Analysis of the Relationship Between Open Defecation Free Behavior and Water Quality in the Kalitebu River, Kali Kedinding Subdistrict, Surabaya

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Abstract

The Kali Tebu River located in Tanah Kali Kedinding Village, Kenjeran District, Surabaya City, is often used by many people for defecation. Data collected by the Tanah Kali Kedinding Health Center in 2023 showed that 48 Heads of Families (KK) or 0.30% of the total population still practice Open Defecation in water channels that flow directly into the river. entering the Kali Tebu River, this can pollute the river water and change the quality of the river water. The purpose of the study was to analyze the results of river water quality tests, water quality status. In this study, a questionnaire was filled out to determine the community profile, then the parameters were tested based on the Regulation of the Minister of Environment and Forestry No. 68 of 2016 consisting of TSS, pH, BOD, COD, Fat Oil, Ammonia, and Total coliform. Then compare the quality status of the Storet method and Pollution Index (IP) which are guided by the Decree of the Minister of Environment Number 115 of 2003 with River Water Quality according to PP RI Number 22 of 2021. The results of the TSS test, BOD Parameters, COD, Ammonia, Fatty Oil and Total Coliform of the Kali Tebu River have not met the class quality standards according to Government Regulation No. 22 of 2021, while the pH, COD and fatty oil parameters meet. Then the water quality status of the Kali Tebu River was determined using the storet method at points 1 - 3, all of which were included in the heavily polluted category with result values of -102, -100, -98. Meanwhile, to determine the water quality status using the average Pollution Index at points 1 - 3, it was included in the heavily polluted category with PIj values > 10, namely 20, 22, 23.

Keywords: CHAPTER, IP, Quality, River Water and Storage

1. Introduction

Lack of public awareness that still defecates indiscriminately (BAB) directly in the river without any treatment can result in the emergence and spread of various diseases. (Nursalim et al., 2020).The results of a survey conducted in Tanah Kali Kedinding Village, based on data from the Health Center, there were 0.30% still defecating in the open (BAB/Buang Air Bela Sembangan) from 48 families. According to Aminah (2018), defecation can cause river water pollution, which can change the quality of river water and cause various types of diseases. The presence of total coliform pollution has the potential to cause pollution of the Kali Bubu River. Total coliform content can come from human or warm-blooded animal feces, and can also be found naturally in the air (Arsyina, 2019).

This study aims to analyze the test results of river water quality with the Regulation of the Minister of Environment and Forestry No. 68 of 2016 concerning Domestic Waste Quality Standards. Analyzing the water quality status of the Kali Tebu river and Analyzing the influence of knowledge, attitudes, and actions of defecating with water quality, water quality status, and identity of respondents in the Kali Tebu river, Tanah Kali Kedinding Village.

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2. Method

Research Location

*Penulis Korespondensi

The location of this research is in the Kali Bubu River, Tanah Kali Kedinding Sub-district, Kenjeran District. Where the location of Semarang defecation (BABs) is locatedRw 6/ Rt (1 and 2), Rw 7/ Rt 5, Rw 4/ Rt (8 and 28). The determination of this point starts from Hulu Sungai Kali Tebu which is located in front of the grave frame. The length of point 1 to point 3 is 2.65 km. Air sampling is carried out 4 times a week at 07.00 - 08.00 WIB, starting from Monday, Wednesday, Friday, and Sunday, then repeated on the same day and at the same time. This is because the peak hours of community activity in carrying out defecation and domestic waste activities are carried out at that time and to determine the thickness that occurs in a week.



Picture 1. Map of BABs locations and sampling points in the Kali Tebu River

Determining the Number of Samples

Data from the Kelurahan shows that Tanah Kali Kedinding has a population of 60,566 people consisting of 17,629 families. The sample size of the questionnaire was determined based on data on families who still defecate, obtained from the Health Center as many as 48 families or 0.30%. Communities that do not have septic tanks are communities that still dispose of feces carelessly. Defecation data from the Health Center were used as respondents for filling out the questionnaire.

