ENVIROMENTAL HEALTH RISK ASSESSMENT (EHRA) ANALYSIS ON THE INCIDENCE OF DIARRHEA IN FLOOD AREA ALONG THE RIVER BANKS IN TUNGGUL IRANG, BANJAR DISTRICT

Laily Khairiyati[1]

[1]Departement of Enviromental Health, Public Health Program Study, Medical Faculty of Lambung Mangkurat University

Email: lailykhairiyati@unlam.ac.id

ABSTRACT

Flooding becomes a problem because it causes the incidence of diseases caused by poor sanitation and personal hygiene conditions. Post-flood environmental conditions are usually most at risk of causing environmental-related disease events such as diarrhea. The purpose of this research is to explain EHRA (Enviromental Health Risk Assessment) analysis to identify environmental health risk and behavior causing incidence of diarrhea in flood area along the river in Tunggul Irang, Banjar District. This research is an observational analytic study with cross sectional design. Sample size used 54 housewives as respondents in this study. The sample is taken by simple random sampling with lottery technique. The instrument of this study used EHRA questionnaire. Data were analyzed using chi-square test with 95% confidence interval. The result shows that there is no relation between environmental health risk, and hygiene and sanitation behavior factor with incidence of diarrhea in Tunggul Irang, Banjar District (p value>0,05). Healthy and decent sanitation facilities are needed, good hygiene and sanitation counseling and cross-sectoral cooperation are need to create a clean and healthy environment.

Keywords: EHRA analysis, incidence of diarrhea, flood

INTRODUCTION

The population growth of Banjar District every year has increased, with an average growth rate of 2.1%. Increasing population means an increase in population density in Banjar District, while the area of settlement land is narrowing as a consequence of increasing population. Increasing population causes environmental imbalances in which waste and wastewater production increases. If sanitation facilities and infrastructures are not adequately available, they may have adverse health effects such as increased disease transmission, such as diarrhea (1).

Lack of environmental infrastructure services such as clean water infrastructure and sanitation systems are the main cause of problems in the settlements. Poor sanitation conditions affect the declining quality of the environment and contamination of clean water sources used by the community to meet the needs of daily living, so that directly or indirectly affect the health and human welfare. Furthermore, the condition can generally reduce the image of a city/ county area

Environmental Health Risk Assessment (EHRA) is a study aimed at understanding the condition of sanitation facilities and behaviors that pose a risk to the health of citizens in a region. The sanitation facilities under study include drinking water sources, waste disposal services, latrines, and sewerage. While the learned behavior is related to hygiene and sanitation, among others, hand washing with soap, defecation, child waste disposal, and household waste sorting (2).

The EHRA study also identifies the presence of toddlers in a household. The presence of toddlers is important because compared to other groups, toddlers are the most vulnerable segment of the population to diseases related to sanitation. Diarrheal disease is the second leading cause of child mortality in Indonesia after ARI (Acute Respiratory Infection) with approximately 40,000 toddlers per year. Therefore, the distribution of toddlers can give an idea of the vulnerability of a particular area (2).

Diarrhea is a disease characterized by changes in shape and consistency of the stool softening up to melting and increasing the frequency of defecation more than three times a day. Until now diarrhea is still a world health problem, especially in developing countries. Based on data from Health Office Banjar District in 2011 there were 8,209 cases of diarrhea, in 2012 increased to 9,650 cases of diarrhea, in 2013 increased to 9,910 cases of diarrhea diseases and in 2014 the incidence of diarrhea in under fives as many as 10,425 cases. This shows a significant increase in diarrhea cases (1).

Diarrheal diseases in children and toddlers are caused by various factors: environmental health status (use of clean water facilities, family latrines, waste disposal, wastewater disposal) and healthy living behavior in the family. While the clinical causes of diarrhea can be grouped into six major groups of infections (which include bacterial, viral and parasitic infections), malabsorption, allergies, poisoning (poisoning chemicals, poisoning by toxins contained and produced either microorganism, fish, fruit vegetables, algae etc.), immunizations, deficiencies and other causes (3,4,5).

According to Bloom Theory, the health status of a population or individual is determined by 4 factors: genetic, environmental, behavior and health services. Environmental factor is the biggest factor causing the condition. Through analysis of EHRA study, the assessment of environmental health risks can be seen the condition of sanitation facilities and behaviors that have risks to the health of citizens.

