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Length of Time Exposed to Air Pollution is Related to Blood Oxygen Saturation in Traffic Control Volunteers in Malang

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ABSTRACT

In Malang City, Indonesia, the number of motorized vehicles is increasing from year to year which causes congestion and air pollution. In this case, there are volunteer traffic control assistants (Supeltas), who are suspected of having affected their oxygen saturation. The purpose of this study was to analyze the relationship between the length of time exposed to air pollution with oxygen saturation in the blood of traffic controller assistant volunteers in Malang City. The design of this study was cross-sectional, involving 30 respondents. Data on the length of time worked were collected through interviews, in addition to checking oxygen saturation through blood gas analysis. The results showed that most of the respondents had oxygen saturation less than normal, with 12-18 months of work time, and 3 hours of work per day. Contingency coefficient test results show p-value = 0.000; which means there is a relationship between the length of time exposed to air pollution with oxygen saturation in the blood.
Keywords: air pollution; oxygen saturation; traffic control assistant

INTRODUCTION

Background

Oxygen saturation is the amount of oxygen carried by 100 milliliters of blood at a certain pressure (blood oxygen content), divided by the amount of oxygen transported by 100 mL of saturated blood (blood oxygen capacity). The oxygen capacity is independent of pressure. Oxygen capacity depends on the hemoglobin content of the blood [(1)]. Oxygen saturation has a relationship with the partial pressure of oxygen. This relationship forms an "S"-shaped curve called the dissociation curve. This dissociation curve is influenced by several factors, namely carbon dioxide levels, temperature, electrolytes, and pH and levels of carbon monoxide in the blood [(2, 3)].

Arterial blood gas testing is usually performed to assess acid-base balance disorders caused by respiratory and metabolic disorders. The basic components of arterial blood gases include pH, partial pressure of carbon dioxide (Pa-CO_2), partial pressure of oxygen (Pa-O_2), oxygen saturation (S-O_2), bicarbonate (HCO_2), and base excess (BE) [(4)].

Every human being has a value of oxygen saturation levels that vary from one another. This includes volunteer traffic controllers (SUPELTAS) who work in traffic jams and breathe motor vehicle fumes.

In Malang City, there were 98 SUPELTAS in November 2016, which were registered with the Malang City Police. The SUPELTAS are usually in traffic jams, for example at an intersection without a traffic light, or a vehicle turning area. The SUPELTAS work outside police operating hours.

According to Arifin [(5)], there are various kinds of substances contained in motor vehicle exhaust gases, namely carbon monoxide (CO), nitrogen monoxide (NO_x), sulfur trioxide (SO_x), particulates, hydrocarbons and lead (Pb). Each of these substances has its own properties and is bad for the human body.

Carbon monoxide can react with hemoglobin to form carbon monoxyhemoglobin or COHb, and COHb cannot bind oxygen. Carbon monoxide poisoning can be classified as a form of anemic hypoxia because the amount of hemoglobin that can carry oxygen is reduced, but the total content of hemoglobin in the blood is not affected by CO. The affinity of carbon monoxide is 210 times greater than the affinity of oxygen for hemoglobin and COHb is very slow in releasing CO. So that hemoglobin is easier to transport CO_2 than oxygen [(3)].

The flow of community mobilization has progressed very rapidly from year to year. The mobilization is related to the economic activities of the community. So that in the end it will increase the number of motorized vehicles, including in the city of Malang. The number of motorized vehicles affects the exhaust gases containing CO. SUPELTAS works on roads filled with various types of vehicles. They are exposed to air pollution every day and inhale a lot of CO released by motorized vehicles, especially during rush hour, many vehicles pass by

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and can cause congestion, so the pollution produced by these vehicles is quite high. The length of SUPELTAS working hours also greatly influences the amount of exposure to pollution.

The results of a preliminary study in October 2016 showed that out of 4 health centers at the intersection of Jl. Blimbing and Jl. Soekarno-Hatta, 1 person had a cough and only 1 person wore a mask. They work 3-4 hours/day and they work for 8-16 months.

Purpose

This study aims to analyze the relationship between the length of time exposed to air pollution with oxygen saturation levels in the blood at SUPELTAS in Malang City.

