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ORIGINAL ARTICLE

HYGIENE AS RISK FACTORS FOR DIARRHEA AMONG TODDLERS IN MULYOREJO PRIMARY HEALTH CENTER, SURABAYA

Higiene Sebagai Faktor Risiko Diare Pada Balita di Puskesmas Mulyorejo, Surabaya

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ABSTRACT

Background: Mulyorejo Primary Health Center (PHC) ranks 12th in Surabaya for diarrhea morbidity in toddlers, and there was one case of under-five deaths due to diarrhea in 2020**. Purpose:** This study aims to analyze hygiene as a risk factor for diarrhea in toddlers at Mulyorejo PHC, Surabaya**. Methods:** This study was conducted with a case-control design from December 2022 to October 2023. The case population was all toddlers aged 12-59 months at Mulyorejo PHC who had diarrhea at least in the last month. The control population consisted of toddlers aged 12-59 months living in the Mulyorejo PHC working area who had not experienced diarrhea for at least one month. The sample size amounted to 114, with a ratio of 1 1, using a simple random sampling technique. The independent variables were handwashing with soap (HWWS), food hygiene practices, latrine ownership, healthy latrines, feces disposal, and access to drinking water. Data were collected using questionnaires and observation. Chi-Square Test and Multiple Logistics Regression analyzed data. **Results:** HWWS (p=0.001), food sanitation (p=0.061), latrine ownership (p=0.032), and proper disposal of toddler feces (p=0.024) had a significant association with the incidence of diarrhea in toddlers at Mulyorejo PHC. **Conclusion:** Only the HWWS variable determines the incidence of diarrhea in toddlers at Mulyorejo PHC. Good handwashing habits with soap can prevent the occurrence of diarrhea in toddlers.

ABSTRAK

Latar Belakang: *Puskesmas Mulyorejo menempati urutan ke-12 di Surabaya untuk angka kesakitan diare pada balita dan terjadi satu kasus kematian*

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balita akibat diare pada tahun 2020. ***Tujuan:*** *Penelitian ini bertujuan untuk menganalisis higiene sebagai faktor risiko terjadinya diare pada balita di Puskesmas Mulyorejo, Surabaya.* ***Metode:*** *Penelitian ini dilakukan dengan desain kasus-kontrol mulai dari Desember 2022 hingga Oktober 2023. Populasi kasus adalah seluruh balita usia 12-59 bulan di Puskesmas Mulyorejo yang mengalami diare minimal satu bulan terakhir. Populasi kontrol adalah semua balita usia 12-59 bulan yang tinggal di wilayah kerja Puskesmas Mulyorejo yang tidak mengalami diare selama minimal satu bulan. Besar sampel berjumlah 114 dengan perbandingan 1:1 yang diambil dengan teknik simple random sampling. Variabel independent penelitian adalah Cuci Tangan Pakai Sabun (CTPS), praktik higiene makanan, kepemilikan jamban, jamban sehat, pembuangan tinja, dan akses terhadap air minum. Pengumpulan data menggunakan kuesioner dan observasi. Data dianalisis dengan uji chi-square dan regresi logistik berganda.* ***Hasil:*** *CTPS (p=0,001), sanitasi makanan (p=0,061), kepemilikan jamban (p=0,032) dan pembuangan tinja balita yang benar (p=0,024) memiliki hubungan yang signifikan dengan kejadian diare pada balita di wilayah kerja Puskesmas Mulyorejo.* ***Simpulan:*** *hanya variabel CPTS yang merupakan faktor determinan kejadian diare pada balita di Puskesmas Mulyorejo. Kebiasaan cuci tangan dengan sabun yang baik dapat mencegah terjadinya diare pada balita.*

INTRODUCTION

Mortality of children. Despite treatment solutions, diarrhea causes an estimated 444,000 or more than 1,200 child deaths each year. About 9 percent of all global deaths in children under 5 years old in 2021 were caused by diarrhea (1). The average cost of diarrheal disease in low and middle-income countries was US$36.56 for each outpatient and US$159.90 per hospitalization. Meanwhile, direct medical costs amounted to 79% of the total direct costs (2). Based on primary health research data in 2018, the prevalence of diarrhea in toddlers in Indonesia was 12.30%. In 2022, diarrhea will be the second leading cause of death after pneumonia in children under 12-59 months in Indonesia (3). East Java is ranked second after West Java for diarrhea cases, with 1,048,885 patients, and Surabaya is the city/ district with the highest number of diarrhea cases (4).

