

The Importance of Personal Protective Equipment for the Health of Motorcycle Mechanics to Smoke Exposure

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The increasing use of motor vehicles greatly triggers the increasing amount of air pollution which causes various effects on the environment and human health. Air pollution can cause various diseases for humans such as sore eyes, coughing, to respiratory problems. Motor vehicle smoke is a contributor to air pollution because it contains a variety of pollutants. This pollutant can enter the body through the respiratory tract so it is dangerous for health. The purpose of this study is to discover the importance of the use of personal protective equipment and the potential illness that can be suffered by motorcycle repair shop workers for a certain period of time in the District of Bandung Kulon, Bandung Regency, West Java. The research method used is descriptive research that describes the phenomena that will be examined to answer research questions using the Atomic Absorption Spectrophotometry (AAS) method. The results of this study indicate that exposure to smoke-free vehicles originating from motorbikes contributes positively to the increased levels of heavy metal Plumbum (Pb) which can threaten the health of workers.

Key words: *Personal protective equipment, Motorcycle repair shop, Mechanic, Motor Vehicle Smoke, Health .*

Introduction

Air pollution is defined as the presence of foreign substances or substances in the air that cause changes in the composition (composition) of the air from its normal state (Ramadhani, 2018). This condition occurs due to the introduction of toxic or toxic pollutants or pollutants (Rosita and Widiarti 2018). As a result of air pollution can cause disruption both environment and health (Fardiaz in Ramadhani, 2018). Air pollution is defined as the presence of foreign

materials or substances in the air that cause changes in the composition (composition) of the air from its normal state. The presence of foreign substances or substances in the air in a certain amount as well as being in the air for quite a long time, will be able to disrupt human life. If such conditions occur then the air in saya is polluted (Ramadhani, 2017). The use of motorized vehicles in Indonesia has increased from year to year and has led to high consumption of gasoline (Khotijah, Sjarifah, Mahendra, Widyaningsih, & Setyawan, 2017).

One that contaminates air pollution is heavy metals. Heavy metals are metals that have a density of $\geq 5 \text{ g / cm}^3$ with atomic numbers 23 to 92 or in the lower right of the periodic table (Alsuhenra and Ridawati 2013). The impact of heavy metals is causing damage to the formation of red blood cells (Indirawati, 2017). One type of heavy metal that is harmful to health is lead (Pb). PB is a heavy metal that is very dangerous for health (Ardillah, 2016). Pb is physically soft, blackish brown in color, and easily purified from mining. Pb has an atomic number 82, atomic weight 207.21 and valence 2-4 (Alsuhenra and Ridawati, 2013). PB has a toxic effect that is disrupting kidney function, digestion, nervous system, decreasing the number of spermatozoa and spontaneous abortion (Rosita and Widiarti, 2018). While the mechanism of Pb in the body can enter through the act of consuming food, drink, or inhalation of air (Rosita and Widiarti, 2018). Poisoning caused by Pb metal compounds can occur due to the entry of metal compounds into the body. The process of entry of Pb into the body can be through several pathways, namely through food and drink, air and seepage or penetration of the membrane or layer of skin. Most of the PB that is inhaled when breathing will enter the lungs. The rate of absorption is greatly influenced by the particle size of the existing Pb compound and the volume of air that is able to be inhaled at the moment of breathing. The smaller the size of dust particles, and the greater the volume of air that can be inhaled, the greater the concentration of Pb absorbed by the body. Pb metal that enters the lungs through respiratory events will be absorbed and bound to the lungs blood to then be circulated to all tissues and organs of the body. More than 90% of the Pb metal absorbed by blood binds to red blood cells (erythrocyt) (Palar, 2012). According to Indirawati (2017) the toxic effects of 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 disorders, infertility in men, spontaneous abortion in women, decreased memory, impaired nerve function and impaired kidney function (Indirawati, 2017).

