

# Sanitation Behavior Among Flood Disaster Victims In Bukittinggi City – West Sumatra

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## Article history

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**Abstract:** Bukittinggi is one of city in West Sumatra that is potentially flooded and happen at the highest rainfall periods. Only three from 24 urban villages in Bukittinggi have low sanitation risk and it increases the flood-following disease. This research was done with quantitative approach to identified sanitation behavior among flood affected people as many as 47 respondents taken by proportional random sampling. The result showed the frequency distribution and percentage of each variable. Most flood-affected people in the Bukittinggi have toilets, but half of them use disposable diapers for their children and end up in trash cans. A small percentage of people dispose their waste water through toilets and their sewers are in poor condition. Most people do not segregate their solid waste and almost all of the solid waste have been dumped to the temporary dump site. Most people wash their hands with soap, but only small number do it before cooking. It is suggested to government to socialize the importance of sanitation and strengthen the role of community leaders to increase community awareness to have clean and healthy lifestyle.

**Keywords:** floods; sanitation behavior; waste disposal behavior; handwashing practice

**Abstrak (Indonesian):** Bukittinggi adalah salah satu kota di Sumatera Barat yang berpotensi banjir yang terjadi pada periode curah hujan yang tinggi. Hanya tiga dari 24 kelurahan di Bukittinggi yang memiliki risiko sanitasi rendah dan hal ini akan meningkatkan jumlah penyakit akibat banjir. Penelitian ini dilakukan dengan pendekatan kuantitatif untuk mengidentifikasi perilaku sanitasi pada warga yang terkena dampak banjir sebanyak 47 responden yang diambil dengan metode proporsional random sampling. Hasil penelitian ditunjukkan dengan distribusi frekuensi serta persentase untuk masing-masing variabel. Sebagian besar masyarakat yang terkena dampak banjir di Bukittinggi memiliki toilet, tetapi separuh dari mereka menggunakan popok sekali pakai untuk anak-anak mereka dan dibuang di tempat sampah. Sebagian kecil responden membuang air limbah melalui toilet dan saluran pembuangan yang dimiliki dalam kondisi tidak baik. Sebagian besar responden tidak memisahkan sampah mereka dan dibuang ke tempat pembuangan sementara. Mereka mencuci tangan dengan sabun, tetapi hanya sejumlah kecil yang melakukannya sebelum memasak. Disarankan kepada pemerintah untuk mensosialisasikan pentingnya sanitasi dan memperkuat peran pemimpin masyarakat untuk meningkatkan kesadaran masyarakat untuk memiliki gaya hidup bersih dan sehat.

**Katakunci:** banjir, perilaku sanitasi, perilaku pembuangan sampah, perilaku mencuci tangan

## 1. Introduction

One of hydro-meteorological disaster caused by climate change is floods. It increases mortality, morbidity and has implication for human health such as sanitation related diseases [1]. Increasing rainfall in Indonesia is 2% to 3% per year and significantly raises the number of flood disaster [2]. Flood occurred 20 times in West Sumatra and six of them was flash floods causing death and injuries. This disaster occurred in the rainy season and followed by increasing environmental-based disease that were 886,813 cases in 2014 to 1,017,667 cases in 2015 [3].

Bukittinggi is one of city in West Sumatra that is potentially flooded. It will be happening at the

highest rainfall periods (November, May and August) [4]. There were 20 times floods with total submerged area of as many as 5,85 km<sup>2</sup> or more than one fifth of Bukittinggi area. This was followed by increasing of ill-effects due to poor sanitation in the form of diarrhea as many as 2,741 cases that were previously only 965 cases and 4,982 skin diseases which were previously only 420 cases [3].

From the results of the Environmental Health Rapid Assessment study on sanitation risk index from water sources, domestic wastewater, garbage, water puddles and clean healthy living behavior, only three from 24 urban villages in Bukittinggi have low sanitation risk [5]. Flood-prone areas have high risk of

diseases and require the improving of quality of family latrine facilities, waste management and sewerage to reduce the risk of flood-following disease. Flood disaster will worsen the community sanitation index [6].

