



Lead Heavy Metal (Pb) Pollution And Community Health Complaints In The Work Area Of The Community Health Center Bandarharjo Semarang

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Abstract

ABSTRACT

Clean water coverage in the city of Semarang is not yet 100%. As many as 18% of households still rely on surface water sources that are vulnerable to pollution for drinking water and sanitation hygiene purposes. Most of the water crises that occur in the Semarang City area are in the upstream and coastal areas. On the coast of the area where clean water is difficult is in the North Semarang area, especially when the tide is high (rob). Previous studies have found evidence of lead (Pb) metal contamination in the blood in women of childbearing age. Heavy

metal pollution is accumulative so that if it is not managed it is feared that it will have an impact on public health problems, especially people living around coastal areas. This study aims to measure the burden of heavy metal pollution in the work area of the Bandarharjo Community Health Center. The study was conducted in 4 (four) urban villages, namely Bandarharjo, Tanjung Mas, Kuningan and Dadapsari villages. The research sample is artesian well water as many as 16 households. The average result of lead (Pb) pollution in the work area of the Bandarharjo Community Health Center is 0.01 mg/L. The concentration of lead (Pb) is still safe, below the environmental quality standard.

Keywords: *lead heavy metal pollution, clean water, public health problems.*

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INTRODUCTION

Lead poisoning (Pb) has the potential to occur in North Semarang District, this is due to areas where the water quality is heavily polluted with lead (Pb) originating from industrial activities, domestic waste and also dense transportation with fossil fuels containing lead (Pb), and water pollution from dug wells comes from seawater intrusion, so that the North Semarang District has the potential to experience pollution in its clean water sources when compared to other areas around North Semarang.

As one of the most developed cities on the island of Java, Semarang City has a population of more than 1.7 million people. Semarang City is one of the important cities located on the north coast of the Java Sea. Based on data from the Central Java Provincial Statistics Agency in 2020, there are 21,467 small-scale companies and 650 large and medium-scale companies in the city of Semarang, some of which are in the work area of the Bandarharjo Community Health Center, North Semarang District.

The increasing number of industries will also increase the amount of waste produced. One component of industrial waste is heavy metals which are harmful pollutants for living things. This is because heavy metal elements are elements that are mostly non-degradable (cannot be decomposed) so that their existence cannot be described. In addition, heavy metal elements also have a high toxicity to living things so that their presence in the environment is very undesirable.

Research on lead pollution (Pb) in North Semarang District had previously been carried out by Marianti A in 2013 in the study it was found that the lead levels in the water consumed by local residents from 6 different water sources obtained an average lead level of 6.324 ppm. The occurrence of chronic lead exposure in the body and accumulates in the hair is the water and food consumed. Another study conducted by Wikri in 2019 found that in samples of seawater, dug well water and groundwater in the work area of the Bandarharjo Community Health Center, North Semarang City, the results showed 0.446 mg/L for seawater samples, 0.194 mg/L for dug well samples, and 0.08 mg/L for deep groundwater samples. By concluding from these results the lead (Pb) content has a value exceeding the quality standard based on Minister of Health Regulation No. 32 of 2017 namely > 0.05 mg/L.

Lead (Pb) can damage some functions of the kidneys, liver, damage the nervous system, interfere with the development of red blood cells, blindness and even mental retardation. The main target organs for lead (Pb) are the hematopoietic system, central nervous system, peripheral nervous system and kidneys. Levels of lead (Pb) if it has been absorbed into the body it will not be destroyed but will remain in the body so that it will be disposed of through the process of excretion. The process of excretion of lead (Pb) in the body is very slow so that lead (Pb) easily accumulates in the body.



This study aims to measure lead (Pb) heavy metal pollution in the work area of the Bandarharjo Public Health Center represented by 4 (four) villages in the work area of the Bandarharjo Community Health Center and identify health problems in the people who live in the research location.