Penentuan Kualitas Air Sungai

Based on the Regional Regulation of the City Number 02 of 2004 concerning Water Quality Management and Water Pollution Control in Surabaya, Sungai Tebu is classified as a Class III river. Where in the Kali Tebu river is used to water flowers and graves near the Kali Tebu river, so the core research was conducted to analyze how polluted the Kali Tebu river is with domestic waste parameters according to Permen LHK No. 68 of 2016. The following are the parameters that will be tested, namely:

Tabel 1. Class III River Water Test Parameters

Parameter	Satuan	Nilai Baku Mutu Kelas III
TSS	mg/L	100
pH	mg/L	6-9
BOD	mg/L	6
IKAN KOD	mg/L	30
Minyak dan Lemak	mg/L	1
Amoniak	mg/L	0,5
E-coli	MPN/ 100 mL	10.000

Source: Peraturan Pemerintah RI No.22 Tahun 2021

Questionnaire Completion Procedure

Conclusion of the questionnaire as an initial observation method to identify the behavior of people in locations that do open defecation (BABs) directly into the river. The contents of the questionnaire include questions about the individuality of respondents, namely Residential Address, Age, Gender, Highest Education, Occupation, Income, and Number of Family

Members. The variables used regarding the behavior of people who defecate in the open (BABs) are knowledge, attitudes and actions using a Likert scale questionnaire. So that respondents can answer examples TP (don't understand) = 4, STP (very don't understand) = 3, P (understand) = 2, and SP (very understand) = 1. Each of these questions has 1 score.

SPSS Analysis

The existence of this SPSS analysis is to analyze the answers of respondents in filling out the questionnaire with the variables used knowledge, attitudes, and actions. The results of running this SPSS are in the form of data validity tests, reliability, and correlation tests. Where this correlation test is carried out to determine the influence between community defecation behavior and air quality parameters.

3. Result and Discussion

Kali Tebu River is a river that flows from the north of Rangkah Public Cemetery in Surabaya to the northern part of Surabaya City, especially in Tambak Wedi Village. Kali Tebu River is 2.65 km long, 2 m deep and 22.7 m wide. The flow of Kali Tebu River from upstream to downstream leads to the north. Kali Tebu River is usually used by people to water their yards, roads and also to water the graveyard.

According to Nurbaya (2023), river water quality can be measured based on physical, chemical, and biological parameters in accordance with Government Regulation of the Republic of Indonesia Number 22 of 2021 which regulates environmental management and protection.



Figure 1. Location 1



Figure 2. Location 2



Figure 3. Location 3

Location Point 1

The location of Point 1 has a length of 0.22 km with an air speed of 0.05 m/s. The cross-sectional area of the Kali Tebu River is 5.2 m3 and the river water discharge is 0.3 m3/s. The location of point 1 is the upstream location, where the first water sample was taken, where at this location there is still no contamination from the behavior of defecating from people who do not have septic tanks.

Location Point 2

The location of Point 2 is located in the middle between the upstream and downstream. Point 2 has a length of 1.23 km with an air speed of 0.25 m / s. The cross-sectional area of the Kali Tebu River is 11.4 m 3 and the river water discharge is 2.85 m 3 / s. The location of point 2 is a middle location between the upstream and downstream, where it is contaminated with human feces that still carry out defecation behavior from people who do not have septic tanks.

Location Point 3

The location of Point 3 has a length of 1.26 km with an air speed of 0.2 m / s. For the cross-sectional area of the Kali Tebu River 11.4 m 3 and the river water discharge of 2.28 m 3 / s. The location of point 3 where the location of point 3 is downstream that no longer enters domestic waste and human waste / feces.

River Water Quality

River water quality is the condition of the air that indicates whether the air is polluted or not at a certain time, by comparing it with the established standards. Data collection of the Kali Tebu River

air quality was carried out at 3 sampling points and involved 7 parameters such as TSS (Total Suspended Solids), pH (Acidity), BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), Fat Oil, Ammonia, and Total coliform. The test results will be compared withAppendix VI of the Government Regulation of the Republic of Indonesia Number 22 of 2021 concerning the implementation of protection and management of Environmental Standards for class III water quality.

TSS (*Total Suspended Solids*) and pH (Degree of Acidity)

Table 2. TSS Concentration Values

Day	TSS value (mg/L)		
	Point 1	Point 2	Point 3
1	240	200	240
2	160	260	200
3	200	120	132
4	160	200	180
5	280	292	240
6	128	136	160
7	160	204	240
8	240	250	245

Table 3. pH Concentration Values

Day	pH value		
	Point 1	Point 2	Point 3
1	6,6	7,1	6,9
2	6,9	7,0	7,8
3	7,2	7,5	7,1
4	7,5	7,3	7,2
5	7,0	7,5	7,3
6	6,9	7,1	6,8
7	7,3	7,4	7,0
8	7,0	7,5	7,4

The high TSS value in the Kali Bubu River is due to community activities in throwing garbage in the river. According to Novembrianti (2023), TSS pollution comes from organic or inorganic particles and waste. While the high pH value is due to population activities, such as washing, bathing and throwing food scraps directly into the river. This factor causes high pH concentrations.

