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The Number of Bacteria Contained In Some Swimming Pool In Padang City

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Abstract:- Swimming pools can be a medium for disease transmission through pool water intermediaries. Pathogenic microorganisms can enter the pond directly or indirectly through contaminated air, soil, dust, rainwater, human or animal waste, and shower waste. This study aims to observe the number of bacteria found in the water of the UNP, ABG, and Teratai swimming pools in Padang. This type of research is a non-specific observational analytic design with a cross-sectional research design. Samples were taken in the form of swimming pool water as much as 100 mL and a depth of 20 cm from the surface of the water. Each sample was taken to the laboratory to determine the number of bacteria present in each swimming pool. The results of observation I showed no bacteria in the morning or evening in the UNP swimming pool water, while in observation II there were bacteria with numbers exceeding the swimming pool water quality standards. Meanwhile, the ABG and Teratai pool water contained several bacteria that exceeded the swimming pool water quality standards in observations I and II, both in the morning and in the evening.

Keywords:- *bacteria, swimming pool.*

I. INTRODUCTION

Water is a daily essential for the life of living things. One of the functions of water for humans is for recreation. One of the recreational sports that uses water is swimming. Natural water is the main source of swimming pool water. The water potential of swimming pools can be increased by frequent water changes and the use of disinfectants [1]. Disinfectant given to swimming pool water serves to inhibit or kill microorganisms. Swimming pools can be infected with pathogenic microorganisms that enter the pool directly or indirectly through contaminated air, soil, dust, rainwater, sewage, human or animal waste, and shower waste [2].

Pathogenic microorganisms are microorganisms that cause diseases, such as bacteria, viruses, fungi, and protozoa that can damage the host's immune system. The spread of these microorganisms can be through droplets, direct contact, and body fluids carried by vectors and can be found in soil, air, water, and even in swimming pools [3]. If swimmers drink pool water contaminated with microorganisms, it can cause diarrhea, typhoid fever, hepatitis, and cholera [4].

Pool water that is not treated properly and contaminated with microorganisms can cause outbreaks of diseases such as skin ulcers, gastroenteritis, conjunctivitis, trachoma, ear infections (such as otitis media), cholera, dysentery, eczema, and skin rashes [2]. There are various types of bacteria found in swimming pools such as: Enterococcus faecalis, Clostridium perfringens, Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, S. epidermidis, and Proteus vulgaris [1].

Since swimming pools can be a medium for disease transmission, swimming pool sanitation needs to be considered. To protect the public using swimming pools, the government issued a regulation from the Minister of Health of the Republic of Indonesia No. 32 of 2017 concerning environmental health quality standards and swimming pool water health requirements, including physical, biological, and chemical [5]. One aspect that must be monitored in swimming pool sanitation is the microbiological quality. This study observed the number of bacteria found in several swimming pools in Padang.

II. MATERIAL AND METHODS

This research is a type of non-specific observational analytic research with a cross-sectional research design. The research location is in the UNP swimming pool (indoor), ABG swimming pool (outdoor), and Teratai swimming pool (outdoor) in Padang. Samples were taken in the form of swimming pool water as much as 100 mL and a depth of 20 cm from the surface of the water. Sampling was carried out on Mondays and Thursdays, in the morning and evening. Samples were taken at one sample point, which is at the edge of the swimming pool. Each sample was grown on a Nutrient Agar medium to determine the number of bacteria present in each swimming pool.

A. Preparation of Nutrient Agar (NA) Medium

Weigh 10 g of NA, then put the material into a glass beaker, then add distilled water until the volume reaches 500 mL The mixture is heated to boiling, then put into an Erlenmeyer and tightly covered with aluminum foil and wrapped. The medium was sterilized using an autoclave at 121^{o} C at a pressure of 15 atm for 15 minutes.

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B. Count the number of bacteria

The number of bacteria calculations was done by serially diluting water samples (10^{-1}, 10^{-2}, 10^{-3}), then 1 mL was transferred to NA medium and incubated for 48 hours. The number of bacteria is calculated in the following way:

JB = A x B

Description: JB = number of bacteria per ml
A = number of bacterial colony
B = dilution factor

III. RESULTS

Based on the results of observations on the number of bacteria from the three swimming pools, it can be seen in observation I that there were no bacteria in the UNP swimming pool either in the morning or in the evening. Meanwhile, in the ABG swimming pool, the number of bacteria was 71.103 CFU/mL (log x = 4.85) in the morning, and 80.103 CFU/mL in the afternoon (log x = 4.90). Likewise, for Teratai swimming pool, there were 56,103 CFU/mL (log x = 4.75) in the morning and 74,103 CFU/mL (log x = 4.87) in the afternoon (Figure 1.).

