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Parameter Analysis of pH, Chromium, and MPN Coliform in Alkaline Water of Various Brands in Indonesia

Fitri Rokhmalia[1], Pratiwi Hermiyanti[1]
[1]Department of Public Health, Polytechnic Ministry of Health Surabaya, Indonesia
Corresponding author: Fitri Rokhmalia (e-mail: fitrirokhmalia88@gmail.com).

ABSTRACT Based on data from the Ministry of Industry and Trade, there are 15 trademarks of alkaline water that are sold in the market. White water is water from nature or a home tap which is then boiled before drinking. Plain water contains one or two hydrogen atoms. While mineral water is natural or artificial water that contains minerals. Mineral water sources are obtained from areas that contain many minerals with different contents. Humans need water for life and up to 70% of the human adult body is water. Consuming enough mineral water for the body can help the digestive process, regulate metabolism, regulate food substances in the body, and regulate body balance. The aim of the study was to analyze the levels of biological and chemical parameters in alkaline water with various trademarks in Surabaya with the code 1, 2, 3, 4. This was an experimental study with the posttest only control group design. Research data were analyzed using one-way ANOVA to assess levels of biological (MPN Coliform) and chemical (total chromium) parameters in alkaline water (1, 2, 3, 4). The E. Coli parameter in 4 brands of alkaline water (1, 2, 3 and 4) met the requirements according to the standard, namely 0 colonies/100 ml. Chemical parameters such as total chromium met the standard with ±0.001-0.01 mg/l. In accordance with the results of the analysis, the process of making and producing alkaline water from various brands under study on the market were in accordance with Good Food Production Methods (GFPM), thus MPN Coliform contents were found. Recommendations for researchers are to conduct further research with different alkaline water trademarks and in other cities with a wider scope. For the public, people are urged to be more selective and smarter in choosing alkaline water so as to gain benefits in line with the purchasing power of middle and lower economic class.

INDEX TERMS Alkaline Water, pH, Chromium, and MPN Coliform

I. INTRODUCTION

Based on data from the Ministry of Industry and Trade, there are 15 trademarks of alkaline water that are sold in the market. White water is water from nature or a home tap which is then boiled before drinking. Plain water contains one or two hydrogen atoms[1]. Demineralized water is bottled drinking water obtained through a purification process by distillation, deionization, reverse osmosis and/or other equivalent processes, with or without the addition of oxygen (O_2) and carbon dioxide (CO_2) [2]. Alkaline water is water that has a pH > 8 which aims to neutralize toxins that enter the body. Some of the methods in producing alkaline water are deionization and reverse osmosis where there is the addition of ions in the form of O_2 and H_2 which are very useful for maintaining the stability of the body's health [3][4]. Alkaline water refers to the electrolysis of water produced from minerals such as magnesium and calcium, which are characterized by very high hydrogen, high pH and negative oxidation-reduction potential. This hydrogen-rich water has been introduced as a possible therapeutic strategy for health promotion and disease prevention. Water with high hydrogen is able to clean ROS, protect DNA from oxidative damage and stimulate metabolism [5]. The main mineral components contained in mineral water include calcium, magnesium, sodium, cadmium, chromium, selenium, and potassium. The functions of minerals in the body are to produce enzymes, control osmotic pressure in the body, form the structure of soft and hard tissues, maintain healthy bones and teeth, help the formation of antibodies, help muscle contraction and nerve responses, prevent muscle pain, control the balance of water and acid-base levels in the blood, take care of brain function, distribute oxygen throughout the body, and maintain heart and nerve health [6] [7]. Time affects the quality of alkaline water. Based on research conducted in 2019, the longest storage time of alkaline water in the open air outside is 6 months because the oxidation ions in alkaline water can change greatly when exposed to sunlight [8].

