

QUALITY ANALYSIS OF LIQUID WASTE AT THE BLOOD TRANSFUSION UNIT OF SOUTH SULAWESI

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ABSTRACT

This study aimed to determine the quality of liquid waste at the Blood Transfusion Unit of South Sulawesi based on the parameters of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and total coliform. This study was conducted with an observational method with a descriptive approach. The results showed that BOD levels that had been processed (44.28 mg/L) and not been processed (429.89 mg/L) were eligible. COD levels that had not been processed (1071.42 mg/L) and those that had undergone processing (107.14 mg/L) were not yet eligible, and Total Coliforms that had not undergone processing 3,500,000 MPN/100 ml and that had undergone 2400 MPN/100 ml were eligible. Based on these three parameters, this study discovered that one of the parameters, the COD parameter was not eligible.

Keywords: quality of liquid waste, BOD, COD, total coliform

ABSTRAK

Penelitian ini bertujuan untuk mengetahui kualitas limbah cair pada UPT Transfusi Darah Provinsi Sulawesi Selatan berdasarkan parameter Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) dan Total Coliform. Penelitian ini dilakukan dengan metode observasional dengan pendekatan deskriptif. Hasil penelitian menunjukkan bahwa kadar BOD yang telah mengalami pengolahan (44.28 mg/L) dan yang belum mengalami pengolahan (429.89 mg/L) memenuhi syarat. Kadar COD yang belum mengalami pengolahan (1071.42 mg/L) dan yang telah mengalami pengolahan (107.14 mg/L) ada pada kategori belum memenuhi syarat, dan Total Coliform yang belum mengalami pengolahan 3.500.000 MPN/100 ml dan yang telah mengalami pengolahan 2400 MPN/100 ml ada pada kategori memenuhi syarat. Berdasarkan ketiga parameter tersebut, penelitian ini menemukan bahwa salah satu parameter yakni parameter COD belum memenuhi syarat.

Kata Kunci: kualitas limbah cair, BOD, COD, total coliform

INTRODUCTION

Wastewater pollution is a result of development in various fields in addition to providing benefits for the welfare of the people. Besides, the increase in environmental pollution, wastewater pollution is also caused by the increasing population and its activities. Liquid waste that is not managed properly can be a danger to the environment and the health of humans and other living things (Indonesian Ministry of Health, 2011).

Efforts must be made to prevent the emergence of environmental pollution and the dangers that will cause social and economic losses, health issues, and environmental issues. There must be

special management of waste to eliminate or have the nature of its danger reduced. Additionally, it is necessary to strive for environmentally friendly management methods and correct and careful supervision by various parties. Health service facilities as social-economic institutions have the function and duty to provide health services to the community in a complete manner. Despite providing beneficial services to the surrounding community, activities at health service facilities also have negative impacts in the form of pollution due to the disposal of waste without going through a proper treatment process according to the principles of overall environmental

management (Indonesian Ministry of Health, 2011).

The Regulation of Indonesian Indonesian Ministry of Health Number 92 of 2015 states that the Blood Transfusion Unit is a health service facility that organizes blood donor services, blood supply, and blood distribution. Some activities carried out by the Blood Transfusion Unit have the potential to produce a relatively large amount and standard quality of liquid waste that is not in accordance with the standards. As a result, it requires efforts to treat wastewater through the Waste Water Treatment Plant. The treatment of liquid waste is carried out to prevent the emergence of various potential risks of environmental impacts on the Blood Transfusion Unit, as well as health impacts for blood donor service recipients and for health workers who provide blood services.

Wastewater produced by the Blood Transfusion Unit can pollute the environment and cause harm to public health. The 2015 Regulation of Indonesian Ministry of Health states that safe handling and disposal of waste is important to minimize the risk of infection in donors, officials, the surrounding community, and the environment. Officers must receive adequate training on infection control procedures, waste management, and safe work practices (Indonesian Ministry of Health, 2015).

The liquid waste content originating from the Blood Transfusion Unit can be a medium for spreading diseases and environmental pollution, namely air pollution, water pollution, soil pollution, and food and beverage pollution. The resulting liquid waste must go through a treatment process before being discharged as it can contain organic and inorganic materials, the content of which is determined by dirty water tests including BOD, COD, and total coliform.

