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BLOOD LEAD AND CADMIUM LEVEL AMONG FUEL STATION WORKERS IN SEMARANG CITY

Nur Kusuma Dewi and Ari Yuniastuti
Department of Biology, Faculty of Mathematic and Natural Science, Universitas Negeri Semarang, Indonesia
E-Mail: nur.kusuma.dewi.unnes@gmail.com

ABSTRACT

Motor vehicles are the largest source of heavy metal pollution in the neighborhood. Lead (Pb) and cadmium (Cd) are toxic heavy metal and dangerous that can poison the environment and have an impact on the entire system in inside the body. This study aims to determine the level of lead and cadmium in blood of fuel station workers in Semarang city.This studyused analytic cross sectional survey design which was conducted on may 2015. In total there are 52 subjects in this study. The blood samples were collected by the author. The analysis was conducted at Food and Nutrition Centre, Gadjah Mada University Yogyakarta. Blood lead and cadmium level was measured using Lead and Cadmium by Blood Test Kits. The average blood lead and cadmium levels was 14, 23± 2, 54 μg/dL and 3, 22±5,24μg/dL, respectly. The conclusion that the blood lead levels among the fuel station workers in Semarang City was 92,3% still withinthe normal limit.The blood cadmium levels among the fuel station workers in Semarang City was 95,1% still within the normal limit.

Keyword: lead level, cadmium level, fuel station workers.

INTRODUCTION

Air pollution contains various heavy metals, one of them is lead (Pb) which produced by the fuel combustion of motor vehicles and industrial emissions. Most inorganic Pb contained in the air is a result of the combustion of tetraethyl lead (TEL) and tetramethyl lead (Temel) which are contained in the motor vehicle fue (Mardiani, 2008). The study of National Institute of Aeronautics and Space (LAPAN) regarding air pollution in urban areas provedthat motor vehicle emissions had been the highest air pollution contributor in Indonesia, which is about 85%. (Gusnita, 2012).

Lead (Pb) can enter the human body from many sources, such as gasoline (petrol) proceeds, recycling or disposal of car batteries, toys, paints, pipes, soils and some types of cosmetics and traditional medicines. The lead accumulation in the human body is dangerous for the health (Ardyanto, 2005). The entry of lead into the body will affect the health and the function of the blood's ability to form hemoglobin, nervous system disorders, anemia, and the damage of the liver and kidneys (Ardyanto, 2005). Cadmium is a contaminant found in most human foodstuffs, which renders diet a primary source of exposure among nonsmoking, nonoccupationally exposed populations (Clemens 2006; Franz *et al*. 2008; McLaughlin *et al.* 2006).

A safe intake limit of 7 μg cadmium/week/kg body weight was set based on the critical renal cadmium concentration of between 100 and 200 μg/g wet weight that corresponds to a urinary threshold limit of 5-10 μg/g creatinine (World Health Organization (WHO 1989, 1993).

Recent epidemiologic studies involving an exposure-effect assessment have linked low-level cadmium exposure of current populations with some adverse effects that are not restricted to kidney and bone, but include almost every organ and tissue where cadmium accumulates, including eye tissue (Soisungwan *et al*., 2010).

MATERIALS AND METHODS

This study used analytic cross sectional survey design, in which data were collected simultaneously between the concentration of lead and cadmium in the blood of fuel station worker. General characteristics of subjects were examined by an interview using a questionnaire. The exclusion criterion subjects include the subjects that unwilling to participate in the study, age below 15 or above 65 years, resident lived outside centre of Semarang city, and who reported chronic diseases. This study conducted on May 2015 with the subjects are fuel station worker in Semarang City. In total there are 52 subjects in this study. 52 subjects who were fuel stations workers represent approximately 92% of workers in these two stations as an application of inclusion and exclusion criteria. Two fuel stations selected randomly from the ten fuel stations that supply leaded benzene and gasoline in the centre of Semarang city. All subjects were interviewed for possible exposure of lead and none reported any collected for laboratory analysis from each subject.

The blood samples were collected by the author. Blood samples obtained by stab the fingers using blood lancets; previously fingers should be washed to avoid contamination. The lateral side of the middle finger was used. A heparinized capillary tube (50 μl) used to collect blood. For each test, the 50 μlblood sample was dispensed from the capillary tube into the treatment reagent tube using certain plungers.