Problems that are often found in people living in urban slums in Indonesia are inadequate access to water and sanitation and poor personal hygiene behavior. This situation can increase the risk of health problems such as diarrhea (5). Research using data from the 2017 Indonesia Demographic Health Survey (IDHS) found several risk factors associated with the incidence of diarrhea in toddlers in Indonesia. The behavior of direct disposal of feces in the sewer and the availability of toilet facilities are significantly associated with the incidence of diarrhea in toddlers in Indonesia (6,7). Previous research on factors associated with diarrhea in elementary school students showed that hygiene factors such as CPTS were significantly associated with diarrhea (8).

The under-five mortality rate due to diarrhea in Surabaya is the highest in East Java, with 7 deaths in 2020. Mulyorejo PHC ranks 12th for diarrhea morbidity in toddlers, which was 110.8 per 1,000 toddlers in 2020 and was the second highest among all puskesmas in the eastern region of Surabaya. There was one case of under-five deaths due to diarrhea at Mulyorejo PHC in 2020 (9). The prevalence of diarrhea in Mulyorejo PHC has increased continuously from 2019 at 6.8 to 2022 at 16.8 cases per 100 toddlers. Diarrhea is the second most common disease, with about 50% of cases in 2021 (10). Similar research has never been done at Mulyorejo PHC, so researchers are interested in conducting this research. This study analyzes hygiene as a risk factor for diarrhea in toddlers at the Mulyorejo PHC in Surabaya City.

METHODS

The design of this study matched case-control, which began in December 2022 and continued through October 2023 in the working area of Mulyorejo PHC in Surabaya City. The case

population is all toddlers aged 12-59 months domiciled in the working area of Mulyorejo PHC who experience diarrhea characterized by an increase in the frequency of defecation in the form of mushy or watery stools 3 or more times within 24 hours. At the same time, the control population is all toddlers aged 12-59 months domiciled in the working area of Mulyorejo PHC who do not experience diarrhea characterized by an increase in the frequency of defecation in the form of mushy or watery stools 3 times or more within 24 hours. The inclusion criteria for the study population were diarrhea that occurred in the last month before data collection and had been domiciled in the Mulyorejo PHC working area for 6 months. At the same time, the exclusion criteria are toddlers with milk allergies, lactose intolerance, or a history of diarrhea due to other digestive disorders based on interviews with the patient's parents.

The sample calculation used the matched case-control formula by Dupont & Plummer (11) with a ratio of 1:1 so that the total number of samples was 90 respondents. Cousens et al (12) recommend increasing the sample size by about 25% to minimize confounding interactions so that the total sample of this study was 114 respondents selected using a simple random sampling technique. The dependent variable in this study is diarrhea in toddlers, who are categorized into yes and no; where data collection is done through secondary data using case data at Mulyorejo PHC and primary data by interview because the number of cases does not reach the sample calculation. Primary data collection by researchers using the operational definition of diarrhea based on WHO, namely an increase in the frequency of defecation in the form of mushy or watery stools at least 3 times or more for 24 hours within the last 1 month. At the same time, the independent variables in this study are the behavior of hand washing with soap (HWWS), which is categorized into good if the total score ≤ the mean score and less if the total score > the mean score, food hygiene practices which are categorized into good if the total score > the mean score and less if the total score ≤ the mean score, latrine ownership which are categorized into shared/general and personal, healthy latrines which are categorized into yes and no, access to drinking water sources which are categorized into adequate and inadequate, and fecal disposal which are categorized into adequate and inadequate. Data collection for the independent variables was conducted by interview and observation using a questionnaire containing several questions and an observation sheet.

The variables of food hygiene practices and HWWS behavior use the scoring method by utilizing a 1-4 Likert categorical scale. Validity and reliability tests were conducted using questionnaire questions about the variables of food hygiene practices and HWWS behavior. The test was conducted on 23 respondents at Kalijudan PHC, which is still one sub-district with Muyorejo PHC, so it can be assumed that the socio-demographics will tend to be similar to the research respondents. The validity test, with the Pearson test, obtained a p-value <0.05 on each question, meaning that all questions about the variables of food hygiene practices and HWWS behavior are valid. While the reliability test was carried out with the Cronbach Alpha test, the Cronbach alpha value was obtained (0.79 for CPTS and 0.70 for food hygiene practices)> 0.6, which means that all questions about the variables of food hygiene practices and HWWS behavior are reliable.

To minimize selection bias, a restriction was made by equalizing the case and control groups based on age and gender. Researchers limited the time of diarrhea toddlers in the last month, starting from the time of data collection, to avoid information bias. Data analysis with the chi-square table, if the p-value <0.25, continued with multiple logistic regression analysis with the enter method (reference category first). This study has received ethical permission with ethical certificate number 153/HRECC.FODM/II/2023 issued by the Health Research Ethics Commission of the Faculty of Dentistry, Universitas Airlangga.

