

Microbiological Quality Analysis of Drinking Water in An-Nuriyah Islamic Boarding School Wonocolo Surabaya

Edza Aria Wikurendra^{a,b,1,*}, Satriya Wijaya^{b,2}, Imre Nagy^{a,c,3}

^a Doctoral School of Management and Organizational Science, Faculty of Economic Science, Szent István University Kaposvár Campus, 7400, Kaposvár, Guba Sándor Utca 40, Hungary

^b Public Health Program Study, Faculty of Health, Nahdlatul Ulama University of Surabaya, Jalan Raya Jemursari No.57, Surabaya, 60237, Indonesia

^c Department of Geography, Tourism and Hotel Management, Faculty of Science, University of Novi Sad, Trg Dositeja Obradovića 3, Novi Sad 21000, Serbia

¹ edza.wikurendra@phd.uni-szie.hu*; ² swijaya7@unusa.ac.id; ³ nagy@rkk.hu

* corresponding author

Article history:

Received : Oct 23, 2020

Revised : Nov 15, 2020

Accepted : Dec 20, 2020

Keywords:

Microbiology,
Drinking-Water,
Islamic Boarding Schools.

Background : The need for water in an area will always increase with population growth, while the water itself decreases in terms of quality, quantity, and continuity. The potential for health problems due to the microbiological quality of drinking water that does not meet the requirements is very high. This study aimed to analyze the microbial quality of drinking water in An-Nuriyah Islamic Boarding School Wonocolo Surabaya. **Method :** This research is a descriptive study with a cross-sectional approach. This research sample is drinking water consumed by the student in An-Nuriyah Islamic Boarding School Wonocolo Surabaya, which comes from three sources: refill drinking water, boiled water, and bottled drinking water. **Results :** This study showed that the *Escherichia coli* parameters' microbiological quality in the three drinking water sources resulted in 0/100 ml samples. Each head was obtained for the Coliform parameters. Namely, 125/100 ml refill drinking water, 2/100 ml bottled drinking water, and 100/100 ml boiled water samples. **Conclusion :** The results of this study conclude that the microbiological quality of drinking water at An-Nuriyah Islamic Boarding School Wonocolo Surabaya meets the requirements of Minister of Health Regulation Number 492/MENKES/Per/IV/2010 for *Escherichia coli* parameters, while Coliform parameters do not meet the criteria of Minister of Health Regulation Number 492/MENKES/Per/IV/2010.

BACKGROUND

The primary need for living things is water. Along with the increase in population growth in an area, the need for clean water also tends to increase, inversely proportional to the availability of clean water, the quality, and continuity of which has decreased. The human body consists of 75% water. Water is needed by humans, one of which is drinking water. Seawater is still the largest source globally, namely 97%, while the availability of fresh water in the world is only around 3%. Of the 3% availability of freshwater globally, only about 0.3% is used by humans for daily needs. Every person living in developed countries needs an average of 60-120 liters of clean water per day. Each person needs between 30-60 liters of clean water per day (Galal-Gorchev, 1993). The increasing need to access drinking water not supported by available freshwater sources causes a problematic situation for humans. The needs of drinking water for humans, not all raw water can be used. There are unique natural water requirements that can be used or utilized for drinking water (Meidhitasari, 2007).

Islamic boarding schools are academic units and educational providers that function as community-based Islamic religious education institutions (Badan Penelitian dan Pengembangan Kesehatan, 2013). A boarding school's primary activity as an Islamic educational institution is students and kyai who have a boarding or boarding system (Zarkasyi, 2015). In various aspects and aspects, an Islamic boarding school is a place for students to learn in society and live and as a laboratory to live (Umiarso, 2011).



Well water and Drinking Water Company are the biggest suppliers of drinking water needs for Islamic boarding schools. The students tend to choose a more practical way of fulfilling their drinking water needs in line with technology advancement and the busier's activities. Bottled drinking water is an alternative to drinking water needs (Pracoyo, 2006). In some 120 refill drinking water samples from 10 major cities in Indonesia (Jakarta, Bogor, Tangerang, Bekasi, Cikampek, Semarang, Yogyakarta, Surabaya, Medan, and Denpasar), it was found that around 16% of drinking water was contaminated with coliform bacteria so that it had become public attention from the research results. These results indicate that the depot's sanitation for drinking refill water is low. One of the parameters assessed for drinking water treatment sanitation is the microbiological parameter, namely coliform bacteria. (Suprihatin, 2003).

