Borneo Journal Of Medical Laboratory Technology
BJMLT
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# FAKTOR RISIKO KELAINAN KADAR ERITROSIT PADA PENGENDARA OJEK MOTOR ONLINE DI KAWASAN INDUSTRI TANJUNG MAS KOTA SEMARANG

## *Risk Factors for Abnormal Erythrocyte Levels in Online Motorcycle Taxi Riders in the Tanjung Mas Industrial Area, Semarang City*

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**Abstrak**

Aktivitas industri dan gas buang kendaraan bermotor memiliki kontribusi terbesar pada pencemaran udara, semakin lama terpapar polutan akan semakin tinggi akumulasi kadar polutan di dalam darah. Pengendara ojek online di Kawasan industri mempunyai risiko tinggi terpapar polutan. Penelitian ini bertujuan untuk mengetahui faktor risiko yang berpengaruh terhadap kelainan kadar eritrosit pada pengendara ojek motor *online* di kawasan industri Kota Semarang. Metode yang digunakan observasional analitik dengan pendekatan secara *cross-sectional*. Hasil dari 55 responden terdapat 41 responden memiliki kadar eritrosit normal dan 14 responden memiliki kadar eritrosit diatas normal (polisitemia). Hasil uji *Chi square* pada status merokok, status Pendidikan, lama waktu kerja, dan Pengetahuan tidak menunjukkan hubungan signifikan (p< 0,05) terhadap kadar eritrosit pada pengendara ojek online di Kawasan industri Kota Semarang. Kesimpulan dari penelitian ini, tidak terdapat hubungan signifikan antara status merokok, status Pendidikan, lama waktu kerja, dan pengetahuan terhadap kadar eritrosit pengendara ojek motor *online* di Kawasan industri Tanjung Emas Kota Semarang.

**Kata Kunci:**
Ojek motor *Online*, Kadar Eritrosit

***Keywords***:
Online motorbike taxis, Erythrocyte Levels

***Abstract***

Industrial activities and motor vehicle exhaust gases have the biggest contribution to air pollution, the longer the exposure to pollutants, the higher the accumulation of pollutant levels in the blood. Online motorcycle taxi drivers in industrial areas have a high risk of being exposed to pollutants. This study aims to determine the risk factors that affect erythrocyte levels in online motorcycle taxi drivers in the industrial area of Semarang City. The method used is analytic observational with a cross-sectional approach. From 55 respondents, 41 respondents had normal erythrocyte levels and 14 respondents had above normal erythrocyte levels (polycythemia). Chi square test results on smoking status, educational status, length of time working, and knowledge did not show a significant relationship (p <0, 05) on erythrocyte levels in online motorcycle taxi drivers in industrial area, Semarang City. The conclusion of this study, there is no significant relationship between smoking status, educational status, length of time working, and knowledge of the erythrocyte levels of online motorcycle taxi drivers in the Tanjung Emas industrial area, Semarang City.

## INTRODUCTION

Air pollution in big cities comes from various sources, such as 15% from industrial activities, 60% - 70% from motor vehicle fumes, and the rest from household activities. Air pollutants such as NOx, SOx, CO, PB, and others from human activities at a certain level can have a negative impact. Pollution caused by human activities will have an impact on the environment and the health of living things.

Exposure to air pollution containing lead can synthesis system to form Hemoglobin by inhibiting the Delta Aminolevulinic Acid Dehydrase (delta ALAD) and ferroketalase enzymes. This results in increased excretion of coprotophorpyrin in the urine and ALA delta and inhibits Hemoglobin synthesis. Pb metal inhaled by humans every day will be absorbed, stored and then accommodated in the blood(Desriyan, Wardhani, and Pharmawati 2015). Absorbed Pb is transported by blood to the organs of the body as much as 95%, Pb in the blood is bound by erythrocytes.

Exposure through the respiratory tract and digestive tract, especially by Pb carbonate and Pb sulfate, Pb that enters the body as much as 100 to 350 µg/day and 20 µg/day is absorbed through inhalation of Pb vapor can cause health problems(Herawati 2019).

The city of Semarang is one of the big cities that investors are interested in establishing industries, it is proven that within three years from 2014 to 2016 there were 29 new industries established. The more rapid industrial growth, directly proportional to the increase in air pollution(Restiani 2018).Toxic waste generated from combustion in industry will usually be disposed of through air chimneys in the form of smoke, this will cause smoke to enter the human body through inhalation, digestion, and contact with skin.

