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ORIGINAL ARTICLE

Relationship Between Blood Lead (Pb) Levels and Hypertension in Motorcycle Taxi Drivers

Hubungan Kadar Timbal (Pb) Darah Dengan Hipertensi Pada Pengemudi Ojek

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ABSTRACT

Background

Hypertension is a disease that is a major health problem in developed and developing countries and is the number one cause of death in the world every year. The causes of hypertension can be divided into genetic and environmental factors. One of the causes of hypertension from environmental causes is exposure to lead. This study aims to determine the relationship between blood lead levels and hypertension.

Methods

The design of this research is descriptive research with laboratory analysis using a cross-sectional approach. Sample selection using a purposive sampling method. The research sample was online motorcycle taxi drivers aged >35 years, with a minimum of 1 year as an online motorcycle taxi driver. Research samples were taken at the Faculty of Medicine, Trisakti University in September 2022. Laboratory examinations were carried out at the Prodia clinical laboratory, in Jakarta.

Results

Of the 133 samples examined, high lead levels were found in 20 respondents (15%) and low lead levels in 113 respondents (85%). High lead levels were found in 7 respondents who had hypertension and 13 respondents with normal blood pressure. The chi-square statistical test value shows a p-value = 0.260.

Conclusions

Blood lead levels do not have a significant relationship with blood pressure in motorbike taxi drivers.

Keywords: hypertension; lead; motorcycle taxi driver

ABSTRAK

Latar Belakang

Hipertensi merupakan penyakit yang menjadi masalah kesehatan utama di negara maju maupun negara berkembang dan merupakan penyebab kematian nomor satu di dunia setiap tahunnya. Penyebab hipertensi dapat dibagi menjadi faktor genetik dan lingkungan. Salah satu penyebab hipertensi dari penyebab lingkungan adalah pajanan terhadap timbal. Penelitian ini bertujuan untuk mengetahui hubungan kadar timbal dalam darah dengan hipertensi.

Metode

Desain penelitian ini adalah penelitian deskriptif dengan analisis laboratorik dengan pendekatan cross sectional. Pemilihan sampel dengan metode purposive sampling. Sampel penelitian adalah pengemudi ojek online berusia >35 tahun, dengan minimal 1 tahun menjadi pengemudi ojek online. Pengambilan sampel penelitian dilakukan di Fakultas Kedokteran Universitas Trisakti pada bulan September 2022. Pemeriksaan laboratorium dilakukan di Laboratorium klinik Prodia, Jakarta.

Hasil

Dari 133 sampel yang diperiksa didapatkan kadar timbal tinggi pada 20 responden (15%) dan kadar timbal rendah pada 113 responden (85%). Kadar timbal tinggi ditemukan pada 7 responden yang mengalami hipertensi dan 13 responden dengan tekanan darah normal. Nilai uji statistik Chi-square menunjukkan nilai p = 0.260.

Kesimpulan

kadar timbal darah tidak memiliki hubungan yang signifikan dengan tekanan darah pada pengemudi ojek.

Kata Kunci: hipertensi; timbal; pengemudi ojek

INTRODUCTION

Hypertension is a disease that is a major health problem in developed and developing countries and is the number one cause of death in the world every year. According to data from the World Health Organization (WHO) in 2015, around 1.13 billion people in the world suffer from hypertension.[1] Meanwhile, the prevalence of hypertension in Indonesia based on Riskesdas data in 2018 is 34.1%, the highest in South Kalimantan. Hypertension occurs in the age group 31-44 years (31.6%), age 45-54 years (45.3%), age 55-64 years (55.2%).[2]

The causes of hypertension can be divided into genetic and environmental factors. Environmental factors that are currently known are lifestyle such as smoking, alcohol, diet, stress, and exposure to dangerous metals, one of which is lead. Among heavy metals, lead has been suspected of influencing blood pressure and cardiovascular disease for several years.[3,4]

Lead exposure can have effects on various body functions such as the cardiovascular, hematopoietic, and renal systems.[4-6] In adults, lead exposure can increase the production of reactive oxygen species, activate nuclear factor-κB, and cause inflammation resulting in endothelial injury and vascular dysfunction.[5]

Research conducted by Shvachiy et al. on experimental rats concluded that intermittent lead exposure can cause hypertension.[6] Similar results were also reported by Xu et al's research on a population in China and Tsoi et al.'s research on various races in America.[5,7]

Lead poisoning can occur through contaminated air, water and food.[4] There are many sources of lead in the environment, one of which is the combustion of motor vehicle fuel. Jakarta is a city that ranks first in terms of air pollution levels.[8] Motorbike taxi drivers who work on Jakarta's

highways every day will of course be exposed to air pollution, one of which is lead. Research on the relationship between lead exposure and the risk of hypertension has not been widely conducted in Indonesia. Therefore, this research was conducted to find out the relationship between blood lead levels and the incidence of hypertension in online motorcycle taxi drivers who work every day on Jakarta highways.

METHODS

Research samples were taken at the Faculty of Medicine, Trisakti University for the period September 2022. Laboratory examinations were carried out at the Prodia clinical laboratory, in Jakarta. The design of this research is descriptive research with laboratory analysis using a cross-sectional approach.

Sample selection using a purposive sampling method. The research population was 133 online motorcycle taxi drivers in the Jakarta area who met the inclusion criteria. The inclusion criteria in this study were online motorcycle taxi drivers aged >35 years, with at least 1 year as an online motorcycle taxi driver and regularly working as a motorcycle taxi driver for at least 8 hours a day, 5 days a week, or 40 hours a week. Exclusion criteria were respondents with a history of liver disorders/diseases, nervous disorders/diseases, anemia, kidney disorders/diseases, and heart disorders/diseases from a long time before becoming a motorcycle taxi driver until the time the research was conducted.

