ANALYSIS OF THE FACTORS AFFECTING THE QUALITY OF THE CHEMICAL AND MICROBIOLOGICAL DRINKING WATER AT THE DEPOT DRINKING WATER REFILL TULUNGAGUNG DISTRICT

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ABSTRACT
Refill drinking water Depot is an industry that does the processing of the raw water into drinking water and sell directly to the consumer. Mn metal and bacterial Coliform is an indicator of refill drinking water polluters. This research aims to find the factors influencing the quality of Microbiology and chemistry at the depot drinking water drinking water refill Tulungagung district. Research using survey method with Cross sectional approach is analytical. The sampling technique used was Simple Random Sampling with a sample of 89 depot drinking water refill. Technique of data analysis using Regression and Logistic regression test linear. Independent variable examined was the source of raw water, the depot operator hygiene of drinking water, hygiene, sanitation, which covers three aspects namely sanitary location, building and facility sanitation. The results showed from 89 depot examined known as much as 79.8% sanitation facilities are not qualified, the value of the MPN 59.55% of eligible and levels of Mn 100% qualified. From Regresilogistik test results between independent variable with the value of the MPN indicate significance of 0.008 < (α = 0.05) on sanitation facilities are variable. This means there are influences between facilities sanitation microbiological quality of drinking water. On Linear regression test results between independent variable with the value obtained significance levels of Mn 0.47 > ((α = 0.05) which means no influence between independent variables with the chemical quality of drinking water. The lack of sanitation facilities increases the potential for bacterial contamination through the operator. Therefore the availability of on-site sanitation depot drinking water is a major factor that affects the quality of drinking water microbiology refills.

Key word*: Depot drinking water, hygiene and sanitation, hygiene, raw water source of the operator, the value of the MPN, manganese (Mn).*

A. Background

Clean water is the most important basic needs and very sensitive in people's lives, as well as being one of the basic necessities for the community. In general the problem of clean water can be divided into three issues, namely the qualitative, quantitative and continuity (Firmanasari, 2015). In urban areas and in rural areas, the current drinking water needs can be met by consuming drinking water in containers (AMDK), because it is considered more practical and more hygienic. Refill drinking water Depot (DAMIU) is an industrial raw water treatment process into drinking water and sell directly to the consumer. In East Java, there are as many as 5,924 depot refill drinking water that is not decent sanitary hygienic certificate pocketed from the East Java Health Office. Of the 6,000 depot drinking water refills, only 76 pocketed only setifikat. It is feared there are microbiology and chemical elements contained in drinking water is not worth consuming. Metal Mn is one of the very large amount of metal in the soil, in the form of oxides or hydroxides. MN sourced from human activities can enter the environment of water, soil, air and food. Microbiological parameters determined by conducting an examination of Coliform bacteria, E-coli and pathogenic bacterial species. Fecal Coliform bacteria there, e.g. E-coli, indicating that there has been contamination with fecal waste. In Tulungagung district around 116 DAMIU registered in the health service as many as 32 samples taken Tulungagung, DAMIU and the result as much as 25% of the water processed be bacteriologically examination are not eligible. The presence of Coliform bacteria may be caused by contamination of raw water, the type of equipment used, maintenance tools, handling water processed results and employees.

B. Research methods

Based on the type, this research using survey method of analytic approach to Croos Sectional, where this research aims to study the dynamics of correlations between risk factors with effects, by the way approach, observation or data collection while at the same time. This means that each subject of study only observed once and measurements of the status or variable character of the subject at the time of the examination (Notoatmodjo, 2015).

C. Results

1. MPN values of frequency distribution

Table 1.1 distribution of Frequency values of the MPN In Tulungagung district drinking water Depot on 20 July – September 20, 2017

	MPN Value	n	(%)
a.	Eligible	53	59,55
b.	Not Eligible	36	40,45

Source : Primary Research Data

Table 1.1 Note that 89 of the depot drinking water there are 53 (59.55%) value of the MPN from the water processed in Tulungagung district drinking water depot has qualified

2. Frequency distribution levels of Mn

Table 1.2 Distribution levels of Mn In Tulungagung district drinking water Depot on 20 July – September 20, 2017

The level of Mn	
Mean	0,10
Minimum	0,04
Max	0,19

Source: Primary Research Data

Data table 1.2 known levels of Mn in air results in processed drinking water depot in Tulungagung district averaged – averaged is 0.10 mg/l. minimum levels of Mn water processed amounted to 0.04 mg/L and the maximum rate is 0.19 mg/L

