Environmental Health Risk Assessment in Flood-prone Area in Tamangapa Sub-District Makassar

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Abstract: Environmental health in Indonesia is still caution to concern, poor sanitation in Indonesia is characterized by the high incidence of infectious diseases in society. The society in flood-prone area has a high-risk exposure on the disease based on the environment because they live in disaster-prone area. This research aimed to describe the condition of sanitary facilities and risky behavior on public health in flood-prone areas in Manggala district particularly in Tamangapa sub-district of Makassar. This research uses an observation method with a descriptive approach. The data is processed by using SPSS and Arc View GIS applications. Environmental risk category is determined by the approach of Environmental Health Risk Assessment (EHRA). The results showed that the flood-prone area in RT 04 RW 06 was included in very high-risk category at 229 with an index value of environmental health risks 212-229. Meanwhile, RT 04 RW 05 was in the category of low risk in the amount of 155 with an index of 155-173. Environmental health hazards identified in Tamangapa flood-prone areas sub-district includes domestic sources of clean water, domestic wastewater, and household garbage.

Keywords: Risk, environmental health, flood

[1] Introduction

Republic of Indonesia is widely located in prone areas of natural disasters such as landslides, earthquakes, volcanic eruptions, tsunamis, floods and others. Indonesia ranks second in the list of highest deaths due to natural disasters in Asia-Pacific. Over the past 20 years, various natural disasters in the country have also caused economic losses of at least US $ 22.5 billion. This data is available in the 2010 Asia Pacific Disaster Report prepared by the Economic and Social Commission for Asia and the Pacific (ESCAP) and the UN International Strategy for Disaster Reduction (UNISDR) [1,2].

People living in flood-prone areas are at risk of exposure to environmental-based diseases, as they live in hazard-prone environments. Flood-prone areas are the areas that affect the health of population who live in the area, influenced by the management of the living habitat and the management of the disturbed environment. One of the problems that often happen in the city of Makassar is the problem of flooding. Almost every year the flood in Makassar occurs on every coming of the rainy season. A total of 24 urban villages in 6 sub-districts with a total area of 2761.84 Ha often become flood subscriptions in the rainy season [3,4].

Environmental Health Risk Assessment (EHRA) is a study to understand the condition of sanitation facilities and behaviors that pose a risk to public health, facilities which are observed includes the Clean Water Source, a healthy latrine facility, household waste, and sewerage of households. For behavior, Hand-washing with Soap and disposing of garbage and Bleeding Behavior are learned, in this research will also be done distribution or assessment of environmental health risk [5].
According to the Sanitation Handbook of Makassar City 2011, sanitation is a deliberate behavior in the culture of clean living with the intention of preventing humans from direct contact with dirt and other hazardous waste materials in the hope that this effort will maintain and improve human health. Sanitation hazards may be physical, microbiological, and chemical or biological agents of related illnesses. The waste material that can cause health problems comprises human or animal feces, solid waste residue, domestic waste water (laundry, urine, bath or laundry materials), industrial waste, and agricultural waste materials [6,7].

Globally, 19% of deaths were due to infectious diseases related to basic sanitation and hygiene or hygiene risk factors. For Indonesia, environmental health is still a concern. The lack of optimal sanitation in Indonesia is characterized by the high incidence of infectious diseases in the community. Data from the Ministry of Health of the Republic of Indonesia shows that the presentation of the population with adequate sanitation facilities in 2011 was only 54.99%. This indicates that less than half of Indonesia's population still has inadequate sanitation facilities [8,9].

Historically, there are spot of flood areas in Romang Tangngaya RT 04, RW 06 and Bontoa RT 04, RW 05 Tamangapa Sub-district in Makassar City which topographically is in the lower plain of the surrounding area beside the River Kajenjeng flowing from upstream that is located in the administrative area of Gowa Regency. Hence, while the rain with high intensity occurring, it will cause floods that inundate not only settlements, but soaking the rice fields and destroying rice crops and crops. The flood often happens for two to three months each year [10].

[2] Method

The type of research was using observation with descriptive approach that aimed to identify the condition of sanitation facilities and behaviors which were at risk to public health in flood-prone area in Tamangapa Sub-District, Manggala, Makassar. The research was conducted on December 8th, 2015 to January 8th, 2016. The population in this study was all households in RW. 5, RT. 4 (Bontoa) and RW. 6, RT. 4 (Romang Tangaya) flood-prone areas of Tamangapa, 129 houses, each 72 houses in Bontoa and 57 houses in Romang Tangaya. The samples in this research were all households in flood-prone areas of Tamangapa Sub-District, Manggala district, Makassar. Respondents in this study were household members found when conducting research, allowing for interviews. Sampling was done by exhaustive sampling. The data analysis used was descriptive by making interpretation and narration of each variable and presentation of data presented in the form of narration, tables of environmental health risks.

[3] Result

The result shows that most of the respondents occupy the house which is owned by the respondent themselves as many as 115 or 89.1% that is each spread in RW 05 RT 04 as many as 58 houses and at RW 06 RT 04 counted 57 houses. Of the 2 research sites in Tamangapa Village, the majority of the population owns 74 stage house houses or 57.4%, each spread in RW 05 RT 04 with 27 houses and RW 06 RT 04 with 47 houses.