RESULTS

Based on Table 1, the number of mothers of toddlers who have practiced HWWS well in both groups is more than those who are not good at practicing HWWS. Based on food sanitation practices, 33 mothers of toddlers with diarrhea (57.89%) were in poor food hygiene practices. In contrast, 35 mothers of toddlers who did not have diarrhea (61.40%) had practiced food hygiene well. Most toddlers came from families with family or private latrines in their residences. The proportion of public toilet owners in the case group was twice as large as the control group. In addition, the proportion of children under five who owned healthy and unhealthy latrines in the case group was not much different from the control group. Based on the category of toddler feces disposal, the % of mothers of children under five who did not have diarrhea who had disposed of toddler feces

adequately was 64.91%, which was greater than the proportion of children under five with diarrhea. Based on access to drinking water at the household level, most families of children under five in the case group (89.47%) and control group (84.21%) had access to adequate drinking water.

Table 1
Distribution of Hygiene Factors on the Incidence of Diarrhea in Toddlers in the Working Area of Mulyorejo PHC in Surabaya City in 2023

Variables	Case		Control	
	n	%	n	%
HWWS Behavior				
Less	27	47.37	10	17.54
Good	30	52.63	47	82.46
Food Hygiene Practices				
Less	33	57.89	22	38.60
Good	24	42.11	35	61.40
Latrine Ownership				
Shared/general	20	35.09	9	15.79
Personal	37	64.91	48	84.21
Healthy Latrine				
No	5	8.77	8	14.04
Yes	52	91.23	49	85.96
Fecal Disposal				
Inadequate	33	57.89	20	35.09
Adequate	24	42.11	37	64.91
Access to Drinking Water				
Inadequate	6	10.53	9	15.79
Adequate	51	89.47	48	84.21

The results of the chi-square test analysis in Table 2 showed that there was a relationship between HWWS behavior (OR = 4.23; 95% CI = 1.79-9.98; p = 0.00), food sanitation practices (OR = 2.19; 95% CI = 1.03-4.63; p = 0.06), latrine ownership (OR = 2.88; 95% CI = 1.18-7.06; p = 0.03) and fecal disposal (OR = 2.54; 95% CI = 1.19-5.42; p = 0.02) with the incidence of diarrhea in toddlers in the Mulyorejo PHC of Surabaya City. Then, the four variables with a p-value <0.25 can proceed to the multivariate analysis stage using multiple logistic regression. Results showed that of all the independent variables with a statistically significant association in the initial step, only the HWWS behavior variable (p-value <0.05) had a statistically significant association after multiple logistic regression testing. Toddlers with mothers with poor HWWS behavior had a 4.23 times higher risk than those with mothers with good HWWS behavior (Table 3).

DISCUSSION

Healthy latrines and access to drinking water in this study did not have a relationship with the incidence of diarrhea among children under five years old at Mulyorejo PHC. These results are supported by research by Arifin et al. (2022), which showed no relationship between the availability of inadequate latrines and the incidence of diarrhea among children under five in five countries in Southeast Asia and also no association between the availability of access to drinking water sources and the incidence of diarrhea among children under five in Indonesia (6). This may occur due to the increasing number of people who use packaged drinking water and refill water for consumption. Availability and practicality, ease of access, and quality of drinking water are the main reasons people choose bottled water as their primary source of drinking water (13).

HWWS behavior, food sanitation practices, latrine ownership, and fecal disposal are associated with diarrhea among toddlers at Mulyorejo PHC. In line with the results of this study, research by Joshi et al (14) in India showed a significant relationship between food hygiene practices (such as washing cooking utensils before use, storage of drinking/cooking water, and separation of eating/cooking utensils for infants) and the incidence of diarrhea among children under five years of age. The study of Tesfaye et al (15) showed an association between latrine ownership and the incidence of diarrhea among children under five in Southern Ethiopia after controlling for confounding factors. In contrast to the study of Delelegn et al (16) latrine ownership was not significantly associated with diarrhea in toddlers after multivariate analysis. Research in Ethiopia also showed that unsafe disposal of toddler feces was statistically significantly associated with the incidence of acute diarrhea in toddlers (17). In contrast, studies by Soboksa et al (18) and Solomon et al (19) showed that fecal disposal was not associated with the incidence of diarrhea among under-fives.

