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ORIGINAL RESEARCH

THE ANALYSIS OF BEHAVIORAL RISK FACTOR OF DIARRHEA OUTBREAK IN TIRTOMARTO VILLAGE, CENTRAL JAVA

Analisis Faktor Perilaku Beresiko terhadap Kejadian Luar Biasa Diare di Desa Tirtomarto Jawa Tengah

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ABSTRACT

Background: Outbreak Diarrhea in Indonesia still threatens the health and even fatal results, namely death. It is caused by unsanitary and healthy behaviors **Purpose:** This research aims to find out behavioral risk factors that influence the occurrence of diarrhea outbreaks. **Methods:** This study used a cross-sectional design with a sampling of 65 people was taken from the population of 180 diarrhea cases using a simple random sample in Tirtomarto, Central Java. The chi-square test was then applied to analyse the data. Measured variables are risky behavior (washing hands with soap before eating, washing hands with soap after defecating, the habit of closing food, soap usage for washing utensils and the place of defecation). **Results:** It is found that the risk factors for unusual diarrhea behavior are washing hands with soap before eating (p = 0.01), washing hands with soap after defecation (p = 0.01), the habit of washing utensils with soap (p = 0.73), the habit of covering food (p = 0.01), bowel habits (p = 0.73). Multivariable analysis results found that the most dominant behavioral risk factors are handwashing with soap after defecation (OR = 0.11) and the habit of covering food (OR = 0.12). **Conclusion:** Behavioral risk factors can influence the occurrence of outbreaks of diarrhea.

ABSTRAK

Latar Belakang: *Kejadian Luar Biasa Diare di Indonesia masih menjadi permasalahan yang mengancam kesehatan bahkan berakibat fatal yaitu kematian. Hal ini disebabkan oleh perilaku yang tidak bersih dan sehat.* ***Tujuan:*** *Penelitian ini bertujuan untuk mengetahui*

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faktor risiko perilaku yang mempengaruhi terjadinya kejadian luar biasa diare. ***Metode:*** *Peneltian ini menggunakan rancangan cross sectional dengan sampel sebanyak 65 orang yang berlokasi di desa Tirtomarto Jawa Tengah dan kemudian data yang diperoleh dianalisis menggunakan uji chi-square. Variabel yang diukur adalah perilaku yang berisiko (mencuci tangan dengan sabun sebelum makan, mencuci tangan dengan sabun setelah buang air besar, kebiasaan menutup makanan, kebiasaan mencuci alat makan dengan sabun dan kebiasaan tempat buang air besar) terhadap kejadian diare.* ***Hasil:*** *Faktor risiko perilaku yang berhubungan dengan diare adalah mencuci tangan dengan sabun sebelum makan (p = 0,01), mencuci tangan dengan sabun setelah buang air besar (p = 0,01), kebiasaan menutup makanan (p = 0,01) dan faktor perilaku yang tidak berhubungan dengan kejadian diare adalah kebiasaan mencuci alat makan dengan sabun (p = 0,73), kebiasaan tempat buang air besar (p=0,73). Hasil uji analisis multivariabel menemukan bahwa faktor risiko perilaku yang paling dominan adalah mencuci tangan dengan sabun setelah buang air besar (OR = 0,11) dan kebiasaan menutup makanan (OR = 0,12).* ***Kesimpulan:*** *Faktor risiko perilaku dapat mempengaruhi terjadinya kejadian luar biasa diare.*

INTRODUCTION

Diarrhea in Indonesia remains a health problem today, often becoming an outbreak and resulting in death (Meliyanti, 2016). During 2016, diarrhea outbreaks in Indonesia occurred in 3 provinces with three events, 198 cases, six deaths, and case fatality rate (CFR) were 3.03%. Moreover, in 2017 the outbreak occurred in 12 provinces with 21 events, 1,725 cases, 34 deaths, and CFR were 1.97%. Furthermore, in 2018 the outbreak happened in 8 provinces with ten events, 756 cases, 36 deaths and a CFR of 4.76%. In 2018, Indonesia handled as much as 1,637,708 (40.90%) diarrhea cases on the health facilities, while the health facilities in Central Java handled around 39.84% of diarrhea cases of the province (Irianty, Hayati, & Riza, 2018).