Analysis was conducted at Food and Nurition of Inter University Center, Gadjah Mada University, Yogyakarta. Blood lead levels were measured using Lead and Cadmium are Blood Care Blood Test Kits. The performance of the Lead Care System was checked on each batch run using appropriate quality control materials, i.e. both high and low known readings lead and cadmium standards by Lead and cadmium Care as well. Results obtained on control samples were within the expected range. The performance of the Lead and cadmium Care System was calibrated after every 20 samples with atomic

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absorption spectrophotometer blood lead and cadmium standard materials. The data was analyzed using the SPSS, software version 15.

RESULT

Based on the examination results of blood lead levels among respondents (fuel station workers in Semarang city) by the Food and Nutrition Inter University Center of Gadjah Mada University found the average of lead levels was14.23±2.54 µg / dL. The highest lead levels was 30.62 µg / dL and the lowest was 5.28 µg / dL. The maximum limit of blood lead levels according to WHO (1995) was 25 µg / dL. Based on these criteria, the 59.6% of respondents hadaverage blood lead levels (10-25µg/dL) which were still within the normal criteria, 32.7% had low lead levels (<10 mg/dL) and 7.7% or 4 respondents had a high lead levels (> 25 mg / dL) (Table-1).

Table-1. Distribution of Blood lead levels among fuel stations workers in Semarang City.

	Frequency	Percentage (%)
Lead level		
Low (< 10 µg/dL)	17	32,7
Average (10-25 µg/dL)	31	59,6
High (>25 µg/dL)	4	7,7
Total	52	100

Source: Primary Data 2015

The results of the blood cadmium levels among the fuel station workers were an average 3,22±5,24µg / dL. The highest cadmium levels was 22.43 µg / dL and the lowest was 2.15 µg / dL. The maximum limit of the blood cadmium levels according to WHO (1995) was 15 µg / dL. Based on these criteria, the 61.5% of respondents had the low blood cadmium levels (<10µg / dL) were still within the normal criteria, 34.6% had theaverage cadmium levels (10-15µg / dL) and 3.9% or 2 respondents had a high cadmium levels (> 25 mg / dL) (Table-2).

Table-2. Distribution of Blood cadmium levels among fuel stations workers in Semarang City.

	Frequency	Percentage (%)
Cadmium level		
Low (< 10 µg/dL)	32	61,5
Average (10-25 µg/dL)	18	34,6
High (>25 µg/dL)	2	3,9
Total	52	100

Source: Primary Data 2015

DISCUSSIONS

Lead poisoning in adults mostly occured at their work place. Prevalence of events were various for each job type. The risk of toxicity dependend on the job that was usually chronic (Darmon, 2001).For 80% respondents did not use a mask whenthey carried out daily activities. The examination results of the blood lead levels on the fuel station workers showed most of them were still in the normal range, only 6.7% was higher than normal. This might be caused by the not too high exposure so that the blood lead levels was still largely within normal limits.

According to Caroline W (1995) in Suciani (2007) the lead exposureduration, the lead exposure dose and the way how leadenter into the body also affected the blood lead levels. This contrasted with the research of Nurjazuli *et al* (2003)[8], on the fuel stations operator in Samarinda had proved that the working duration was a dominant factor for high blood lead levels.

Robert Malkin in Environmental Research (1995) stated that the house condition such as the use of paint containing lead and also the habit of using the painted ceramics of tableware (such as mugs) would affect the blood lead level. In addition, the house location also affected the lead exposure, for example a house located near a busy highway traffic would be exposed higher lead exposure than a house away from a busy highway traffic.

According to OSHA (2008) when the lead levels in the air of working environment reached 40 pgr / m3 and workers exposed for 30 days or more, so that they should conduct a health surveillance. Health surveillance included blood tests, including lead and zinc protoporphyrin (ZPP). If lead exposurewas quite low, at below 40 pgro / o in the blood so the monitoring was carried out every 6 months. The US-OSHA (2008) required that the worker had to moved or rested then conducted surveillance of each month and wereallowedto work again after the blood lead levels decrease below 40 pgro / o.

The amount of cadmium use in daily life caused the amount of cadmium ranging from 25 to more than 200 mcg. Although cadmium absorption by the body was only about 20%, but the metal cadmium was difficult to be removed from the body. This resulted in the accumulation of the metal cadmium in the liver and kidneys.

CONCLUSIONS

The blood lead levels among the fuel station workers in Semarang City was 92, 3% still withinthe normal limit, only 7, 7% respondents hadthe blood lead levels above normal (> 25 µg/dL). The blood cadmium levels among the fuel station workers in Semarang City was 95, 1% still within the normal limit, only 3, 7% respondents hadthe blood lead levels above normal (>15 µg/dL).

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