Personal Protection Equipment (PPE) is a tool needed to protect a person from potential physical and health hazards. PPE that should be appropriate to the type of work, can be used flexibly, meets existing requirements and is not easily damaged (Sugarda, Santiasih and Juniani, 2014). In fact, the use of PPE by workshop workers does not comply with the standards, and there are no air holes according to SNI (Mulyadi, Mukono, and Notopuro, 2015). There are even workshop workers who do not use PPE, incomplete PPE effects make it easier to expose heavy metal particles that threaten health. Exposure to this heavy metal can cause toxic effects in the form of anemia, gastrointestinal disorders, infertility in men, spontaneous abortion in women, decreased memory, impaired nerve function and impaired kidney function (Indirawati, 2017). Disposal of vehicle fumes in large quantities causes health problems so that they are often ignored by workshop workers who interact daily with vehicle fumes and do not use PPE that is in accordance with various factors and reasons. This is because the workshop workers are not familiar with the use of PPE, while the effect of PB directly facilitates the exposure of PB to health. . If you do not wear a mask, the heavy metal Pb will be inhaled, while not wearing

gloves it will enter the digestive system with food. In the body, Pb is distributed into the blood and then bound to red blood cells, and the rest is bound to plasma and a portion of Pb is stored in soft tissue and bone. Excretion is mainly through the kidneys and digestive tract (Rosita and Widiarti, 2018).

Research Method

Participants

The research subject is part of the population element that results from the sampling strategy (Swarjana, 2015). The research subjects used in this study were 10 motorcycle repair shop workers with a period of 1-5 years in the Bandung District of Kulon, West Java.

Design and Procedure

This type of research is descriptive which describes the phenomenon that will be investigated to answer the research question which is to find out the Importance of Personal Protective Equipment for the Health of Motorcycle Workshop Workers (Swarjana, 2015). and measurement of Plumbum (Pb) heavy metal content in the blood of motor repair shop workers using the Atomic Absorption Spectrofotometry (AAS) method.

Results and Discussion

The results of examination of Plumbum (Pb) levels in the blood of motorcycle repair shop workers

The technique of checking Pb levels in blood samples of workshop workers in the Bandung Kulon District using the Atomic Absorption Spectrophotometry (AAS) method. The equation of the line on the standard solution curve obtained is $y = 0.0095x + 0.0007$.

Table 1. Data from the Measurement of Plumbum Heavy Metal (Pb) in the blood of workshop workers

No	Samples	Smoking Habit	Length of work (Year)	Concentration (mg/L)
1	Sample 01	Yes	3	1,01
2	Sample 02	Yes	2	1,09
3	Sample 03	Yes	5	1,30
4	Sample 04	Yes	4	1,11
5	Sample 05	Yes	3	1,11
6	Sample 06	Yes	5	1,16
7	Sample 07	Yes	1	1,01
8	Sample 08	Yes	3,5	1,12
9	Sample 09	Yes	4	1,16

10	Sample 10	Yes	6	1,31
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Table 1. Shows the levels of Plumbum (Pb) heavy metals after measuring using the Atomic Absorption Spectrofotometry (AAS) method. From these results it can be seen that the research conducted on the measurement of Plumbum Heavy Metal (Pb) levels in motorbike repair workers in Bandung Kulon District. used with a total sample of 10 samples. The minimum yield is 1.01 mg / L while the highest yield of the 10 examined samples is 1.31 mg / L. Before checking the lead level of Plumbum (Pb) in the blood of workshop workers in the Bandung Kulon District using the Atomic Absorption Spectrofotometry (AAS) method, a standard curve with a concentration value of 0 mg / L with a concentration of 0.001, 1 mg / L with an absorbance value of 0.0109 , 2 mg / L with an absorbance of 0.0199, 3 mg / L with an absorbance of 0.0291, 4 mg / L with an absorbance of 0.0387 and 5 mg / L with an absorbance of 0.0480. The standard solution was prepared from a solution of Pb 1000 mg / L and HNO₃ 0.5 mol / L. A standard solution is a solution that contains precisely known concentrations of an element or substance, which functions as the making of a standard curve whose concentration is known.

