

**RELATIONSHIP OF KNOWLEDGE, DEFECATION BEHAVIOR AND FLY DENSITY
WITH INCIDENCE OF DIARRHEA ON CHILDREN: A CASE CONTROL STUDY**

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Abstract

Introduction: Diarrhea is a significant public health problem because it is the third major contributor to child morbidity and mortality in various countries, including Indonesia. This study aimed to determine the relationship between the density of flies in the geographic area, the knowledge of the mothers, their defecation behavior, and the presence of diarrhea in children in Jambi City, Indonesia

Materials and Methods: This type of research is a quantitative study with a case-control approach involving 76 children under five, namely 38 cases and 38 control groups. The research data were analyzed using the Odds Ratio test.

Results: Mothers who have less knowledge are 12 times more likely to have a toddler suffering from diarrhea than mothers who have good knowledge. Mothers with poor behavior in dealing with toddlers' defecation habits will have a 5 times greater risk of having a toddler with diarrhea problems; on the other hand, if mothers behave well in dealing with children's defecation problems, then the toddler will not be at risk of having diarrhea. The density of flies does not provide a significant risk for the incidence of diarrhea in infants.

Conclusion: the incidence of diarrhea in children under five in the Putri Ayu Public Health Center in Jambi City is influenced by low parental knowledge and bad defecation behavior

Keyword: Availability of latrines, Behavior, Knowledge, Diarrhea, Children

Introduction

Diarrhea is the expulsion of feces with increasing frequency (three times a day) and changes in the consistency to become soft or watery, with or without blood/mucus [1–5]. Diarrhea is also a public health problem in developing countries like Indonesia because of its high morbidity and mortality. Diarrhea is an endemic disease and a potentially extraordinary disease often associated with death [6–8]. Of all deaths of children under five due to diarrheal diseases, 78% occur in Africa and Southeast Asia [9,10]. In 2019 cases in Indonesia were 4,485,513 people with diarrhea services for toddlers 40%. In 2016, people with diarrhea of all ages served at health facilities amounted to 3,176,079 people, and in 2017 it increased to 4,274,790 people. In that year, there have been 21 outbreaks spread across 12 provinces and 17 districts/cities. In 2017, the coverage of services for children with diarrhea in Indonesia was 40.07%, with the highest being West Nusa Tenggara (96.94%) [11].

Diarrhea is a symptom of infection in the intestinal tract, which can be caused by various bacterial, viral and parasitic infections. Infection is spread through contaminated food and drink, or from person to person as a result of poor sanitation. Diarrhea is usually transmitted through food and drink contaminated with feces and vomit from people with diarrhea. Transmission of diarrhea can also be caused by the behavior of defecating in any place, not washing hands after defecating, not washing hands before and after eating [12–14].

The formation of behavior starts from the knowledge or information that has just been obtained. The individual must first know the benefits and advantages of the knowledge or information they get before adopting it in behavior. The more information obtained, the stronger a person's attitude will change. A person becomes healthy if his daily behavior is healthy and sound. Otherwise, if someone is sick, his daily behavior is wrong or unhealthy [15–17].

The relationship between fly density and the incidence of diarrhea is that the higher the density of

flies, the higher the incidence of diarrhea. Transmission routes of the diarrheal disease include water and food, and mechanical arthropods [18].

Toddlers are an age group that is vulnerable to nutrition and prone to disease, especially infectious diseases, one of which is diarrhea. Diarrhea attacks many toddlers because their immune systems are weak, so they are very susceptible to viruses that cause diarrhea. Toddlers who suffer from diarrhea tend to be more at risk of becoming dehydrated quickly. This condition is hazardous and has a negative impact because it can inhibit child growth and development, which can reduce the quality of life [17,19,20].