Based on the study carried out to determine the effect of time and temperature on the quality of alkaline water from various trademarks on the market, during 60 days of monitoring the pH quality of alkaline water decreased + 0.1 -1. The concentration of Cr minerals decreased between 0.001 - 0.01 mg/l. Every toxicant that enters the body will affect the condition of body fluids, especially blood pH. When more toxicants enter, the blood pH becomes acidic [9]. Blood fluids and body tissues require alkaline conditions to maintain balance in the body's metabolic processes. Determining the pH of the blood can be done by testing the pH of the urine using a pH strip or litmus paper. The condition of blood fluids under alkaline conditions is said to be good when the pH is 7.365 and the urine pH is around 7.2-7.5. Blood pH below 7 indicates the level of acidity in blood fluids that can damage all organs in the body. Usually, those with cancer show a pH in the body of 4.5 or 5, which is relatively acidic because the cancer virus continues to grow uncontrollably causing the body's immune system and capability to produce red blood cells to fight the cancer cells to decline [10].

Based on data from the Surabaya City Department of Industry and Trade, sales of alkaline water in Surabaya during 2018-2019 include the Millagross, Pristine, Total-8+, and Eternal Plus (E+) brands. These brands must already meet the standards in Regulation of the Ministry of Industry No.78/M-IND/PER/11/2016 on Compulsory Enforcement of SNI for Mineral Water, Demineralized Water, Mineral Water, and Dew Drinking Water, with microbiology content such E. Coli and MPN Coliform at 0/100 ml, maximum threshold of chromium at 0.05 mg/l and chemical pH level at 8-9 [11][12].

The objectives of this study are checking the chemical content (pH, total chromium, alkaline water with code 1,2,3,4, with monitoring time every 20 days for 3 months and room temperature (27^0C), boiling temperature (1000C), and frozen (-5^0C). Checking the microbiological content (MPN Coliform) of Alkaline Water with code 1,2,3,4 with monitoring time every 15 days for 3 months and room temperature 27^0C), boiling temperature (100^0C), and freezing (-5^0C). Analyze and compare the effect of time and temperature factors on the quality of alkaline water with codes 1,2,3,4.

The results of this study can provide people with being smarter in choosing alkaline water to maintain a healthy body by consuming alkaline water with a pH of 8 and pH 3 for antiseptic.

II. METHODS

A. MATERIALS

This was an experimental study with the posttest only control group design because the researcher wanted to compare the chemical and microbiological quality of various types and brands of alkaline water with code (1, 2, 3, and 4).

B. OBJECT OF RESEARCH

The objects in this study were chemical (total chromium) and microbiological (MPN Coliform) parameters in various brands of alkaline water, namely 4 trademarks with a monitoring time of 60 days, where every 20 days laboratory tests were carried out testing room (27°C), boiling (90°C), and frozen (-5°C) temperatures.

C. PROCEDURE

The steps in this study were: the first identifying alkaline water trademarks in Surabaya, where 4 trademarks were selected with codes (1,2,3,4). Second preparing alkaline water from the machine to be used as a sample and examined in the laboratory. Third affter all alkaline water were available, 5 samples from each trademark were taken identified with codes (1, 2, 3, 4). Fourth examining the content of the alkaline water with chemical (total chromium) and microbiological (MPN Coliform) parameters of the coded alkaline water (1, 2, 3, 4) in the laboratory. Fifth analyzing and comparing the effect of time and temperature factors on the quality of the alkaline water. Sixth comparing the quality of alkaline water with chemical (total chromium) and microbiological (MPN Coliform) parameters in 4 brands of alkaline water with a monitoring time of 60 days, where every 20 days laboratory tests were carried out testing room (27°C), boiling (90°C), and frozen (-5°C) temperatures in accordance with Regulation of the Head of BPOM RI No: HK.03.1.23.07.11.6664 of 2011 on Food Packaging Supervision and Regulation of the Ministry of Industry No.78/M-IND/PER/11/2016 on Compulsory Enforcement of SNI for Mineral Water, Demineralized Water, Mineral Water, and Dew Drinking Water.

D. DATA COLLECTION

The examination was carried out to determine theconcentration of microbiological parameters (MPN Coliform) and chemical (pH and chromium) of various types and brands of alkaline water including alkaline water(1,2,3,and 4).

E. STATISTIC ANALYSIS

The data collected was presented in the form of tables and narratives, then analyzed using statistical tests with α=0.05. From the statistical analysis results conclusions were drawn. The statistical tests used were one-way ANOVA to compare chemical (total chromium) and microbiological (MPN Coliform) parameters in various brands of alkaline water (1, 2, 3, 4).