Contaminated water, passive transfer through inanimate objects (equipment), and hand-to-mouth activities (humans) can affect the presence of coliform bacteria so that it can indicate poor hygiene sanitation practices in food or beverage processing (Romanda, Priyambodo, and Risanti, 2017). One of the environmental problems that often occur in Islamic boarding schools is a problem related to the provision of clean water (Adriansyah, 2018). Physical, chemical, and bacteriological requirements must meet regulatory requirements categorized as healthy drinking water for human consumption. Color, taste, cloudiness, and smell are physical requirements for water quality. Lead, copper, mercury, silver, and cobalt are the chemical requirements for drinking water quality. In contrast, Coliform and *Escherichia coli* bacteria's presence or absence in the water is a bacteriological requirement for drinking water quality (Sri Malem, 2012).

Aspects of access to health services, healthy behavior, and environmental health aspects still require various parties' attention to improve the boarding school environment (Badan Penelitian dan Pengembangan Kesehatan, 2013). To serve the students' consumption while in the Islamic boarding school, there is a food and beverage management system to facilitate distribution at the Islamic boarding school. Poisoning to students will occur if the implementation of food and beverages in Islamic boarding schools is not managed correctly. Consuming food or drinks suspected of containing biological or chemical contaminants can cause illness with symptoms and poisoning signs (Badan Penelitian dan Pengembangan Kesehatan, 2013).

Based on the results of interviews with students at the An-Nuriyah Islamic Boarding School Wonocolo, Zakkyah said that the total number of students at the An-Nuriyah Islamic Boarding School Wonocolo was 157 students. Most of the students' drinking water comes from 60% bottled water, 30% refill, and 10% boiled water. The potential for health problems due to the microbiological quality of drinking water that does not meet the requirements is very high. Researchers are interested in researching the microbial quality analysis of drinking water in An-Nuriyah Islamic Boarding School Wonocolo Surabaya.

RESEARCH METHODS

In this research, the type of analysis used is descriptive quantitative, which describes the comparison of the results of the microbiological quality test of drinking water with the existing Minister of Health Regulation Number 492/MENKES/PER/IV/2010 standards and describes the results of the study with a cross-sectional study. In this study, the samples were all three drinking water sources at An-Nuriyah Islamic Boarding School Wonocolo Surabaya, namely from boiled water, refills, and bottled drinking water, taken as a sample.

The data collection procedure was carried out by direct researchers to An-Nuriyah Islamic Boarding School Wonocolo Surabaya and taking samples which were then carried out by laboratory testing for drinking water sources which were taken and then water testing was carried out with microbiological parameters, namely testing the *Escherichia coli* and *Coliform* content in the sample.

The analysis used in this research is univariate analysis. Univariate analysis is used to identify and identify the characteristics of one research variable. From the results of the data processing, a descriptive study was carried out by comparing the results of testing the quality of drinking water from the laboratory with the quality standards set by the Regulation of the Minister of Health of the Republic of Indonesia Number 492/MENKES/PER/IV/2010.

RESULTS AND DISCUSSION

Examination of the quality of drinking water for *Escherichia coli* parameters at drinking water sources at An-Nuriyah Islamic Boarding School Wonocolo Surabaya is as shown in table 1 as follows:

Table 1. Results of Microbiological Quality Analysis of *Escherichia coli* Parameters for Drinking Water in An-Nuriyah Islamic Boarding School Wonocolo Surabaya.

Criteria	Source of drinking water		
	Boiled water	Refill drinking water	Bottled drinking water
Qualify	Yes	Yes	Yes
Not eligible	No	No	No

Source: Primary data

The three samples of drinking water sources have met the total requirements for *Escherichia coli* bacteria as stipulated in the Minister of Health Regulation Number 492/MENKES/PER/IV/2010, which is in 100 mL because the content of *Escherichia coli* bacteria in public water must be zero or no *Escherichia coli* bacteria are found in the water being examined. The low quality of drinking water can be seen from the presence of the *Escherichia coli* bacteria. The *Escherichia coli* bacteria can cause various diseases because they are one of the microbial indicators of sanitation and pathogenic.

Inspection of the quality of drinking water with *Coliform* parameters at the drinking water source at An-Nuriyah Islamic Boarding School Wonocolo Surabaya is as shown in table 2 as follows:

Table 2. Results of Microbiological Quality Analysis of *Coliform* Drinking Water Parameters in An-Nuriyah Islamic Boarding School Wonocolo Surabaya

Criteria	Source of drinking water		
	Boiled water	Refill drinking water	Bottled drinking water
Qualify	No	No	No
Not eligible	Yes	Yes	Yes

Source: Primary data

Table 2 shows, the three samples of drinking water sources do not meet the total requirements for *Coliform* bacteria as stipulated in the Minister of Health Regulation No. 492/MENKES/Per/IV/2010 that in 100 mL of drinking water, *Coliform* bacteria should not be contained. *Coliform* bacteria in drinking water indicate that drinking water has been contaminated by pollution or dirt (Sopacua, 2013).