Negative effects may arise as a result of unhealthy environmental conditions due to imperfect hospital

wastewater management, including the presence of pathogenic bacteria that cause disease. Hospital wastewater has the potential to be hazardous to health, therefore it is necessary to handle wastewater properly by having a wastewater management installation. Therefore, the construction of the hospital must be accompanied by supervision, monitoring, and attention to hospital waste produced (Rahmawati & Azizah, 2005).

Based on hospital environmental sanitation health teaching materials by the Indonesian Ministry of Health's Human Resources Education Center for Health in 2017, wastewater from the laboratory must be treated at the wastewater treatment plant. If a wastewater treatment plant is not available, wastewater must be managed in accordance with needs that apply through collaboration with other parties or authorities (Health Human Resources Development and Empowerment Agency, 2018).

In the Regulation of Indonesian Ministry of Environment Number 5 of 2014, it is stated that businesses and/or activities of health service facilities where health service facilities conduct waste management of hazardous and toxic materials distributed to the wastewater treatment plant must have their wastewater meet the standards of domestic wastewater quality with the physical parameters of temperature, dissolved solids, suspended solids, chemistry, pH, BOD, COD, TSS, oil and fat, MBAS, and ammonia nitrogen total coliform (Indonesian Ministry of Environment, 2014).

The Blood Transfusion Technical Implementation Unit of South Sulawesi located in Makassar is classified as the main type of Blood Transfusion Unit, which carries out blood transfusion activities and blood laboratory examinations. The South Sulawesi Provincial Blood Transfusion Technical Implementation Unit has obligations in the control and management of liquid waste as regulated by the Regulation of Indonesian

Ministry of Environment Number 5 of 2014.

The South Sulawesi Provincial Blood Transfusion Technical Implementation Unit currently conducts wastewater treatment through the Wastewater Treatment Plant. However, the liquid waste generated by the Blood Transfusion Technical Implementation Unit could still contain hazardous substances which have great potential to impact the health of humans who are in service internally and people who are out of service, namely people or communities who live around the Implementing Unit Technical Blood Transfusion. Furthermore, the resulting liquid waste can potentially reduce environmental quality.

According to Nainggolan and Susilawati (2011), cited in Manora (2017) pollution can damage the environment if there is no balance between pollutants and recipients (the environment). If in this case it is not managed properly, it will cause various human health problems. Apart from the development of various human health problems, it can cause damage to objects, plants, and livestock, as well as damage and potentially kill aquatic biota (Nadeak, 2017).

In the process of operating wastewater treatment plants owned by health service facilities, various standard operating procedures are required from the time of initial operation (startup) to the end. Routine maintenance of the wastewater treatment plant is needed up to the cessation of operation of the Wastewater Treatment Plant. Problems that occur during the operation of the wastewater treatment plant must be overcome as quickly as possible, such as blockages in the channel resulting in the flow of liquid waste into the reactor. These problems require handling quickly and precisely in order for the final goal of wastewater treatment through the Wastewater Treatment Plant to be achieved.

Based on the above background, research is needed on the quality of liquid waste based on BOD, COD, and total coli parameters before and after liquid waste treatment at the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit. By conducting this research, the quality of liquid waste produced by the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit will be known and allow for the handling efforts to be carried out more quickly.

METHODS

The research used observational research with a descriptive approach. This research was conducted at the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit in Makassar beginning in April 2019 and ending in June 2019. The population of this study was wastewater originating from the activities of the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit. The research sample had two points, the first of which was point I at the Wastewater Treatment Installation Inlet, which was the combined result of various types of wastewater from each room carrying out activities in the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit South. Point II was the result of waste from the wastewater treatment plant.

The sampling technique utilized in this study was the composite sampling technique (combined time). This technique uses instantaneous sampling taken at the same place at different times within a certain period. Sampling was carried out in the morning at 08.00 and in the afternoon at 17.00. The number of samples at each sampling point was 2 (two) points multiplied by 2 (two) times of sampling, and then multiplied by 3 (three) parameters again giving a total number of 12 samples. Sampling was done by placing each

sampling point consisting of 4 (four) samples.