A research was done in Bangladesh, found that every year during flood most of the toilets become inundated. During flood, about 97% of the toilets became unusable due to inundation with flood water [7]. Solid waste is also harm to human health because contaminants from leachate easy to spread during flood [8]. Community should have hygiene habit to prevent flood-following disease like washing hand with soap and running water because the increasing of disease during flood [9]. The aim of this research is to identified sanitation behavior among people affected by flood disaster in Bukittinggi city, West Sumatra.

## 2. Method

This research was done with quantitative approach to identified sanitation behavior among flood affected people. The population in this study was 105 heads of households affected by flood disaster in 2015. The sample was 47 respondents taken by proportional random sampling located in Anak Aia, Tarok Dipo and Aua Tajungkang Tengah Sawah sub-district. This research was done in June to July 2017. Collected data was about stool disposal behavior, liquid and solid waste disposal behavior and hand washing practice.

Data were collected by visiting home by interviewing the head of household with questionnaires guide and some observation. Data analysis was done by univariate analysis, which is aimed to explain or describe the characteristics of each research variable. This analysis showed the frequency distribution and percentage of each variable. Literature study of the Bukittinggi's Health Office documents conducted to know the disease caused by flooding in flood prone area.

## 3. Result and Discussion

### 3.1. Characteristic of respondents

Most of respondents have high education level, which is Senior high school (48.6%) followed by college (31.9%). More than half of respondents have income below regional minimum wages (51.1%) and 53.2% of them has their own home.

High education level will lead people to have a good behavior about healthy life and good personal hygiene. More educate and higher education level people will easy to get and digest information, and easy to determining healthy life choices including sanitation behaviors [10].

Low income level will have a tendency to have lower lever of sanitation access [11]. This increase

reliance to public sanitation and inability to provide sustainable sanitation facility [12]. Almost half of respondents (46.8%) rent their house. People who rent their house are more vulnerable to flood risk than who have their own house. This relates to capability to bear the risk and recover after flooding [13].

Table 1. Characteristic of Respondents

Characteristic of Respondents	n	%
<b>Education</b>		
Primary school	4	8.5
Junior high school	5	10.6
Senior high school	23	48.6
College	15	31.9
Amount	47	100
<b>Income</b>		
Uncertain	16	34
Below regional minimum wages	24	51.1
More than regional minimum wages	7	14.9
Amount	47	100
<b>Type of home owners</b>		
Rent	22	46.8
Owned	25	53.2
Amount	47	100

### 3.2. Stool Disposal Behavior

Almost all respondents have their own toilet (95.7%) but 42.6% of them using public toilet. 78.7% of respondents toilets end in septic tanks. Most of them use antiseptics when they clean their toilet (83%) and 41% respondents who have children use disposable diapers to dispose the children's stool and it ends in garbage bin.

Almost all respondents have private toilets at home, but some of them still dispose their stool into pond or river. They are found in the housing around the river channel and they are usually found in household with low income [14]. It is necessary to engage community leaders to coach the community to change the knowledge and behavior on the importance of using toilets that meet health requirements.

Table 2. Stool Disposal Behavior

Stool Disposal Behavior	n	%
<b>Ownership of toilets</b>		
Do not have a toilet	2	4.3
Have Toilet	45	95.7
Amount	47	100
<b>Stool disposal practices</b>		
Defecating to a pond / river	4	8.5
Public toilet	20	42.6
Toilet at home (seating/squatting)	23	48.9
Amount	47	100
<b>End of toilet water channels</b>		
Waterways/rivers	10	21.3
Septic tanks	37	78.7
Amount	47	100
<b>Use of antiseptics</b>		
No	8	17
Yes	39	83
Amount	47	100
<b>How to dispose of children's stool aged 0-3 years (if have)</b>		
In the yard	1	4.5
Use disposable diapers (end in garbage bin)	9	41
Use toilet	12	54.5
Amount	22	100

The management of sewage disposal in Bukittinggi is still individualized with on-site system, but the management of sludge cannot be done because there is no Installation of Fecal Mud Processing in this city. In addition, there is no regulation regarding the necessity of suctioning stool periodically. If the community requests for the service of sludge removal, the government requests assistance to the Office of Hygiene and Gardening from Payakumbuh city [14]. Therefore, there should be a policy to empty septic tanks regularly to reduce groundwater contamination and to reduce the risk of disease seed breeding.

