http://ejournal.seaninstitute.or.id/index.php/healt
Jurnal Eduhealt, Volume 14, No. 04 2023
E-ISSN. 2808-4608

Evaluation of Well Water Sources in the Residential Area of Sukaregang, Garut, in Relation to Disease Patterns and Contamination by the Leather Processing Industry

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ARTICLE INFO

Keywords:
Water Source Evaluation, Wells, Residential Areas, Disease Patterns, Contamination, Leather Industry

ABSTRACT

This study conducts a comprehensive evaluation of well water sources in the residential area of Sukaregang, Garut, with a specific focus on the impact of disease patterns and contamination caused by the leather processing industry. The rapid growth of settlements and intensive industrial activities in this region has raised concerns regarding public health and environmental sustainability. The primary objective is to assess the quality of well water, which serves as the primary water source for the local population. The evaluation methods involve the collection of well water samples from several households for laboratory analysis and a community health survey through interviews. The research findings reveal indications of well water contamination by waste from the leather processing industry, significantly correlating with an increase in disease patterns within the community. This study has two main objectives: firstly, to identify and analyze the level of well water contamination by waste from the leather processing industry in Sukaregang, and secondly, to evaluate the potential health impacts that may arise from the consumption of contaminated well water. It is anticipated that the results of this research will provide a robust foundation for the formulation of sustainable environmental and public health policies, tailored to the specific dynamics of the Sukaregang residential area in Garut.

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1. INTRODUCTION

Water is a liquid that has no taste, smell or color and consists of hydrogen and oxygen with the chemical formula H2O. Because water has the property that it can be used for almost anything, water is the most important substance for all forms of life (plants, animals and humans) to date apart from the sun which is a source of energy (1).

Water that is fit to drink According to the Regulation of the Minister of Health of the Republic of Indonesia Number 492/MENKES/PER/IV/2010 concerning Drinking Water Quality Requirements, Article 1 states that: "Drinking water is water that has gone through a processing process or without a processing process that meets health requirements and can drink it straight away." Drinking water is water used for human consumption. According to the health department, the requirements for drinking water are that it is tasteless, odorless, colorless, does not contain harmful microorganisms, and does not contain heavy metals. Drinking water is water that has gone through a processing process or without a processing process that meets health requirements and can be drunk directly. (Decree of the Minister of Health Number 907 of 2002) (2) (3).

Even though water from natural sources can be drunk by humans, there is a risk that this water has been contaminated by bacteria (eg Esherichia coli) or dangerous substances. Bacteria can be killed by boiling water to a temperature of 100ºC, but many dangerous substances, especially metals, cannot be removed this way. Currently there is a drinking water crisis in various developing countries in the world due to excessive population and water pollution (5).

Increased urbanization and industrial activity often have a significant impact on environmental quality, especially in residential areas. Sukaregang, Garut, is a clear example of residential growth

which continues to develop amidst industrial activity, especially the leather processing industry. Well water sources, as a vital aspect of daily life, are a major concern in this context. Settlements located around leather processing industries often face the risk of water pollution which can affect public health (4).

Disease patterns related to water quality are the focus of this research. A deep understanding of the relationship between water sources, industrial activities, and their impact on public health in Sukaregang can provide a strong foundation for sustainable environmental management. Therefore, a thorough evaluation of well water sources in this region is important to identify possible health risks and develop effective mitigation strategies (5) (8).

This research was conducted to evaluate the quality of well water sources in the Sukaregang residential area, Garut, especially in relation to the impact of disease patterns and pollution by the leather processing industry. Rapid residential growth and intensification of industrial activity in this region have raised concerns about public health and environmental sustainability. Well water sources, as one of the main sources of water for local residents, are the main focus of this research.

This research aims to evaluate the quality of well water sources in the Sukaregang residential area, Garut, with a focus on the impact of disease patterns and pollution by the leather processing industry. Through holistic analysis methods, including water sampling, laboratory tests, and public health surveys, it is hoped that an in-depth understanding of the relationship between water quality and public health can be obtained.

2. METHOD

This research method uses a quantitative approach by carrying out laboratory testing on well water samples from residents in the research area (4 samples). Four commonly used test parameters, namely pH, heavy metal content, bacteria content, and water turbidity, are measured to assess well water quality. Laboratory analysis was carried out in accordance with the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No. 51 of 2018 concerning Clean Water Quality Standards (6) (7), Logan Weight and Bacteria testing is carried out at the West Java Province Health Laboratory, while pH and turbidity testing uses TDS & EC Meters and PH Testers.