Diarrhea is a plausible cause of dehydration (loss of water in the body), metabolic acidosis (impaired acid-base concentration), hypoglycemia, circulatory disorders, and nutritional disorders (Setiyabudi & Setyowati, 2016). The loss of electrolytes and fluids initiate the symptoms of dehydration. Then, weight loss, eyes and large fontanel become concave, mucous membranes of the lips and mouth, and the skin looks dry (Sharfina, Fakhriadi, & Rosadi, 2016). Dehydration is a very dangerous symptom in cases of diarrhea because it is one of the direct causes of death due to diarrhea, especially that which occurs in infants and toddlers (Hartati & Nurazila, 2018).

In general, the surrounding environment (the physical and social environment) affects humans both directly and indirectly. It therefore plays a crucial role in the interaction between the host and the causative elements in the disease process. In diarrhea, the physical environment consists of air, humidity and water (Sari, 2019). Hence, diarrhea cases commonly happen in residence areas that do not meet health requirements, such as areas with no latrines, poor landfills, and inadequate clean water sources. The poor environment, such as unclean drinking water, absence of sewerage water reservoirs, open-air latrines, also high population density, can cause the spread of germs (Hartati & Nurazila, 2018; Lidiawati, 2016). In addition to environmental factors, behavioral factors also play an essential role in the case of diarrhea, namely the habit of washing hands with soap before eating, the practice of washing hands with soap after defecation, the pattern of closing food, the habit of washing cooking utensils and dishes (Sumolang, Nurjana, & Widjaja, 2019). Soap used handwashing reduces diarrhea's risk because it breaks the transmission chain of pathogenic bacteria into the body, hence preventing diarrhea (Hartati & Nurazila, 2018; Rahmawati, Rahayu, & Pratama, 2018).

A sick or healthy state is a result of the behavior or habits conducted. Unhealthy behaviors

or habits are supporting factors to disease occurrence, while healthy habits are preventive to an illness. Therefore, a healthy state is achievable by changing unhealthy behaviors and maintaining proper behavior (Sulistiyowati & Lestari, 2017). Based on the above problems related to the incidence of diarrhea, this research aims to analyze the behavioral factors that effected diarrhea.

METHODS

This research was conducted in Tirtomarto, Dusun Jetis, RT 11 RW 05 Klaten, Central Java Province. Data collection were done in February 2018. The selection of this location was based on the magnitude of the diarrhea outbreak. This study uses observational analytics with a cross-sectional design. A sampling of 65 people was taken from the population of 180 diarrhea cases using simple random sampling. Sample criteria are those who have experienced illness with the main clinical symptoms of diarrhea are watery feces with the frequency of more than three times a day followed by nausea, vomiting, stomach ache and fever.

Studied variables are hand-washing behavior, namely washing hands with soap before eating and washing hands with soap after defecating, the habits of washing cooking utensils and cutlery, and the habits of closing food. All variables measured are categorized binomially (yes or no). After that, the author collected data primarily using a questionnaire. Then, it was analyzed by applying quantitative methods with multiple logistic regression. The risk factors of diarrhea were first analyzed using a bivariate test, then any significant indicator (p-value less than 0.05) was further analyzed multivariate using logistic regression. The most dominant behavior factors for the occurrence of diarrhea and interpretation of the data were calculated using a prevalence ratio with 95% CI. This research has been approved by the Health Research Ethics Commission of Surya Mitra Husada College of Health Science with a certificate of ethical acceptance 748/KEPK/II/2018.

RESULTS

Table 1 showed that thirty-seven respondents had the habit of not washing their hands before eating with soap. Respondent's hand-washing habits are minimal required, such as washing hands improperly, without flowing water and did not use soap. All respondents did not have a sink, so their hand washing was done in the bathroom or the kitchen sink. Moreover, a clean appearance hand leads the respondent to unwashed. The study shows that 49 respondents have no habit of washing their hands using soap after defecating. Hand-washing was conducted only under running water. Sixty-three respondents have a habit of defecating in the toilet, but the respondent uses a toilet that does not meet health requirements. Some of the bathrooms used are not waterproof, have no soap, are smelly, and the disposal distance from the well is less than 10 m. Respondents who defecated outside the latrines did it in the river or rice field closest to home. This study also found households that use toilets without septic tanks. In latrines without septic tanks, feces can seep into the soil around the latrines and pollute water sources. The results of research conducted by the author still find people who do not close the food to be consumed, so that food that is not sealed will invite flies as a vector of disease, but some people have the habit of covering food but the food cover used is too small so that not all menu can be covered.