Measurement methods in this research used tools, materials, and work procedures that are as follows:

BOD Measurement

In measuring BOD, the tools consisted of Winkler incubation bottles, incubators 20°C or 28°C, erlenmeyer, dropper pipettes, scale pipettes, burettes, and measuring cups. Meanwhile, the materials used for BOD measurements included NaOH.KI, MnSO₄, H₂SO₄, Kanji, and Na₂S₂O₃ with the following work procedures: 1) enter the sample into a dark BOD bottle and a bright BOD bottle, cover no bubbles; 2) incubate dark BOD bottles for 5 nights; 3) to the bright BOD bottle, add 1 ml of MnSO₄ and 1 ml of NaOH.KI until it turns brown and homogeneous; 4) add 1-2 drops of H₂SO₄ until yellow and homogenized; 5) transfer 50 ml into the measuring cup, then transfer into Erlenmeyer; 6) add 1-2 drops of the starch solution until it changes colour and is homogeneous; 7) conduct titration using 0.025 N Na₂S₂O₃ solution slowly until the mixture becomes clear; 8) calculate the use of the Na₂S₂O₃ solution; 9) after incubation for 5 nights, perform BOD measurements on dark BOD bottles; 10) add 1 ml of MnSO₄ and 1 ml of NaOH.KI to the bottle until homogeneous; 11) add 1-2 drops of H₂SO₄ until homogeneous; 12) pour 50 ml of the mixture into the measuring cup, then transfer into erlenmeyer; 13) add 1-2 drops of starch solution until homogenized; and 14) slow titration using a 0.025 N Na₂S₂O₃ solution until the colour turns clear.

Calculation

$$DO \text{ (mg/l)} = \frac{V \text{ Thiosulfat} \times N \text{ Thiosulfat} \times 1000 \times Be \text{ O}_2 \times P}{V \text{ Sample}}$$

$$BOD = DO_0 - DO_5$$

Information:

DO₀ : DO immediately (DO nol)
DO₅ : DO 5 day
P : Thinner

Be O₂ : Equivalent Weight

P : Thinner

COD Measurement

The COD measurement utilized a COD reactor, a 5.0 ml volumetric pipette, 10 ml, 25 ml, 5 ml, and 10 ml pipettes, glass cups, an erlenmeyer, 100 ml and 1000 ml measuring flasks, and analytical scales. The materials prepared included K₂Cr₂O₇ solution, FAS solution, H₂SO₄ reagent, and a ferroin indicator.

The COD measurement work procedures consisted of: 1) put the sample in an organic free bottle; 2) if not analyzed immediately, the sample is preserved by adding H₂SO₄ until the pH is less than 2 and stored in a cooler at 2-6°C with a recommended maximum shelf life of 7 days; 3) pipette a 2.5 ml sample into the COD tube and add 1.5 ml each of the digestion solutions and 3.5 ml of the sulfuric acid reagent solution; 4) 2.5 ml distilled pipette as a blank, and add 1.5 ml of the digestion solution and 3.5 ml of sulfuric acid reagents; 5) beat until homogeneous, then cover; 6) heat the COD reactor until it reaches a temperature of 150°C; 7) insert all the tubes into the COD reactor that has reached a temperature of 150°C, leave for 2 hours; 8) remove all cylinders and cool to room temperature; 9) titration with a 0.05 M FAS solution with a ferroin indicator; and 10) use the blank form as a reference

Calculation:

$$\text{Mg/L COD sebagai O}_2 = \frac{(A - B) \times M \times 8000}{\text{ml sample}}$$

Where:

A = FAS volume used for blank titration (ml)

B = FAS volume used for sample titration (ml)

M = FAS molarity

8000 = milliequivalent oxygen weight x 1000 ml/L

Measurement of Total Coliform MPN

This study measured the total MPN of coliform using tools such as: incubators,

sample bottles, measuring pipettes, test tubes, Durham tubes, tube racks, and needles.