3. **Cross-Tabulations Between Hygiene and sanitation With the value of the Processed Water MPN Depot drinking water**

Table 1.3 Cross Tabulations Between Hygiene Sanitation With the value of the Processed Water MPN Depot drinking water Tulungagung district on 20 July – September 20, 2017

Variable	Value of MPN				p value
	TMS		MS		
	n	%	n	%	
Location sanitation					
TMS	31	46	36	54	0,05
MS	5	23	17	77	
Build					
TMS	27	48	29	52	0,05
MS	9	27	24	73	
sanitation facilities					
TMS	35	49	36	51	0,001*
MS	1	6	17	94	

* a statistically Meaningful with p < 0.05
Source: Primary Research Data

Based on table 1.3 above note that the location of the sanitation depot qualified drinking water shows the value of the processed results of MPN water 77% qualified. In terms of the building, if the building drinking water depot qualify then the value of the processed water MPN depot drinking water also qualify (73%). Viewed from a sanitation facilities sanitation facilities, if the depot drinking water qualify then the value of the processed water MPN depot drinking water would be eligible anyway (94%). The Chi square test results from all three of these variables is obtained p value 0.001 on the sanitation facilities variable means there is a connection between sanitation facilities with a value of processed water MPN depot drinking water.

4. **Cross-Tabulations Between Raw water source with a value of Processed Water MPN Depot drinking water**

Table 1.4 Tabulate cross between Raw water sources drinking water Depot is used With the value of the Processed Water MPN Depot drinking water Tulungagung district on 20 July – 20 September 2017

Variable	Value of MPN				p value
	TMS (n%)		MS (n%)		
	n	%	n	%	
The raw water source					
Well Water	4	57	3	43	0,35
Mountain Water	32	39	50	61	

Source : Primary Research Data

Based on the table above 1.4 can be seen if the depot drinking water using raw water source of water the mountains then the value of the processed water MPN depot drinking water tend to be eligible i.e. amounting to 61%. From the Chi square test results obtained p value 0.35 which means there is no relationship between the use of the raw water source with the value of the MPN.

5. **Cross-Tabulations between the Depot Operator Hygiene of drinking water With the value of the Processed Water MPN Depot drinking water**

Table 1.5 Cross Tabulations Between Operator Depot drinking water Hygiene With the value of the Processed Water MPN Depot drinking water Refill Tulungagung district on 20 July – September 20, 2017

Variable	Value of MPN				p value
	TMS		MS		
	n	%	n	%	
Hygiene operator					
TMS	31	44	39	56	0,16
MS	5	26	14	74	

Source : Primary Research Data

Based on table 1.5 can be seen if the State of hygiene of drinking water depot operators qualify then the value of the processed water MPN depot drinking water tend to be eligible i.e. amounting to 74%. From the Chi square test results obtained p value 0.16 which means there is no relationship between the operator's hygiene with a value of processed water MPN depot drinking water.

6. **The results of the logistic regression test Between Independent Variables with the quality of Microbiology (MPN)**

a. The dominant influence of the independent variable to the quality of the drinking water Microbiology (MPN)

Table 1.6 analysis of factors influencing the quality of Microbiology of water Drink In The Depot Drinking Water Refill Tulungagung Regency

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Location_Sanitation	,354	,897	,156	1	,693	1,425
	Build	,681	,728	,875	1	,350	1,975
	Satination fasilitation	2,867	1,308	4,801	1	,028	17,578
	Hygiene_Sanitation	-,396	1,501	,070	1	,792	,673
	The raw water source	1,002	,934	1,151	1	,283	2,723
	Hygiene_operator	,457	,642	,508	1	,476	1,579
	Constant	-2,259	1,852	1,487	1	,223	,105

a. Variable(s) entered on step 1: Location sanitation, Build, Sanitation fasilitation, Sanitation Hygiene, The raw water source, Hygiene operator.

Saource : Primary Research Data

Based on table 1.6 shows that of the six independent variables following the logistics regression test conducted only one variable that affects the quality of drinking water Microbiology at the depot drinking water refill Tulungagung district, namely, facilities sanitation (p = 0.028; Or = 17.578). This means that if the sanitation facilities don't qualify then the risk of microbiological quality of unqualified 17.578 times larger than sanitation facilities that qualify. So it can be concluded that the most dominant factor influencing the quality of Microbiology of drinking water sanitation facilities is a factor with the influence of 17.578 times.

