



Analysis of Physical Properties of Well Water Quality in Pasuruhan Kidul Kudus Village

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Abstract

Water is a natural resource that is very important for human life and other creatures. Water is used to meet various needs, including bathing, drinking, cooking, and washing. This study aimed to determine the quality of healthy water in the village of Pasuruhan Kidul Jati Kudus. One of the parameters measured for hygiene sanitation is a physical parameter. Measurement of physical parameters is the first step in analyzing water quality. In this study, several physical parameters were used to determine water quality, including temperature, turbidity, color, Total Dissolved Solid (TDS), taste, smell, and pH. This research was conducted for 7 days in three different places: home, mosque, and school. The method used in this research is to analyze the water quality of wells, mosques, and schools in Pasuruan Kidul Village. The results showed that the temperature values in the three places were around 29.4-29.6°C, the turbidity of the three places was 1 NTU, the water in all places was colorless, tasteless, odorless, the value of Total Dissolved Solid (TDS) at the three places the value is around 412.8-418.4 (mg/l), and the pH is 7.4 so that the water quality in the three places is below the maximum water quality standard threshold.

INTRODUCTION

Water is a natural resource that is very important for human life and other creatures. Water is used for various needs, including bathing, drinking, cooking, and washing. Meanwhile, as one of the primary needs to support human life, water has a risk in the form of water-borne diseases. So one aspect that must be considered in the provision of clean water or drinking water is the prevention of water-borne diseases.

Based on the regulation of the Minister of Health of the Republic of Indonesia number 37 of 2017 concerning environmental health quality standards and water health requirements for sanitation hygiene purposes, swimming pools, solus per aqua, and public baths. Environmental health quality standards for water media for sanitation hygiene purposes include physical, biological, and chemical parameters. Water for hygiene purposes is used to maintain personal hygiene such as bathing, brushing teeth, washing food, eating utensils and clothes. In addition, it is used as raw water for drinking water (Permenkes RI number 32 of 2017).

One of the parameters measured for hygiene sanitation is a physical parameter. Several physical parameters used to determine hygiene sanitation include temperature, turbidity, color, Total Dissolved Solid (TDS), taste, odor, and pH. The parameters measured to refer to the regulation of the Minister of Health of the Republic of Indonesia number 37 of 2017 concerning the need for sanitation and hygiene.

Astuti (2015) conducted research on well water in Kembangan and Dalangan villages. The analysis results show that the healthy water in Kembangan and Dalangan Villages has high TDS and turbidity content and is close to the maximum limit for clean water quality standards. High TDS levels in well water in Kembangan and Dalangan villages are because both villages are close to the factory. This is following the results of research Wolo (2020), which states that the high TDS value may be caused by weathering of rocks, runoff from the soil, and anthropogenic influences/human activities in the form of domestic waste and the tourism industry. Turbidity in water can also describe the value of TDS in water. Rosyidah *et al.* (2016) stated that the more turbid the waters, the greater the TDS value. A large number of dissolved particles will block sunlight from entering the water. As a result, the water becomes oxygen-poor.

Ismawati *et al.* (2020) conducted a study on analyzing the physical properties of healthy water quality in Kandren Hamlet, Banjarsari Village, Windusari District, Magelang Regency. The results show that healthy water in Kandren Hamlet,

Banjarsari Village, Windusari District, Magelang Regency has low levels of turbidity and dissolved solids, far below the permissible threshold. Turbidity is determined by the number of dissolved particles and silt in the water. In addition to TDS and turbidity, the temperature is also an essential parameter in the aquatic environment. Zharifa *et al.* (2019) conducted a study by analyzing healthy water quality in the Parigi Lama Village, Pondok Aren District, Tangerang Banten. The research results showed that the temperature and turbidity values followed quality standards, but there were some points with low temperatures. This is because these points are not exposed to direct sunlight. After all, they are blocked by trees and affected by the water sampling time.

Residents in Pasuruhan Kidul Village, Jati Subdistrict, Kudus Regency, complained about the interference with the pollution of healthy water used to meet their daily needs, cloudy water. Therefore, researchers researched water quality in Pasuruan Kidul Village, Jati District, Kudus Regency.

METHODS

The method used in this study is to analyze the quality of healthy water in Pasuruan Kidul Village, Jati District, Kudus Regency. The samples used were 3 samples of water with the same volume from three different places, namely houses, mosques, and schools. Data collection was carried out for 7 days. Physical parameters measured included temperature, turbidity, color, taste, odor, TDS (Total Dissolved Solid), and pH. The tools used in this research are a digital thermometer, TDS meter, litmus paper, and Hydrocolor application. The data obtained from the measurements, processed and analyzed descriptively by comparing the water quality parameters of the research results with the regulations of the Minister of Health of the Republic of Indonesia.

RESULTS AND DISCUSSION

Water quality is essential because knowing water quality can indicate that a water body is experiencing heavy, moderate, or light pollution. Measuring water quality is expressed in physical, chemical, and biological parameters. The physical parameters of the water examined for sanitation hygiene purposes include the parameters of turbidity, color, dissolved solids, temperature, taste, and odor. The results of testing the physical parameters are presented in Table 1.