METHOD

This type of research is a survey research with a cross sectional design, namely by measuring the levels of heavy metal lead (Pb) at one time with a spatial approach to describe or analyze the distribution of heavy metal lead (Pb) in clean water used daily by the community. residents in the working area of the Bandarharjo Community Health Center which is then made in spatial analysis. This research was conducted in the work area of the Bandarharjo Community Health Center with 4 (four) villages namely Bandarharjo, Tanjung Mas, Kuningan and Dadapsari Villages. The population of the subjects in this study is the people who live in the research location. The object population in this research is water samples from artistic wells used by the community. The samples were then analyzed at the Regional Health Laboratory of Central Java Province. The results of the analysis of heavy metal lead (Pb) were then compared with the clean water quality standard of the Minister of Health RI No.32 of 2017.

RESEARCH RESULT

1. Analysis of Lead (Pb) Heavy Metal Content Description of Lab Test Results

Table 1. Pb Levels in Clean Water Samples in the Bandarharjo Community Health Center Working Area

No.	Information	Pb . level	Quality standards	Unit
1	Point 1 Clean Water Bandarharjo1	≤ 0.01	0.05	mg/L
2	Point 2 Clean Water Bandarharjo2	≤ 0.01	0.05	mg/L
3	Point 3 Bandarharjo Clean Water3	≤ 0.01	0.05	mg/L
4	Point 4 Bandarharjo Clean Water 4	≤ 0.01	0.05	mg/L
5	Point 5 Bandarharjo Clean Water 5	≤ 0.01	0.05	mg/L
6	Point 6 Clean Water Bandarharjo 6	≤ 0.01	0.05	mg/L
7	Point 10 Tanjung Mas Clean Water 1	≤ 0.01	0.05	mg/L
8	Point 11 Tanjung Mas Clean Water 2	≤ 0.01	0.05	mg/L
9	Point 12 Tanjung Mas Clean Water 3	≤ 0.01	0.05	mg/L
10	Point 13 Tanjung Mas Clean Water 4	≤ 0.01	0.05	mg/L
11	Point 14 Tanjung Mas Clean Water 5	≤ 0.01	0.05	mg/L
12	Point 15 Brass Clean Water 1	≤ 0.01	0.05	mg/L
13	Point 16 Brass Clean Water 2	0.015	0.05	mg/L
14	Point 17 Brass Clean Water 3	≤ 0.01	0.05	mg/L



15	Point 18 Brass Clean Water 4	≤ 0.01	0.05	mg/L
16	Point 19 Brass Clean Water 5	≤ 0.01	0.05	mg/L
17	Point 20 Dadapsari Clean Water1	≤ 0.01	0.05	mg/L
18	Point 21 Dadapsari Clean Water 2	≤ 0.01	0.05	mg/L
19	Point 29 Dadapsari Clean Water 3	≤ 0.01	0.05	mg/L
20	Point 30 Dadapsari Clean Water 4	≤ 0.01	0.05	mg/L

Table 2 above is the result of the analysis of laboratory tests conducted by the Regional Health Laboratory of Central Java Province. A total of 20 samples of clean water used daily by residents in the working area of the Bandarharjo Public Health Center, the results showed that the Pb content in 20 samples of clean water examined, only one sample exceeded the specified quality standard, namely the Minister of Health Regulation of the Republic of Indonesia N0.32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitary Hygiene, Swimming Pools, Solus Per Aqua and Public Baths.

2. Description of Respondents Characteristics

The subjects in this study are people who live in the working area of the Bandarharjo Community Health Center, namely in 4 (four) urban villages, Bandarharjo, Tanjung Mas, Kuningan and Dadapsari villages who are willing to be interviewed. The characteristics of the respondents studied were respondent's age, education, occupation, respondent's weight, respondent's height, length of stay, source of clean water, frequency of seafood consumption.

Table 2. Distribution of Respondents' Characteristics in the Work Area of the Bandarharjo Community Health Center

No.	Variable	n	Min	Max	Mean	SD
1	Respondent's age (years)	102	17	49	35.62	8,675
2	Respondent's weight (Kg)	102	37	101	62,388	14,681
3	Respondent's height (Cm)	102	144	168	154,898	5,399
4	Respondent's length of stay (years)	102	1	58	25,58	13,697
5	Frequency of seafood consumption (x/week)	102	0	7	2,77	1,640

Based on table 2 above, it can be seen that the average age of the respondents in this study was 35.62 years with a standard deviation of 8.675 and a minimum value of 17 years and a maximum value of 49 years. The average weight of the respondents was 62,388 kg with a standard deviation of 14,681 and a minimum value of 37 kg and a maximum value of 101 kg. The average height of the respondents is 154.898 cm with a standard deviation of 5.399 and a minimum value of 144 cm and a maximum value of 168 cm. The average length of stay of respondents was 25.58



years with a standard deviation of 13,697 and a minimum value of 1 year and a maximum value of 58 years. The average weight of the respondents was 62,388 kg with a standard deviation of 14,681 and a minimum value of 37 kg and a maximum value of 101 kg. The average frequency of seafood consumption is 2.77 times per week with a standard deviation value of 1.640 and a minimum value of 0 times and a maximum value of 7 times a week.