Distribution by source of clean water and drinking water treatment was found that for drinking purposes most used by respondents was unavoidable dug well water of 39 or 30.2% and the least was water from unprotected springs as much as 1 or 0.8% , for the most commonly used water cooking purposes is well protected water wells as much as 39 or 30.2% and the least is water from unprotected springs as much as 1 or 0.8%, for the purposes of MCK as much as 40 or 31% , and the least is water from unprotected springs as much as 1 or 0.8% (Table 1).

Private latrines owned by respondents are much more around 92 or 71.3% while those who do not have 37 or 28.7%. For bowel space there are 92 or 71.3% using private latrines and 1 or 0.8% using excavation pits (Table 2). The respondents who have a waste bin of 29 or 22.5% and the number of respondents who do not have more than 100 or 96.1%. For the respondents who dispose of waste before disposal as much as 5 or 3.9% while that does not sort the waste more by 124 or 96.1%.

The incidence of environment-based disease in flood-prone areas of Tamangapa Sub-district, Manggala District, Makassar City is still dominated by diarrhea disease with the highest percentage of 69.8% of total respondents. While the lowest incidences of disease are eye disease and
vector-based disease. Based on 4 variables which are used to determine the table of environmental health risk index. The cumulative results show that RW 06 RT 04 with the environmental health risk index value of 229, becoming the very high-risk category, while RW 05 RT 04 with an environmental health risk index score at 155, falling into the less risky category (Table 3). Then the results are inserted at the point of coordinates in pairs using the Arc View Gis computer program and performed digitization and marking at each coordinate point used to obtain an environmental health risk map (Picture 1, Picture 2).

[4] Discussion

It was found in this study that most households utilize well dug water is not protected in meeting their daily needs of 30.2%. On the other hand that many also used by the respondents is the source of water coming from the well water drill. The shape of topography in a region can affect the groundwater in the area. In the lowland area the frequency of groundwater extraction is relatively large because in this area the population growth is growing rapidly while the plateau area, this area is located on the slopes of the mountain foot [11].

The practice of bowel movements can be one of the risk factors for contamination of the environment including water sources, especially when open-air practices such as in river / gutters / gardens, but can also include comfortable latrine facilities at home. Although defecation is done at home with convenient toilet advice, but if the shelter and treatment facilities are not adequate, for example because it is not water-resistant, the risk of pathogen contamination will remain high. For people who have a habit of defecating carelessly obtained data of 23.2% done by family members who are not known clearly who the person. It may be influenced by the embarrassment by the respondent when questioned about it [6,12].

In this study also asked about the intensity of people's waste, the data show 45% of respondents throw their garbage every day. The longer the garbage is stacked at home, the higher risk of environmental health, because the garbage that builds up in the house will be the source of the smell, the source of the bacteria, and the source of the disease-carrying vector. Based on survey results of 129 respondents in the data, there are 70 respondents or 54.3% who do not have sewerage of households. Some studies suggest that untreated or well managed waste water can be harmful to human health as it can serve as a disease-carrying medium, especially infectious diseases that are transmitted through contaminated water. Seeing the condition of the location of research that when entering the rainy season will experience flooding, so it is possible to occur at the location of the study. As for handwashing variables are as many as 83 or 64.3% who have done handwashing with soap. Judging from the 5 important time to wash the hands, it is concluded that no one performs CTPS at a critical time. This is due to the lack of public knowledge about the importance of handwashing with soap.

Diarrhea is the highest disease that is 69.8%, this is because almost all household area use dug well water is not protected and also research location is flood-prone area. Several studies have revealed that the incidence of diarrhea is largely determined by the frequency of a polluted area caused by floods carrying bacteria and pathogens. The process of transmission of the disease is influenced by the characteristics of the host (immunity, nutritional status, health status, age, and sex) and host behavior (personal hygiene and food hygiene) [13].

Each value of environmental health risk index obtained then accumulated at each research location and obtained value at RW 05 RT 04 equal to 155 while at RW 06 RT 04 equal to 229. From that value to determine 4 categories of risky area that is less risk, medium risk, high risk, and the very high-risk. So that the results obtained less risky category entry on the vulnerable 155 - 173, the risk is susceptible value 174 -192, high risk categories exist in value 193 -211 and the last risk is too high between 212-229 value.

If it is reviewed overall, the risk picture in the flood-prone areas of Tamangapa Sub-district, Manggala district, Makassar. Romang Tangaya or RW 06 RT 04 area is very high. iil is because the access of facilities and infrastructure is far from the standard of sanitation and behavior which is still low and also locations that are difficult to access if the rainy season becomes one of the factors that affect it. In terms of population precisely Romang Tangaya is less than Bontoa (RW 05 RT 04) but the risk in Bontoa is lower than in Romang Tangaya, so the population does not guarantee high risk or
less risk, but depends on people's behavior. If community behavior is healthy then it will be able to reduce environmental health risks and opportunities [6,12].

