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Association of Environmental Residential Sanitation Factors to Communicable Disease Risk Among Musi Side-River Household in Palembang, Indonesia: A Study of Slum Area

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***Abstract*—A slum area becomes an urban problem and a result of challenges in health sector. Environmental sanitation is a major problem in that area since the dwellers got lack access to it. Therefore, some communicable diseases exist there. Palembang Musi riverside is an area that becomes urban slum area as long as the river. This study aim was to analyze the association of environmental residential sanitation factors to communicable disease risk among Musi riverside dwellers. This was an observational study with cross sectional approach where we used questionnaire and checklist as tools to measure the variables. One hundred and fifty four participants were recruited living in a slum area. A purposive sampling method was used to obtain the participants. This study used chi square to analyze statistically. This study study found that diarrhea and typhoid were the highest prevalence there. Lack of access to clean water and missed food handling were significantly associated with communicable disease risk then, domestic solid treatment was also associated to it. Improving environmental sanitation should be focused in slum area, therefore the spreading of communicable disease could be reduced.**

Keywords: communicable disease, sanitation, slum area

I. INTRODUCTION

Sanitation remains a problem in the world. Basic sanitation which includes the provision of healthy latrines, access to clean water and facilities for disposal of household wastewater are the focus of access to sanitation. Indonesia is still listed as the second worst sanitation country after India among the G2O countries. The worst sanitation problem in Indonesia is the problem of open defecation which is still at a high rate. Sanitasi masih menjadi permasalahan di dunia [1, 2]

Around 2.4 million deaths in the world can be prevented if each individual has sanitation facilities that meet the standardization requirements determined by the Ministry of Health Regulation, adequate clean water and maintain personal and environmental hygiene sanitation[3].

Sanitation problems are the basis in overcoming various infectious diseases in Indonesia. Previous studies have found that several risk factors for infectious diseases such as diarrhea, typhus or pneumonia appear from poor sanitation [4]. Diarrhea is always among the 10 highest infectious diseases in Indonesia, even in the world is still the highest cause of death in infants [5].

South Sumatra was still a province with low access to sanitation. Data was recorded that only one village has undergone Community Led Total Sanitation (STBM) program. Musi River is a river located in the center of Palembang City. Around the river there are many settlements with poor levels of sanitation that eventually form slums with high population density and low access to sanitation. Some infectious diseases still rank first in this area such as diarrhea, tuberculosis, DHF, ARI and typhoid [6-9].

The purpose of this study was to analyze the association between sanitation of the home environment with the risk of infectious diseases in the Palembang river slum communities.

II. METHOD

A community based cross-sectional study was conducted to determine the prevalence household with communicable disease at risk, among slum dwellers. This study was conducted from July-September, 2019 at Seberang Ulu I and II subdistrict. The populations were all slum dwellers living in Musi River-side. Samples were a numbers of slum dwellers who stayed in house when the study was being conducted. While exclusion criteria were households that just moved in slum area not longer than three months and participants who refused to join this study. The sample size was calculated using hypothesis tests for two population proportions. There were 154 household recruited to participate in this study.

Data were collected during house visits by face-to-face interviews using a structured interviewer-administered questionnaire and check-list to measure sanitation variables. Social demographic and communicable disease was measured using questionnaire. Then, sanitation variables consisted open defecation, washing hand with soap, food and water treatment in household, household solid and liquid waste

treatment.

The dependent variabel of this study is communicable disease at risk among members of household which is measured using questionnaire. The vulnerability of household determined through experience of household members having at least a communicable disease not longer than three months when study was being conducted. The communicable disease consisted of diarrhea, pneumonia, tuberculosis, dengue fever, infection of acute respiratory and typhoid.

The independent variable which consist of family income, total of family member, a head of family (fathers)'education background and age were measured using a structured questionnaire. Meanwhile, sanitations variables which consist of open defecation, washing hand with soap, food and water treatment in household, household solid and liquid waste treatment.

Open defecation was measured through observation of household latrine ownership and its condition. Check-list was used to determine latrine condition. Parameters used were cleanliness, location (inside or outside house) latrine facility such as water, washing soap, lighting, floor condition, latrine type, windows, roofs and door condition. Latrine fulfilled the parameters was classified as a good latrine and on the contrary.

Washing hand with soap was measured through interviewing their habits after defecating, before eating and feeding children, after washing defecated children and before handling or cooking the food. Meanwhile, we also observed ownership of washing hand facility such as water tap and soap in the home. Food and water treatments was measured through interviewing whether they treated their water such as filtering, cooking or others before it was consumed, then food handling was measured through standards of food hygiene and sanitation, consists of food material preference, material storage, processing, cooked food storage and cooked food serving. Then variables of solid and liquid waste treatment were measured through observing whether the household implement the treatment shown by facility they had.