83% of respondents uses antiseptics when cleaning the toilet. The use of disinfectants is important to reduce the spread of microbes and avoid diseases cross-contamination [16]. Therefore, it is important to educate hygiene for households to reduce microbial contamination after using of toilets.

Low consistency of children's waste disposal would improve infectious pathogens to nearby communities [17]. Almost half of respondents use disposable diapers in their 0-3 year old children. On the one hand, the use of disposable diapers provides health benefits such as reducing the risk of leakage of urine and feces thereby reducing the transmission of disease,

although babies are susceptible to diaper rash [18]. To reduce contamination in landfills (temporary/final), disposable diapers may be cleaned in the toilet first. Parents need to understand the importance of toilet training so that children are accustomed to removing stool in the toilet and reducing the use of disposable diapers. The effectiveness of toilet training can be started at 18 months and its success depends on the child's motor skills and the willingness of the parents to provide good examples with verbal and non-verbal [19].

### 3.3. Liquid Waste Disposal Behavior

More than half respondents discharge their liquid waste into holes through the pipes (61.7%), but still found some households discharge it into toilet (10.6%). More than half respondents (53.2%) have sewerage channel in poor condition with some damage and blockage.

Table 3. Liquid Waste Disposal Behavior

Liquid Waste Disposal Behavior	n	%
<b>Way to discharge household liquid waste</b>		
Water canal	13	27.7
Toilet	5	10.6
Holes through the pipes	29	61.7
Amount	47	100
<b>Conditions of sewerage</b>		
Some damage and blockage	25	53.2
Good condition	22	46.8
Amount	47	100

10.6 % respondents still dispose liquid waste to the toilet, this will cause the incompatibility of septic tank capacity, which is only intended for mud feces. The city of Bukittinggi already has a Wastewater Treatment Plan (WTP) but cannot be used because the connection to the resident's house has not been completed [14].

The government should hasten the utilization of WTP that has been built and improved the community sewerage. The purpose of WTP is to eliminate pathogens that prevent disease transmission. For the city scale, higher technology is needed for liquid waste treatment because simple processes such as deposition, active sludge, phytoremediation, oxidation trench and others are less effective for removing disease agents [20]. If water from WTP has been processed, water can be used for other activities and if it has been eligible to be reused for drinking water sources.

For the flood prone area, drainage dredging needs to be done periodically [21]. In addition,

rehabilitation for unstandardized drainage must be done and provide understanding to the community to avoid solid waste carried to sewerage channel during washing.

### 3.4. Solid Waste Disposal Behavior

72.35% respondents do not separate their waste, and 87.2% does not involved in solid bank program. 78.7% of them dump the waste to temporary dump site and hung waste bag before picked up by sanitary officer in front of their house.

Table 4. Solid Waste Disposal Behavior

Solid Waste Disposal Behavior	N	%
Separation of organic, inorganic and hazardous waste		
Unseparate	34	72.35
Just separate organic and inorganic	9	19.15
Separates organic, inorganic and hazardous waste	4	8.5
Amount	47	100
Involvement in the Waste Bank Program		
No	41	87.2
Yes	6	12.8
Amount	47	100
How to throw solid waste		
Dumped into the yard	3	6.4
Burned	7	14.9
Dumped to temporary dump site (solid waste hung before picked up by sanitary officer)	37	78.7
Amount	47	100

Most of respondents do not separate solid waste whereas Bukittinggi already has a garbage bank program that can be followed by the community. From the observations, the solid waste bank staff collect the solid waste from household. As compensation they can take gold from any garbage that are given to the solid waste bank. This program has slogan “save your garbage, get your gold”. Therefore, it is necessary to socialize the advantages of sorting waste from its source and ‘save’ their waste in the solid waste bank. As cities in Japan, they have conducted recycle system for waste and they keep quantity of waste as much as 40% and reduce landfill operation cost [22]. If local solid waste management can be integrated to solid waste banks system and get support from local government and private sectors, amount of handled solid waste could be increased [23]. Waste

management program should begin in their source i.e households and industries. Family members and household income are important determinants of the waste generation [24]. In industrial aspect, waste is generated by ineffectively in manage they life cycle of the product [25]. Waste minimization behavior will be affected by environmental values and moral obligation [26].