The work procedures in measuring the total MPN of coliform included: 1) enter the sample into a sterile bottle, homogeneous 25 times; 2) make 10x, 100x, and 1000x dilutions into a Phosphate Buffer Solution (PBS) pH 7.2; 3) continue with the preliminary test using Lactose Broth (LB) media; 4) each dilution uses 5 LB media by inserting 1 ml sample into LB media; 5) incubate at 35°C for 24-48 hours; 6) observe each tube to see the presence or absence of gas, there is gas showing positive results; 7) proceed to the affirmation test only for positive tubes using Brilliant Green Lactose Broth (BGLB) media; and 8) gather positive results based on turbidity and gas in the Durham tube.

Primary data collection was performed by conducting water sample inspection activities carried out at the Makassar Health Laboratory Center on with three parameters, namely BOD, COD, and total coliform. Secondary data collection was done by collecting the general profile and the technical profile of the implementation of wastewater treatment through the Wastewater

Treatment Plant as released by the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit.

Data analysis was performed by analyzing the results of the examination of samples in the laboratory and describing them in narrative form descriptively.

The research has passed the process of examining the research protocol and obtained the Certificate of Ethical Review Number 05-KEPK-FKM-UPRI on October 7, 2019 by the Health Research Ethics Committee of the Faculty of Public Health, University of Pejuang.

RESULTS

The results of this research were based on sampling at two points of sewerage. Point I was wastewater that came from the Inlet, which was waste that had not been treated. Point II, namely wastewater at the Outlet, which was waste that had undergone a treatment process. Samples of the BOD, COD and Total Coliform parameters were examined at the Makassar City Central Health Laboratory. The results of the wastewater parameters examined are described in the following parameters:

Biological Oxygen Demand (BOD) Parameters

Table 1. Results of BOD Liquid Waste Examination in the Blood Transfusion Unit of South Sulawesi Province

Parameter	Check Up Result			Information
	Inlet	Outlet	Standard	
BOD	429.89 mg/l	44.28 mg/l	50 mg/l	Meet the standards

Source: Primary Data, 2019

The results of the sample inspection of these parameters were then compared to the Wastewater Quality Standards for Health Services Facilities based on factors determined by the Ministry of Environment Number KEP-58/MENLH/12/1995 Indonesian Ministry of Environment, 1995).

The examination in Table 1 shows that the BOD content of wastewater in the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit at point I (Inlet) was 429.89 mg/l and at point II (Outlet) 44.28 mg/l. The examination results showed that the BOD content of wastewater decreased after treatment, and BOD levels after processing

met 50 mg/l as the requirement of Wastewater Quality Standards for Health Services Facilities as determined by the Indonesian Ministry of Environment Number KEP-58/MENLH/12/1995 (Indonesian Ministry of Environment, 1995).

There was a decrease in BOD levels in wastewater after going through the treatment process through the Wastewater Treatment Plant with a value of 44.28 mg/l, which means that it has met the specified standard of 50 mg/l.

The results of this study show that there was improvement in the quality standard of wastewater after going through the treatment process. This can be seen in the BOD levels at point I (Inlet) with a

value of 429.89 mg/l, which indicates it far exceeds the standards.

Thus, if no treatment is carried out through the Wastewater Treatment Plant, the BOD levels contained in the liquid waste would have caused adverse impacts on environmental health and would have been a disruption to health of health workers, donors, families, donors, and the community around the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit. The results of the study also reinforce that efforts to treat wastewater need to be done consistently and continuously, given the significant decrease in BOD levels after the wastewater treatment process.

Chemical Parameters of Oxygen Demand (COD)

Table 2. Results of Liquid Waste COD Examination in the Blood Transfusion Technical Implementation Unit of South Sulawesi Province

Parameter	Check Up Result			Information
	Inlet	Outlet	Standar	
COD	1071.42 mg/l	107.14 mg/l	80 mg/l	Does not meet standards

Source: Primary Data, 2019

Table 2 shows the COD content of wastewater in the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit at point I (Inlet) to be 1,071.42 mg/l and at point II (Outlet) 107.14 mg/l. The inspection showed that the COD content of wastewater decreased after treatment, and the COD content after processing did not meet the requirements because it exceeded 80 mg/l as the Wastewater Quality Standards of Health Services Facilities based on the decision of the Minister of Environment Number KEP-58/MENLH/12/1995.

