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The Effect of Smoking on Oxygen Saturation Level of Patients Covid-19

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Abstract

Introduction: The Novel Coronavirus (Covid-19) disease caused by SARS-COV2 was first discovered in Wuhan, China, in December 2019. WHO has set Covid 19 to be a pandemic which has increased death rates worldwide. Covid-19 attacks the respiratory system which resembles pneumonia but has signs of a decrease in oxygen saturation. In Indonesia, many people, especially men, practice smoking, where smoking can cause respiratory system problems, but there is no sign of a decrease in oxygen saturation.

Objectives: This study aims to determine the effect of smoking on oxygen saturation levels in Covid-19 patients.

Methods: This type of research is an analytic study with a cross-sectional design. Total population of 52 people, with inclusion and exclusion criteria.

Results: This study shows that 21.2% of patients who smoke 6-12 cigarettes/day have oxygen saturation <75%, with the result p-value = 0.000, which means that there is an effect between smoking on decreasing oxygen saturation, with a 53-fold chance of covid patients. People who smoke can cause a decrease in oxygen saturation.

Conclusion: Decrease in oxygen saturation in covid-19 patients, can be caused due to the toxicity of cigarettes smoked. In smokers who are confirmed Covid-19, there will be a worsening of oxygen supply in the blood, which is indicated by a decrease in oxygen saturation <75%.

Keywords: Smoking, oxygen saturation, hypoxemia, coronavirus

Introduction

The Novel Coronavirus (Covid-19) disease is caused by SARS CoV-2 and is a potentially fatal disease-causing agent that has been of great concern to global public health since December 2019.¹ Covid-19 was first discovered in Wuhan, China, China which was discovered in December 2019 and now it has attacked the whole world. WHO (2020) states that this virus infects the respiratory tract which will cause rapid respiratory failure and death.² Clinically, the symptoms of covid-19 are confirmed as the transmission of pneumonia which can be transmitted from humans to other humans.

According to WHO data on January 24, 2021, there were a total of 96 million cases worldwide with 2 million deaths.³ Continents Confirmed by covid-19 as many as 12 million people, while Indonesia, according to the Covid-19 Task Force Data, stated that there were 977,474 confirmed people and in Jakarta as many as 243 thousand people, 215 thousand recovered and 3.9 thousand died. This indicates that covid-19 still cannot be resolved, the death rate continues to increase even though it is balanced with the recovery rate which also continues to increase.⁴

Covid-19 is a respiratory infection that attacks the whole world, especially in Indonesia. Before covid-19 entered Indonesia, there were cases of respiratory infections in Indonesia. One of the causes of respiratory infections is the smoking habit of Indonesian people. Smoking behavior that can interfere with health, can lead to worsening of respiratory infections caused by covid-19. Smoking can cause damage to lung defenses and reduce mucociliary clearance mechanisms, and cigarette smoke can also increase airway resistance and pulmonary epithelial permeability and damage the cilia, increase macrophages synthesis of elastase and reduce the production of antiprotease.⁵ Global Youth Tobacco Survey, the use of tobacco in Indonesia is as much as 19.2% of students, 38.2% of boys, and 2.4% of girls who smoke cigarettes.⁶ In Indonesia, 57.8% of students are exposed to cigarette smoke at home, and 66.2% of students are exposed to cigarette smoke outside the home. Each cigarette smoked contains several types of chemicals, including carbon monoxide (CO), carbon dioxide (CO₂), hydrogen cyanide, ammonia, nitrogen oxidants, hydrocarbons, tar, nicotine, benzopyrene, phenols, and cadmium.⁷ Present in cigarettes can cause cellular hypoxia which will disrupt ATP so that anaerobic metabolism occurs, while the nitrogen oxides found in cigarette smoke will cause the accumulation of methemoglobin in the body which will cause the oxygen dissociation curve in hemoglobin to shift left and oxygen cannot be properly channeled to the tissue causing hypoxia.⁸

In patients with covid-19 cases, hypoxia is often found, which is indicated by measuring the oxygen level in the blood (saturation) of less than 90%. The same thing happens to people who smoke which can lead to hypoxia. This study aims to determine the effect of smoking on oxygen saturation levels in covid-19 patients.

Methods

This type of research is analytic with a cross-sectional approach. The study was conducted in February 2021 - April 2021 at Budhi Asih Hospital, East Jakarta. The number of study respondents was 52 people, with inclusion criteria, a man who smoked, aged 18-55 years and confirmed Covid-19, and was undergoing hospitalization. Respondents who fit the inclusion and exclusion criteria will then sign an informed consent. The tools and materials used were oximetry, inpatient status, and questionnaires. The research data were analyzed using the chi-square test.

