled	323	19.4	1341	80.6		
Sanitation Hygiene Factors						
Source of Drinking Water						
Not Improved	107	25.2	317	74.8	1.421 (1.125-1.797)	0.004*
Improved	692	19.2	2914	80.8		
Treatment of Drinking Water						
Not boiled/other methods (excluding bottled water)	227	21	852	79	1.108 (0.933-1.317)	0.262
Boiled (including bottled water)	572	19.4	2379	80.6		
Toilet Facility						
Not Improved	261	24.9	787	75.1	1.507 (1.273-1.783)	<0.001*
Improved	538	18	2444	82		
Handwashing Facility						
No water and/or soap available	66	20.9	250	79.1	1.074 (0.809-1.425)	0.675
Water and soap available	733	19.7	2981	80.3		
Health Care Utilization Factors						
Immunization Status						
Incomplete according to age	361	20.1	1431	79.9	1.037 (0.887-1.211)	0.679
Complete according to age	438	19.6	1800	80.4		
Vitamin A in the Last 6 Months						
No	174	18.6	762	81.4	0.902 (0.749-1.087)	0.300
Yes	625	20.2	2469	79.8		
Socio-demographic Factors						
Maternal Age (years)						
15-29	444	22.1	1563	77.9	1.335 (1.142-1.560)	<0.001*
30-49	355	17.5	1668	82.5		
Maternal Education						
Primary or lower	201	22.1	707	77.9	1.200 (1.002-1.437)	0.053
Secondary or higher	598	19.2	2524	80.8		
Maternal Working Status						
Employed	325	19.8	1318	80.2	0.995 (0.85-1.165)	0.968
Unemployed	474	19.9	1913	80.1		
Economic Status						
Low	397	22.3	1387	77.7	(1) 1.112 (0.903-1.369) (2) 1.442 (1.208-1.720)	<0.001*
Middle	157	20.5	610	79.5		
High	245	16.6	1234	83.4		
Residence						
Rural	427	21.2	1590	78.8	1.185 (1.014-1.384)	0.036*
Urban	372	18.5	1641	81.5		

*p value<0.05

Multivariate Analysis

Multivariate analysis was applied to find the more actual association between the independent variable and the dependent variable and also the dominant variable associated with diarrhea. Multivariate analysis results in Table 3 reveal that using bottle feeding, toilet facility, maternal education, and maternal age had a significant association with children's diarrhea. The dominant factor associated with diarrhea was determined by looking at the highest OR value among variables with a significant association (p value <0.05). Toilet facility becomes the variable with highest OR value of 1.500 (1.262-1.784). This value means that children with unimproved toilet facilities had 1.5 higher possibility of getting diarrhea than children with improved toilet facilities.

Table 3. Multivariate Analysis of Factors Associated with Diarrhea in 6-23 Month-old Children in Indonesia, 2017

Variables	p value	OR (95% CI)
Bottle Feeding		
Yes No	0,001*	1,324 (1,126-1,557)
Toilet Facility		
Not Improved Improved	<0,001*	1,500 (1,262-1,784)
Maternal Age		
15-29 years 30-49 years	<0,001*	1,340 (1,144-1,569)
Maternal Education		
Primary or lower Secondary or higher	0.044*	1,213 (1,005-1,463)

Furthermore, the variables that, after going through multivariate analysis, still had the p value <0.05 were bottle feeding, maternal age, and maternal education. The analysis showed that the bottle-feeding variable had OR 1.324 (95% CI; 1.126-1.557), meaning that children who were bottle fed had a 1.3 higher risk of getting diarrhea than children who were not bottle fed. The maternal age variable had OR 1.340 (95% CI; 1.144-1.569), meaning that children with mothers aged 15-29 years old had 1.3 greater risk of getting diarrhea than children with mothers aged 30-49. The maternal education variable had OR 1.213 (95% CI; 1.005-1.463), meaning that children with mothers from primary or lower education had 1.2 greater risk of getting diarrhea than children with mothers from secondary or higher education.

DISCUSSION

This study points out that diarrhea prevalence in 6-23 month-old children in Indonesia in 2017 was 19.8%. This number is consistent with IDHS 2017 data that the period of 6-23 months old is the peak prevalence of children's diarrhea, ranging from 19-20% (4). Compared to other studies, this number is lower than a study in Ghana, which shows that the diarrhea prevalence was 53% among children aged 6–23 months (15). However, compared to another country in Southeast Asia, the number in Indonesia was higher than a prior study in Myanmar, which was found that the diarrhea prevalence was 16% in 6-23 month-old children (16).