III. RESULT

The research results achieved by comparing the microbiological and chemical quality of alkaline water from various commercial brands are as follows:

A. MICROBIOLOGICAL PARAMETER

In this study, the biological parameter of alkaline water studied was MPN Coliform, as shown in TABLE 1 below:

TABLE 1
Average of Alkaline Water Microbiological Parameter Examination Results

No	Parame-ter	Unit	Stan-dard	KW	M	P	T
1	MPN Coli	col/100 ml	0	0	0	0	0

Based on the table above, it is known that the parameters of MPN coli in 4 types of alkaline water with codes 1,2,3,4 meet the requirements according to the standard, namely 0 colonies/100 ml.

B. CHEMICAL PARAMETER

The chemical content of the alkaline water studied was pH and water mineral (total chromium). The chemical content of the commercial alkaline water brands can be seen in Figure 1 and Figure 2. In Figure 1 for pH parameter, it can be seen that there is a decrease in the quality of alkaline water pH from various trademarks coded 1, 2, 3, 4 at room (27°C), boiling (90°C) and freezing (-5°C) temperature with monitoring on day 0, 20, 40, and 60. Factors affect the decrease in chemical parameters, especially pH but still within the requirements in accordance with Regulation of the Head of BPOM RI No: HK.03.1.23.07.11.6664 of 2011 on Food Packaging Supervision and Regulation of the Ministry of Industry No.78/M-IND/PER/11/2016 on Compulsory Enforcement of SNI for Mineral Water, Demineralized Water, Mineral Water, and Dew Drinking Water. The results of the laboratory examination showed the pH conditions on day 0 at the room temperature of 27^0C were: sample code 1: 8.42, sample code 2: 8.32, sample code 3: 8.36, and sample code 4: 8 ,37. The pH conditions at the boiling temperature of 90^0C were: sample code 1: 7.82, sample code 2: 7.83, sample code 3: 7.84, and sample code 4: 7.85. The pH conditions at the freezing temperature of -5^0C were: sample code 1: 8.61, sample code 2: 8.51, sample code 3: 8.52 and sample code 4: 8.56. Based on the monitoring on day 20, pH conditions at the room temperature of 27^0C were: sample code 1: 8.32, sample code 2: 8.23, sample code 3: 8.23, and sample code 4: 8.28. The pH conditions at the boiling temperature of 90^0C were: sample code 1: 7.52, sample code 2: 7.58, sample code 3: 7.75, and sample code 4: 7.68. The pH conditions at the freezing temperature of -5^0C were: sample code 1: 8.54, sample code 2: 8.43, sample code 3: 8.46, and sample code 4: 8.49.

The results of the monitoring on day 40 showed pH conditions at the room temperature of 27^0C: sample code 1: 8.22, sample code 2: 8.13, sample code 3: 8.13, and sample code 4: 8.18. The pH conditions at the boiling temperature of 90^0C: sample code 1: 7.42, sample code 2: 7.48, sample code 3: 7.65, and sample code 4: 7.85. The pH conditions at the freezing temperature of -5^0C: sample code 1: 8.44, sample code 2: 8.23, sample code 3: 8.36, and sample code 4: 8.39.

On day 60 of monitoring, the results for pH conditions at the room temperature of 27^0C were: sample code 1: 8.1, sample code 2: 8.03, sample code 3: 8.03, and sample code 4: 8.08. The pH conditions at the boiling temperature of 90^0C were: sample code 1: 7.32, sample code 2: 7.38, sample code 3: 7.55, and sample code 4: 7.48. The pH conditions at the freezing temperature of -5^0C were: sample code 1: 8.34, sample code 2: 8.13, sample code 3: 8.26, and sample code 4: 8.29.