Total Coliform Parameters

Table 3. Results of the Total Coliform Test for Liquid Waste in the Blood Transfusion Technical Implementation Unit of South Sulawesi Province

Parameter	Check Up Result			Information
	Inlet	Outlet	Standar	
Total Coliform	3.500.000 PN/100ml	2400 PN/100ml	500 PN/100ml	Meet the standards

Source: Primary Data, 2019

Table 3 shows that the total levels of Coliform wastewater in the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit at the point I (Inlet) were 3,500,000 MPN/100 ml and at point II (Outlet) 2400 MPN/100 ml. The results of the examination showed that the level of total coliform wastewater decreased after treatment, and the levels of total coliform after treatment meet the requirements of Wastewater Quality Standards for Health Services Facilities based on the decision of the Indonesian Ministry of Environment Number KEP-58/MENLH/12/1995, which is 5,000 MPN/100 ml.

DISCUSSION

The South Sulawesi Provincial Blood Transfusion Technical Implementation Unit has a wastewater treatment facility for its wastewater to run through before it is channelled into the waterways in the environment. However, it is necessary to test the wastewater in order for the liquid waste quality standards produced by the Blood Transfusion Technical Implementation Unit to be identified to allow efforts to deal with the impacts that are likely to be made possible immediately.

Wastewater from the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit in general comes from the kitchens, donor blood collection rooms, laboratories, and toilets or bathrooms.

Research was conducted by examining the quality of wastewater from the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit by taking samples, namely wastewater that did not undergo prior treatment and wastewater that had undergone processing. The parameters used to measure the sample included BOD, COD and total coliform by examining samples at the Makassar Health Laboratory Center.

Biological Oxygen Demand (BOD) Parameters

The BOD test results describe the amount of dissolved oxygen needed by living organisms to break down or oxidize waste materials in water. The measured BOD value indicates the amount of oxygen needed to oxidize waste in wastewater.

The value contained in the BOD parameter indicates that if the oxygen level is too low, then organisms that require oxygen to live, such as aerobic bacteria, will die. Furthermore, if aerobic bacteria die, aerobic organisms will decompose organic matter and produce other materials such as Methane and H₂S, which can cause a foul odour in water.

Meanwhile, if the BOD value is too high, it can affect the wastewater treatment process because the existing bacteria cannot grow and develop properly due to lack of oxygen. This happens because of the large number of pollutants in liquid waste, causing organic materials and other pollutant materials to not be able to decompose properly due to the lack of bacteria consuming organic materials contained in wastewater to be reduced.

Based on the results of laboratory tests on samples taken at the Inlet point, the BOD level was 429.89 mg/l, and at the Outlet point, the BOD content was 44.28 mg/l. From both points, the value obtained shows that they are in accordance with the Standard Quality Standards of Health Service Facilities Liquid Waste in accordance with the Decree of the Indonesian Ministry of Environment Number KEP-58/MENLH/12/1995.

The reduction in BOD levels in wastewater after going through the treatment process at the wastewater treatment plant with a value of 44.28 mg/l is important to note in efforts to improve the quality of liquid waste in healthcare facilities and their surrounding environmental conditions. Thus, environmental impacts that can adversely affect the health of people who have good activities within the South Blood Transfusion Technical Implementation Unit including employees, donors and introductors, and the people who live around the Regional Transfusion Technical Implementation Unit can be overcome from the aspect of BOD levels.

The research is in line with research conducted by Wage Komarawidjaja (2007), which states that, based on the Decree of the Indonesian Ministry of Environment Number Kep-03/MenKLH/10/1995 regarding the quality standards of industrial wastewater, the BOD parameters after undergoing processing at the processing unit the activated sludge system has met the quality standards for industrial wastewater.

According to the quality standards, the maximum level of BOD quality standard is 60 mg/l. With reference to the textile industry wastewater quality standards, the BOD parameters have met the quality standards (Komarawidjaja, 2011)

This study is different from the study conducted by Gafur in 2014 concerning the study of Waste Water Treatment Plant Efficiency on Liquid Waste Quality in Makassar Hajj Hospital which obtained the average BOD content at the hospital's waste water treatment plant inlet was at 178.4 mg/l and at the outlet 72.8 mg/l, not in accordance with the standard of ≤ 30 mg/l in the Decree of the Indonesian Ministry of the Environment Number Kep-58/MENLH/12/1995 (Gafur, 2015).