METHODS

The design of this study was cross-sectional. The population of this study were all volunteers who control traffic in Malang, amounting to 100 people. The sample size is 30 people, selected by purposive sampling

The independent variable in this study was the length of time exposed to air pollution, while the dependent variable was oxygen saturation in the blood. Oxygen saturation was checked in the laboratory and there was no follow-up after the laboratory results came out. The relationship between the two variables was analyzed using the contingency coefficient test.

RESULTS

Based on Figure 1, information is obtained that out of 30 SUPELTAS, 14 (47%) have worked 12-18 months. Table 1 shows that 24 (80%) SUPELTAS had oxygen saturation <95% (abnormal).

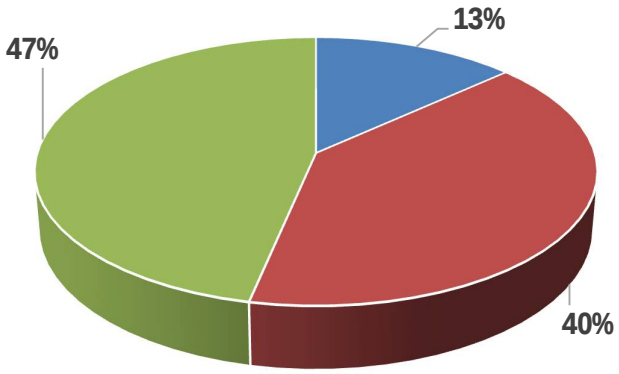

Table 1. Oxygen saturation in SUPELTAS blood in Malang City in June 2017

NO	O_2	Frequency	Percentage
1.	Normal (S-O_2 ≥ 95%)	6	20
2.	Abnormal (S-O_2 < 95%)	24	80

The results of the contingency coefficient test show p-value = 0.000 (<0.05), which means that there is a relationship between the length of time exposed to air pollution and oxygen saturation in the blood of SUPELTAS in Malang City.

DISCUSSION

Based on the results of the study, it was found that there was a relationship between the length of time exposed to air pollution and oxygen saturation in the blood of the SUPELTAS using blood gas analysis in

Malang City. The longest working time for SUPELTAS is in the sufficient category; while the oxygen saturation in the blood almost entirely (80%) is in the abnormal category. This is due to the increasing number of vehicles per hour in Malang City. In addition, it is also caused by SUPELTAS' unwillingness to use personal protective equipment such as masks. This study differs from the results of research from Faris [6] in Malang that overall, the respondents have oxygen saturation in the normal category, but with hypoxia it can be predicted that the occurrence of respiratory system disorders will be greater if no preventive measures are taken. On initial exposure, COHb concentrations can increase rapidly. COHb levels fall within 3 hours after exposure and are in a stable phase 6 to 8 hours after exposure. At this time the CO concentrations in alveolar respiration and ambient air are practically the same.

The second reason is SUPELTAS' working hours are above average. According to Ganong [5], the level of CO that enters the body is influenced by the length of time exposed to carbon monoxide and the level of carbon monoxide inhaled by the respondent.

CONCLUSION

The results showed that there was a relationship between the length of time exposed to air pollution and blood oxygen saturation levels at SUPELTAS in Malang City

REFERENCES

1. Green JH. Pengantar Fisiologi Tubuh Manusia. Tangerang: Binarupa Aksara; 2010.
2. Rab T. Ilmu Penyakit Paru. Jakarta: Trans Info Media; 2010.
3. Ganong WF. Buku Ajar Fisiologi Kedokteran, Edisi 22. Jakarta: Penerbit Buku Kedokteran EGC; 2008.
4. Kee JL. Pedoman Pemeriksaan Laboratorium & Diagnostik. Jakarta: Penerbit Buku Kedokteran EGC; 2008.
5. Arifin Z. Pengendalian Polusi Kendaraan. Bandung: Alfabeta; 2009.
6. Faris. Gambaran Saturasi Oksigen pada Sukarelawan Pembantu Pengatur Lalu Lintas di Kota Malang. Malang: KTI Poltekkes Kemenkes Malang; 2015.