The results of the study with 60 days of monitoring for chemical parameters in the form of chrome can be seen in Figure 2. The results of laboratory tests showed that the chromium parameters on day 0 with the room temperature of 27^0C were: sample code 1: 0.02 mg/l, sample code 2: 0.02 mg/l, sample code 3: 0.02 mg/l, and sample code 4: 0.02 mg/l. The concentrations of chromium at the boiling temperature of 90^0C were: sample code 1: 0.02 mg/l, sample code 2: 0.02 mg/l, sample code 3: 0.03 mg/l, and sample code 4: 0.02 mg /l. The concentrations of chromium at the freezing temperature of -5^0C were: sample code 1: 0.01 mg/l, sample code 2: 0.02 mg/l, sample code 3: 0.01 mg/l, and sample code 4: 0.01 mg/l.

On day 20 of monitoring, the chromium concentrations at the room temperature of 27^0C were: sample code 1: 0.011 mg/l, sample code 2: 0.012 mg/l, sample code 3: 0.012 mg/l, and sample code 4: 0.011 mg/ l. The concentrations of chromium at the boiling temperature of 90^0C were: sample code 1: 0.019 mg/l, sample code 2: 0.0185 mg/l, sample code 3: 0.025 mg/l, and sample code 4: 0.017 mg/l. The concentrations of chromium at the freezing temperature of -5^0C were: sample code 1: 0.011 mg/l, sample code 2: 0.012 mg/l, sample code 3: 0.011 mg/l, and sample code 4: 0.011 mg/l.

On day 40 of monitoring, the chromium concentrations at the room temperature of 27^0C were: sample code 1: 0.0102 mg/l, sample code 2: 0.0101 mg/l, sample code 3: 0.0102 mg/l, and sample code 4: 0.0102 mg/l. The concentrations of chromium at the boiling temperature of 90^0C were: sample code 1: 0.0174 mg/l, sample code 2: 0.0162 mg/l, sample code 3: 0.0162 mg/l, and sample code 4: 0.0166 mg /l. The concentrations of chromium at the freezing temperature of -5^0C were: sample code 1: 0.0101 mg/l, sample code 2: 0.0102 mg/l, sample code 3: 0.0101 mg/l, and sample code 4: 0.0101 mg/l.

On day 60 of monitoring, the chromium concentrations at the room temperature of 27^0C were: sample code 1: 0.006 mg/l, sample code 2: 8,0.005 mg/l, sample code 3: 0.003 mg/l, and sample code 4: 0.003 mg/l. The concentrations of chromium at the boiling temperature of 90^0C were: sample code 1: 0.0048 mg/l, sample code 2: 0.0045 mg/l, sample code 3: 0.0044 mg/l, and sample code 4: 0.0046 mg /l. The concentrations of chromium at the freezing temperature of -5^0C were: sample code 1: 0.08 mg/l, sample code 2: 0.006 mg/l, sample code 3: 0.007 mg/l, and sample code 4: 0.075 mg/l.