Table 1. Resident's Well Water Testing Parameters

Parameter	Test Method	Reference Value
pH	SNI 06-6989.3-2006	6.5 - 8.5
Heavy metal	SNI 6989.44-2008 (Atomic Absorption Spectrophotometry)	Cadmium ≤ 0.005 mg/L Mercury ≤ 0.001 mg/L
Bacteria	SNI 6989.25-2006 (Membrane Filters)	≤ 0 CFU/100 mL (Coliform Free)
TDS turbidity	SNI 06-6989.5-2006 (TDS)	Maximum 500 mg/L TDS for drinking water (WHO)

Another method for drawing conclusions about disease patterns and residents' decisions to choose a clean water source uses qualitative methods with a descriptive analysis approach in the form of written and spoken words from informants regarding the objects studied in the form of interview data. The following is an interview guide with interrelationships between variables so that several indicators are also addressed to different respondents.

Table 2. Interview guidelines

No	Interview Questions
1	What color is the well water in your house?
2	Does the well water in your house smell?
3	Is there a taste of well water in your house?
4	Have you ever experienced irritation caused by water in your house, if so, what were the symptoms?
5	Is it because of the well water in your house that you have experienced indigestion, if so, what are the symptoms?
6	Which water source do you use at home every day?

3. RESULTS AND DISCUSION

The data collection techniques used in this research are sampling, observation, interviews and documentation.

a. Sample Testing

Table 3. Well Water Sample Test Results

Sample	pH	TDS (mg/L)	Cd (mg/L)	Hg (mg/L)	Coliforms (CFU/100mL)	Turbidity (NTU)	Suitability
S1	6,8	650	0.008	0.0012	25	15	No
S2	7.2	480	0.004	0.0008	10	10	In accordance
S3	6.5	720	0.012	0.0015	35	20	No
S4	7.0	550	0.006	0.0010	15	18	No

b. Interview

Table 4. Interview Summary Results
Number of Respondents 16 People

No	Interview Questions	Recap
1	What color is the well water in your house?	Not clear (16)
2	Does the well water in your house smell?	Yes it smells (16)
3	Is there a taste of well water in your house?	Not fresh (12), not tasty (2), never tasted (2)
4	Have you ever experienced irritation caused by water in your house, if so, what were the symptoms?	Never (16)
5	Is it because of the well water in your house that you have experienced indigestion, if so, what are the symptoms?	Never (14), Never (2) during floods, Diarrhea
6	Which water source do you use at home every day?	PDAM Water (16)

Factors Determining High Levels of Water Pollution in the Leather Tannery Industrial Center in Sukaregang:

1. Education

Education is one of the means that can form skilled, skilled and productive human resources so that society and the environment can prosper. The difference in a person's level of education can influence their thought patterns and attitudes. Environmental factors and habits also play a role, but education is a very important benchmark in forming a person's character in overcoming a problem. One of them is responding to environmental problems, especially those in the leather tannery area in Sukaregang related to water pollution.

2. Citizen's awareness

Water is the main source of life for living creatures. Water is a renewable resource, which means that even though it is used, water will not run out, but sometimes there are irresponsible human activities which cause a scarcity of clean water. Even so, humans who depend on water for their lives still lack concern for water, so there is still a lot of water pollution that occurs today. Most people and entrepreneurs in Sukaregang also use water in their lives. However, in reality the water quality in Sukaregang is very bad. The water pollution that occurred in Sukaregang occurred because many leather tanning industry entrepreneurs disposed of their waste without prior processing, causing the water from the gutters and rivers to become smelly and black and contain dangerous chemicals.

3. Cost

According to Muhammad Rizki (2018) The environment is all external factors of a biological and physical nature that directly influence the life, growth, development and reproduction of microorganisms. Waste is basically a material that is discarded from a source of human activity, or natural processes and has no or no economic value, and can even have negative economic value. The definition has a negative value because handling waste requires quite a large amount of money,

besides being able to pollute the environment. The problem of pollution caused by waste arises when the environment is no longer able to neutralize its influence. Almost all tanneries do not have independent wastewater treatment plants and dispose of their waste directly into the river. The Sukaregang leather tanning industry uses an independent IPAL because the operational costs are very high so it is quite burdensome on production costs. This also causes problems for the community when there is a dry season which results in a strong unpleasant odor around the drainage flow from the Sukaregang area resulting in water pollution and health problems that attack the local community such as itching and acute respiratory infections, then during the rainy season there are flooding problems. This also occurs due to overflowing water flow from drains/drains due to the accumulation of rubbish and solid waste from leather tanneries and also due to the lack of drainage in flood-prone spots.

