Indonesian Journal of Global Health Research
Volume 4 Number 2, May 2022
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

THE IMPACT OF EXPOSURE TO BLOOD LEAD LEVELS ON ONLINE OJEK DRIVER STUDENTS ON INTELLIGENCE AND COMMUNICATION ANXIETY

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ABSTRACT
Motor vehicle smoke pollution contains lead exposure which if accumulated in the blood exceeds the stipulated level, it can cause health problems, both psychological and physical. This study aims to determine the effect of exposure to lead emitted by motor vehicle fumes on students who take part-time jobs as online motorcycle taxi drivers. The influences studied include IQ levels and communication anxiety. Measurement of IQ using the WAIS test (Wechsler Adult Intelligence Scale) while Communication Anxiety was measured using the Communication Anxiety Scale. Blood lead levels were checked using the GFAAS tool. The data on blood lead levels, IQ scores and communication anxiety were then tested for normality using the Kolmogorov Smirnov technique and followed by a linearity test with a test of linearity. Then for hypothesis testing, the data were analyzed using simple regression analysis. The result is that there is a relationship between blood lead levels with IQ levels and communication anxiety.

Keywords: communication; intelligence; lead exposure

First Received	Revised	Accepted
28 March 2022	12 April 2022	24 May 2022
Final Proof Received		**Published**
25 May 2022		30 May 2022

How to cite (in APA style)
Susilowati, I., Dewi, N., Trikusumaadi, S., & Saputri, D. (2022). The Impact of Exposure to Blood Lead Levels on Online Ojek Driver Students on Intelligence and Communication Anxiety. *Indonesian Journal of Global Health Research*, *4*(2), 309-314. https://doi.org/10.37287/ijghr.v4i2.1043.

INTRODUCTION

The increase in crime rates in urban areas is getting higher. Nowadays the response of society is getting faster and the aggressiveness of teenagers is getting higher. Juvenile delinquency behavior and antisocial tendencies are more often associated with social-hereditary factors such as parents who have antisocial genetics, poverty, and a bad social environment (addicts to cigarettes, alcohol, drugs). In several studies, it is known that the bad natural environment also plays an important role in influencing adolescent behavior. One of the roles is lead exposure.

Gasoline with heavy metal content of lead has been used as the main fuel for motorized vehicles in Indonesia for decades. Jakarta, Batam and Bali, which have not used it, respectively, since 2001, 2003 and 2004. The negative effects of lead heavy metals, including decreased IQ levels, hearing loss, growth disorders, and reduced hemoglobin levels, will continue and threaten children. The study of heavy metal levels of lead in blood in Jakarta, 2001, found 5% of primary school children with blood lead levels (BLLs) 10 g/dl, and 2.4% had BLL > 20 g/dl (CDC-USAEP 2001) .

Exposure to lead in the blood when accumulated in the long term can damage the nervous system in humans. This exposure can be through wall paint, water pipes, and gasoline residue

(Kriswedani, 2015). Pollution-prone locations will have an impact on their students. Lead exposure is at least known to have an impact on decreased intellectual abilities and problematic behavior that leads to a tendency to antisocial behavior.
Research on the harmful effects of lead exposure accumulation in the blood has been widely carried out abroad. The study was conducted on a number of pregnant women in locations with high lead exposure. Examinations are carried out periodically starting from infants until the babies born are 18 years old. The result is an increase in blood lead exposure which is correlated with high crime rates in the area. The results showed that every 5 mg/dl increase in blood lead exposure in children aged 6 years increases the risk of antisocial behavior in adolescents by 50% (Wright et al, 2008).

Lead exposure also has an impact on health. In children it can cause behavioral changes, hyperactivity, impaired concentration, and decreased IQ. In adults it can cause hypertension, headaches, anemia and some other minor health problems (Needelman, 2004). According to Sciarillo et al (1992) the findings in the study stated that lead exposure at an early age led to a number of maladaptive behaviors in children that had the potential for juvenile delinquency. This data was obtained based on filling out maladaptive behavior questionnaires filled out by parents. Children with blood lead exposure levels of more than or equal to 15 mg/dl on two consecutive checks showed more maladaptive behavior than children with lower lead exposure levels. Maladaptive behaviors reported in children aged 2-5 years include withdrawal from the environment, easily discouraged, sleep disturbances, frequent excuses of illness, hyperactivity, aggression, and destructiveness.

The natural environment is one of the factors that play a role in influencing health. In this study, the duration and frequency of being on the highway are factors that also play an important role in addition to the variables studied. This is because students who work as online motorcycle taxis spend almost a third of their time on the road. Based on its harmful effects, the researcher intends to find out whether there is a relationship between exposure to lead in the blood on IQ levels and communication anxiety.