BOD (*Biological Oxygen Demand*) andCOD (*Chemical Oxygen Demand*)

Table 4. BOD Concentration Values

Day	BOD value (mg/L)		
	Point 1	Point 2	Point 3
1	32	46	32
2	14	13	14
3	25	10	25
4	19	42	42
5	29	14	38
6	19	17	18
7	23	14	25
8	15	21	14

Table 5. COD Concentration Values

Day	COD value (mg/L)		
	Point 1	Point 2	Point 3
1	65,6	74,2	62,5
2	96	79	91
3	59	83	83
4	67	94	9 6
5	50,6	29,9	54,1
6	16,0	25,3	51,5
7	44,1	72,6	38,6
8	27,0	34,6	44,1

The high BOD value is due to the many activities of people around the river who defecate. According to Mada et al (2023) stated that the increase in BOD value can be caused by the activities of the surrounding community and also the TSS value, because the TSS value represents the amount of dissolved suspended solids in organic and inorganic forms. While the high COD value is because when sampling was carried out in the dry season so that the concentration of organic matter in the water increased and there were community activities in throwing garbage directly into the river and defecating. According to Soukotta (2019) stated that community activities at the location and factors from domestic waste, floating organic waste such as leaves, tree stumps, vegetables and other food scraps.

Oils and Fats and Ammonia

Table 5. Oil & Fat Concentration Values

Day	Minyak & Lemak (mg/L)		
	Point 1	Point 2	Point 3
1	0,4	0,8	1,0
2	14	1	9
3	3	2	0,4
4	2	0,8	8
5	0,41	0,41	0,98
6	2,0	0,8	1,0
7	4,0	2,0	1,0
8	0,8	1,0	2,0

Table 6. Ammonia Concentration Values

Day	Amoniak value (mg/L)		
	Point 1	Point 2	Point 3
1	26	28	44
2	18	30	22
3	20	18	40
4	18	30	15
5	11,1	17,8	17,6
6	12,4	18,3	18,8
7	14,3	19,2	21,6
8	11,0	16,0	17,3

High oil and fat due to home industry in the process of making fried crackers, selling fried foods and tempura. According to Victor, the high concentration of oil and fat is usually caused by households, markets and restaurants. While the high Ammonia value is because at the time of collection there is waste such as leftover chicken pieces, in the form of chicken skin and feathers. According to Novembrianto (2023), organic materials that produce protein content are the main source of high ammonia concentrations.

Total coliform

Table 7. Total Coliform Concentration Values

Day	Amount of Colirfom (MPN 100/L)		
	Titik 1	Titik 2	Titik 3
1	160 . 000 . 000	2 . 400 . 000	1.600 . 000
2	160 . 000 . 000	92 . 000 . 000	3 . 500 . 000
3	160 . 000 . 000	292 . 000 . 000	3 . 500 . 000
4	4 . 800 . 000 . 000	54 . 000 . 000 . 000	92 . 000 . 000 . 000
5	28 . 000 . 000	240 . 000 . 000	240 . 000 . 000
6	5 . 400 . 000 . 000	9 . 200 . 000 . 000	9 . 200 . 000 . 000
7	9 . 200 . 000 . 000	16 . 000 . 000 . 000	16 . 000 . 000 . 000
8	58 . 000 . 000	79 . 000 . 000	16 . 000 . 000

The high total coliform is due to its location being close to the market and where that day is the peak hour for people to carry out activities producing domestic waste and feces. According to Hermawan (2021), the high total coliform concentration value is due to the presence ofFecal contamination, total coliform is a group of bacteria that includes several types, including Escherichia coli (E. coli) which can be an indicator of fecal contamination.

Result of Correlation Test of Defecation Behavior on (Knowledge, Attitude and Action)

Tabel 8. Correlation Test Results of Respondent Profiles on Defication Behavior

Correlated Variables		Correlation Cefficient	Information
Gender	Knowledge	0,023	Significant
	Attitude	0,044	Significant
	Action	0,05	Significant
Age	Knowledge	0,144	Not Significant
	Attitude	0,018	Significant
	Action	0,339	Not Significant
Last education	Knowledge	0,021	Significant
	Attitude	0,044	Significant

Correlated Variables		Correlation Cefficient	Information
	Action	0,027	Significant
Income/ Salary	Knowledge	0,019	Significant
	Attitude	0,046	Significant
	Action	0,028	Significant