7. **Linear regression test Results Between Independent Variables With Chemical Quality (levels of Mn)**

Table 1.7. Dominant Influence variables independent of the chemical quality of drinking water (levels of Mn)

Coefficients[a]							
	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	,101	,030		3,324	,001		

Location sanitation	,015	,015	,167	,974	,333	,386	2,592
Build	-,021	,013	-,264	-1,601	,113	,419	2,384
Sanitation fasilitation	-,004	,013	-,043	-,308	,759	,574	1,741
Hygiene_ Sanitation	-,001	,018	-,009	-,071	,944	,659	1,518
The raw water source	,004	,016	,026	,240	,811	,958	1,043
Hygiene_ operator	-,019	,011	-,205	-1,788	,077	,864	1,157
Value. MPN	,007	,009	,087	,747	,457	,835	1,198

a. Dependent Variable: Kadar_Mn

Saource : Primary Research Data

Based on Table 1.7 shows that of the six independent variable linear regression test done after none of the variables that affect the chemical quality of drinking water in the depot drinking water refill Tulungagung district. This can be inferred by looking at the value of Sig which of the six independent variable value Sig > 0.05.

D. Discussion

The main findings of this research is the availability of on-site sanitation is the most dominant factor influencing the quality of the drinking water microbiologically refills in Tulungagung district. This is evidenced from the results of statistical analysis with cross-tabulations (bivariat) statistical analysis and regression (Logistic Regression). The results of the statistical analysis tabulate sanitation facilities as a cross between an independent variable with the value of the dependent variable resulting MPN value of 0.001 p while the results of the statistical analysis with logistic regression results are obtained in the form of There is only one variable that affects the quality of drinking water Microbiology at the depot drinking water refill Tulungagung district, namely sanitary facilities (p = 0.028; Or = 17.578). The calculation of the value of the MPN refill drinking water conducted by the method of Coliform MPN test and examined in the laboratory of the health area (Labkesda) Tulungagung district. Calculation of the parameters of the MPN are said to be eligible if in 100 ml sample is not found Coliform MPN (Permenkes No. 43 Year 2014). This is in line with the classification of the WHO that mention that the levels of koliform on good water atauconformity is 0 cfu/100 ml of sample. Many factors affect the quality of drinking water microbiologically refills, including aspects of Hygiene and sanitation consists of 3 factors, i.e. factors place/location, equipment and penjamah factors (Permenkes No. 43 Th 2014). Aspects of the places seen with at least 11 parameters, namely the location of the pollution-free area, building powerful and easy maintenance, waterproof floors, walls, roofing and waterproof ceiling is strong, has a door that is strong and durable, lighting pretty, good ventilation, the air humidity is comfortable, have access to basic sanitation facilities and free of carrier animals and vectors of disease. The results obtained in this study that only variables statistically sanitation facilities means of MPN DAM. This is not in line with the results of previous studies conducted in the city of Denpasar. Previous research by Sabariah (2016) mentions that many of the factors that affect the quality of drinking water microbiologically refills, including sanitation of raw water, the location, the

process of disinfecting and sanitation facilities but that deal in the statistics are only a factor of sanitation site (p value = 0.000).

In this study showed a statistically meaningful sanitation facilities. Memilikifasilitas no sanitation in the form of hand-washing place, and or have a hand-washing but not equipped with running water and SOAP, so that its potential can be bacteriologically through contamination by operators who are not hygienic in beke that's like not washing tangansebelum serve consumers due to outage means washing his hands (Suriadi et.al., 2016). The difference in results of this research with some earlier research caused by weaknesses of this research. There are several weaknesses in this study, namely design and great samples. In the design of a cross-sectional study, exposure (exposure) and diseases (outcomes) measured simultaneously or concurrently on each of the subjects of the research. It is like we make a snapshot of the population at the same time. This resulted in the emergence of the limitations of the study, i.e. If there is a relationship between exposure and outcomes, the temporal nature of the relationship (Gordis, 2013). The second weakness comes from large samples. Researchers are trying to anticipate the onset of effect perancu by choosing engineering samples of Simple Random Sampling and has done a great sample calculation with a maximum error rate of 5% and a total population of 116. However, the population of the DAM a number of 116 turns out does not represent the whole of the existing DAM in Tulungagung district.