Post-flood environmental conditions are usually most at risk of causing the incidence of environmental-based disease transmission, especially diarrhea caused by pollution of clean water by congenital inborn water. Floods carry a variety of pathogenic bacteria and viruses from garbage, sewers and septic tanks that spread rapidly to the surrounding flood affected settlements. This is exacerbated by poor personal hygiene and sanitation behaviors that facilitate the transmission of diarrhea in flood-affected people.

Based on data from the Regional Disaster Management Agency in District Banjar, there are eight

districts that are prone to flooding. These areas include Sungai Pinang, Sambung Makmur, Pengaron, Astambul, Karang Intan, Martapura, Sungai Tabuk and Mataraman (6). By 2015, floods from the Riam Kanan River start to hit Martapura Kota, Martapura Timur and Martapura Barat districts. In Martapura Kota, water soaked settlements in the area Tunggul Irang, Kampung Jawa, Bincau Muara to Tambak Baru (7).

The low location of District Banjar from sea level causes the flow of water on the surface of the soil to become substandard. As a result, some areas are always inundated (29.93%) some (0.58%) are inundated periodically. Tunggul Irang is included in the period of flooding periodically due to flood due to overflow of the Riam Kanan Dam (8).

Tunggul Irang area is an area that every year experienced floods so that most affected. Flooding becomes a problem because it causes adverse effects, especially the incidence of diseases exacerbated by poor environmental sanitation and personal hygiene conditions. Based on the above background description, we need research on EHRA (Enviromental Health Risk Assessment) analysis to identify environmental health risk and behavior causing diarrhea in flood area along the river banks in Tunggul Irang, Banjar District.

RESEARCH METHODS

This research is an observational analytic research with cross sectional design, to identify environmental health risk causing diarrhea in flood area along the river in Tunggul Irang area, Banjar District. In this study, to determine the minimum sample size used "Slovin Formula" to estimate the proportion of the population by using the proportion of the sample. So the number of samples has 54 respondents that living along the river banks ares in Tunggul Irang Ulu and Tunggul Irang Ilir area, Banjar District. Sample represent are housewifes or woman because they are group of citizen who understand the environmental condition at home. The research instrument used EHRA (Enviromental Health Risk Assessment) questionnaire to identify environmental health risks consisting of household waste management, stool disposal, wastewater disposal, and water source management as well as hygiene and sanitation behavior consisting of handwashing with soap, water treatment behavior, water storage behavior, and household waste sorting behavior with diarrheal diseases. Data were analyzed by using chi-square test with 95% confidence interval degree.

RESULTS AND DISCUSSION
A. Univariate

Based on the results of the study, the distribution and frequency of EHRA components and the incidence of diarrhea are presented in table 1 below:

Table 1. Distribution and Frequency of EHRA Components

Number	EHRA Components	Frekuency	(%)
	Environmental Health Risks		
1	Household waste management Risk	0	0

	No risky	54	100
2	Fecal disposal		
	Risk	14	25.9
	No risky	40	74.1
3	Management of water resources		
	Risk	7	13
	No risky	47	87
4	Wastewater disposal		
	Risk	18	33.3
	No risky	36	66.7
	Hygiene and Sanitation Behavior		
5	Behavior of handwashing with soap		
	Risk	33	61.1
	No risk	21	38.9
6	Behavior of water treatment		
	Risk	8	14.8
	No risky	46	85.2
7	Behavior of water storage		
	Risk	11	20.4
	No risky	43	79.6
8	Behavior of household waste sorting		
	Risk	46	85.2
	No risky	8	14.8
9	The incidence of diarrhea		
	Yes	16	29.6
	No	38	70.4

From table 1 above, then for the first component of EHRA that is environmental health risks consist of: Household waste management in Tunggul Irang is no risky i.e 54 respondents (100%). Household waste management at the site of the research is that garbage produced at household level or domestic waste is managed by collecting garbage collectors, recycling collectors, or collected and disposed of to temporary waste disposal sites. Fecal disposal in Tunggul Irang is still at risk with 14 respondents (25.9%). Disposal of stools at risk for example is the behavior of people who still

open defecation free. Based on this research, it is found that there are still household member of open defecation free beside in toilet/ wc without septic tank that is in river. Management of water sources at risk

in the field of research such as the main source of water used by respondents is water that has not undergone processing that is still using water wells and river water. The wastewater disposal in Tunggul Irang is still at risk, which is 18 respondents (33.3%). Disposal of risky wastewater at the research site i.e waste water discharged into the river, open road, in front or back of the house causing environmental contamination around it. The management of water resources in Tunggul Irang is still at risk, 7 respondents (13%).