Statistical test results showed in table 1 further describe the overall risk factors of diarrhea based on the bivariate analysis. Overall, the bivariate test shows that adequate behavior factors such as hand-washing with soap (after defecation and before the meal) washing utensils with soap, proper food storage, and the use of latrines statistically reduced the risk of diarrhea with varied magnitude in each of the risk factors. After defecating, soap usage for hand wash appears to be the risk factors with the highest odds ratio. At the same time, the utilization of latrine and the pristine state of cooking utensils seems to have the slightest risk of diarrhea. Moreover, the bivariate test shows that the risk of diarrhea based on latrines and washing cooking utensils has a p-value>0.05. Therefore, the use latrines and washing cooking utensils with soap were not included in the further multivariate test.

The bivariate test indicates that hand-washing with soap is statistically correlated with diarrhea. The habit of washing hands without soap after defecating has a seven times risk of diarrhea. Furthermore, non-adherence to washing hands with soap before eating increases the risk of diarrhea by three times. Proper food storing with closed storage also correlates significantly with diarrhea with as much as three times risk compared to those who left the food open. On the other hand, while prewashed cooking and eating utensils and the use of latrines are positively

correlated with the risk of diarrhea, the statistical test shows an insignificant correlation.

Table 2 shows the results of multivariate analysis of behavioral risk factors with diarrhea. Multivariate analysis indicates that all three behavioral risk factors, namely washing hands with soap after defecating, hand-washing with soap before the meal, and the habits of covering food while storing are correlated significantly with diarrhea, with the magnitude of the risk factors are slightly different. The results of multivariate analysis statistically indicated a significant correlation between the habits of washing hands with soap after bowel movements with the incidence of diarrhea. Hence, people who did not habit of washing their hands with soap after defecation risk getting diarrhea 0.11 times greater than those who practice hand-washing with soap after defecation. Statistical significance was also shown in the habit of covering food with the occurrence of diarrhea. It is known that people who do not have the practice of sealing food properly will be exposed to the risk of diarrhea 0.12 times greater than those who have the habit of closing food properly with the occurrence of diarrhea.

DISCUSSION

Washing Hands with Soap Before Meals

The study found a significant correlation between hand-washing with soap before meals with diarrhea. With the odds ratio of 3.02, hand-washing with soap after meals showed a reduced risk of catching diarrhea by 1 to 7 times compared to unwashed hands. This study is in line with research conducted by Setiyabudi & Setyowati (2016), which states there is a relationship between the habit of washing hands with soap before eating and diarrhea incidence.

Hand-washing with soap is one of the simplest healthy ways to prevent disease spread. As the hand is the body part with the highest contact with outside items, any contact with things that are not necessarily clean may increase the risk of contact with microorganisms that cause disease. When conducted properly, soap usage in hand-washing is preventive to various infectious diseases such as diarrhea, H1N1 (swine flu), H5N1 (bird flu), and typhus (Rahmadian, Ketaren, & Sirait, 2017). Though the use of soap when washing hands takes more time, soap usage is practical because dirt and grease that stick to the hands will decrease or disappear when the hands are rubbed and washed with soap and running water (Rospita, Tahlil, & Mulyadi, 2017). Accordingly, Ainsyah & Lusno (2018) study indicates that dirty hands before eating lead to various diseases.

Unawareness results in a temporary behavior, so a comprehensive effort to accommodate behavior shaping is needed to support family and environment in preventing illness. The action consists of supporting facilities such as a proper hand wash facility, provision of soap and other tools (Umboh, Engkeng, & Munayan, 2020).