To explore the relationship between communicable disease at risk and environmental residential sanitation and another factors, used chi-square which resulted Risk Ratio (RR).

III. RESULTS

This study found that among slum dwellers diarrhea was dominated disease that they ever had. Typhoid and diarrhea were the highest prevalence for communicable disease in slum area. Almost nothing found hepatitis A spreading. Vector borne disease found was dengue fever, meanwhile both Pneumonia and Acute Respiratory Infection (ARI) had the same prevalence (figure 1).

Head of household were dominated in productive age between 26 years old until 45 years old with low education background. Family income was obtained by accumulating all income both husband and wife. We found the highest income not more than Rp 2.900.000 which is regional income standard in Palembang. In order the data could be analyzed further, we classify it into two categorize, upper and under Rp 1.500.000(around 100 USD) which is cut of point based on mean value.

Communicable disease is classified into at risk and not at risk. House with communicable at risk was when a household ever had at least one communicable disease, not longer than three months before. The study found that only around one third slum dweller never got communicable disease at all. Then, Sanitation factors which were high number in this study were solid and liquid domestic treatment. Those numbers were as high as open defecation prevention. Other variables, washing hand practice and food & water treatment mostly conducted well by slum household.

Table I. Distribution of household characteristics

Variables	Total (n)	Percent
Family members		
crowded	110	71.4
Not crowded	44	28.6
Family monthly income		
< 100 USD	40	26.0
≥ 100 USD	114	74.0
Head of family's education		
Uneducated	2	1.3
Elementary graduated	57	37.0
Junior school graduated	45	29.2
High school graduated	45	29.2
Bachelor graduated	5	3.2
Age of family head		
17-25 years old	22	14.3
26-35 years old	44	28.6
36-45 years old	51	33.1
46-55 years old	37	24.0
Communicable disease		
At risk	107	69.5
Not at risk	47	30.5
Open defecation prevention		
No	74	48.1
Yes	80	51.9
Washing hand practice		
Poor	20	13.0
Good	134	87.0
Food and water treatment		
Poor	20	13.0
Good	134	87.0
Solid waste treatment		
No	81	52.6
Yes	73	47.4
Liquid waste treatment		
No	97	63.0
Yes	57	37.0
Total	154	100.0

Source: Primary Data, 2019

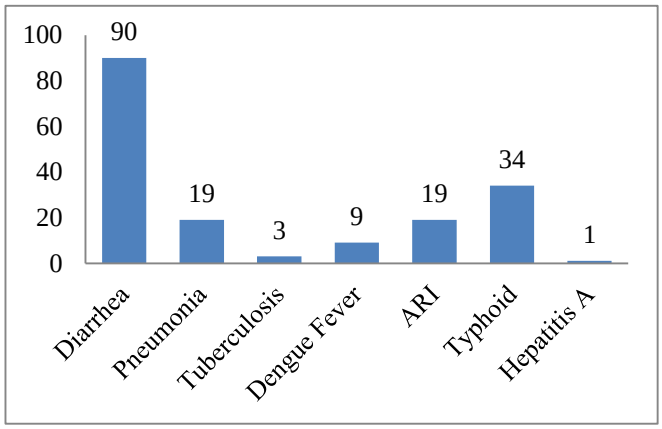

Figure 1. Distribution of Communicable disease among Household

Analysis of bivariate conducted using chi-square found two variables which were significantly associated with communicable disease. They were food and water treatment and domestic solid treatment. Other variables could not explain significantly association.

Table 2. Association of environmental residential sanitation to communicable disease risk among house hold

Variables	Categorized	Number of risk	% Communicable disease	RR (95% CI)*
Family member	Crowded	28	63.6	0.68 (0.33-1.44)
	Not crowded	79	71.8	Ref
Family monthly income	< 100 USD	24	60.0	0.56 (0.26-1.19)
	≥ 100 USD	83	72.8	Ref
Open defecation prevention	No	51	68.9	0.95(0.48-1.9)
	Yes	56	70.0	Ref
Washing hand practice	Poor	14	70.0	1.03(0.4-2.9)
	Good	93	69.4	Ref
Food and water treatment	Poor	26	86.7	3.45(1.13-10.53)*
	Good	81	65.3	Ref
Solid waste treatment	No	64	79.0	2.63(1.29-5.34)*
	Yes	43	58.9	Ref
Liquid waste treatment	No	72	74.2	1.81(0.90-3.65)
	Yes	35	61.4	Ref