Lead (Pb) is one of the airborne pollutants in the form of metallic dust particles, lead can enter the body in various ways such as breathing, digestive tract, and physical contact through the skin. Even in small amounts, this can cause poisoning(Kasanah, Setiani, and Joko 2016). Inhaled lead will be absorbed into the blood which can cause abnormalities in the blood profile and inhibition of hemoglobin synthesis, anemia, and shortening of the life span of erythrocytes.(Hartini 2011). This is in line with research from Juliana (2017) which states that there is a significant relationship between blood lead levels and the number of erythrocytes, one of the factors causing the low number of erythrocytes in pregnant women is the level of lead in the blood above the normal threshold (Juliana, Nurjazuli, and Suhartono 2017).

The chemical compound CO gas is a type of gas that contributes to air pollution due to the less than optimal combustion of motor vehicle fuel. Health problems caused by CO gas include reducing the flow of oxygen in the blood. The affinity of CO is higher than that of oxygen so that hemoglobin binds more CO gas than binds to oxygen. This can cause anoxia thereby stimulating the production of the hormone erythropoietin which can increase the number of erythrocytes in the blood(Sofyanita 2021).

The Tanjung Emas Industrial Area in Semarang City has a high emission load. This is due to the existence of a Steam Power Plant by PT. Indonesia Power which uses coal as its fuel, as well as industries in the Tanjung Emas areaSemarang(Restiani 2018). One of the criteria for people who have a high risk of exposure to pollutants is people who work in dense traffic areas (Decree of the Minister of Health of the Republic of Indonesia No. 1406, 2002). The longer a person is exposed to pollutants in the air, the higher the accumulation of pollutant levels in their blood so that they can cause health problems in the body. Online motorcycle taxi drivers who are in the Tanjung Mas industrial area of Semarang City are jobs that have a high risk of exposure to pollutants because they work in industrial areas and highways that are traversed by many motorized vehicles.

## RESEARCH METHODS

The type of research used is analytic observational with a cross-sectional research design. The sample size obtained was 55 respondents according to the inclusion criteria, namely willing to become research respondents by signing an informed consent and being a male online motorbike taxi in the Tanjung Mas Industrial area, Semarang. The primary data was obtained by examining erythrocyte levels in online motorbike taxi respondents in the Tanjung Mas area of Semarang at RSJD Dr. Amino Gondohutomo and questionnaire for each respondent to analyze the factors that can affect the respondent's erythrocyte levels.

## RESULTS AND DISCUSSION

The research was conducted on online motorcycle taxi drivers in the Tanjung Mas area, Semarang. There were 55 respondents who filled out questionnaires and examined the levels of erythrocytes in the blood at the RSJD. Dr. Amino Gondohutomo. The results of this study can be seen in the table below

**Table 1. Results of Examination of Erythrocyte Levels in Respondents**

| category | Frequency (n) | Percentage (%) |
|---|---|---|
| Normal | 41 | 75% |
| Abnormal | 14 | 25% |
| **Total** | **55** | **100%** |

**Table 2. Risk Factor Relationships at Levels Respondent Erythrocytes**

| *Variable* | Normal | | Abnormal | | p value |
|---|---|---|---|---|---|
| | f | % | f | % | |
| **Smoking Status** | | | | | |
| Do not smoke | 15 | 68.1 | 7 | 31.9 | |
| Light smoker | 17 | 77.2 | 5 | 22.8 | 0.650 |
| Heavy smoker | 9 | 81.8 | 2 | 18.2 | |
| **Educational status** | | | | | |
| Lower | 1 | 100 | 0 | 0 | |
| Intermediate | 37 | 74 | 13 | 26 | 0.742 |
| On | 3 | 75 | 1 | 25 | |
| **Working Period Status** | | | | | |
| ≤ 1 year | 8 | 66 | 4 | 34 | |
| 2-5 years | 17 | 70 | 7 | 30 | 0.455 |
| ≥ 5 years | 16 | 84.2 | 3 | 15.8 | |
| **Knowledge Status** | | | | | |
| Well | 41 | 74.5 | 14 | 25.5 | - |
| Not enough | 0 | 0 | 0 | 0 | |

Based on table 1, examination of erythrocyte levels in 55 online motorcycle taxi respondents in the Tanjung Emas area of Semarang City, there were 41 (75%) respondents had normal erythrocyte levels and 14 (25%) of respondents had abnormal erythrocyte levels. These 14 respondents had erythrocyte levels above normal values or commonly called polycythemia. This can occur due to various factors including exposure to air pollution. Air pollutants can come from vehicle fumes or from factory waste exhaust gases.