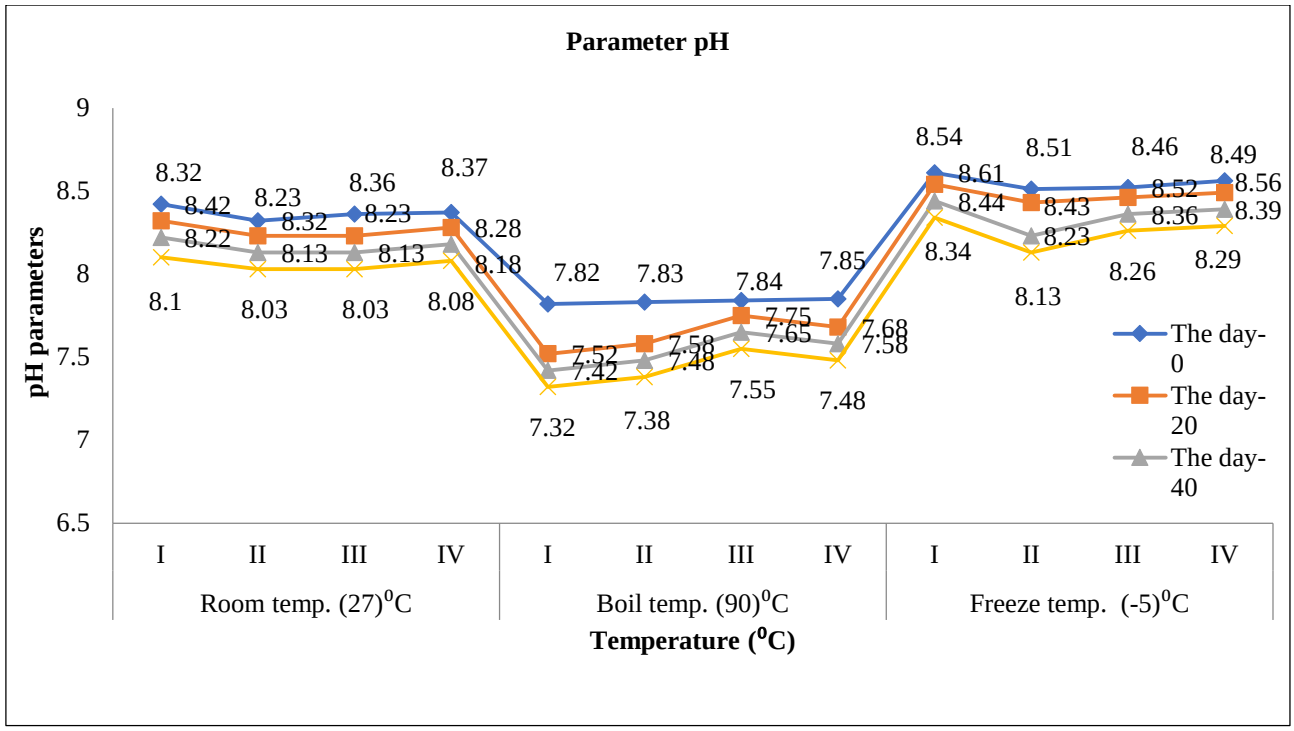

FIGURE 1. pH Conditions in Alkaline Water

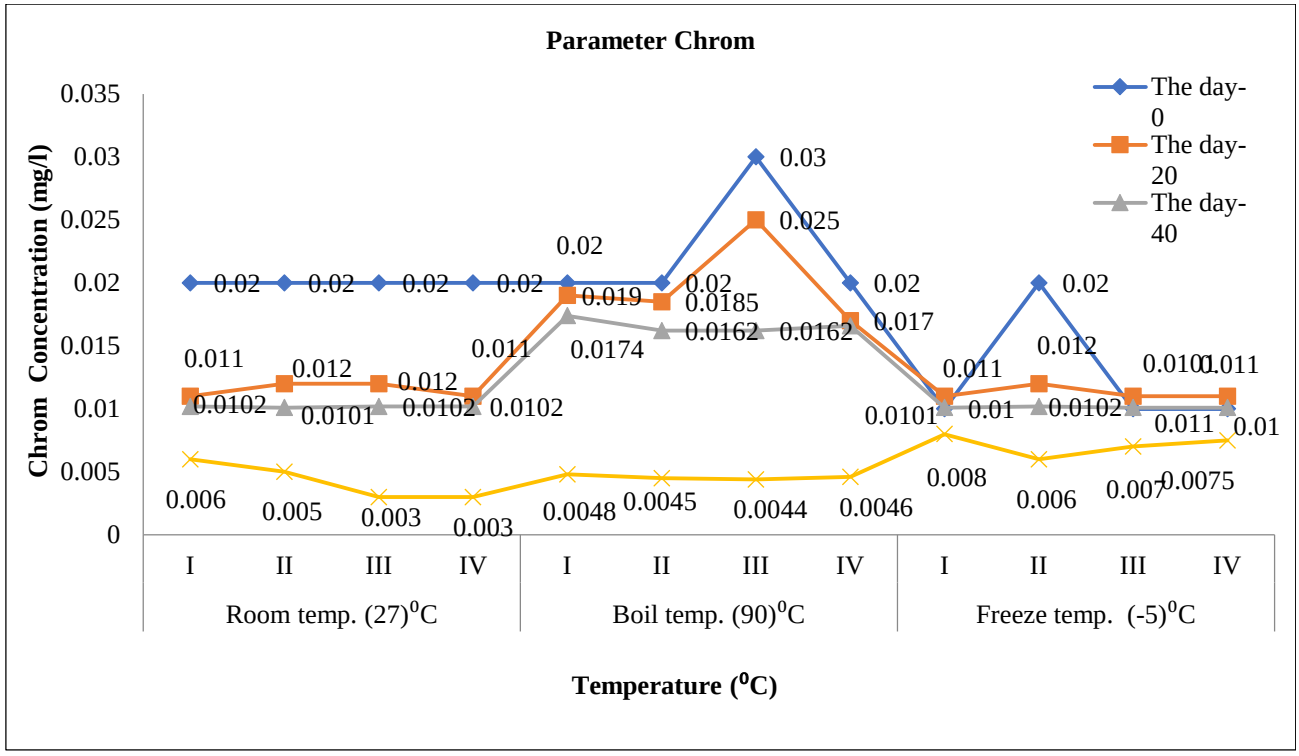

FIGURE 2. Levels of Chemical Parameters in Alkaline Water

C. STATISTICAL ANALYSIS

TABLE 2 presents the results of laboratory tests that were analyzed using one way ANOVA. The purpose of statistical test analysis was to determine the difference in chemical and biological quality of various brands of alkaline water on the market. The results of the analysis of differences in chemical and microbiological quality in alkaline water from various trademarks during 60-day monitoring can be seen in the following table:

TABLE 2
Statistical Analysis of pH, Chromium and MPN Coliform Parameters in the Studied Alkaline Water

Parameter	Independent Variable	F	p
pH	Time	113.234	.000*
Total Chromium		67.233	.000*
MPN Coliform		54.467	.001*
pH	Temperature	125.745	.000*
Total Chromium		50.922	.000*
MPN Coliform		0.808	0.452
pH	Alkaline Water Trademarks	0.157	0.935
Total Chromium		0.238	0.870
MPN Coliform		1.435	0.245

* $p \leq 0,05$ (significant)

Based on the statistical test above, it can be seen that the variables that have a significance of $p<0.05$ are pH, total chromium and MPN Coliform with time and temperature, and temperature for the MPN Coliform variable. A significance of $p>0.05$ in the pH, total chromium and MPN Coliform showed differences in concentrations in the parameters. The difference in the concentration of mineral content is influenced by the surrounding environmental conditions [13].

IV. DISCUSSION

A. MICROBIOLOGICAL PARAMETER