Washing hands is related to one's hygiene, so washing hands affects health and insufficient soap use while hand washing before a meal is vital. Washing hands using running water and soap is an indicator of healthy lifestyle behavior (Mardiana, Fahrurrozi, Tanjung, Rossanty, & Ningrum, 2020). Hand-washing with soap is a sanitary action as cleaning hands and fingers under running water, and soap breaks the chain of germs. Hand-washing with water is insufficient. Soap usage in handwashing shortens the time of hand-washing, helps remove germs on the skin surface, and eventually leaves a fragrant smell (Ratnasari & Patmawati, 2019).

The Habit of Washing Hands with Soap After Defecating

The study found that washing hands with soap after defecation reduces the odds of catching diarrhea by an average of 7 times compared to unwashed hands. This research is in line with what was done by Sumolang, Nurjana, & Widjaja (2019), who said there was a relationship between the habit of washing hands using soap after defecation with the occurrence of diarrhea. Washing hands can break the transmission of pathogenic germs into the body to prevent diarrhea. Hand-washing with soap effectively remove bacteria.

Diarrhea disease is often associated with water conditions. However, human secretion disposal such as feces and urine disposal is vital because diarrheal bacterial and germs come from this waste. Contaminated hands, drinking water, raw food, and unclean meal utensils increase contamination risks (Mardiana, Fahrurrozi, Tanjung, Rossanty, & Ningrum, 2020). Hand-washing using soap after doing activities or after defecation is vital. If hands are infected with germs, bacteria or viruses will make food that is touched contaminated by microbes that can cause diarrhea. The practice of washing hands with soap consistently decreases pain and death caused by diarrheal disease. The chain of transmission of

diarrheal disease can only be broken by washing hands with soap is a simple behavior, easy to do, no need to use a lot of time and a lot of costs (Bangun, Sinaga, Manurung, Asnawati, & Siregar, 2020).

The Habit of Using Latrines

Health regulation requires that sewage disposal conditions to be closed contained so that the disposal could not pollute its surroundings soils, waters, or become a vector habitat. Non-sanitary latrines are a source of E. coli, a bacterium that causes diarrhea. Studies show that the unmet sanitary requirement of toilets increases the risk of diarrhea in families (Oktariza, Suhartono, & Dharminto, 2018; Prakoso, 2020). Feces that are dumped openly in the garden or rice field invite flies and become a source of transmission of diarrhea. Besides, wastes discharged in rivers or irrigation channels can pollute river water and irrigation channels. At the same time, river water or irrigation channels are also used for cleansing and washing hands after defecation (Rasako, Joko, & Dangiran, 2018), but the result of the current study indicates an insignificant relationship between the habit of defecating with diarrhea.

A latrine is considered healthy for rural areas if it meets the requirement: no pollution of soil around the latrine nor polluting surrounding water, inaccessible to insects, especially flies and cockroaches, simply designed, affordable, and user-friendly. Limited latrine use causes the surrounding soil to be polluted by feces and pollution around washing places and landfills (Taha & Hastikawati, 2020). Open defecation has been a habit and is commonly practiced in a particular community. This problem results in direct and indirect contamination of drinking water sources and recontamination of water resources and food. It shows the insignificance of clean and healthy living habits for several people. Moreover, poor sanitation lack of health-related behavior conducted by a community member will affect the whole community (Aulia, Nurjazuli, & Darundiati, 2021; Fitrianingsih & Wahyuningsih, 2020).

Table 1
Bivariate Analysis of Behavioral Risk Factors regarding Diarrhea Outbreak in Tirtomarto Village, Central Java

Risk Factors	Diarrhea				*p value*	OR (95% CI)
	Yes		No			
	n	%	n	%		
Soap using hand-wash before eating						
No	20	54.05	17	45.95	0.01	3.02
Yes	5	17.86	23	82.14		(1.29-7.06)
Soap using hand-wash after defecating						
No	24	48.98	25	51.02	0.01	7.83
Yes	1	6.25	15	93.75		(1.15-53.40)
Defecating in Latrines						
No	1	50.00	1	50.00	0.73	1.31
Yes	24	38.10	39	61.90		(0.31-5.43)
Washing cooking and eating utensils						
No	1	50.00	1	50.00	0.73	1.31
Yes	24	61.54	39	61.90		(0.31-5.43)
Closed food storage						
No	10	83.33	2	16.67	0.01	2.94
Yes	15	28.30	38	71.70		(1.79-4.84)
Total	25	100.00	40	100.00		