Table 2
Relationship Between Hygiene Factors and the Incidence of Diarrhea in Toddlers in Mulyorejo PHC, Surabaya City, 2023

Variables	Diarrhea in Toddlers				*p-value*	OR (95% CI)
	Yes		No			
	n	%	n	%		
HWWS Behavior						
Less	27	47.37	10	17.54	0.00	4.23 (1.79-9.98)
Good	30	52.63	47	82.46		
Food Sanitation Practices						
Less	33	57.89	22	38.60	0.06	2.19 (1.03-4.63)
Good	24	42.11	35	61.40		
Latrine Ownership						
Shared/general	20	35.09	9	15.79	0.03	2.88 (1.18-7.06)
Personal	37	64.91	48	84.21		
Healthy Latrine						
No	5	8.77	8	14.04	0.56	0.59 (0.18-1.92)
Yes	52	91.23	49	85.96		
Fecal Disposal						
Inadequate	33	57.89	20	35.09	0.02	2.54 (1.19-5.42)
Adequate	24	42.11	37	64.91		
Access to Drinking Water						
Inadequate	6	10.53	9	15.79	0.58	0.63 (0.21-1.90)
Adequate	51	89.47	48	84.21		

Table 3
Multivariate Analysis of Hygiene Factors on the Incidence of Diarrhea in Toddlers in the Working Area of Mulyorejo PHC Surabaya City in 2023

Variable	*p-value*	OR	95% CI for odds ratio	
			Lower	Upper
HWWS Behavior	0.01	3.16	1.22	8.20
Food Sanitation Practices	0.86	1.08	0.44	2.65
Latrine Ownership	0.14	2.06	0.79	5.41
Fecal Disposal	0.20	1.73	0.74	4.03
Constant	**0.09**	**0.440**		

Handwashing behavior is a determinant factor affecting the incidence of diarrhea among toddlers at Mulyorejo PHC after multiple logistic regression analyses. Toddlers with mothers who wash their hands poorly or inadequately are 3.69 times more likely to experience diarrhea than mothers who wash their hands well. Toddlers with mothers who wash their hands poorly or inadequately are 3.69 times more likely to experience diarrhea than mothers who wash their hands well. A study in Western Ethiopia also showed that toddlers from mothers who did not practice handwashing with soap had a 5.92 times risk of acute diarrhea (OR 5.92, 95% CI: 2.58-13.7) (20). A study in Kupang also showed that good handwashing practices with soap were a protective factor against diarrhea among children under five years old (21). The results of this study are also consistent with studies conducted in Ethiopia and Uganda (15,22).

Hands are one of the transmission routes of germs between humans and the environment. Hand contamination is highest in low/middle-income countries. Hands are a sentinel indicator of human exposure to enteric pathogens (23). Bacteria on hands can be divided into resident and transient. The amount of transient and resident flora is relatively equal between individuals. A straightforward way that can be done to reduce the number of disease-causing illnesses is to wash hands using soap (24). A rural study in eastern Ethiopia showed that handwashing with soap reduced the risk of diarrhea among children under

five by 41% (25). A systematic review and meta-analysis study also showed that handwashing with soap behavioral interventions can reduce the risk of diarrhea by 30% in children under five years of age in low- and middle-income countries (26).

Hand washing hands with soap, especially before feeding children and after defecation, can block fecal-oral microbial transmission in the environment (27). Hand washing with soap can protect the body from many diseases by destroying pathogens such as bacteria and viruses (28). The effectiveness of using soap was also proven by Noguchi in Laos, which showed that toddlers with handwashing facilities not equipped with soap had a 1.31 times risk of diarrhea compared to toddlers with handwashing facilities equipped with water and soap (29). The behavior of not washing hands with soap at critical times increases the vulnerability of mothers to be more easily infected with the causative agent of diarrhea. It increases the possibility of transmitting it to children.

Research Limitation

The strength of this study is that it is a matched case-control study based on community cases and targeting diarrhea cases in urban communities. A limitation of this study is the case-control study design, which has the potential for recall bias. Some variables, such as handwashing with soap practices, food sanitation practices, and fecal disposal of infants, were collected by self-reported respondents. This allows some answers to be different from the practices carried out before the case occurred. The number of samples in this study is relatively small, which may affect the study results. Future research is expected to develop the data collection process, questionnaire items, and data analysis with a larger sample size to explore the factors associated with the incidence of diarrhea among children under five.

CONCLUSION

HWWS behavior, food sanitation practices, latrine ownership, and fecal disposal are associated with diarrhea among children under five in Mulyorejo PHC. At the same time, healthy latrines and access to drinking water do not have a relationship with the incidence of diarrhea among children under five in Mulyorejo PHC. Only the HWWS variable affects under-five diarrhea in Mulyorejo PHC, and it can be said that HWWS is a determinant factor of under-five diarrhea in Mulyorejo PHC. As an effort to prevent the incidence of diarrhea among children under five, Mulyorejo PHC is expected to conduct interventions that focus on improving handwashing with soap behavior, especially related to the correct handwashing steps and the time required to wash hands as well as socialization about the benefits and disadvantages of handwashing with soap.

CONFLICT OF INTEREST

There is no conflict of interest in this research.

AUTHOR CONTRIBUTIONS

All authors worked on this article and were responsible for its content. AMS: analyzed the data and drafted the article. LNP: conceptualization, methodology, and collecting data. MAI: providing direction and revision.

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