Parameters of MPN coli in 4 types of alkaline water with codes 1,2,3,4 meet the requirements according to the standard, namely 0 colonies/100 ml. Parameter microbiological contents (E .Coli and MPN Coliform)ofthesealkalinewatermettherequirementsandinaccordance with the Per.KaBPOM RI (Regulation of theHead of Food and Drug Administration of the Republic ofIndonesia) No: HK.03.1.23.07.11.6664. Year2011concerning Supervision of Food Packaging and the Regulation of Minister of Industry No.78/MIND/PER/11/2016 concerning the Compulsory Enforcement of SNI for Mineral Water,Demineralized Water,Mineral Water,and Dew Drinking water.

Based on the results of laboratory examinations, the alkaline water production process in this study has been carried out using the proper method so that the microbiological quality of the alkaline water traded in the market is maintained. The production process is in accordance with the Good Food Production Methods (GFPM), and the alkaline water did not contain MPN Coliform bacteria as set out in Regulation of the Head of BPOM RI No: HK.03.1.23.07.11.6664 of 2011 on Food Packaging Supervision and Regulation of the Ministry of Industry No.78/M-IND/PER/11/2016 on Compulsory Enforcement of SNI for Mineral Water, Demineralized Water, Mineral Water, and Dew Drinking Water [1][10].

The pathogenic bacteria used as an indicator of this bacteriological quality test were coliform bacteria. Coliform is a group of rod-shaped bacteria, which are aerobic and facultative anaerobes. The less coliform bacteria in drinking water, the better the quality of drinking water. Meanwhile, the higher the number of coliform bacteria in drinking water, the worse the water quality [11][12].