Table 1. Pasuruhan Kidul Village Well Water Quality

Parameter	Quality Standard (Maximum Grade)	Location		
		House	Mosque	School
Temperature (°C)	Air Temperature $\pm 3^{\circ}\text{C}$	29,6	29,5	29,4
TDS (mg/l)	1000	417,6	412,8	418,4
pH	6-8	7,4	7,4	7,4
Turbidity (NTU)	25	1	1	1
Color	Colorless	Colorless	Colorless	Colorless
Smell	No smell	No smell	No smell	No smell
Flavor	No taste	No taste	No taste	No taste

According to the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990, the maximum quality of clean water that can be used is air temperature $\pm 3^{\circ}\text{C}$, TDS 1000 mg/l, pH value 6-8, turbidity value 25 NTU, colorless, tasteless, and odorless. smells (according to table 1 in the second column). The temperature of the clean water should not be hot because the hot temperature can help dissolve the chemicals in the water channels/pipes and water containers (Sudibyo, 1999). According to Peraturan Menteri Kesehatan Republik Indonesia No. 416/MENKES/PER/IX/1990, the standard of clean water is equal to air temperature $\pm 3^{\circ}\text{C}$. At the time of sampling, the air temperature in Pasuruan Kidul Village was 30°C , so the standard temperature values ranged from $27^{\circ}\text{C} - 33^{\circ}\text{C}$. From the results of temperature measurements in table 1, it can be concluded that the temperature of healthy water both at home, in mosques, and in schools has met the standard

TDS is a solid consisting of organic and inorganic compounds soluble in water, minerals, and salts (Budiarti & Soenoko, 2013). The results of TDS measurements in three places, namely homes, mosques, and schools, were scored 417.6, 412.8, and 418.4. From these results, it can be concluded that the TDS values in the three places have met the requirements of the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990.

The degree of acidity of drinking water must be neutral and not acidic or alkaline. Pure water has a pH of 7. $\text{pH} < 7$ means the water is acidic, while $\text{pH} > 7$ means the water is alkaline (it tastes bitter). The pH of healthy water in three places has the same value, 7.4, which means normal according to quality standards, namely 6-8. The results of measuring the pH of healthy water can be suitable for clean water because it is neutral. Drinking acidic or alkaline

water will significantly affect digestion, and disorders of the stomach, kidneys, and blood vessels (Sasongko *et al.*, 2014).

Turbidity indicates the presence of particles from the soil and the possibility of metal contamination such as iron, manganese, and so on (Budiarti & Soenoko, 2013). Turbidity is determined by the number of dissolved particles and silt in the water. The more particles and dissolved organic matter, the higher the turbidity (Sari & Huljana, 2019). Turbidity in water can also describe the value of TDS in water. The more turbid the waters, the greater the TDS value. A large number of dissolved particles will block sunlight from entering the water. As a result, the water becomes oxygen-poor (Rosyidah *et al.*, 2016). As shown in Table 1, the turbidity of healthy water in three places, namely houses, mosques, and schools, has the same value, namely 1 NTU. The turbidity parameter standard is based on the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990 maximum is 25 NTU, so the three wells can be concluded have met the standard requirements for turbidity parameters.

Watercolor can be caused by the presence of natural metal ions (iron and manganese), humus, plankton, aquatic plants, and industrial waste (Budiarti & Soenoko, 2013). Table I shows that in terms of color parameters, it shows that the healthy water in the three places is colorless; this is obtained from the results of interviews with 30 respondents. And from these results, it can be concluded that the well water is following the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990.

Smelly water indicates contamination with organic substances, such as protein. The smell of rancid water is usually caused by algae, fungi, and so on (Budiarti & Soenoko, 2013). Examination of the odor parameters presented in table II gives

results that do not smell good for well water at homes, mosques, and schools. This is the same as the research conducted (Caesar David Laksamana, 2017) in the wells of Cranggang Village. In this study, it was found that the clean water sampled in the study was odorless, tasteless, and colorless. Smell, taste, and color can be parameters that water is in a polluted condition. Some of the primary odor sources are hydrogen sulfide and organic compounds produced by anaerobic decomposition. Meanwhile, the taste is caused by molecular changes in water influenced by pH values. This means that the healthy water in Pasuruhan Kidul Village follows the odor parameter standard stipulated by the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990.

Water may taste bitter, salty, and so on. The presence of a taste indicates that the water has been contaminated by various substances that can endanger health. Therefore, drinking water must meet the requirements, and clean water must be tasteless (Sudibyo, 1999). Table I shows that both house, mosque, and house well water gave the same result, which was tasteless. This means that the healthy water in Pasuruhan Kidul Village follows the standard taste parameters set out in the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990.

CONCLUSION

Based on the results of the study, it can be concluded that the quality of healthy water in Pasuruan Kidul Village from three places, namely houses, mosques, and schools in terms of physical characteristics, meets the requirements in accordance with Permendikbud. Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990, namely the temperature is around 27°C-33°C, TDS is 1000 mg/l, pH is 6-8, turbidity is 25 NTU, colorless, tasteless, and odorless.

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