According to the results that have been studied Plumbum levels in the blood of workshop workers obtained from samples one to 10 have a high enough value of the normal threshold value with the smallest value of 1.01 and the largest value of 1.31 mg / L. Anemia caused by lead, can be a direct consequence of obstacles to the biosynthesis of hemoglobin, lead also has a relationship with disruption in the synthesis of globin, the effect of lead on the haemopoetic system causes reduced synthesis of hemoglobin and causes anemia (Purnomo 2015). Red blood cells are a form of chelate complex formed by Fe (iron) metal with haeme and globin groups. The synthesis of the complex involves 2 kinds of enzymes, namely ALAD (Amino Levulinic Acid Dehydrase) enzymes. ALAD enzymes are cytoplasmic type enzymes. This enzyme will react actively in the early stages of synthesis and during the red blood cell circulation takes place (Palar, 2012). At this time, one of the most dangerous air pollutants is lead metal, which is often called Plumbum (Pb), which has accumulated properties in the body so that it is very dangerous to human health for a long time. In addition Plumbum is one of the types of heavy metals included in the B3 classification (Mukono, 2008).

Conclusion

Based on research that has been done, it can be concluded that the average levels of Plumbum (Pb) heavy metals contained in the blood of Bandung Kulon workshop workers using the Atomic Absorption spectrophotometry (AAS) method is 1.138 mg / L while the lowest results are 1.01 mg / L which is included in the quite high category. This shows that the smoke-free exposure of motor vehicles has a big influence in threatening the health of motorbike repair workers with various types of diseases it causes.

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References

- Alsuhehri., & Ridawati. (2013). Toxic substances in food. Bandung.
- Ardillah, Y. (2016). Risk factors for lead content in the blood. *Journal of Public Health* 7 (6); 150-155.
- Eka, H., & Mukono, J. (2016). Relationship of blood lead levels with hypertension of car painting workers in Surabaya. *Journal of Public Health*, 9 (1); 66-74.
- Indirawati, S. M. (2017). Heavy metal and CD pollution and health complaints to communities in the Belawan coastal area. *JUMANTIK Journal*, 2 (2): 54-60.
- Khotijah., Sjarifah, I., Mahendra, P. G. O., Widyaningsih, V., & Setyawan, H. (2017). The effects of lead (pb) exposure to blood pb concentration and hemoglobin levels in book sellers and street vendors of Surakarta. *Journal of Public Health*, 13 (2) Occupational Safety and Health Program, Faculty of Medicine, Sebelas Maret University
- Muliyadi., & Mukono, H. J., & Notopuro, H. (2015). Air lead exposure to blood lead, hemoglobin, cystatin C serum of car paint workers. *Journal of Public Health*, 11 (1); 88
- Palar, H. (2012). Pollution and toxicology of heavy metals. Jakarta: Rineka Cipta.
- Ramadhani, P. (2018). Analysis of exposure and lead levels (Pb) in two-wheeled motor vehicle repair shop workers in the city of Medan. [Thesis] Faculty of Health Community Sumatera Utara Medan 2018.
- Rosita, B., & Widiarti, L. (2018). The relationship of lead toxicity (pb) in blood with hemoglobin in Pekanbaru painting workers, 1 (1); 1-2
- Sugarda, A., Santiasih, I., & Juniani, A. I. (2014). Analysis of the effect of the use of Personal Protection Equipment (PPE) on Allowance of wood cutting work processes (Case study: PT. PALI INDONESIA). *J @ TI Undip*, 9, 139-146.
- Swarjana, K. I. (2015). Health research methodology. Publisher Andi, Stikes Bali; Yogyakarta