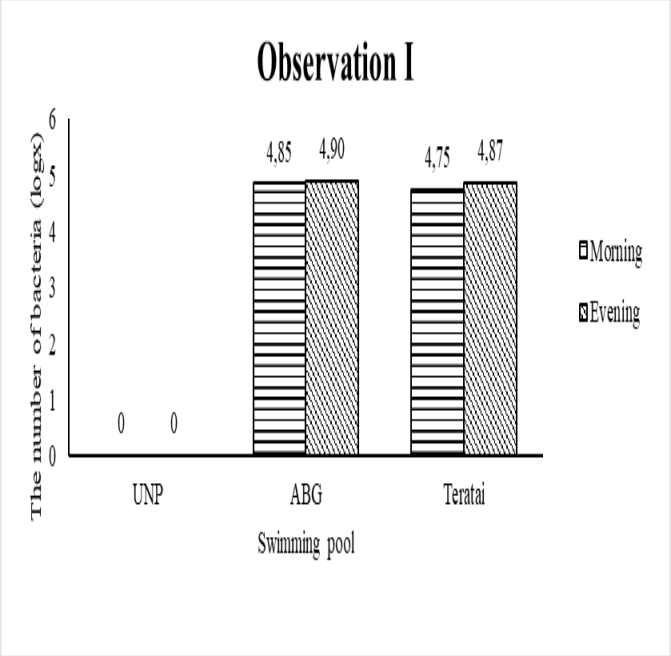

Fig. 1: The number of bacteria in the swimming pool of observation I.

Observation II of this study showed that in the morning there were no bacteria found in the UNP swimming pool, while in the afternoon the number of bacteria was found to be 15,101 CFU/mL (log x = 2.18). In the morning the ABG swimming pool found the number of bacteria 4.103 CFU/mL (log x = 3.6), and in the afternoon 13.103 CFU/mL (log x = 4.11). While in the Lotus swimming pool, there were 1,102 CFU/mL (log x = 2.0) in the morning and 11,103 CFU/mL (log x = 4.04) in the afternoon (Figure 2.).

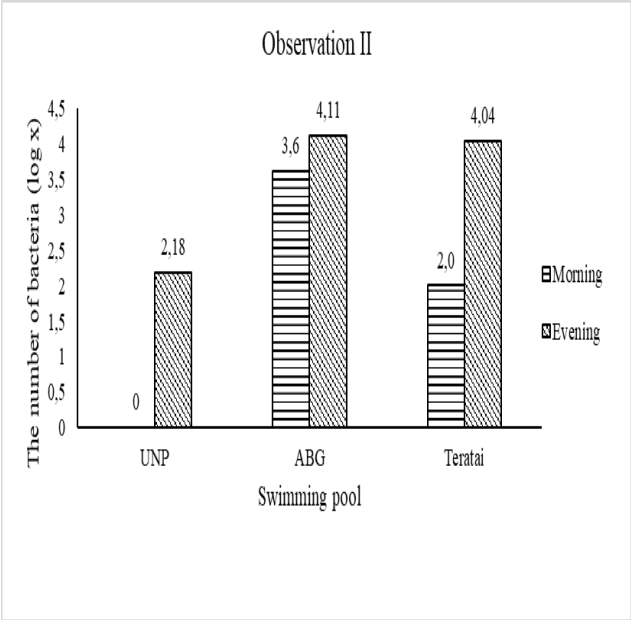

Fig. 2: The number of bacteria in the swimming pool of observation II.

Based on the Regulation of the Minister of Health of the Republic of Indonesia Number 32 of 2017 concerning Environmental Health Quality Standards for swimming pool water, the maximum number of bacteria is 100 CFU/100 mL (1 CFU/mL). From observation I that has been made, only the UNP swimming pool meets the established pool water quality standards because no bacterial colonies were found. However, observation II found the number of bacteria 15,101 CFU/mL in the afternoon. This does not meet the pool water quality standard, which is 1 CFU/mL. Both ABG and Teratai swimming pools have bacterial counts that exceed the pool water quality standards, both observation I (morning and evening), and observation II (morning and afternoon).

The discovery of the presence of bacteria in high numbers and not in accordance with the pool water quality standards are thought to be caused by the frequent occurrence of swimmers excreting the rest of the body's metabolism in the pool, or swimmers not rinsing themselves before entering the water. Amala and Aleru [6] observed the bacteriological quality of swimming pool water in Port Harcourt Metropolis, of the 10 swimming pools studied, there are 4 swimming pools that contain bacteria. The types of bacteria identified were a group of bacteria that did not come from feces, including Staphylococcus epidermidis, Bacillus cereus, Micrococcus, and S. aureus.

The presence of enterotoxin-producing bacteria such as S. aureus and B. cereus, can be associated with gastroenteritis caused by ingestion of swimming pool water [1]. S. aureus present in pool water may originate from swimmers since it is a normal flora of the body and mucous membranes and is the most common etiologic agent of septic arthritis [7].

Escherichia coli is a bacterium that can be an indicator to determine contamination in swimming pool water caused by feces [8]. Water that has been contaminated with Escherichia coli bacteria can cause waterborne disease. Waterborne disease is a disease that is transmitted through drinking water and has been contaminated with pathogenic microorganisms. Most waterborne diseases are characterized by diarrhea, which involves excessive bowel movements, often resulting in dehydration and possibly death [9]. Thus, the presence or absence of microorganisms in swimming pool water is a determinant of the cleanliness of pool water and the safety of the swimmers' health [10].

IV. CONCLUSION

No bacteria were found in the UNP swimming pool water in observation I, while the observation II contained bacteria in the afternoon and exceeded the pool water quality standards. As for ABG and Teratai swimming pools, the number of bacteria exceeding the swimming pool water quality standards was found, both in observations I and II.

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