According to Suyono and Budiman (2011), Buntaa, Sondakh, and Umboh (2019) stated that the high BOD parameters can be caused by high organic content in the form of the remains of vegetables, fruits, oil, and leaves that will cause a foul odour due to the decomposition process (Buntaa, Sondakh, & Umboh, 2019). Similar research was also carried out by Herlina Oliy (2013) at the Datoe Binangkang Regional General Hospital in the Bolaang Mongondow district, which resulted in an examination of BOD levels at effluent points I and II. The results did not meet the requirements of the Liquid Waste Quality Standards of Hospital Activities based on the Decree of the Indonesian Ministry of Environment Number 58 of 1995 (BOD = 30 mg/L). This was due to a large amount of organic matter content in wastewater produced from home activities that does not degrade easily. This was also affected by the wastewater in the Datoe Binangkang Regional General Hospital not undergoing processing before being accommodated (Oliy, 2014).

Chemical Oxygen Demand (COD) Parameters

COD test results provide an analysis of the level of chemical pollutants

present in wastewater. Additionally, COD test results can measure organic compounds that cannot be solved biologically.

In general, COD content is higher than BOD content due to the greater amount of materials contained in wastewater that can be chemically oxidized compared to biologically oxidized. The difference between COD values and the BOD values is caused by factors such as chemicals that are resistant to biochemical oxidation. The difference is not caused by chemicals resistant to chemical oxidation, such as lignin, and chemicals that can be oxidized chemically and are sensitive to biochemical oxidation. The presence of toxic materials in waste that will interfere with the BOD test but do not interfere with the COD test will not cause differences between the COD and BOD values.

The results of the study showed that the level of COD exceeded the standard quality of wastewater or did not meet the requirements when compared to the maximum levels allowed by the Decree of the Indonesian Ministry of Environment Number KEP-58/MENLH/12/1995, which is 80 mg/l.

The COD level that exceeded the above standards should indicate the presence of environmental threats that can adversely affect public health to the population in and around the Southern Province Blood Transfusion Technical Implementation Unit, as well as the population around the Regional Transfusion Technical Implementation Unit.

The high level of COD that exceeded the stipulated wastewater quality standard indicates that the Wastewater Management Installation of the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit has not worked optimally in controlling liquid waste.

Meanwhile, the Decree of the Indonesian Ministry of Environment Number KEP-58/MENLH/12/1995

concerning Quality Standards for Liquid Waste for the Activities of Hospitals aims to preserve the environment and allow it to remain beneficial for the lives of humans and other living creatures. This has the potential to produce waste that can cause environmental pollution, therefore it is necessary to control the disposal of liquid waste that is discharged into the environment by setting a Standard Quality of Liquid Waste for Hospital Activities.

The results of the study are in line with the results of a study entitled Efficiency of wastewater treatment plants on the Quality of Wastewater Treatment at Makassar Hajj Hospital conducted by Gafur in 2014, which had results of COD examination tests at the Hajj Hospital wastewater treatment plant inlet at an average of 404.1, and an average of 161.8 mg/l at its outlet, neither of which meet the requirements of the Decree of the Indonesian Ministry of Environment Number Kep-58/MENLH/12/1995, which is less than or equal to 80 mg/l (Gafur, 2015).

This study is not in line with research conducted by Erista Manora Nadeak, et al. (2017) at the H. Adam Malik Central General Hospital, which stated that hospital wastewater has met the standards in the Regulation Number KEP-58/MENLH/12/1995 concerning Hospital Liquid Waste Quality Standards (Nadeak, 2017).

A similar study was carried out by Windari, Rafika Tri (2013) who had determined the levels of COD in the liquid waste of Sultan Sulaiman Hospital using a Spectroquant Nova 60. Heated for two hours at a temperature of 148°C conducted inside, the thermoreactor found that COD levels in the wastewater during the first week was at an average of 40.150 mg/L, the second week was at an average of 45.249 mg/L, and third week was at an average of 53.558 mg/L. COD levels obtained were still below the maximum level. The results obtained show that the hospital wastewater did not exceed the

standards set by KEP-58/MENLH/12/1995 concerning Hospital Liquid Waste Quality Standards (Windari, 2013).