The data collected are lead levels from venous blood tests and blood pressure obtained from measurements. Lead levels were categorized into low (<5 µg/dL) and high (>5 µg/dL). Blood pressure is categorized into normal and hypertension. Data analysis took the form of univariate analysis in the form of a description of the subject's characteristics and the results of calculating the variables examined. The analysis continues with bivariate analysis to look for differences between the variables studied and look for relationships. Analysis with the Chi Square test using the SPSS application with a confidence level of 95% ($p<0.05$). This research has an ethical review number 175/KER/FK/VIII/2022.

RESULTS

Characteristics of research subjects

Research subjects were selected from questionnaires using consecutive sampling who met the inclusion criteria. Blood pressure measurements and blood sampling were carried out at the Faculty of Medicine, Trisakti University from 12 September 2022 to 20 September 2022. The research subjects were 133 respondents with characteristics that can be seen in Table 1.

Table 1. Characteristics of research subjects

Variable	N	Percentage
Gender		
Men	101	76
Woman	32	24
Age		
< 55	129	97
≥ 55	4	3
Blood pressure		
Normal	72	54
Hypertension	61	46
Lead level		
Low	113	85
High	20	15

The general characteristics of research subjects based on gender show that the largest population is men, namely 101 respondents (76%) and women, 32 respondents (24%). Research subjects in the age group 55 years or more were 4 respondents (3%), while the age group under 55 years were 129 (97%). The prevalence of hypertension in motorbike taxi drivers is 46%. Blood lead levels were generally low, namely 113 respondents (85%).

Relationship between Blood Lead Levels and Blood Pressure

The results of measuring blood lead levels showed high lead levels in 20 respondents (15%) and low lead levels in 113 respondents (85%). High lead levels were found in 7 respondents who had hypertension and 13 respondents with normal blood pressure (Table 2).

Table 2. Relationship between blood lead levels and blood pressure

	Blood pressure		
Lead Level	**Normal**	**Hypertension**	**p-value**
Low	59	54	0.260*
High	13	7	
Total	72	61	

*Chi-square test

The chi-square statistical test value shows the significance of the relationship between blood pressure variables and blood lead levels. The significance value in the Asymptotic Significance column (2-sided) is 0.260, which indicates there is no significant relationship between blood pressure and blood lead levels.

Table 3. Relationship between length of time working as a motorbike taxi driver and blood lead levels

	Lead Level		
Work Duration	**Low**	**High**	**p-value**
< 5 years	43	7	0.869*
> 5 years	70	13	
Total	113	20	

*Chi-square test

The significance value in the Asymptotic Significance column (2-sided) is 0.869, which indicates there is no significant relationship between length of work and blood lead levels.

DISCUSSION

Several studies show a relationship between blood lead levels and hypertension in humans[5-7,9-11], including motorcycle taxi drivers in Indonesia. However, not all studies support a relationship between blood lead levels and hypertension. This research shows that motorbike taxi drivers in Indonesia are a group of workers who are at risk of increasing blood lead levels and hypertension.

Further studies are needed to evaluate the relationship between blood lead levels and hypertension in motorbike taxi drivers in Indonesia by considering other risk factors. In addition, efforts to prevent and control air and lead (Pb) pollution must be carried out to reduce health risks to motorcycle taxi drivers and the general public.

Based on the data analysis that has been carried out, it was found that there is no significant relationship between blood lead levels and the incidence of hypertension in motorcycle taxi drivers. This is shown by the results of the Chi-Square test which shows a p-value of 0.260, which means it is greater than α=0.05.

These results do not seem to be in line with several previous studies that found an association between lead exposure and hypertension. Research by Shvachiy, et al and Xu, et al stated that lead exposure can cause hypertension.[6,7] However, differences in these results may be caused by many factors, such as differences in the intensity and duration of lead exposure, population genetic variations, and other factors such as lifestyle and health condition of the subject. The government's "unleaded gasoline" program since 2006 has succeeded in reducing lead levels in air pollution[8] so that in this study generally low blood lead levels were found. In addition, hypertension is influenced by many other factors, including genetics, diet, stress, and physical activity.[12-15]

A study conducted by Yu, et al showed that hypertension was not related to blood lead levels in workers who were exposed to lead for 2 years.[16] The duration of lead exposure in this study was probably too short because motorbike taxi drivers worked for a minimum of 1 year. In addition, the subjects in this study were generally young so they may not have had hypertension. Miao et al's research shows a significant relationship between blood lead levels and the prevalence of hypertension in men.[9] This study used a large sample size so that it could detect a smaller statistical relationship. The sample size in the study may have been too small so the number of respondents with high blood lead levels was too small.

However, these results do not minimize the risk of lead exposure to general health. Even though there is no significant relationship with hypertension, lead is still a dangerous toxin and can cause various other health problems, such as poisoning, nervous disorders and other health problems.

This study has several limitations, such as a relatively small sample and lack of control for several other variables that might influence the results. Therefore, the results of this study need to be strengthened with further research involving a larger sample and better control of confounding variables.

CONCLUSION

From this research, it was found that the prevalence of hypertension in motorcycle taxi drivers was 46%. The results of statistical analysis show that there is no significant relationship between blood lead levels and blood pressure in motorcycle taxi drivers.

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AUTHORS CONTRIBUTION

JC played a role in making research proposals and reports. IW and RD participated in the examination of research subjects. FI helped with statistical analysis and discussion of research results. All authors read and approved the final research report.

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CONFLICT OF INTEREST

In this research there is no conflict of interest.

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