3. Public Health Complaints in the Residential Areas of the Bandarharjo Community Health Center

Table 3. Public Health Complaints in the Bandarharjo Community Health Center Work Area

No	Health Complaint	Amount	Percentage
1	Diarrhea	31	30,3
2	Itchy rash	10	9,8
3	Out of breath	12	11,7
4	Headache/Dizziness	18	17,6
5	Hypertension	12	11,7
6	Nausea (bloating/ulcer)	6	5,8
7	Back pain	9	8,8
8	No Complaints	4	3,9
Total		102	

Source: Processed Data

DISCUSSION

Content of Lead (Pb) in Clean Water

Based on table 2 the results of laboratory tests for lead (Pb) levels in clean water samples in the work area of the Bandarharjo Community Health Center, it is still safe because it is still below the Threshold Threshold (NAB), only one sample exceeds the Threshold Limit Value (NAV) with the results of levels lead (pb) 0.015 mg/L in Kuningan Village. One sample that exceeds the quality standard of the Minister of Health of the Republic of Indonesia N0.32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitary Hygiene, Swimming Pools, Solus Per Aqua and Public Baths is due to other than lead (Pb) produced by industrial waste located Around the research location, Pb also comes from sea transportation, namely fishing boats that use gasoline as fuel. Pb is widely used in the battery, cable, gilding, pesticide industry, as an anti-explosion agent in gasoline, as a soldering or soldering agent, as a pipe connector formulation.



The toxic effects of Pb on humans originate from contamination of food and beverages, through inhalation from the air, Pb contaminants, and skin contact. Pb metal is not needed by the body. Pb in the human body can inhibit the activity of enzymes involved in the formation of Hb. Pb toxicity is chronic and acute. Pb can cause gastrointestinal gas disorders, infertility in men, spontaneous abortion in women, decreased memory, impaired nerve function and impaired kidney function (Widowati, 2008).