It can be seen from the results that there are 10 significant relationships and 2 relationships that are not significant, where gender has a relationship with knowledge, attitudes, and actions towards the practice of Open Defecation, this is because female respondents prefer to behave cleaner. Meanwhile, the correlation test based on the respondent's age towards knowledge, attitudes, and actions has an insignificant value, where there is still a lack of socialization of knowledge and actions in the behavior of Open Defecation (BABs). The results of the correlation test based on the respondent's age towards attitudes are significant, because many people are already adults so that there is a relationship between the behavior of Open Defecation (BABs) and age. Testing based on the correlation of the respondent's last education towards knowledge, attitudes, and actions has a significant value, where most have a high school education, even some of them have an elementary and junior high school education, so this causes a relationship between knowledge and actions in the behavior of Open Defecation (BABs) towards the last education. The results of the correlation test based on income in one month towards knowledge, attitudes, and actions have a significant value, where the more income is obtained, both knowledge, attitudes and actions, the more opportunities there are to continue education in order to understand the meaning of the behavior of Open Defecation (BABs) towards the last education.

Parameter Correlation Test Results

Table 9. Parameter Correlation Test Results

Correlated variables		signature. (2-tails)	Information	Pearson Correlation	Correlation Relationship Level
TSS	Knowledge	0.034	Significant	0.425	Correlation Sufficient
	Attitude	0.022	Significant	0.245	Very Weak Correlation
	Take action	0.045	Significant	0.545	Strong Correlation
pH	Knowledge	0.034	Significant	0.546	Strong Correlation
	Attitude	0.023	Significant	0.325	Correlation Sufficient
	Take action	0.045	Significant	0.234	Very Weak Correlation
BOD	Knowledge	0.04	Significant	0.543	Strong Correlation
	Attitude	0.021	Significant	0.234	Very Weak Correlation
	Take action	0.017	Significant	0.312	Correlation Sufficient
COD	Knowledge	0.023	Significant	0.786	Strong Correlation
	Attitude	0.017	Significant	0.55	Strong Correlation
	Take action	0.043	Significant	0.66	Strong Correlation
Fat Oil	Knowledge	0.013	Significant	0.285	Very Weak Correlation
	Attitude	0.023	Significant	0.951	Strong Correlation
	Take action	0.023	Significant	0.519	Strong Correlation
Ammonia	Knowledge	0.004	Significant	0.713	Strong Correlation
	Attitude	0.023	Significant	0.237	Very Weak Correlation
	Take action	0.045	Significant	0.879	Strong Correlation
Total coliform	Knowledge	0.036	Significant	0.587	Strong Correlation

Attitude	0.015	Significant	0.82	Strong Correlation
Take action	0.042	Significant	0.467	Correlation Sufficient

The results of the parameter test using correlation have a significant influence on the quality of the Kali Bubu river water. The high*Total Suspended Solids*(TSS) in the air can trigger changes in public knowledge, attitudes, and actions towards environmental conservation. The Kali Buaya River alsohas a high level of sedimentation in the area around the river, and high levels of human activity in the area around the river contribute significantly to the decline in the physical quality of river waters.The level of knowledge, attitudes, and actions of the community towards pH in the environment can influence each other. Community activities around the Kali Buana River cause the influence of knowledge, attitudes, actions with high pH values in the Kali Buana River due to the activity of disposing of household waste directly into the river. Increasing BOD can increase public awareness of air pollution caused by organic waste.Pollution by organic materials shows an increase in BOD concentration in waters. Where one of the contributions comes from household waste and community behavior that still defecates. So the influence of knowledge, attitudes and actions are related to the high BOD value in the Kali Bubu River.An increase in COD can indicate the level of organic pollution in waters.Untreated defecation along rivers or in areas around rivers can carry organic waste, including human waste, into the river water.The results of the correlation test of oil and fat values have a significant influence, because the presence of oil and fat in waters can increase public awareness of its adverse effects on aquatic ecosystems and aquatic life. High concentrations of ammonia can increase public awareness of the impact of ammonia on aquatic organisms and aquatic ecosystems, thereby helping people understand the importance of maintaining ammonia levels within safe limits. Total coliform has a significant influence on knowledge, attitudes and actions because it is around the Kali Bubu River. The high coliform value comes from the activities of people who defecate directly into the river without any processing. This is because there are still residents who do not have septic tanks so that the channels go directly to the river. This affects knowledge, attitudes and actions.

4. Conclusion

Based on the analysis that has been carried out, the following conclusions can be drawn:

1. The TSS, BOD, COD, Ammonia, Fat Oil and Total Coliform parameters of the Kali Tebu River do not meet the class quality standards according to Government Regulation No. 22 of 2021, while the pH, COD and Fat Oil parameters meet them.
2. The effect of testing the correlation between respondent identity and knowledge, attitudes and actions is mostly significant.
3. The influence of knowledge, attitude, action has significant results, while the correlation between the reciprocal status of values on knowledge, attitude, action all have no relationship or are not significant.

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