Results

The characteristics of respondents were based on age, oxygen saturation at the time of entry to the emergency room, smoking status, and number of cigarettes consumed.

Table 1. Distribution of respondents based on Age

Age	Frequency	%
17-25	2	3.8
26-35	9	17.3
36-45	8	15.4
46-55	33	63.5
Total	52	100

Table 2. Distribution of respondents based on Oxygen Saturation Level

Oxygen Saturation Levels	Frequency	%
≤ 75%	18	34.6
76% - 89%	13	25.0
90% - 94%	10	19.2
≥ 95%	11	21.2
Total	52	100

Table 3. Distribution of respondents based on the number of cigarettes per day

Cigarettes/day	Frequency	%
≤ 5	6	11.5
6 - 12	25	48.1

The Effect of Smoking on Oxygen Saturation Level of Patients Covid-19

≥ 13	21	40.4
Total	52	100

Table 4. Analyze the number of cigarettes per day on the oxygen saturation levels of Covid-19 patients

Oxygen Saturation Levels	Cigarettes/day						Total		P-Value	OR
	≤ 5		6 - 12		≥ 13		N	%		
	N	%	N	%	N	%				
≤75%	6	11.5	11	21.2	1	34.6	18	34.6	0.000	53.955
76% - 89%	0	0	13	25	0	0	13	25		
90% - 94%	0	0	0	0	10	19.2	10	19.2		
≥95%	0	0	1	1.9	10	19.2	11	21.2		
Total	6	11.5	25	48.1	21	40.4	52	100		

Discussion

Based on the results of the univariate analysis in table 1, it was found that the distribution of respondents based on age was mostly in the 46-55 year old group with 33 people (63.5%), and the least vulnerable people aged 17-25 years were 2 people (3.8%). The distribution of respondents based on oxygen saturation levels (SpO₂) was mostly at SpO₂ <75% as many as 18 people (34.6%), while at least 10 people (19.2%) were susceptible to SpO₂, including mild hypoxemia. The distribution of cigarette consumption is at most 6-12 cigarettes/day as many as 25 people (48.1%), while the vulnerable are at least <5 cigarettes/day as many as 6 people (11.5%).

Oxygen is a colorless and odorless gas that is needed by humans to be able to assist in metabolic processes which are useful for survival.⁹ Normal oxygen saturation of human oxygen, about > 95% is carried by blood from the results of the diffusion process in the lungs and circulated to the body tissue. Where the level of oxygen saturation can be a sign that there is a disturbance in the respiratory system, which results in dysfunction of the diffusion process.¹⁰ In smokers who do not have a history of respiratory disease will have normal oxygen saturation levels in themselves, even though cigarettes have various kinds of substances contained in them. Every breath of cigarette smoke has 4000 chemicals that will enter the lungs.¹¹ But it is known that in someone who is confirmed covid-19, whether that person smokes or does not smoke also experiences hypoxemia.¹² For this reason, researchers want to know whether consumption smoking will cause a decrease in oxygen saturation which is called hypoxemia.

Based on the results of the chi-square test analysis, it was found that patients who consumed 6-12 cigarettes/day had oxygen saturation results <75%, as many as 11 people (21.2%) with a p-value = 0.000 and odds ratio = 53,955. This is because the carbon monoxide in cigarettes can reduce the ability of cells in the respiratory system. Excess carbon monoxide in the lungs can cause a decrease in oxygen transport capacity in the blood. Carbon monoxide bound to hemoglobin will cause the availability of oxygen to the tissue to decrease, this is what causes oxygen levels in the blood to drop or oxygen saturation to decrease.¹³

Claude Bernard in 1857 discovered the toxic effect of carbon monoxide causes the release of oxygen bonds from hemoglobin to become carboxyhemoglobin. The main toxicity effect is due to cellular hypoxia caused by impaired oxygen transport. Carbon dioxide bound to hemoglobin will decrease the availability of oxygen in the tissues. According to Sagone's research, states that smokers who consume more than one pack of cigarettes per day have higher red blood cells than non-smokers. The result of an increase in red blood cells is explained as a response to tissue that lacks oxygen supply as a result of exposure to carbon monoxide and can reduce oxygen affinity for hemoglobin thereby reducing oxygen saturation levels in the blood.¹⁴