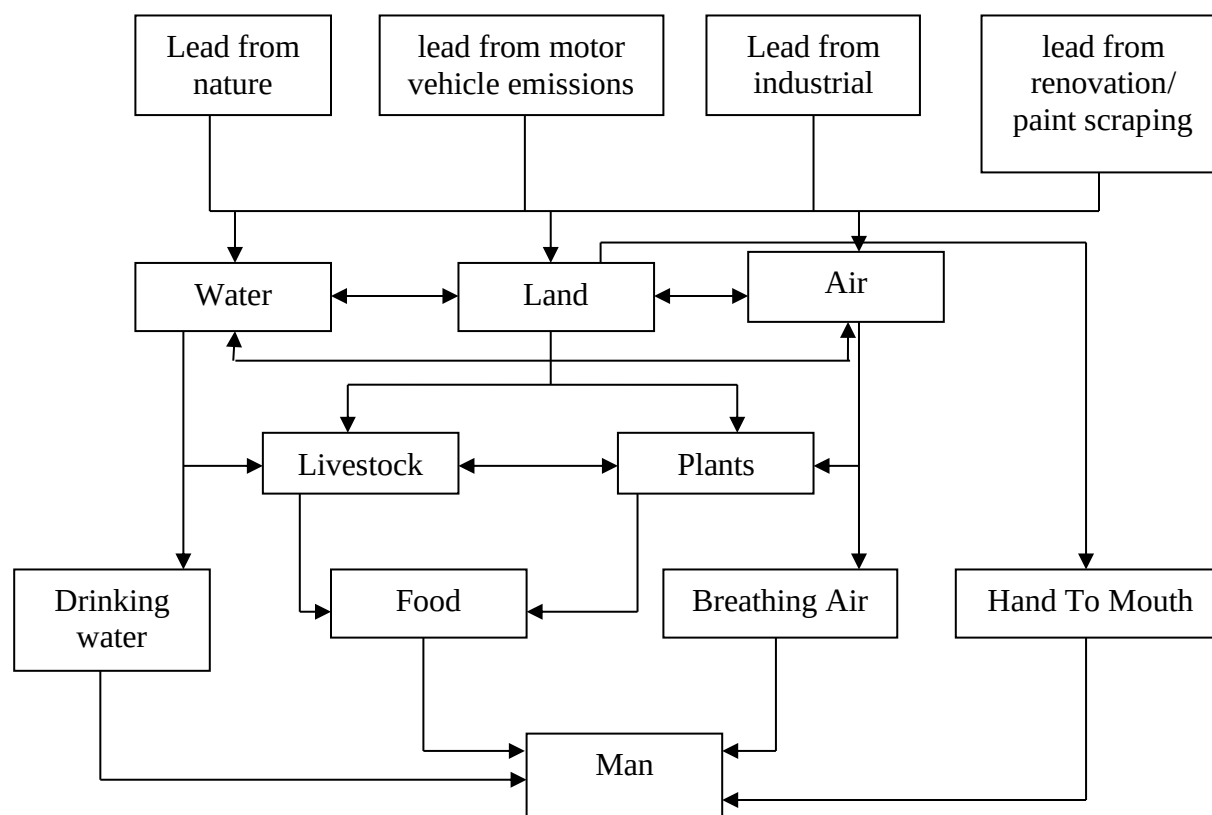


Figure 1. The journey of lead (Pb) from the environment to enter the human body (National Health and Medical Research Councils)

Research on heavy metal levels in drinking water in Malaysia found Pb and Al levels were above the MMOH and WHO quality standards, identified as sources of pollution were industrial waste, urban waste and rusty pipes (HafizaN.AR et al, 2015). The following is the mechanism of Pb travel in the environment and affecting public health.

The results of data collection through questionnaires obtained that the respondent's disease complaints data in the last 3 (three) months showed several characteristics of complaints of heavy metal lead (Pb) poisoning. Common complaints are diarrhea, itching of the skin, headache or



dizziness, nausea and bloating (ulcer). Health complaints suffered or felt by respondents are basically common symptoms experienced by the research sample in the last three months. These complaints cannot be confirmed as symptoms of poisoning due to heavy metals, because there are many other supporting factors that may contribute to the emergence of these complaints, such as the influence of diet that causes stomach complaints (ulcer) so that respondents feel nauseous, decrease appetite, feel weak, and weight tends to decrease. This can be proven if blood, urine, or hair samples are taken as bio-monitoring of metals in the human body.

In this study, no blood or urine samples or body tissues were taken, so it cannot be known with certainty whether the complaints of illness that arose in the last 3 (three) months were the result of lead poisoning (Pb). Lead (Pb) in the body is accumulative. Lead (Pb) in the body can cause haematotoxic disorders which cause inhibition of hemoglobin formation so that it can cause anemia. Lead (Pb) accumulates in the body and is stored in the kidneys, nails, hair and fat tissue. The accumulation of lead in the blood in adults can interfere with kidney function, digestive tract, nervous system, reduce fertility by decreasing sperm count and can even cause spontaneous abortion, stunted fetal development, causing emotional and behavioral disorders (Gilbert, 2005; ATSDR, 2007). Efforts to overcome lead metal (Pb) pollution is to carry out environmental management that involves cross-sectoral. Community empowerment is very supportive in environmental management. Health complaints can be overcome if the community participates in implementing PHBS (Clean and Healthy Living Behavior) at the family level.

CONCLUSION

1. The average result of lead (Pb) heavy metal pollution in the work area of the Bandarharjo Community Health Center is 0.01 mg/L. There is only one sample that exceeds the Threshold Value (NAV), namely in Kuningan Village with a value of 0.015 according to the Minister of Health RI N0.32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitary Hygiene Needs, Swimming Pools, Solus Per Aqua and Public Baths.
2. Complaints about public health found are diarrhea, skin diseases have not specifically complained about the impact of heavy metal lead (Pb) pollution.



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