The prevalence of diarrhea in children in Jambi Province in 2018 was around 7.7%. In 2016 from 11 districts/cities, the incidence of diarrhea in Jambi city has increased. The highest number of sufferers from 2014, as many as 10,491 cases. In 2015, as many as 15,429 cases compared to other districts/cities in Jambi Province, while the incidence of diarrhea was 1,005 cases in 2019 in the Putri Ayu Health Center Work Area, Jambi City [21].

Based on this phenomenon, conducted this study to determine the relationship between knowledge, public defecation behavior, and fly density with diarrhea incidence.

Methods

Design

This research is a quantitative research with a Case-Control study approach

Participants

This research was conducted in Legok Village, Jambi City, Indonesia. The research was carried out in January-April 2020, involving 76 mothers with a ratio of the number of cases and controls being 1:1; in this study, the number of case groups was 38 respondents, and the control group was 38

respondents with matching mothers education. The case group is mothers who have children suffering from diarrhea while in the control group are mothers who have children who do not suffer from diarrhea.

The minimum sample size required for this study was calculated using the G*Power program, considering effect size of 0.3, α -value of 0.05, power of 0.85, and sample group ratio of 1 [22].

The selection of research samples was carried out randomly with inclusion criteria such as mothers who have toddlers and mothers who have never been respondents in previous studies with the theme of diarrhea.

Intervention

In this study, there are three independent variables: mother's knowledge, fly density, and defecation behavior, with diarrhea incidence as the dependent variable. All questions in the study used a dichotomous scale so that the scale used was the Guttman scale [23].

The density of flies has the objective criteria of dense and less dense and was measured using a Guttman scale questionnaire with 10-item questions and a rating range of 0-10, if the respondent answered yes was given a score of 1 and the answer was not given a score of 0.

Defecation behavior variables have good objective criteria and are not measured using a Guttman scale questionnaire with 10-item questions and a rating range of 0-10, if the respondent answered yes was given a score of 1 and the answer was not given a score of 0.

Mother's knowledge has the objective criteria of dense and less dense and was measured using a Guttman scale questionnaire with 10-item questions and a rating range, if the respondent answered correctly was given a score of 1 and the wrong answer was given a score of 0. The incidence of diarrhea varies, but there are objective criteria for cases and controls, which are measured using a Guttman scale questionnaire.

The variable incidence of diarrhea has objective criteria for cases and controls measured using a Guttman scale questionnaire with 10 item questions with a rating range of 0-10, if the respondent answered yes was given a score of 1 and the answer was not given a score of 0.

Blinding

In this study, 2 enumerators were used to collect research data. The previous enumerators did not know the participants because they were students who had been trained by the researcher before collecting data.

Ethical Consideration

No economic incentives were offered or provided for participation in this study. Before carrying out data collection, the researcher first took care of ethical permission.

The authors state that this study followed all ethical clearance processes and was approved by the health research ethics committee of Jambi University, Faculty of Medicine and Health Sciences, and registration number: LB.03.02./3.5/121/2019.

Statistical analysis

Data were presented as numbers or percentages for categorical variables. Continuous data are expressed as the mean \pm standard deviation (SD), or median with Interquartile Range (IQR). The Odds Ratio was used to evaluate significant differences of proportions or percentages between two groups. If the OR value is more than 1.0 then it is considered significant or the variable is considered a risk factor. Statistical analysis was performed using the SPSS version 16.0 application. All tests with p-value (p) $<$ 0.05 were considered significant.

Results

The characteristics of the respondents in this study can be seen in table 1 below.