The incidence of decreased oxygen saturation in smoking patients will have an impact if the patient is confirmed with covid-19. This is because the occurrence of hypoxemia or decreased oxygen saturation often occurs in patients with confirmed covid-19, and is one of the signs that a person has covid-19. The decrease in oxygen levels in covid-19 patients is often the result of respiratory problems caused by the interaction of ACE-2 (angiotensin-converting-enzyme-2), the SARS CoV-2 cell receptor, expressed in carotid bodies, where oxygen-sensitive chemoreceptors

cause hypoxemia. To be able to find out the level of oxygen in the blood, a tool to measure it called oxygen saturation is needed which is used to detect the occurrence of hypoxemia. Decreased oxygen saturation in covid-19 patients can also be caused by pulmonary fibrosis. The process of pulmonary fibrosis in covid-19 patients is due to cytokine storm.¹⁵ The occurrence of pulmonary fibrosis can result in a diffusion process which will eventually result in dyspnea and if it is not done properly it will result in a decrease in oxygen saturation and result in respiratory failure.¹⁶ Joko, the habit of smoking in covid-19 patients will have the potential for 2 times more patients to experience worsening, which is due to desaturation or hypoxemia, and increases the length of time patients undergoing intensive care in the ICU and even the risk of death.¹⁷

Conclusion

The conclusion of this study is the effect of smoking habit on the decrease in oxygen saturation in Covid-19 patients. Oxygen saturation decreased by <75% in patients with smoking habits of 6 to 12 rods/day.

Conflict of Interest Declaration

This research has no personal or commercial interests, this research only aims to be able to provide insights related to science, especially on Covid-19 and the effects of smoking.

References

1. Zhao, Shi, et al. "Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak." *International Journal of infectious diseases* 92 (2020): 214-217.
2. Wu, Peng, et al. "Real-time tentative assessment of the epidemiological characteristics of novel coronavirus infections in Wuhan, China, as at 22 January 2020." *Eurosurveillance* 25.3 (2020): 2000044.
3. Jebiril, Nadia. "World Health Organization declared a pandemic public health menace: a systematic review of the coronavirus disease 2019 "COVID-19"." *Available at SSRN 3566298* (2020).
4. "Data Sebaran Pasien Covid 19 di Indonesia". Satgas Covid-19. 2021. 24 januari 2021. <https://covid19.go.id/>
5. Purnamasari, Yuliyanti. "Hubungan merokok dengan angka kejadian tuberkulosis paru di RSUD DR. Moewardi Surakarta." (2010).
6. Suryati, Tati, and Ingan Ukur Tarigan. "Perilaku Konsumsi Tembakau Pelajar SMP Usia 13–15 Tahun di Sumatra dan Jawa (Analisis Indonesia–Gyts 2009)(Behavior Tobacco Consumption of Junior High School Student Aged 13–15 Years in Sumatra and Java (Analysis of Indonesia–Gyts 2009))." *Buletin Penelitian Sistem Kesehatan* 16.3 (2019): 20854.
7. Yahya, A. Fauzi, and F. I. H. A. Sp JP K. *Menaklukkan Pembunuh No. 1: Mencegah dan Mengatasi Penyakit Jantung Koroner Secara Tepat dan Cepat*. Qanita, 2010.
8. Hon, Yuen Yi, et al. "Characterization of erythrocytic uptake and release and disposition pathways of nitrite, nitrate, methemoglobin, and iron-nitrosyl hemoglobin in the human circulation." *Drug metabolism and disposition* 38.10 (2010): 1707-1713
9. Sutanto AD, Fitriana Y. "Kebutuhan Dasar Manusia." Yogyakarta: Pustaka Baru, 2017: 5-8.
10. Hafen, Brant B., and Sandeep Sharma. "Oxygen saturation." (2018).
11. Mustikaningrum, Sari. "Perbedaan kadar trigliserida darah pada perokok dan bukan perokok." (2010).
12. Couzin-Frankel, Jennifer. "The mystery of the pandemic's 'happy hypoxia'." (2020): 455-456.
13. Hoffmann, Ilse, and Dietrich Hoffmann. "The changing cigarette: chemical studies and bioassays." *Tobacco: Science, policy and public health* (2004): 53-92.
14. Sagone Jr, Arthur L., Thomas Lawrence, and Stanley P. Balcerzak. "Effect of smoking on tissue oxygen supply." *Blood* 41.6 (1973): 845-851.
15. Ojo, Ademola S., et al. "Pulmonary fibrosis in COVID-19 survivors: predictive factors and risk reduction strategies." *Pulmonary medicine* 2020 (2020).
16. Zhou, Fei, et al. "Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study." *The lancet* 395.10229 (2020): 1054-1062.
17. Atmojo, Joko Tri, et al. "Dampak Merokok terhadap Covid-19." *Jurnal Ilmiah Permas: Jurnal Ilmiah STIKES Kendal* 11.1 (2021): 169-176.
18. Purnama, Agus, et al. "Characteristics of Sleep Patterns in Patients Before COVID-19 Diagnosis." *STRADA Jurnal Ilmiah Kesehatan* 10.1 (2021): 206-212.