Too often exposed to motor vehicle exhaust gas can experience carbon monoxide gas poisoning. The affinity for carbon monoxide is higher than oxygen so that hemoglobin in the blood binds more carbon monoxide than oxygen. This causes the body to experience anoxia, if this continues for a long time the body will provide stimulation to increase the production of erythrocytes(Charkiewicz and Backstrand 2020). Meanwhile, waste gas originating from factories can be harmful to the human body such as exposure to the heavy metal lead (Pb) which can cause disturbances in the process of erythropoiesis where there are obstacles to hemoglobin synthesis, anemia, and shortening of the life span of erythrocytes so that a person who is exposed to lead metal for a long period of time old d has below normal erythrocyte levels(Hartini 2011).

The results of the research on erythrocyte levels were distinguished by four factors, namely smoking status, education status, length of time working status, and knowledge.

Table 2 shows that there is no significant relationship between smoking status and online motorcycle taxi erythrocyte levels in the Tanjung Emas area of Semarang City. This is in line with a similar study conducted by Woelansari (2014) which stated that there was no significant relationship between the number of erythrocytes, hemoglobin levels, and hematocrit levels in tobacco farmers who smoked and did not smoke. Although there was no significant relationship, according to the results of the researchers' observations, 14 respondents had more than normal erythrocyte levels (polycythemia). Increased levels of erythrocytes can be influenced by several factors, including the carbon monoxide contained in cigarettes can increase the levels of erythrocytes and hemoglobin in the blood. The impact of smoking will be felt after 10-20 years after exposure.(Septiani et al. 2022).

There is no significant relationship between educational status and erythrocyte levels in online motorcycle taxis in the Tanjung Emas area of Semarang City with a p=0.742. Based on table 2, it shows that the majority of online motorcycle taxi education in the Tanjung Emas area of Semarang City have sufficient education, namely junior and senior high schools. Based

on the results of observations, it shows that respondents know the dangers caused by motorized vehicle fumes or factory fumes to health so they take better care of their health and use masks properly. Consumption of healthy food and a healthy lifestyle can prevent the negative effects of toxic substances that enter the body, according to(Al-Attar and Zari 2010)states that the antioxidant system in the body can ward off free radicals such as exposure to metal Pb and prevent oxidative stress, such as glutathione peroxidase, superoxide dismutase, vitamin C, and vitamin E. The existence of this defense system can minimize or prevent exposure to Pb in the body which is supported by a lifestyle such as exercising, consuming healthy food, and getting enough sleep.

The working period of online motorcycle taxi drivers in the Tanjung Mas area of Semarang has no significant relationship with the levels of erythrocytes in the blood. This study did not find respondents who had erythrocyte levels below normal, this could be possible because the respondents had not experienced exposure to lead (Pb) for too long from vehicle exhaust or factory waste exhaust gas so that it had not caused severe hematopoiesis disorders, in line with the results of the researchers' observations. which can be seen in table 2 shows that the majority of online motorcycle taxis working in the Tanjung Emas area of Semarang City have worked for 2-5 years. This is supported by Khasanah's statement (2016)(Kasanah, Setiani, and Joko 2016)states that the damage caused by tin metal (Pb) is fluctuating, that is, it will be seen if someone is exposed for a long time with high exposure intensity.

In table 2 it can be seen that there is only one variation, that is, all respondents have a good knowledge level of 100%. based on the results of observations of researchers including, regarding the dangers of exposure to vehicle fumes, exposure to exhaust gas pollution in factories, and the importance of wearing masks while driving. Factors that can cause abnormalities in red blood cells can vary, including poor environmental conditions. Air pollution in Indonesia comes from various sources, including industrial activities which contribute 15% to air pollution in big cities. Meanwhile, motorized vehicles contribute 60-70% of pollutants, and the rest comes from household waste such as lead.(Gunawan, Setiani, and Suhartono 2013).

## CONCLUSIONS

Based on the results of the examination, there were 41 respondents (75%) who had normal erythrocyte levels and 14 respondents (25%) above the normal threshold (polycythemia).

There is no significant relationship between smoking status, educational status, working period status, and knowledge of erythrocyte levels in online motorcycle taxi drivers in the Tanjung Mas area of Semarang City.

Multivariate data analysis could not be continued because there were no risk factors that affected the erythrocyte levels of online motorcycle taxi drivers in the Tanjung Mas Region, Semarang.

For future researchers, a more in-depth examination of the erythrocyte profile such as MCV, MCHC, and MCH can be carried out in the respondents. Research respondents preferably online motorcycle taxi drivers in the Tanjung Mas area of Semarang who have worked for more than 10 years.

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