Drinking water should not exceed the predetermined requirements. If drinking water and clean water have been contaminated with Escherichia Coli and Total Coliform bacteria that exceed the normal threshold, this can cause diarrhea, vomiting and other digestive or gastroenteritis problems. The presence of MPN Coliform is caused by the contamination of coliform normally present in feces of humans and warm-blooded animals found in septic tanks in raw water, the type of equipment used, due to lack of knowledge about hygiene and sanitation [14][15].

B. CHEMICAL PARAMETER

Based on the results of monitoring for 60 days, there was a decrease of ±0.1-1. The pH conditions in alkaline water can change due to the following factors [16]:

a. CO_2 Concentration in Water

The concentration of carbon dioxide (CO_2) dissolved in water is a factor that affects pH. Carbon dioxide triggers an increase in the concentration of hydrogen ions which decrease the pH level of the water. That means, when carbon dioxide is high, the pH of the water will automatically become acidic. This carbon dioxide can come from the atmosphere and room air. Carbon dioxide also comes from the respiration process of humans and plants at night, where a lot of carbon dioxide is released. This causes the water to have a lower than neutral pH.

b. Temperature.

The temperature at which the water is located affects the solubility of carbon dioxide. When water is exposed to a lot of heat intensity from sunlight, its surface temperature will rise. When the surface temperature of the water rises, the solubility of carbon dioxide decreases, so the pH will increase and the water will become alkaline. Meanwhile, when the temperature decreases, the surface temperature of the water

will also decrease and automatically the solubility of carbon dioxide will be higher. Therefore, when the temperature is low, the pH of the water will drop and the water will become acidic.

c. Carbonate and Bicarbonate Concentration

The carbonate and bicarbonate ions which belong to the base group affect the pH. If water has a high enough concentration of carbonate and bicarbonate ions, it can be ascertained that the pH will change. From neutral, the water will become alkaline. If acidic initially, it can turn into neutral after getting additional carbonate and bicarbonate ions. The change of water to alkaline due to carbonate and bicarbonate ions is often found in water flowing out of the mouth of the cave by passing through carbonate rocks containing calcium.

d. Organic Material Decomposition Process

Decomposition is a process of decomposition that occurs in organic matter and living things in the water. Because organic matter and living things contain the element carbon (C), when the decomposition process occurs, there will be a lot of carbon released into the water. However, because organic compounds tend to be unstable and easily oxidized, what enters the water is carbon dioxide and water itself. Therefore, when carbon dioxide enters the water, it is certain that the pH level will change. Water that is initially neutral can become acidic because the dissolved inorganic carbon content can increase hydrogen ions, decreasing the pH. Thus, when working in laboratories or industrial production processes, it is best to keep water away from organic materials that can change its initial pH. It can be concluded that the factors that affect the pH of the water are the entry of carbon dioxide.

The concentrations of Cr minerals in alkaline water at room temperature and frozen saw a decrease, which was between ±0.001-0.01 mg/l compared to other treatments because during the heating process, minerals evaporated more quickly due to heat. In Cr^{2+} basic compounds can be formed. In the acidic state of the chromic ion (CrO4 2-) a very strong reduction event can occur. Chromium is widely used in industrial activities such as electroplating, leather tanning and painting which is generally known from chromate and dichromate compounds [17]. In everyday life chromium has a role in the body. In human and animals, chromium in low concentrations is an essential micronutrient, but in high concentrations it can be carcinogenic. The recommended safe limit of chromium in food is 50–200 g per day [18][19].

Based on the results above, it can be seen that the chemical quality parameters met the requirements for the four types of alkaline water, meaning that the alkaline water is safe and can be consumed by the public. The human body is capable of balance/homeostasis. Homeostasis is all processes that occur in living organisms in maintaining the internal environment so that conditions remain optimal for the life of the organism concerned. Acid-base balance is related to regulating the concentration of free H ions in body fluids [20]. Efforts to maintain body balance can be realized by healthy behavior and diet, maintaining stress levels, exercising, and not consuming alcohol or acidic foods and drinks, and consuming 8 liters of water/day. The total body fluid of an adult is about 45–75% of body weight. It is 60% for men, 55% for women and 70-80% (75% average) for children. Water has many functions in the human body; however, its most important function is to promote blood flow and metabolism. Water also activates the life of bacteria in the intestines and enzymes and removes dirt, toxins and pollutants. All carcinogenic food additives can be flushed out of the body by consuming more alkaline water in accordance with the requirements [21].