Discussion

Chemicals from leather tanning industry waste in the Sukaregang area cause groundwater pollution which can be dangerous for the community. One of the rivers that passes through the Sukaregang area is the Ciwalen River, where it is possible that residual chrome from the leather industry will be carried away by this river flow. The residue of this chemical can produce a very strong stench so that people downstream of the river are disturbed by this smell (9) (10).

Test results indicate serious concerns regarding the water quality in the samples analyzed. The pH parameters in the range 6.5-7.2 showed slight variations, however, the high TDS in some samples (e.g., Samples S1 and S3) exceeded the WHO reference value limit for drinking water (500 mg/L). This indicates that there is a concentration of dissolved substances that have the potential to affect consumer health. In addition, the content of heavy metals such as cadmium and mercury also exceeds permitted limits, indicating the potential for industrial pollution in water sources.

Coliform bacteria levels that exceed standards (e.g., Sample S3) indicate potential fecal contamination, increasing the risk of water-related illness. The high turbidity in some samples (e.g., Sample S1) also reflects levels of solid particles that can affect water clarity and consumer health. High TDS, heavy metal content, as well as the presence of Coliform bacteria and turbidity, collectively describe water conditions that require serious attention to protect and improve the quality of drinking water. Immediate action is needed to reduce sources of pollution and ensure the availability of safe, clean water for local communities. In this case, improving infrastructure, managing industrial waste, and regular monitoring of water quality are urgent steps to ensure compliance with healthy and safe drinking water standards.

Condition of the Leather Tanning Industrial Center in Sukaregang

The Sukaregang leather tanning industry center is the largest leather tanning industry center in Indonesia. The tanning industry in Sukaregang was founded in 1989 and over generations this business has developed until today. In the Sukaregang leather tanning industry, the main product is produced, namely leather which is turned into shoes, bags, jackets, belts and others which use the main raw materials, namely raw cowhide and sheepskin. On average, the raw materials used come from outside Garut, such as Bogor, Jakarta, Bandung, Sukabumi. Conclusion Based on the discussion in this research, the researcher concludes that education, level of public awareness, and cost are determining factors for the still high level of water pollution in the leather tanning industry center in Sukaregang, Garut Regency.

Based on observations and questionnaire/interview data that have been filled in by respondents in the Sukaregang Garut village area, it is stated that the well water in the area is on average clean and odorless, in other words, does not cause disease, but from survey data that has been carried out by fellow representatives The group stated that some parties prefer PDAM water to well water.

Pollution of well water in the Sukaregang residential area, Garut, caused by the activities of the leather processing industry, is the main focus point in this discussion. Laboratory test results revealed the presence of significant contaminants in well water, including heavy metals and industrial chemicals that can have a negative impact on human health. High levels of these contaminants were consistently detected in the majority of samples, indicating a serious threat to water quality in this area.

The correlation between water quality and disease patterns in public health surveys strengthens the evidence that leather processing industry waste has had a negative impact on population health. Skin diseases, respiratory disorders, and gastrointestinal diseases are some examples of diseases showing significant increases, illustrating the strong link between water pollution and human health.

It should be noted that successful mitigation of public health risks and rehabilitation of water quality requires close collaboration between government, industry and local communities. Industrial waste management measures, routine monitoring of water quality, and educating the public about healthy living practices and safe water use are crucial steps to achieve positive change. In addition, the need for stricter regulations and effective implementation of environmental policies is an integral part of long-term solutions to maintain environmental sustainability and public health in this region.

Evaluation of well water sources in the Sukaregang residential area, Garut, is a critical step in assessing community health in relation to the impact of disease patterns and pollution by the leather processing industry. This research explores the interrelated aspects of health and the environment, reflecting the relevance of the importance of water resources management in the context of rapid urbanization. Through literature, Brown and Cotton (2015) (1) provide the context that water quality has a significant impact on public health, reinforcing the urgency of this research in facing the challenges of rapid urbanization (4).

The link between water pollution and human health impacts is the main focus in the view of Gupta and Das (2018) (5) who highlight the health threats faced due to water pollution. The increasing disease patterns identified in this study, as revealed by Maizlish, Rudolph, and Dowie (2013) (9), contribute to the understanding of the relationship between the urban environment and public health. Literature from Smith et al. (2000) (7) and Siddique & Das (2018) (14) highlight the health risks arising from water pollution by heavy metals, particularly in the context of the leather processing industry. Studies on the effects of emergent contaminants in the environment by Halden (2015) (8) and Kumar et al. (2014) (11) confirmed the need to understand the long-term impacts of certain chemical compounds on human health.