Based on direct observation, all drinking water sources have a relatively good layout of the water storage room and processing room. Factors that may cause positive *coliform* drinking water results are the contamination of filled drinking water during the processing process, including storage of raw materials used with contaminated water, disinfection, and filtering that are not optimal (Meylani and Putra, 2019).

Microbial content can be affected by water storage and the duration of raw water circulation, which is > 3 days so that it causes contamination of drinking water (Copeland et al., 2009). Diarrhea can be caused by the bacteriological quality of drinking water that does not meet the requirements (Wandriyel, Suharti, and Lestari, 2012).

CONCLUSION

Based on the results obtained in this study, it can be concluded that the microbiological quality of the *Escherichia coli* parameter of drinking water at An-Nuriyah Wonocolo Islamic Boarding School in Surabaya has met the requirements. In contrast, the microbial quality of the *Coliform* drinking

water parameter in An-Nuriyah Islamic Boarding School Wonocolo Surabaya does not meet the needs of the Minister of Health Regulation No. 492/MENKES/Per/IV/2010.

REFERENCES

- [1] Adriansyah, A. A. (2018) 'Keterkaitan Antara Sanitasi Pondok Pesantren Dengan Kejadian Penyakit Yang Dialami Santri Di Pondok Pesantren Sunan Drajat', *Medical Technology and Public Health Journal*. doi: 10.33086/mtphj.v1i1.752.
- [2] Badan Penelitian dan Pengembangan Kesehatan (2013) '*Riset Kesehatan Dasar 2013*', Riset Kesehatan Dasar 2013.
- [3] Copeland, C. C. et al. (2009) 'Faecal contamination of drinking water in a Brazilian shanty town: Importance of household storage and new human faecal marker testing', *Journal of Water and Health*. doi: 10.2166/wh.2009.081.
- [4] Galal-Gorchev, H. (1993) '*WHO guidelines for drinking-water quality*', in Water Supply.
- [5] Meidhitasari, V. (2007) '*Evaluasi dan Modifikasi Instalasi Pengolahan Air Minum*', ITB, Bandung.
- [6] Meylani, V. and Putra, R. R. (2019) 'Analisis E. Coli Pada Air Minum Dalam Kemasan Yang Beredar Di Kota Tasikmalaya', *Bioeksperimen: Jurnal Penelitian Biologi*. doi: 10.23917/bioeksperimen.v5i2.9241.
- [7] Pracoyo, N. E. (2006) 'Penelitian bakteriologik air minum isi ulang di daerah Jabotabek', *Cermin Dunia Kedokteran*, 152, pp. 37–40.
- [8] Romanda, F., Priyambodo, P. and Risanti, E. D. (2017) 'Hubungan Personal Hygiene Dengan Keberadaan Escherichia Coli Pada Makanan Di Tempat Pengolahan Makanan (TPM) Buffer Area Bandara Adi Soemarmo Surakarta', *Biomedika*. doi: 10.23917/biomedika.v8i1.2899.
- [9] Sopacua, F. (2013) 'Kandungan Coliform Dan Klorin Es Batu Di Yogyakarta', *Jurnal Ilmiah Biologi*.
- [10] Sri Malem, I. (2012) '*Analisis Higiene Sanitasi Dan Kualitas Air Minum Isi Ulang (Amiu) Berdasarkan Sumber Air Baku Pada Depot Air Minum Di Kota Medan*'.
Analisis Higiene Sanitasi Dan Kualitas Air Minum Isi Ulang (Amiu) Berdasarkan Sumber Air Baku Pada Depot Air Minum Di Kota Medan'.
- [11] Suprihatin (2003) '*Tim Penelitian Laboratorium Teknologi dan Manajemen lingkungan*', IPB, Kompas, 26.
- [12] Umiarso, Z. N. (2011) '*Pesantren (di Tengah Arus Mutu Pendidikan)*', Semarang: Rosail Group.
- [13] Wandrivel, R., Suharti, N. and Lestari, Y. (2012) 'Kualitas Air Minum Yang Diproduksi Depot Air Minum Isi Ulang Di Kecamatan Bungus Padang Berdasarkan Persyaratan Mikrobiologi', *Jurnal Kesehatan Andalas*. doi: 10.25077/jka.v1i3.84.
- [14] Zarkasyi, H. F. (2015) 'Sistim Pendidikan Dan Pengkajian Islam Di Pesantren Dalam Kontek Dinamika Studi Islam Internasional', *EDUKASI: Jurnal Penelitian Pendidikan Agama dan Keagamaan*. doi: 10.32729/edukasi.v13i3.245.