Variables	Case (n=38)	Control (n=38)
	N(%)	N(%)
Mother's age (y.o)		
Median (IQR)	29 (27-30)	28.5(26-29)
mean±SD	28.63±2.63	28.00±3.01
≤ 25 years	3 (7.9)	5 (13.2)
]25 – 30] years	29 (76.3)	29 (76.3)
> 30 years	6 (15.8)	4 (10.5)
Child's age (month)		
Median (IQR)	59.5 (48-64.8)	52(47.3-64.8)
mean±SD	53.9±14.01	53.3±13.92
[24, 36[3 (7.9)	3 (7.9)
[36, 48[6 (15.8)	7 (18.4)
[48, 60[10 (26.3)	12 (31.6)
[60, 72]	19 (50.0)	16 (42.1)
Child Gender		
Male	18 (47.4)	15 (39.5)
Female	20 (52.6)	23 (60.5)
Mothers education		
Elementary	15 (39.5)	15 (39.5)
Junior school	7 (18.4)	7 (18.4)
High school	12 (31.6)	12 (31.6)
Bachelor	4 (10.5)	4 (10.5)
Working status		
Employed	22 (57.9)	20 (52.6)
Unemployed	16 (42.1)	18 (47.4)
Parity		
Primipara	23 (60.5)	12 (31.6)
Multipara	15 (39.5)	26 (68.4)

Table 1. *Distribution of respondent characteristics*

Table 1 shows that the age group of 26-30 years dominated the respondents as much as 76.3% in the case group. The elementary education level was 39.5%, the dominant working mother was 57.9%, and primiparas were 60.5%. While in the control group, the age group of 26-30 years dominated the respondents as much as 76.3%, the elementary education level was 39.5%, the dominant working mothers were 52.6%, and multiparas were 68.4%. In the case group, the median age of children was 59.5 while in the control group it was 52, and the frequency was almost the same.

Table 2 shows that mothers who have less knowledge are 12 times more likely to have a toddler suffering from diarrhea than mothers who have good knowledge.

Mothers with poor behavior in dealing with toddlers' defecation habits will have a 5 times greater risk of having a toddler with diarrhea problems; on the other hand, if mothers behave well in dealing with children's defecation problems, then the toddler will not be at risk of having diarrhea.

The density of flies does not provide a significant risk for the incidence of diarrhea in toddler.

Variable	Case N(%)	Control N(%)	OR 95% CI
Knowledge			
Good	35 (92.1)	19 (50)	11.667
Poor	3 (7.9)	19 (50)	(3.056-44.539)
Defecation behavior			
Good	31 (81.6)	17 (44.7)	5.471
Poor	7 (18.4)	21 (55.3)	(1.934-15.477)
Fly density			
Dense	28 (73.7)	26 (68.4)	1.292
less dense	10 (26.3)	12 (31.6)	(0.478-3.494)

Table 2. *Frequency Distribution of Respondents Based on Research Variables*

Discussion

This study aimed to determine the relationship between the density of flies in the geographic

area, the knowledge of the mothers, their defecation behavior, and the presence of diarrhea in children in Jambi City, Indonesia. Knowledge results from 'knowing,' which occurs after people have sensed a particular object. Sensing occurs through the five human senses, namely the senses of sight, hearing, smell, taste, and touch. Most human knowledge is obtained through the eyes and ears [24]. Knowledge of cognition is an essential domain for forming one's actions (overt behavior). Based on experience and research, behavior based on knowledge will be more lasting than behavior that is not based on knowledge [25]. The results of statistical tests show that mothers who have less knowledge are 12 times more likely to have a toddler suffering from diarrhea than mothers who have good knowledge. The results of this study are in line with the results of research conducted by Hartati [26], namely there is a significant relationship between respondents' knowledge and the incidence of diarrhea with a p-value of 0.001. also in line with research conducted by Palancoi [18], namely there is a significant relationship between respondents' knowledge and the incidence of diarrhea with a p-value of 0.010.