For the second component of EHRA, hygiene and sanitation behaviors consisted of: Behavior handwashing with soap in Tunggul Irang most of them risk 33 respondents (61.1%). Behavior of handwashing with soap is still done at the research site mostly still do not use soap and running water in 5 (five)

important time that is after open defecation free, after clean the baby's/ child feces, before feed/ feeding the child, before processing the food, and after holding the animals. The behavior of water treatment in Tunggul Irang is still at risk, 8 respondents (14.8%). Risk water treatment behavior in the field of research such as in handling raw water without going through the screening and precipitation process first. The behavior of water storage in Tunggul Irang is still at risk with 11 respondents (20.4%). The risky water storage behavior of the research site such as boiled water is still stored in an open place and non-hygienic water taking by using a scoop or water bowl. The behavior of household waste sorting in Tunggul Irang is mostly risk that 46 respondents (85.2%).

Behavior of household waste sorting at risk is still done by the community at the place of research that is garbage produced at the household level without going through the process of sorting between organic waste (waste that is easily destroyed like vegetables, leaves) and inorganic waste (plastic wrap) so both types of garbage is still mixed and immediately thrown into the trash.

From table 1 above it can be seen that for the incidence of diarrhea only experienced by 16 respondents (29.6%) in Tunggul Irang, while the rest 38 respondents did not experience diarrhea (70.4%). The incidence of diarrhea in this study was stated if ever experienced diarrhea since the beginning of 2017 until the last 6 months.

B. Bivariate

Cross-tabulation of EHRA components with diarrhea incidence is shown in table 2 below:

Number	Ehra Components	Incidence of Diarrhea				Total		P value
		Yes		No				
		N	%	N	%	N	%	
1	Household waste management							-
	Risk	0	0	0	0	0	0	
	No risky	16	29.6	38	70.4	54	100	
2	Fecal disposal							0.735
	Risk	5	35.7	9	64.3	14	100	
	No risky	11	27.5	29	72.5	40	100	
3	Management of water resources							0.410
	Risk	3	42.9	4	57.1	7	100	
	No risky	13	27.7	38	72.3	47	100	
4	Wastewater disposal							0.140
	Risk	3	16.7	15	83.3	18	100	
	No risky	13	36.1	38	63.9	36	100	
5	Behavior of handwashing with soap							0.174
	Risk	12	36.4	21	63.6	33	100	
	No risk	4	19.0	17	81.0	21	100	
6	Behavior of water treatment							0.217
	Risk	4	50	4	50	8	100	
	No risky	12	26.1	34	73.9	46	100	
7	Behavior of water storage							0.474
	Risk	2	18.2	9	81.8	11	100	
	No risky	14	32.6	29	67.4	43	100	

8	Behavior of household waste sorting							
	Risk	15	32.6	31	67.4	46	100	0.474
	No risky	1	12.5	7	87.5	8	100	

Table 2. Cross-tabulation of EHRA components with diarrhea incidence

Based on table 2 above, it is known that the number of respondents who manage household waste is not at risk of diarrhea incidence as many as 16 people. This is because there are other factors that affect diarrhea in addition to these factors. Based on the research of Da Silva et al (2008) and Junias, et al (2008), other causes of diarrhea are flies vectors, open dustbin conditions and dry season factors at the time of the study also became one of the supporting events of diarrhea in respondents (9, 10).

Garbage collection is a series of activities included in a process of waste management and processing. This garbage collection and collection is the responsibility of each household, institution and/ or place that produces/ produces waste. For that we need a place that can accommodate the garbage collected before it is transported to landfill.

Variables of household waste management in this research are statistically found to be homogenous data distribution that is in the classification of household waste management that is not risky so that there is no relationship with incidence of diarrhea or p value is not valid.

Based on table 2 above, it is known the number of respondents who dispose of fecal at risk but did not experience the incidence of diarrhea as many as 9 people. This is because there are other factors that affect diarrhea in addition to these factors. The fact of the field shows that respondents who dispose of their feces are at risk in the meaning of defecate in the river but do not have diarrhea show good behavior in preventing diarrhea such as washing hands with soap, boiling water to boiling and the actions of respondents who do not use river water that has been contaminated with feces.

