

# Water Quality in Wastewater Treatment Plants Effluent at Central General Hospital. Prof. dr. RD Kandou Manado

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**Abstract-** Hospitals are part of a health care system that provides medical, preventive, and promotional, and rehabilitation services. Medical needs are urgently needed, although the apparent effect of any discharge from the hospital is largely determined by the existing wastewater treatment system. Definition of wastewater quality will also affect the surrounding community, especially the health side of hospital waste. The purpose of this study is to determine the extent to which hospital pollution contributes to pollution. This study is a descriptive short course with practice conducted at Central General Hospital. Professor dr. RD Kandou Manado, North Sulawesi, Indonesia. Samples were taken from the hospital's wastewater treatment plant. The findings of this study indicate that WWTP is at Central General Hospital. Professor dr. RD Kandou Manado has successfully removed TSS, Turbidity, and BOD. Although in the case of fecal coliform bacteria, grains from WWTP did not show a significant decrease, further treatment is also required, and chlorination system regeneration is recommended.

**Index Terms-** Water quality, hospital, and fecal coliform.

## I. INTRODUCTION

Hospitals are part of a health services program that provides treatment, prevention, promotion, and rehabilitation services. In the provision of outpatient services, emergency outpatient and non-medical services produce waste that can affect the environment around the hospital. (Adisasmito, 2014).

The concept of hospital environmental management is emphasized in waste management, i.e. all waste from hospital operations in solid form, liquid, and gas by the Proclamation of the Minister of Health of the Republic of Indonesia Number 1204/Menkes/SK/X/2004 [1]. Most of the chemicals that use pollutants in the hospital are the so-called pollutants that come out; often uncontrolled pollution with potential health effects and monitoring of its occurrence. Their main feature is that they do not have to insist on the environment to create adverse effects because their high removal rates can be compensated for by their continued introduction to the environment (Verlicchi, et al., 2010).

Hospitals bring in an environment of deep-rooted antibodies that can be released into the sewage system (Katouli, et al., 2009). With hospital-specific antimicrobials, there may be a selective effect and therefore limiting hospital discharges containing antimicrobials may affect the amount of antimicrobial resistance (Harris, et al, 2013). As a result, the prevalence of antimicrobial resistance (AMR) is increasing worldwide. The contribution of clinical wastewater to contamination of contaminated wastewater resources (WWTP) is not fully understood. AMR bacteria containing hospital contaminants can be released into wetlands and soil after WWTP processing (Suvi Harris, et al., 2014).

Identify the constructs of a Journal – Essentially a journal consists of five major sections. The number of pages may vary depending upon the topic of research work but generally comprises up to 5 to 7 pages. These are:

- 1) Abstract
- 2) Introduction
- 3) Research Elaborations
- 4) Results or Finding
- 5) Conclusions

**In Introduction you can mention the introduction about your research.**

## II. RESEARCH ELABORATIONS

This study is a cross-sectional study with a method of the practice performed at Central General Hospital. Professor dr. RD Kandou Manado, North Sulawesi, Indonesia. Samples were taken from the hospital's wastewater treatment plant. Each sample is packaged in a colorless plastic bottle containing 2 liters of chemical and physical analysis and sterile samples of 100 mL bottles of coliform and fecal coliform analysis according to Indonesian National Standard (SNI) 6989.57 in 2008 (BSN 2008). Samples were taken to the SGS Laboratory Manado and the parameters tested were in situ, pH, turbidity, dissolved oxygen, all solids, BOD, complete coliform, and fecal coliform. The fecal coliform (*Escherichia coli*) was analyzed at Sam Ratulangi's Faculty of Math and Science University using a high probability number (MPN) with 3 steps, namely: (1) A presumptive test, this test to detect the presence of coliform bacteria, (2) A confirmed test, this test to re-evaluate the accuracy of coliform bacteria with the help of a selected isolation area and (3) Completed the test, this test to complete the results of the confirmation test by detecting yeast structures and viewing coliform bacteria.

## III. RESULTS

The measured parameters for wastewater samples from Central General Hospital. Prof. dr. RD Kandou Manado inlet and outlet are shown in table 1.