Total Coliform Parameters

Coliform bacteria are a group of microorganisms that are commonly used as indicators because they can be an indication to determine whether a water source has been contaminated by pathogens or not. Existing research literature suggests coliform bacteria can cause cancer. In addition, based on the results of research conducted by Alang (2015) through the proceedings of a national seminar on Microbiology Health and the Environment, these decomposing bacteria produce various poisons such as indole and skatole, which can cause disease if an excessive amount is present in the body. Coliform bacteria can be used as an indicator because its density is directly proportional to the level of water pollution (Alang, 2015).

This bacterium can detect pathogens in water such as viruses, protozoa, and parasites. In addition, these bacteria also have a higher resistance than pathogens and are more easily isolated and grown. The results of laboratory examinations of samples taken at the Inlet point show 3,500,000 MPN/100 ml total coliform levels and 2,400 MPN/100 ml total coliform levels were obtained at the Outlet point.

The values obtained from sample checking at both points indicate that the value of the total coliform is in accordance with the Standard Quality Standards of Wastewater that are permitted by health services in accordance with the Decree of the Indonesian Ministry of Environment Number KEP-58/MENLH/12/1995.

This research is in line with research conducted by Abdullah, Umboh, Bernadus (2019) about the description of the quality of liquid waste in hospitals using the total coliform parameter. The coliform content in the 9 MPN inlet tub and at outlet 34. Meanwhile, the total

coliform after undergoing 24 mg/l, 46 mg/l and 34 MPN has fulfilled the KEP-58/MENLH/12/1995 quality standard of coliform bacteria, which is 10,000 MPN/100ml. Examination and monitoring are needed for other chemical parameters in hospital waste (Abdullah, Umboh, & Bernadus, 2019).

The results of this study differ from the results of research conducted by Rahmawati and Azizah in (2005) on the topic of Differences in Levels of BOD, COD, TSS, and Coliform MPN in Wastewater, Before and After Treatment in Nganjuk District General Hospital with MPN Coliform research results the wastewater before and after treatment exceeds the standard quality of liquid waste that has been set (Rahmawati & Azizah, 2005).

Research was also conducted by Harlisty et al, (2016) at the Bitung City Regional General Hospital with the results of the study stating that the total Coliform Bacteria content at the Inlet point at 09.00 had an average value of 156,666 MPN/100 ml, while the Inlet point at 19.00 had an average value of 160,000 MPN/100 ml. The outlet at 09.00 had an average value of 160,000 MPN/100 ml, while at 19.00 it had an average value of 137,333 MPN/100 ml. The study concluded that the content of coliform total bacteria had not met the quality standard, so it was necessary to repair damaged wastewater treatment equipment to increase the efficiency of removing organic matter and pathogenic microorganisms (Harlisty, Akili, & Kandou, 2016).

The density of activities that exist in the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit has an impact on the possibility of risks that occur due to waste treatment that does not meet quality standards. Active community groups in the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit include donors who come to donate blood, employees carrying out daily tasks in contact with donors,

blood donors and samples of sick people from hospitals, hospital staff or families of sick people who visit to bring requests for blood and blood samples, and the general public around the area. All these groups are exposed when the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit discards their waste improperly in the surrounding environment.

CONCLUSION

It can be concluded that the value of BOD levels that had not been treated (429.89 mg/l) and those that have undergone processing (44.28 mg/l) meet the requirements. It is recommended to maintain BOD levels according to requirements by undergoing processing before being accommodated. The COD levels that had not been processed (1071.42 mg/l) and those that have undergone processing (107.14 mg/l) did not qualify. It is recommended that the COD processing is done through heating. Total coliforms that had not undergone 3,500,000 MPN/100 ml processing and those that had undergone 2,400 MPN/100 ml processing are eligible. To maintain this, routine maintenance is needed for the wastewater treatment plant to remain in good condition and maintain its efficiency in removing organic matter and pathogenic microorganisms. Thus, it is recommended that the South Sulawesi Provincial Blood Transfusion Technical Implementation Unit review the process of wastewater treatment at the Wastewater Treatment Plant, especially using the COD parameters. Furthermore, it is advisable to conduct training for officers who are responsible for implementing the wastewater treatment plants.

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