Tabel 2
Multivariate Analysis of the behavioral risk factors with the incidence of diarrhea outbreak in Tirtomarto Village, Central Java

Risk Factor Variable	OR	P	95%CI
Habits of washing hand with soap after defecating	0.11	0.04	0.01<OR<0.92
Closed food storing	0.12	0.01	0.02<OR<0.64

The Habit of Washing Tableware with Soap

Cleanliness of cutlery becomes vital in everyday life because unclean cooking utensils such as cutlery, unwashed dishes and pans are prone to microorganism contamination. When food is put into dirty cutlery, bacterial contaminations can cause bacterial proliferation. Then, the breeding of bacteria in cutlery interfere with the human digestive system because the food eaten is contaminated with bacteria that attach to the cutlery (Lanida & Farapti, 2018).

Soiled cooking utensils and tableware contribute to the incidence of diarrhea as it enhances the possibility of contamination, increasing the exposure to bacterial contamination. Bacterial contamination leads to an infection in the epithelium, the small intestinal, and sometimes even cause intestinal hyper-peristaltic, causing a lot of unabsorbed fluid. Eventually, the diarrhea will occur (Akter, Ferdousi, & Siddiqua, 2017).

This study indicates no significant correlation between diarrhea and the habits of washing cooking utensils and tableware with soap. Contrarily, a study by Harris, Heriyani, & Hayatie (2017) indicated a relationship between the cleanliness of milk bottles (drinking equipment) with the incidence of diarrhea. Moreover, it is stated that unsterile milk bottles (drinking equipment) are hazardous because they are a breeding medium for pathogenic microorganisms such as bacteria, viruses and parasites, which can cause disease, one of which is diarrhea.

The Habit of Closed Food Storage

This study found that storing food in a closed container correlated significantly with the reduced risk of diarrhea. Storing cooked food openly or in the open air increases the risk of diarrhea. Similarly, thoroughly washed groceries, well-cooked food, and closed-food storage are shown to reduce the risk of diarrhea among the family members (Ratnasari & Patmawati, 2019).

Covering food with a serving hood is one effort to maintain the food quality, as it prevents contamination of dust, insects, flies or other animals. Food contamination occurs in food storage to utensils, eventually leading to diarrhea among family members (Silalahi & Sinambela, 2020).

Indigestion and diarrhea are problems in one of the digestive system organs that occurs in one of the digestive system organs. In contrast, digestive systems receive food, digest, and absorb nutrients. These nutrients are then distributed throughout the body through the bloodstream. Moreover, the digestive system also functions to separate and remove undigested food. Therefore, improper digestion leads to food intolerance, causing food intolerance (Mayasari, 2020).

A served food requires several basic principles. Those principles are storing food in a clean container, locating food in a clean dish, avoiding direct sunlight, and keeping the food from animals or pests (Suherman & 'Aini, 2018; Trigunarso, 2020). Food processors should always maintain personal hygiene by washing their hands and cooking utensils with soap and running water to prevent the risk of diarrhea.

Research Limitations

This research has limitations because it was conducted cross-sectional; the study results only indicate the correlation between variables but did not show the causative association between the dependent and independent variables.

CONCLUSION

The most dominant behavioral risk factor that causes diarrhea is the habit of not washing hands with soap after defecating. Dirty hands increase the susceptibility for viruses and bacteria to grow and, therefore, become a media of transmission. The nested bacteria and virus then enter the body through the mouth, nose or anus touched by the contaminated hands. The body through the mouth, nose, or anus is touched by the dirty hands, causing several diseases, one of which is diarrhea.

CONFLICT OF INTEREST

The authors state that there is no conflict of interest in this study.

AUTHOR CONTRIBUTIONS

Each author contributes to this article from the beginning to the completion of the article. ED contributed to making the instruments and conducting the research data collection. ASN contributed to processing data and writing the article draft in Indonesian. EFH contributed to editing and translating the article draft into English.

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