Table 1. Distribution of Cleaned Water Source in Flood-prone Area *Tamangapa* Sub District, Makassar

| Distribution of Cleaned Water Source | 05/04  | 06/04  | Total  |
|-------------------------------------|--------|--------|--------|
|                                     | n      | %      | n      | %      | n      | %      |
| **Drinking Water**                  |        |        |        |        |
| Mineral Bottle Water                | 5      | 6,9    | 0      | 0      | 5      | 3,9    |
| Refill Water                        | 27     | 37,5   | 0      | 0      | 27     | 20,9   |
| Well Water Drill                    | 7      | 9,7    | 14     | 24,6   | 21     | 16,3   |
| Well Water Dug Protected            | 11     | 15,3   | 8      | 14     | 19     | 14,7   |
| Well Water Dug Unprotected          | 5      | 6,9    | 34     | 59,6   | 39     | 30,2   |
| Protected Water Spring              | 0      | 0      | 0      | 0      | 0      | 0      |
| Unprotected Water Spring            | 0      | 0      | 1      | 1,8    | 1      | 0,8    |
| Rainwater                           | 0      | 0      | 0      | 0      | 0      | 0      |
| Water Work Municipal                | 17     | 23,6   | 0      | 0      | 17     | 13,2   |
| **Cooking Purposes**                |        |        |        |        |
| Mineral Bottle Water                | 1      | 1,4    | 0      | 0      | 1      | 0,8    |
| Refill Water                        | 5      | 6,9    | 0      | 0      | 5      | 3,9    |
| Well Water Drill                    | 18     | 25     | 14     | 24,6   | 32     | 24,8   |
| Well Water Dug Protected            | 15     | 20,8   | 8      | 14     | 23     | 17,8   |
| Well Water Dug Unprotected          | 5      | 6,9    | 34     | 59,6   | 39     | 30,2   |
| Protected Water Spring              | 0      | 0      | 0      | 0      | 0      | 0      |
| Unprotected Water Spring            | 0      | 0      | 1      | 1,8    | 1      | 0,8    |
| Rainwater                           | 0      | 0      | 0      | 0      | 0      | 0      |
| Water Work Municipal                | 28     | 38,9   | 0      | 0      | 28     | 21,7   |
| **Extensive Purposes (Bathing, Washing, Etc)** | | | | | |
| Mineral Bottle Water                | 0      | 0      | 0      | 0      | 0      | 0      |
| Refill Water                        | 4      | 5,6    | 0      | 0      | 4      | 3,1    |
| Well Water Drill                    | 21     | 29,2   | 14     | 24,6   | 35     | 27,1   |
| Well Water Dug Protected            | 16     | 22,2   | 8      | 14     | 24     | 18,6   |
| Well Water Dug Unprotected          | 5      | 6,9    | 34     | 59,6   | 39     | 31     |
| Protected Water Spring              | 0      | 0      | 0      | 0      | 0      | 0      |
| Unprotected Water Spring            | 0      | 0      | 1      | 1,8    | 1      | 0,8    |
| Rainwater                           | 0      | 0      | 0      | 0      | 0      | 0      |
| Water Work Municipal                | 26     | 36,1   | 0      | 0      | 26     | 20,2   |
| **Total**                           | 72     | 100    | 57     | 100    | 129    | 100    |
Table 2. Distribution of Toilet Ownership, Toilet and Type of Toilet in Flood-prone Area Tamangapa Sub District, Makassar

|                       | RW/RT               | Total            |
|-----------------------|---------------------|------------------|
|                       | 05/04               | 06/04            | n    | n    | n    | %    | %    |
| **Toilet Ownership**  |                     |                  |      |      |      |      |      |
| Yes                   | 64                  | 28               | 92   | 71.3 |
| No                    | 8                   | 29               | 37   | 28.7 |
| **Toilet**            |                     |                  |      |      |      |      |      |
| Private Toilet        | 64                  | 28               | 92   | 71.3 |
| General Water Closet  | 8                   | 23               | 31   | 24   |
| Garden                | 0                   | 3                | 3    | 2.3  |
| Digging Hole          | 0                   | 1                | 1    | 0.8  |
| Neighbour Toilet      | 0                   | 2                | 2    | 1.6  |
| **Type of Toilet**    |                     |                  |      |      |      |      |      |
| Swan Squat Closet     | 62                  | 17               | 79   | 61.2 |
| No Closet             | 8                   | 29               | 37   | 28.7 |
| Old-style squat toilet| 0                   | 8                | 8    | 6.2  |
| Swan Sit Closet       | 2                   | 1                | 3    | 2.3  |
| Garderobes            | 0                   | 2                | 2    | 1.6  |
| **Total**             | 72                  | 57               | 129  | 100  |

Table 3. Score of Environmental Health Risk in Flood-prone Area Tamangapa Sub District, Makassar

|                   | RW/RT | IEHR Score | Risk Category  |
|-------------------|-------|------------|----------------|
| 05/04             |       | 155        | Low Risk       |
| 06/04             |       | 299        | Very high-risk |

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