Based on the data obtained, some respondents have a low level of knowledge about diarrhea. A mother tends to find it challenging to protect and prevent her toddler from transmitting diarrhea. This low knowledge of mothers is due to the lack of information or counseling provided by health workers, making it difficult to prevent and take action when a child has diarrhea. The author suggests that health workers at the Putri Ayu Health Center increase the socialization of maternal and child health books and counseling about diarrhea so that public knowledge about diarrhea increases. Defecation-prone mothers are five times less likely to have a toddler who has diarrhea than mothers who have normal bowel habits. The findings of this study are consistent with those of Ambar and Suci [27], who found a significant association between defecation behavior and the occurrence of diarrhea with a p-value of 0.002. From the data at the research location, it is known that there are respondents who have poor defecation behavior. The behavior of open defecation

reflects a culture of public ignorance, which can be interpreted as an attitude of not caring about anything. In this case, the community does not care about the detrimental effects of open defecation on themselves and others. Clean and healthy living behavior has a close relationship with diarrhea incidence. The behavior of washing hands before eating, feeding the baby, and defecating is a factor in breaking the chain of transmission of diarrheal diseases.

Based on the author's observations, it is known that most of the sewerage facilities (latrines) in the research location do not meet the requirements, such as not having a septic tank. Family restrooms that do not meet the requirements cause environmental pollution, including soil pollution, water pollution, food contamination, and the breeding of flies. The author suggests changing the habit of open defecation (BAB) into clean and healthy living behavior (PHBS) and seeking latrines that meet sanitary requirements, among others, by having a septic tank and maintaining the cleanliness of the feces disposal site to avoid diarrhea. Flies are one type of nuisance insect and can be disease-transmitting insects to human health that can spread disease. The presence of flies in an area can be used to indicate that the area is not clean or hygienic [28]. One of the causes of diarrhea is the contamination of food and drink by bacteria carried by house flies. This fly is considered a nuisance because it perches in damp and dirty places, such as garbage. If microorganisms contaminate the food infested by house flies, bacteria, protozoa, eggs/larvae of worms, or even viruses that are carried and removed from the mouths of flies and, when eaten by humans, can cause diarrheal disease [17,29]. The eradication of flies affects the entire community. Garbage is linked to the emergence and reproduction of flies. Insecticides can also eradicate flies, albeit this is less effective. Keeping the house clean, not littering, utilizing sanitary latrines (water-sealed latrines), and leading a clean and healthy lifestyle are all actions that must be taken to remove flies [14]. The number of flies does not appear to be a substantial risk factor for diarrhea in toddlers. The findings of this study agree with those of Firmansyah [1], who found that there is no significant link

between fly density and diarrhea incidence, with a P-value of 0.080. The findings of the field investigation revealed that some respondents had a high degree of fly density. The researchers saw a lot of waste surrounding the house, which was tossed haphazardly, resulting in the appearance of flies. The presence of a large number of flies might be caused by poor or unclean housing cleanliness. If the house is in the high category, flies will land wherever, including food and drinks that are not covered in the house, and there will be bacterial contamination from flies to food and drinks for toddlers, causing digestive system disorders and diarrhea in many toddlers. Because of their good understanding of food processing, such as covering food after cooking or washing hands before cooking, many of the respondents were aware of the dangers of flies as a cause of diarrhea.

Conclusion

The incidence of diarrhea in children under five in the Putri Ayu Public Health Center in Jambi City is influenced by low parental knowledge and bad defecation behavior. The author recommends that individuals pay attention to the cleanliness of their homes, particularly their rubbish, because flies are intimately associated to garbage because garbage serves as a breeding place for them. It is expected that the community will further improve clean and healthy living behavior, especially by taking steps to prevent diarrhea, such as washing hands after defecating and before eating with soap and seeking latrines that meet sanitation requirements. Sanitation requirements include having a septic tank and maintaining the cleanliness of the waste disposal site, and not getting used to defecating in the river.

Limitations

The limitation of this research is the number of samples is very limited and does not compare the variables studied in the community between countries, in the future research must be carried out involving a larger community with coverage between countries.

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Competing interests statement

There are no competing interests for this study.

Author's Contributions

SP and RF were responsible for the study conception and design; performed the data collection; and performed the data analysis; were responsible for the drafting of the manuscript; SP made critical revisions to the paper for important intellectual content.

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