Solid waste from household are taken by motorized pedicab then transported by garbage truck/amroll to temporary waste site. For houses which are adjacent to the temporary waste site, people immediately throw the garbage into that place. For areas are not covered by garbage trucks, bag wastes hung in front of the house and transported by motorized pedicab and collected in containers, to be transported by garbage trucks then disposed of at final waste disposal site [14].

Policies to hang bag wastes in front of the house or dispose to the temporary waste site should be accompanied by a policy about the time of collecting waste by environmental officer. This will relate to the negative impact that will be felt such as unpleasant smells, flies and unpleasant scenery. In addition, there are still people who put the trash just on the side of the road. This is a risky behavior because when it rains, the microbe from waste can be carried away by the water and clog the ditches. People actually know that throwing garbage carelessly can cause flooding [27]. However, habits to dispose waste carelessly cannot be change because obstacles in changing behavior.

### 3.5. Handwashing Practice

Hand hygiene is the most important method to avoid the transmission of harmful germs and prevent health care-associated infections. Therefore, when the risk of disease increases during floods, the community has been accustomed to prevent the spread of disease seeds by washing hands with soap and running water. More than half of respondents (68.1%) wash their hands with running water and soap. However, they still have a bad habit that only 29.7% wash their hands before cooking and only 42.6% before and after feeding the child. Hand washing showed reductions in sanitation related diseases around 30%, and of 43–53% if soap is used [28].

Table 5. Handwashing Practice

Handwashing Practice	n	%
How to wash hand		
Only with water	15	31.9
With water and soap	32	68.1
Amount	47	100
Washing hand with soap practice		



Before and after meal	24	51.1
After using toilet	29	61.7
Before cooking	14	29.7
Before and after feeding children	20	42.6
When hand are dirty	32	68.1

Mother and child who reported washing their hands with water and soap had lower percentage of diarrhea [29]. Diarrhea disease was the commonest morbidity in flood prone population. Hand washing without soap was found to be associated with high attack rate of diarrhea. This is also significantly higher in flood prone population than in non-flood prone area during the same season [30]. Community education for good hand washing practice is one of important way to reduce the spread of infectious microbe around community prone to flood disaster.

Women have a higher prevalence of irritable bowel syndrome and most of them caused by diarrhea. It induces rectal sensitivity more than men [31]. Women are advised to more maintain their personal hygiene because they will easily spreading the disease to the child. Women have many contact with microbe sources include menstruating, cleaning child stool, cleaning household appliances, cleaning raw food before cooking and other risk factors that increase the risk of diarrhea during floods.

Compared with non-flood prone area, diarrhea disease was the commonest morbidity in flood prone area. It associated with some behaviours, like use dirty water for utensil wash and kitchen purpose, improper hand washing before eating and after defecation, and don't have safe water source from flood contamination. Diarrhea attack rates in flood prone population are also significantly higher than non-flood prone area during the same season [30].

#### 4. Conclusion

Most flood-affected people in the Bukittinggi have higher education, own their homes, but have income below regional minimum wages. They have toilets, but still use public toilets to defecate. The toilets ends up in a septic tank and mostly uses an antiseptic to clean the toilet. Nearly half of respondents use disposable diapers for their children, but end up in trash cans. A small percentage of people dispose their wastewater through toilets and their sewers are in poor condition. Most people do not segregate their solid waste and do not follow the solid waste bank program. Almost all of the solid waste has been dumped to the temporary dump site. Most people wash their hands with soap, but small number do it before cooking.

It is suggested to government to socialize the importance of sanitation behavior to community that

prone to flood disaster. Government should strengthen the role of community leaders to increase community awareness to have clean and healthy lifestyle.

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