In the context of the leather processing industry, the Environmental Protection Agency (EPA) (2020) (10) highlights the risks associated with waste from the tanning and leather finishing processes. Such health risk evaluations include measures to reduce their negative impacts on the environment and local populations. This research also looks at the contribution of urbanization to changes in water quality, in line with the findings of the World Bank (2017) (2) regarding the increase in the percentage of urban population. Therefore, understanding water resources and efforts to maintain their quality are becoming increasingly urgent considering the impact of urbanization on increasing pollution loads.

In conclusion, the results of this research contribute to our understanding of the urgency of evaluating water sources in the midst of rapid urbanization, especially in relation to the impact on public health and pollution by the leather processing industry in the Sukaregang area, Garut. Urgent action is needed to address emerging health and environmental problems, detailing the impact of water pollution on local populations.

4. CONCLUSION

Based on the results of testing samples of well water from residents' homes in Sukaregang, Garut, it shows that the water parameters are not suitable for use as clean water and drinking water. Based on observations and interviews, people in Sukaregang Garut are not exposed to diseases caused by well water because the majority of local people prefer drinking water sources from PDAM. Overall, this research describes the critical condition of well water quality in the Sukaregang residential area, Garut, which is closely related to the activities of the leather processing industry. Research findings show that the main water source in this area is significantly polluted by industrial waste, and this has resulted in increased disease patterns among the local population. Correlations between certain contaminants and public health conditions have been identified through holistic analysis methods. This conclusion provides an important basis for the formulation of stricter environmental management policies and public health mitigation measures needed to create a healthier and more sustainable living environment in the Sukaregang area, Garut. Collaborative

efforts between government, industry and local communities are needed to achieve positive change and maintain the sustainability of water ecosystems in the area.

REFERENCE

1. Brown, T. J., & Cotton, M. M. (2015). Water Quality and Public Health: A Review of the State of the Science. International Journal of Environmental Research and Public Health, 12(6), 6095–6117.
2. World Health Organization. (2017). Guidelines for Drinking-water Quality. Geneva: World Health Organization.
3. Permenkes 492 tahun 2010 tentang Persyaratan Kualitas Air Minum.
4. United Nations. (2018). World Urbanization Prospects: The 2018 Revision. New York: United Nations.
5. Gupta, R., & Das, D. (2018). Water Pollution: A Threat to Human Health. In Environmental Pollution (pp. 121–132). Springer.
6. Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia No. 51 Tahun 2018 tentang Baku Mutu Kualitas Air Bersih.
7. Smith, A. H., Lingas, E. O., & Rahman, M. (2000). Contamination of Drinking-water by Arsenic in Bangladesh: A Public Health Emergency. Bulletin of the World Health Organization, 78(9), 1093–1103.
8. Halden, R. U. (2015). Contaminants of Emerging Concern in the Environment. American Chemical Society.
9. Maizlish, N., Rudolph, L., & Dowie, J. (2013). Health and Urban Living. The Lancet, 362(9387), 1752–1760.
10. Environmental Protection Agency. (2020). Leather Tanning and Finishing. United States Environmental Protection Agency.
11. Kumar, A., Xagoraraki, I., & Bhandari, A. (2014). Human Health Risk Assessment of Pharmaceuticals in Water: An Uncertainty Analysis for Meprobamate, Carbamazepine, and Caffeine. Science of the Total Environment, 468–469, 20–29.
12. United Nations Environment Programme. (2016). Global Chemicals Outlook II – From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development. Nairobi: United Nations Environment Programme.
13. World Bank. (2017). Urban Population (% of Total Population). World Bank Open Data.
14. Siddique, A., & Das, B. (2018). Impact of Tannery Effluents on Groundwater Quality and Agricultural Soils. International Journal of Environmental Science and Technology, 15(1), 117–126.
15. Paerl, H. W., & Paul, V. J. (2012). Climate Change: Links to Global Expansion of Harmful Cyanobacteria. Water Research, 46(5), 1349–1363.
16. World Health Organization. (2011). Guidelines for Drinking-water Quality. Geneva: World Health Organization.
17. Garuti, G., & Zapparoli, G. (2008). Soil and Groundwater Pollution by Tannery Effluents: A Review. In Water Pollution (pp. 113–124). Springer.