Alkaline water is a liquid or water with a pH ≥ 8 and is alkaline because it contains ions (OH-). Ionized alkaline water (IAW) is water that has a high redox potential value (i.e., it is a good antioxidant because it has a negative ORP (Oxidation Reduction Potential) value and the water molecule size in the smaller group than ordinary water (micro-clustered)). All these things help to inhibit the spread of cancer and help in killing cancer cells, directly or indirectly. If the environment in our bodies has changed from oxygen in an acidic environment to an alkaline environment full of oxygen, viruses, bacteria and fungi cannot live. Ionized Alkaline Water can prevent acidic conditions in our body and make our body an alkaline environment [22][13].

The content of fluoride is useful for rebuilding previously weakened tooth enamel, slowing the loss of minerals from tooth enamel, stopping the initial process of cavities, and preventing the growth of oral bacteria that damage teeth [23]. Chromium within the permissible limits helps convert glucose in the blood into energy for the body, which in turn lowers glucose in the blood. On the other hand, the way the mineral Chromium LKPOPILP in the body also helps build muscle, burn fat and utilize carbohydrates [24][25].

C. STATISTICAL ANALYSIS

Based on statistical tests comparing the content of chemical and microbiological parameters of alkaline water brands on the market, it can be seen that the four types of alkaline water studied meet the requirements, but those that are highly recommended for consumption are those that have. The difference in the concentration of mineral content is influenced by the surrounding environmental conditions. Mountain springs are naturally formed from rainwater that infiltrates into the system of volcanic rock layers due to the force of gravity. On its way through the layers of volcanic rock, the rainwater is filtered and naturally absorbs minerals that are essential for the human body, such as calcium, sodium, magnesium and potassium. This natural process produces water with naturally balanced mineral content [1]. Alkaline water is refined, energizing, cleansing water that has a unique combination of water characteristics. This water is also micro which has an unparalleled ability to be absorbed by the body. Rich in alkaline minerals, it helps in buffering acidic conditions in the body. With an abundance of available electrons, IAW promotes cells to destroy harmful free radicals [16][26].

V. CONCLUSION

Based on the study conducted chemical content (pH, total chromium, alkaline water with code 1,2,3,4, with monitoring time every 20 days for 3 months and room temperature (27^0C), boiling temperature (100^0C), and frozen (-5^0C) the following conclusions can be drawn: there is a decrease of $\pm$ 0,1-1 in the quality of alkaline water pH with various trademarks coded 1, 2, 3, 4 at the room temperature of 27°C, boiling temperature of 90°C and freezing temperature of -5°C, at day 0, 20, 40, and 60 of monitoring. The concentration of Cr minerals decreased between + 0.001-0.01 mg/l. Based on the study conducted microbiological content (MPN Coliform) of Alkaline Water with code 1,2,3,4 with monitoring time every 20 days for 3 months and room temperature 27^0C), boiling temperature (100^0C), and freezing (-5^0C) meet the requirements according to the standard, namely 0 colonies/100 ml. Based on the statistical test above, it can be seen that the variables that have a significance of $p<0.05$ are pH, total chromium and MPN Coliform with time and temperature, and temperature for the MPN coliform variable. A significance of $p>0.05$ in the pH, total chromium and MPN Coliform showed differences in concentrations in the parameters. The difference in the concentration of mineral content is influenced by the surrounding environmental conditions

VI. ACKNOWLEDGMENTS

Suggestions that can be given in accordance with the conclusions above are as follows, further research is needed on other trademarks of alkaline water to develop science and technology about alkaline water with a wider range. People are urged to be more selective and smarter in choosing alkaline water so as to gain benefits in line with the purchasing power of middle and lower economic class. The public must be smarter in reading the guidelines for storing alkaline water, especially at room temperature so that the quality of alkaline water does not change as much as when it was produced.

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