The high prevalence of diarrhea in 6-23 month-old children can be attributed to the season in Indonesia. IDHS data collection was performed from July-September 2017. Based on Meteorological, Climatological and Geophysical Agency data, most areas in Indonesia entered the dry season in July-September 2017 (17). During the dry season, the rainfall intensity decreases, or there is no rain at all, which reduces the availability of clean water. This condition can higher the risk of diarrhea or other hygiene-related diseases (18).

Based on multivariate analysis, the use of bottle feeding has a significant association with diarrhea. Children who were bottle fed had greater odds of getting diarrhea compared to children who were not bottle fed. The outcome is consistent with previous studies conducted in Indonesia and Nigeria (6,14,19). The risk of contamination in using bottle-feeding can occur due to inappropriate hygiene when washing bottles and when preparing liquids (14). Pathogenic bacteria that cause diarrhea can enter the human body through hands or food utensils such as contaminated milk bottles. Improper hygiene methods make microorganisms or bacteria grow on milk bottles. The residue of the milk that sticks

inside the milk bottle due to poor hygiene methods becomes a medium for the growth of bacteria (19).

The toilet facility had a significant association with diarrhea in multivariate analysis and became the dominant factor related to diarrhea incidence. Children with unimproved toilet facilities had higher risk of getting diarrhea rather than children with improved toilet facilities. The unimproved toilet facility is defined as toilet with no septic tank, shared (public) facility, and no facility/bush/field (open defecation), where the improved toilet facility is defined as toilet with septic tank and pit latrine. This result is consistent with previous research conducted in Indonesia, Ethiopia, Cambodia, and Malawi (9,14,20–23). Open defecation can pollute groundwater sources such as open wells, hand pump wells, and tube wells, which contaminate the daily water source (24). The polluted environment provides an ideal condition for flies to transmit pathogens to water, food, and eating utensils (25). Shared (public) toilet facilities can contribute to the transmission of diarrheal diseases caused by hygiene and maintenance problems, overuse, or caused by users who sometimes choose unhygienic methods of disposal of waste (26).

Maternal age had a significant association with diarrhea in multivariate analysis. Children whose mothers were 15-29 years old had a greater possibility of getting diarrhea rather than children whose mothers were 30-49 years old. The result is consistent with preceding studies conducted in Indonesia, India, Kenya, Malawi, and multi-country analysis (13,14,21,27–29). Mothers have an essential role in child care. Younger mothers are less likely to have experience with child care than older mothers, which can affect their children's health (13,14,27).

Maternal education also had a significant relationship with diarrhea in multivariate analysis. Children with mothers from primary or lower education were more likely to experience diarrhea than children with mothers from secondary or higher education. This result is consistent with earlier studies conducted in Ethiopia, Indonesia, Kenya, and multi-country analysis (9,13,14,20,28). Mothers with poor education level may be less willing to seek information about preventing diarrhea, and prone to have insufficient understanding in diarrhea prevention (14).

Based on transmission route, the transmission of diarrhea is essentially similar for all agents (fecal-oral transmission). However, there might be various routes, such as indirect transmission through contaminated food or water inside or outside the home, and direct person-to-person transmission mediated through hands contaminated with feces or inanimate objects (fomites) (30). Thus, this concept is consistent with the finding of this study that unimproved toilet facility becomes the risk factor of diarrhea, and the use of bottle feeding is an important child feeding practice associated with children's diarrhea as it poses risk of contamination. The finding of this study also shows that socio-demographic factor such as maternal age and education can become the risk factors of children's diarrhea.

This research has strengths and limitations. Some of the strengths are that the study can describe the factors associated with children's diarrhea more comprehensively and uses nationally representative IDHS data collected with internationally standardized questionnaires. Meanwhile, the limitations of this study are not being able to determine the type of diarrhea, the possibility of recall bias, and the cross-sectional study design so that it could not analyze a causal association between the dependent and the independent variable.

CONCLUSIONS AND SUGGESTIONS

Conclusion

Diarrhea's prevalence among Indonesian children aged 6-23 months was 19.8% in 2017. The use of bottle feeding, non-improved toilet facilities, maternal age 15-29 years, and low maternal education were significantly associated with diarrhea. Non-improved toilet facilities defined as toilet with no septic tank, shared facility, and no facility/bush/field were the dominant factor associated with diarrhea in Indonesian children aged 6-23 months.

Suggestion

It is recommended for the related agencies to strengthen the Community-Led Total Sanitation program, which prioritized for people in rural areas and people with low

economic status. The multisector coordination between the public health agency, health cadres, and public figure is important in giving effective health education related to diarrhea for the targeted group. Healthy latrines utilization and ending open defecation should become the main focus for diarrhea prevention.

In addition, it is necessary to improve education programs or health counseling regarding appropriate child feeding practices according to WHO recommendations, especially the continuation of breastfeeding for up to two (2) years and how to properly wash children's eating utensils and feeding bottles. Education programs need to be prioritized for young mothers and mothers with low levels of education.

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