METHOD

The toxicological mechanism of lead is due to an ionic mechanism with its ability to replace other bivalent cations such as Ca2+, Mg2+, Fe2+ and monovalent cations such as Na+, thereby affecting the body's basic biological processes (Lidsky & Schneider, 2003). It has a significant effect on various fundamental cellular processes such as intra and intercellular signaling, cell adhesion, protein folding and maturation, apoptosis, ionic transport, enzyme regulation, neurotransmitter release and others (Garza et al., 2006). The ionic mechanism contributes mainly to neurological deficits, where lead displaces calcium ions, and can cross the blood-brain barrier (BBB), after crossing the BBB it accumulates in astroglial cells (lead binding proteins).

Lead easily damages immature astroglial cells and blocks the formation of the myelin sheath. Lead, even in picomolar concentrations, can displace calcium, thereby influencing key neurotransmitters such as protein kinase C, which regulates long-term neural excitation and memory storage. It also affects the concentration of sodium ions, which are responsible for vital activities in biological activities such as responses to actions in excitatory tissues for the purpose of cell-to-cell communication, uptake of neurotransmitters (choline, dopamine and GABA), regulation of calcium utilization and retention by synaptosomes. The interaction between lead and sodium seriously impairs the normal functioning of sodium (Bressler et al., 1999).

This study uses a correlational quantitative research design. Prior to data collection, licensing administration was carried out as well as socialization regarding the benefits of the research. After the licensing and socialization management is complete, the next stage is an initial assessment as well as a try out questionnaire and giving informed consent. The try out was used to test the validity and reliability of the communication anxiety questionnaire. Giving informed consent is used as evidence of students' willingness to be a research sample. In the next stage, the number of research samples will be determined for further research data collection. This study uses purposive non-random sampling with sample criteria including: active students who work as online motorcycle taxi drivers.

Checking the blood lead level is done by taking a 3 cc blood sample which is inserted into a purple vacuum tube and placed in an ice box and brought directly to the Yogyakarta Health Laboratory. , and observation of IQ data by looking at the results of the WAIS test which has been accompanied by the norms for categorizing IQ levels and communication anxiety by looking at the communication anxiety scale score.

The validity and reliability of the communication anxiety questionnaire were tested using corrected item total correlation. Valid and reliable items were then rearranged for research data collection. Data on blood lead levels, IQ scores and communication anxiety scale scores were then tested for normality using the Kolmogorov Smirnov technique and followed by a linearity test with a test of linearity. Then to test the hypothesis, the data were analyzed using simple regression analysis techniques.

RESULTS

The results of the study using 15 blood samples of students working as online motorcycle taxis who were checked with GFAAS at BLK Jogjakarta, as well as the results of IQ test scores and communication anxiety scales obtained the data shown in the table below.

Table 1.
Results of Pb Levels, Communication Anxiety and IQ

No Sampel	Pb . level (µg/L)	Working Period (Years)	Working Hours (Hours)	Communication Anxiety	IQ
1	17,87	1	14	60	85
2	13,89	2	5	49	85
3	09,01	1	8	52	96
4	01,06	3	10	52	106
5	06,57	3	12	60	96
6	11,45	1	4	77	90
7	10,54	3	7	49	85
8	08,70	2	10	61	90
9	09,01	2	7	60	96
10	09,62	2	6	55	96
11	10,84	1	14	69	90
12	14,81	3	8	52	90
13	11,76	2	8	63	96
14	10,54	1	3	56	96
15	17,87	1	14	60	85

The Pb level from the results of the study showed that it was still within the normal threshold according to OSHA (Occupational Safety and Health Association) standards where the threshold value for inorganic lead, dust and vapor should not exceed 0.5 ppm (OSHA, 2005). According to the limits for lead levels in the blood according to the Center for Disease Control and Prevention or CDC (2012) are Adults: < 10 g/dL and children: < 5 g/dL. The results of the Iwo Way Anova test show that the variables of communication anxiety, IQ, tenure, and length of work show that the sig value is > 0.05, so it can be concluded that the Pb level variable does not show a significant difference in the IQ value, communication anxiety, period of time. work, and length of work. Paired Sample Test results obtained Sig value <0.05 there is a relationship between Pb levels with anti-social, communication anxiety, and IQ. The length of work and the working period affect the lead content.