Based on the study of Da Silva et al (2008) showed that the group who did not have latrines had a greater proportion of diarrheal events than those with latrines. In addition, groups that do not have latrines, the habit of defecation in rivers has a greater proportion of diarrheal events than those defecating in public latrines (9). Respondents whose disposal is not at risk but still have diarrhea are also caused by other factors such as glucose intolerance or allergies and incompatibility with a food, consuming food contaminated with pathogenic bacteria or respondents not applying good behavior of handwashing with soap.

Based on statistical test of chi square, found no relation between fecal disposal factor with incidence of diarrhea (p value 0,735>0,05). Statistically it does not show significance due to several reasons such as small sample size and uneven distribution of data. However, field facts show the relationship of both that is still there are respondents with fecal disposal at risk of open defecation free in the river and have diarrhea.

Based on table 2 above, it is known that the number of respondents who manage the water source is not at risk but still have diarrhea incidence as many as 13

people. This is caused by other factors such as not applying handwashing with good soap so that although the respondent uses safe water source if hand condition to hold food is not in clean condition it will facilitate the happening of diarrhea. In addition, the facts in the field also indicate that cooking utensils and cutlery are still washed with river water that has been contaminated with feces to allow the occurrence of diarrhea.

The results of this study indicate that there is no relationship between the management of water sources with the incidence of diarrhea with p value 0.410> 0.05. In contrast to the results of the Puspitasari study (2015) which concluded there was a significant relationship between clean water facilities and the incidence of diarrhea (p = 0,000) (10). In addition, Simatupang (2003), showed that most diarrhea is caused by bacteria transmitted by oral route. One medium of diarrheal disease is clean water used by the community (13).

Statistically it does not show significance due to several reasons such as small sample size and uneven distribution of data. However, field facts show the relationship of both that is still there are respondents with the management of water sources at risk that is to wash cookware and cutlery and drink and wash bottles still using water contaminated so easy to experience diarrhea. Thus water from sources that do not meet health requirements can transmit disease by way of waterborne mechanism and waterwashed mechanism.

Based on table 2 above, it is known that the number of respondents that wastewater disposal at risk but do not have diarrhea incidence as many as 15 people. This is because there are other factors that affect diarrhea in addition to these factors. Facts in the field show that the respondents who dispose waste water at risk pollute the surrounding environment is inundating the land around but diarrhea does not show good behavior and adequate in preventing diarrhea such as washing hands with soap, boiling water to boil.

The results of this study indicate that there is no relationship of wastewater disposal with incidence of diarrhea (p value 0,140> 0,05). This is in contrast to the results of the Puspitasari (2015) study indicating that there is a relationship between the sewerage channel with diarrhea in infants (p = 0,000) (11).

Statistically it does not show significance due to several reasons such as small sample size and uneven distribution of data. However, field facts show the relationship of both that is still there are respondents with disposal of waste water at risk of sewage that is inundated around the house and diarrhea.

Notoatmodjo (2011), state that untreated wastewater will cause environmental health problems among others to become a transmission or media spread of various diseases, become a medium for breeding pathogenic microorganisms, becoming a breeding ground for mosquitoes, creating odors and unpleasant views, become source of contamination of surface water, soil, and other environment. The condition of unqualified waste water drainage can have an impact, among others, as a breeding vector of disease spreading vector, from aesthetic aspect can cause unpleasant odor and unpleasant view for both the family and the

surrounding community and can cause the incidence of diseases such as diarrheal diseases (12).

Based on table 2 above, it is known that the number of respondents who wash hands with soap is risky but did not experience the incidence of diarrhea as many as 21 people. This is caused by other factors such as immune system/ immune system of respondents are good and not affected by pathogenic bacteria.

Most infectious germs that cause diarrhea are transmitted through oral fecal pathways. Transmission by inserting into the mouth, liquid or contaminated objects (especially feces/ stools), such as drinking water, fingers, food prepared in a pot washed with contaminated water. Individual habits associated with the transmission of germs that cause diarrhea is a habit of washing hands, especially when finished defecating, after removing waste before preparing food, before feeding the child or before eating (14).