Based on the observations of the researchers and the scientific search data from multiple news articles and there are still many DAMS that do not have a business license and no response in the health service. Data from the employers ' Association and the distribution of drinking water Supplier Indonesia (APDAMINDO) mentions that three thousand of the depot drinking water spread area of Jabodetabek, only 20-30% that already have permission from the Ministry of industry and be eligible to be consumed (Online legal, 2013). Therefore research samples taken a number of sample population represents only 89 DAM that had been licensed in Tulungagung district so the withdrawal results conclusions cannot be generalized to the population in General in the region of DAM Tulungagung Regency. The limitations of the research on the chemical quality of drinking water chemical quality parameters are only viewed based on levels of Mn. This is because it is not possible to test all components of the chemical in drinking water causes health problems. Nevertheless, we can prioritize to see the levels of some metals such as iron, manganese and hardness. High levels of manganese can cause neurotoksik effects (WHO, 2011 and Adelina et.al., 2012). The results of statistical analysis showed that all the factors the only Predictor can predict levels of chemical quality Mn of 7.6%. This means 92.4% there are other factors which are not examined in this study.

The research indicates that levels of Mn were found from 89 DAM in Tulungagung district belongs to the categories of normal, i.e. does not exceed 0.4 mg/litre (Permenkes No. 492 Th 2010). Measuring results against levels of Mn shows that the average levels of Mn from the sample water recharge in Tulungagung district is 0.10 0.04 minimum value and maximum value of 0.19 and normal distribution of the data. This means there is no metal pollution Mn on drinking water refill. The absence of contamination metals Mn can also be proven from the water refills are not felt because of the high levels of the metal manganese is usually associated with high levels of iron so that on water recharge with a metal, it is certain that water high levels of iron and the levels

of Mn (Adelina et.al., 2012). In this study there was no leaching of Mn levels caused by raw water sources used for water refills came almost entirely from the mountains in the area, namely Sendang, Tulungagung. Levels of Manganese (Mn) in the environment increased in line with the the increasing human activities and industrial, manganese sourced from human activities can enter the environment of water, soil, air and the environment (Setiyono, 2014). There are several factors cause the chemical pollution of water, namely the nature of the soil or water quality, pollution of raw water treatment, at the time the screening process or material that direct contact with drinking water, filtration methods and equipment used (the WHO, 2011 and Adelina et.al., 2012). Unlike the microbial contamination may result in acute contamination, chemical compound causes latent health problems due to exposure to certain chemicals that constantly. Contamination may have occurred many years before the health problem is detected (Adelina et.al., 2012).

E. Conclusion
1. The value of the MPN in drinking water drinking water depot refill Tulungagung district amounted to 59.55% qualified. This indicates that from 89 samples processed water depot refill drinking water the majority of purity are not eligible.
2. Levels of Mn in air results in processed drinking water depot refill Tulungagung district averages – average of 0.10 mg/l. minimum Levels of Mn 89 samples of processed water amounted to 0.04 mg/L and the maximum levels of 0.19 mg Mn/l. From those results show that 89 samples processed water depot drinking water refill Tulungagung district all meme nuhi terms is chemically.

3. Hygiene sanitation depot drinking water rated from three aspects, namely, the location of buildings and sanitation facilities sanitation. Of these only three aspects of sanitation facilities that have an impact on the quality of the processed water microbiology depot drinking water refill Tulungagung district. This is proved by the results of statistical tests which the p value = 0.008.
4. raw water sources used by the depot drinking water refill Tulungagung district the majority (92%) using raw water source of water of the mountains. Statistically the use of raw water source there is no influence on quality of Microbiology or chemical quality.
5. Hygiene 89 operators of the depot drinking water refill Tulungagung district of 79% do not qualify. Based on statistical tests do not affect the quality of the operator's hygiene microbiological or chemical quality. This is evidenced by the value of the p value = 0.163.
6. independent of the variable factors that most influence the quality of Microbiology variable is statistically sanitation facilities. There is no independent variables that affect the quality of chemically processed water depot drinking water refill Tulungagung district.

F. Suggestion
1. For the community for the community should pay attention to the quality of drinking water recharge into daily consumption. How that can be done among others by knowing the certificate of hygiene or be eligible to list quality test results from the laboratory of the health area that belongs to the depot drinking water.

2. For Health Agencies For health agencies in order to better improve the supervision of the quality of water by conducting regular inspections three months once the processed result to water depot drinking water refill. To the consumer should provide insight into the importance of the quality of the chemical and microbiological drinking water and its impact on health.

3. For the next Researcher To the next so that researchers pay more attention to the research of the variable. In this case the operator hygiene variables become limitations in this study due to the inability of researchers to find out with certainty the actual operator conditions.

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