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DISCUSSION

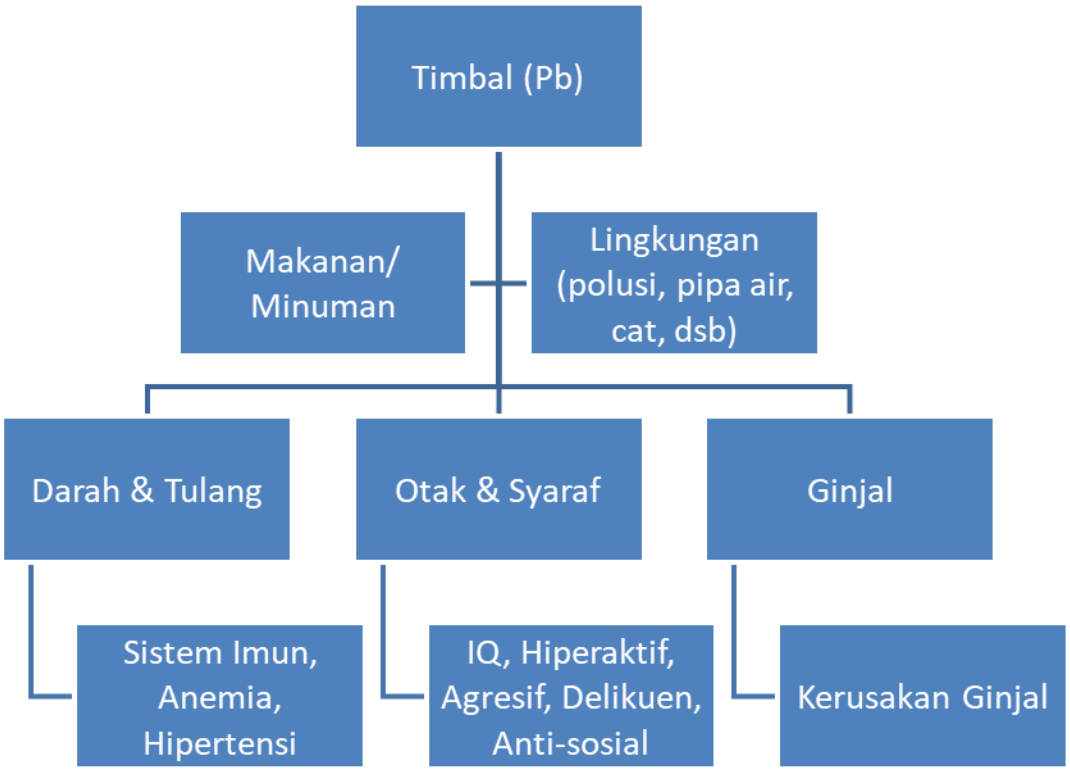

Figure 1. Overview of the Toxicological Impact of Lead on Health

Toxicology of lead (Pb) is a highly hazardous hazard with the potential to cause irreversible health effects. It is known to interfere with several body functions, especially affecting the center, hematopoietic, liver and kidney (Kalia & Flora, 2005). Acute toxicology is related to occupational exposure and is rare, whereas chronic toxicology occurs at lead levels in the range of 40 – 50 g/dL. This can be more severe if not treated with patients characterized by frequent vomiting, encephalopathy, lethargy, delirium, seizures and coma (Flora et al., 2006; Pearce, 2007).

Compared to the effect of Pb on body organs, the nervous system is the main target and is more sensitive to Pb toxicology in inducing (Cory-Slechta, 1996). Pb exposure will affect the nervous system and peripheral nervous system. Effects on the peripheral nervous system are more pronounced in adults while the central nervous system is more pronounced in children (Brent, 2006; Bellinger, 2004). Encephalopathy (progressive degeneration of certain parts of the brain) is a direct consequence of lead exposure and its main symptoms include dullness, irritability, poor attention, headaches, muscle tremors, memory loss and hallucinations. More severe manifestations include delirium, lack of coordination, seizures, paralysis, coma and ataxia (Flora et al., 2006).

In particular, fetuses and young children are more susceptible to the neurological effects of lead as the developing nervous system absorbs higher lead fractions. The proportion of acquired systemic circulating lead access to the brain of children is significantly higher than that of adults (Needleman et al., 2004). Children may appear inattentive, hyperactive and irritable even at low lead exposure. Children with greater lead levels may be affected with delayed growth, decreased intelligence, short term memory and hearing loss, at higher levels, Lead can cause permanent brain damage and even death (Cleveland et al., 2008). There is evidence to suggest that exposure to low levels of lead significantly affects IQ along with the child's behavior, concentration and attention skills. The effects of lead exposure on the peripheral nervous system have also been observed in forms of peripheral neuropathy, involving reduced motor activity due to loss of the myelin sheath that insulates the nerves, thereby severely impairing the transduction of nerve impulses, leading to muscle weakness, especially of the external muscles, fatigue and lack of muscle coordination. (Sanders et al., 2009).

CONCLUSION

The longer the working period and the longer the working hours, the more lead exposure will accumulate in the body, thus affecting the nervous system and peripheral nervous system. Exposure to low levels of lead significantly affects IQ along with behavior, concentration and attention skills, resulting in manifestations of communication anxiety.

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