Table 1. Inlet and Outlet Parameter Results

Parameters	Unit	Result		Reference
		Inlet	Outlet	
Temperature	°C	28.5	27	38*
pH	n/a	7.1	7.75	6.0 – 9.0*
Total Suspended Solid (TSS)	mg/L	78	4	100*
Turbidity	NTU	73.5	7.4	**
Biological Oxygen Demand (BOD)	mg/L	162	9	75*
Dissolved Oxygen (DO)	mg/L	0.07	6.01	**
Fecal coliform ( <i>e-coli</i> )	MPN/100mL	>24200	24200	**
Total coliform	MPN/100mL	>24200	>24200	5000*

\* Decree of the Minister of the Environment No. 5 the year 2014

\*\* N/A

The results of the measured parameters for the hospital sewerage system outlet are shown in table 5.2.

Table 3. Estimation Test Result

Sample	Dilution Factor				Result
	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>	10 <sup>-4</sup>	
Inlet (morning)	(+)	(+)	(+)	(+)	Positive
Outlet (morning)	(+)	(+)	(+)	(+)	Positive
Inlet (afternoon)	(+)	(+)	(+)	(+)	Positive
Outlet (afternoon)	(+)	(+)	(+)	(+)	Positive

Information: (+) = produces gas, (-) = does not produce gas

The results of the *E. coli* estimation test showed that the sample tube showed positive results for the presence of *E. coli* bacteria, which resulted in a bubble in the Durham tube for each sample from both the inlet and outlet sampling points.

Table 4. Assertion Test Results

Sample	Dilution Factor				Result
	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>	10 <sup>-4</sup>	
Inlet (morning)	(+)	(+)	(+)	(+)	Positive
Outlet (morning)	(+)	(+)	(+)	(+)	Positive
Inlet (afternoon)	(+)	(+)	(+)	(+)	Positive
Outlet (afternoon)	(+)	(+)	(+)	(+)	Positive

Information: (+) = produces gas, (-) = does not produce gas

The results of the *E. coli* assertion test showed that the sample tube showed positive results for the presence of *E. coli* bacteria which in these results produced gas bubbles in the tube for each sample from both the inlet and outlet sampling points.

Table 5. Total Plate Count (TPC) Test Results

Sample	Repetition			Mean (10 <sup>2</sup> )	Std. Deviation
	R1 (10 <sup>2</sup> )	R2(10 <sup>2</sup> )	R3(10 <sup>2</sup> )		
Inlet (morning)	11.2	13.19	13.2	12.53	1.15
Outlet (morning)	1.2	1.7	2.2	1.7	0.5
Inlet (afternoon)	8.9	7.1	7.5	7.8	0.95
Outlet (afternoon)	4.2	3.9	3.1	3.7	0.57

The Total Plate Count (TPC) test shows the number of microbes present in the inlet and outlet samples of the Hospital's WWTP by counting the bacterial colonies grown on agar media. The results obtained are as shown in table 5 above.

### Discussion.

According to the standards of the Environment Minister's announcement No. 5 in 2014, the acceptable pH level of discharge from water is 6.0 to 9.0 [6], considering our study findings it is clear that pH value status is one of the most important parameters for wastewater quality testing. An increase or decrease in this parameter in wastewater will result in corrosion and damage to WTP and sanitation and play a major role in biological processes in wastewater management [7].

As shown in Table 1, the effects of TSS on influential and polluted people were at an acceptable level. Research results in Iraq show that it means TSS concentrations in contaminated sewage have higher outcomes in some hospitals [8].

BOD screening as a result of this study was 162 mg / L in waste and decreased to 9 mg / L in wastewater. The mean BOD's removal from the WTP of Shahid Beheshti, Yahyanejad, and Children of Amir kola hospital was 76.1, 70.5, 78.8, and 77, 83.8, and 82.1%, respectively. This result is consistent with our result when the BOD removal was 94.4%. The findings of another study show that the removal of BOD and COD from 70 Iranian hospitals was 67.5 and 64.3%, respectively, according to our research findings [9].

According to Indonesian standards from Environment Minister Decree No. 5 of 2014 water reuse rates, the permissible limit of total coliforms bacteria in hospital wastewater waste is 1000 MPN per 100ml of contaminant [6]. The elimination of fecal coliform from WWTP at this hospital cannot be determined precisely as there appears to be no significant reduction in strength (> 24200 MPN / 100mL) and contamination (> 24200 MPN / 100mL). In some studies, termination was more effective in secondary and higher education. (George, et al., 2002).

### IV. CONCLUSION

The findings of this study indicate that WWTP is at Central General Hospital. Professor dr. RD Kandou Manado has successfully removed TSS, Turbidity, and BOD. Although in the case of fecal coliform bacteria, grains from WWTP did not show a significant decrease, further treatment is also required, and chlorination system regeneration is recommended.

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