The results of this study indicate that there is no relationship between handwashing behavior with soap diarrhea with p value 0.174>0.05. This is in line with the results of the study of Junias et al (2008), where there is no correlation between the habit of washing the hands of respondents with the incidence of diarrhea (p value = 0.39) (10). Unlike the case of Da Silva et al (2008), where groups did not wash hands with soap before meals had a greater proportion of diarrheal events than those who had a habit of washing hands with soap before meals (9).

Statistically it does not show significance due to several reasons such as small sample size and uneven distribution of data. However, field facts show the relationship of both that is still there are respondents with handwashing with soap in risky category i.e washing hands without using soap in 5 (five) important time after defecating, after cleaning the baby's stool, before eating/ feed the children, before processing the food, and after holding the animal so easy to have diarrhea.

Based on table 2 above, it is known the number of respondents who conduct water treatment behavior is not at risk but still experienced diarrhea incidence as many as 12 people. This is caused by other factors such as not applying hand washing with proper soap, accidentally eating food or drink that has been contaminated with bacteria e. coli, as well as cutlery is washed with contaminated water pathogenic bacteria to facilitate a person affected by diarrhea.

The results of this study indicate that there is no relationship between water management behavior with the incidence of diarrhea with p value 0.217> 0.05. Unlike the case of Da Silva (2008), where groups with pre-drinking water habits have a lower proportion of diarrhea events than those who did not cook water before drinking (9).

Statistically it does not show significance due to several reasons such as small sample size and uneven distribution of data. However, field facts show the relationship of both that is still there are respondents with risk management water behavior that is not processing or not boiling water until completely boiling before consumption so easy to experience diarrhea.

Based on table 2 above, it is known the number of respondents whose water storage behavior is not

risky but still experienced diarrhea incidence as many as 14 people. This is due to other factors such as the improper application of handwashing with soap, the use of cutlery and contaminated bacteria, consuming contaminated food for buying food in unhygienic places or due to a weak immune system.

The results of this study indicate that there is no correlation between water storage behavior with diarrhea occurrence with p value 0,474> 0,05. Unlike the case with Da Silva's (2008) study, the group that has a habit of serving food and drinks without a serving and a kettle or flask of water storage has a greater proportion of diarrheal events than a group that has a habit of serving food on a table with a hood (9).

Statistically it does not show significance due to several reasons such as small sample size and uneven distribution of data. However, field facts show the relationship of both that is still there are respondents with water storage risky behavior that is boiled water is still stored in an open place and taking water that is not hygienic by using a scoop or water bowl so easy to experience diarrhea.

Based on table 2 above, it is known that the number of respondents whose household waste sorting behavior is risky but did not experience diarrhea incidence as many as 31 people. This is caused by other factors such as immunity/ endurance and good nutritional status of respondents so that the immune system ward off pathogenic bacteria that enter the body so that diarrhea does not occur.

The results of this study indicate that there is no correlation between household waste sorting behavior with diarrhea occurrence with p value

0,474>0,05. This is in contrast with the results of Syahrizal (2016) study which shows there is a relationship between waste management (p value = 0.001) with the incidence of diarrhea in infants at the Ingin Jaya Community Health Center of Aceh Besar District (15).

Statistically it does not show significance due to several reasons such as small sample size and uneven distribution of data. However, field facts show the relationship of both that is still there are respondents with household waste sorting behavior that is risky that respondents do not sorting organic waste and inorganic waste and become mixed. In some times vector diseases such as flies and cockroaches easily overflow the waste then settles into food and diarrhea events are very easy to happen.

CONCLUSION

The conclusion of this research is that there is no relationship between environmental health risks (household waste management, fecal disposal, management of water resources, and wastewater disposal) and hygiene and sanitation behavior (behavior of handwashing with soap, behavior of of water treatment, behavior of water storage , and behavior of household waste sorting) with the incidence of diarrhea in flood area along the river banks in Tunggul Irang, Banjar District. Although it is not statistically significant, it can not be denied in theory and the fact that diarrhea is always related to environmental and sanitation factors.

The suggestions can be given, among others, for the community to be able to use health facilities environment (sewerage, clean water, and latrines) are healthy, so as not to

get diarrhea. In addition, it needs intensive socialization and counseling about clean and healthy life behavior and the importance of environmental health to the community. Likewise, cross-sectoral cooperation, both government and private, is needed to create a clean environment.

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