*Risk Ratio (RR) (95% confidence interval (CI)) unadjusted
#Sig < 0.05
Ref: reference

IV. Discussion

A diarrhea is common disease happen in slum area. The bacteria agent spread through fecal oral, man to man or man to infected household stuff [10]. It spreads through food and drink contaminated by fecal and spreading in poor environmental sanitation and low awareness of personal hygiene. The bacteria could contaminate hand, food, water, eating utensil then it enters people's digestive tract through oral [10-12]

The diarrhea was commonly spreading fast with short incubation period it resulted the prevalence of it was the highest one than another disease. Besides that, it was also supported by poor environmental sanitation [13]. This study found that most of slum residents had latrine outside the house which had bad smell and so many insect like flies and cockroach living there.

Other issue found was washing hand with soap. Awareness of it spread to almost dwellers. They had washed hand but it was on contrary with facilities such as water tap. We found, they did not wash hand correctly. Low access of clean water made them wash hand without tapping water.

Other findings obtained from this study were food containers that were not clean, there is no safe treatment of waste that was disposed of, and untreated liquid waste before it was disposed. Besides making the environment dirty and reducing the quality of the environment so that it can cause them to be susceptible to diarrhea, which is included in one of the infectious diseases. The slums behavior can also increase the risk of occurrence or spreading of infectious diseases such as using contaminated drinking water [14-16].

Water pollution can occur at the source or when stored at home. Pollution in the home can occur if the storage area is not closed or if contaminated hands touch water when handling or processing water from the storage [17-20]. Food before processing must be washed first using running water to make the bacteria in the food material decay along with running water [21-23].

Previous study Awoke and Muche [24] also found a significant relationship between drinking water treatment and household food with infectious. Research by Pratama [25] also found that there was a significant relationship between food processing and the incidence of diarrhea.

This study found that drinking water and household food processing variables applied by the community were still not optimal. Drinking water and food processing should include drinking water that should be stored in a closed container, clean drinking water storage; food served closed, clean food containers. As result of observations of this study some people ignore it. We still find many households that did not close their food after cooking or just put it on the table and the food storage was also not clean. It happened because the community considers the food that has been served to be eaten immediately so that it did not require food cover.

The results obtained a p-value of 0.011, which means that there was a significant relationship between household waste treatment and infectious disease-prone households, where infectious disease-prone households was more common in community with poor household waste processing.

Littering can cause accidents such as injuries due to sharp objects such as iron, glass, and so on. Ikhtiar [26] concluded that the trash that is not good will make the

waste as a breeding ground for disease vectors, such as flies, mice, cockroaches and can cause the incidence of diarrheal disease to increase due to disease vectors living and multiplying in the trash

In environmental health science, a good garbage bin does not become a breeding ground for disease-carrying microorganisms and does not become a medium for spreading disease. Other requirements that must be met in waste processing are not to pollute the air, water and soil, do not cause odors, and do not cause fire [4, 17, 27, 28]

Previous studies conducted by Mukti, et al. [29], stated that there is a significant relationship between waste management and the incidence of diarrhea in infants, another previous study by Mohammed, et al. [30] concluded that there was a significant relationship between waste processing and the incidence of diarrhea.

Musi side-river residents throw their garbage under their houses. They thought it was practically easy. Collecting the trash became their economic burden due to cost of paying the garbage picker was expensive enough for them. Besides that, the availability of rubbish dump was not adequate to cover the resident's need in daily. We found that there were floating rubbish under their houses, it was confirmed by previous study [31]. Some people use plastic bags to collect garbage and later after 3 days or after it is full they will throw it into landfills. Meanwhile, some people use trash bins piled in front of their homes and every few days there will be garbage officers who take their trash to be thrown into landfills. However, the trash can does not have a lid that can invite flies, which are vectors of diarrheal disease. If flies land on trash then land on food / drink this has the potential to cause diarrhea. Some people used plastic bags to collect garbage and later after 3 days or after it was full they will throw it into landfills. Meanwhile, some people use trash bins piled in front of their homes and every few days there would be garbage officers who take their trash to be thrown into landfills. However, the trash can did not have a lid that can invite flies, which are vectors of diarrheal disease. If flies land on trash then land on food or drink this had the potential to cause diarrhea.

V. Conclusion

There was significant association statistically among food and water treatments and solid treatment to communicable disease at risk for household slum. Lack of knowledge about sanitation factor influence their sanitation practice.

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