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Research Article

Analysis of the relationship between using personal protective equipment (PPE) masks on the incidence of respiratory symptoms disorders of online motorcycle taxi drivers in Malang

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ABSTRACT

Health problems that are often encountered due to work are respiratory disorders that cause premature death every year. Exposure to pollution is harmful to health, and chronic exposure causes lung cancer and COPD. The use of masks is an alternative in reducing exposure to pollution. This study aimed to determine the relationship between the habit of wearing masks on the incidence of respiratory symptoms disorder of online motorcycle taxi drivers in Malang. This study was an analytic observation with a cross-sectional design. Samples were determined using the comparative bivariate analytical sample formula. The data were analyzed using a univariate test and bivariate analysis with a chi-square test. This study showed a significant relationship between the habit of wearing a mask with p score = 0.015 ($p < 0,05$), changing time with p score = 0.004 ($p < 0,05$), and the type of mask on respiratory symptoms disorders with p score = 0.006 ($p < 0,05$). The results obtained regarding the description of the habit of using masks, the results of the method of using masks were mainly in the good category. In conclusion, there is a significant relationship between the habit of wearing masks and the incidence of respiratory symptoms disorders among online motorcycle taxi drivers in Malang.



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INTRODUCTION

Globally, there are an estimated 2.3 million work-related deaths each year, with 86.9% due to work-related illnesses. In the UK, deaths from exposure to chemicals, dust, and fibers in the workplace have increased over the last 40 years, with currently around 13,000 premature deaths annually from lung disease and occupational cancer (Dimakakou et al., 2018). Exposure to air pollution is of particular concern because 91% of the world's population lives in areas with poor air quality and exceeding the World Health Organization guidelines (Zhong et al., 2021).

In urban areas, motorized vehicles are responsible for air pollution caused by their exhaust emissions (Lawin, Fanou, Hinson, et al., 2018). Bus, car, and motorcycle drivers in urban areas are at risk of being exposed to air pollution while working, and the vehicles they drive are a source of air pollution for other communities and other drivers, which will be harmful to health, resulting in respiratory morbidity, decreased lung function, and even cause heart problems and on chronic exposure can cause lung cancer and COPD (Damayanti et al., 2019; Lawin, Fanou, Kpangon, et al., 2018; Sasikumar et al., 2020)

The use of masks is an alternative in reducing pollution exposure, which is very practical, inexpensive, and can protect oneself from the transmission of acute respiratory infections (Hansstein & Echegaray, 2018). In general, masks are protective equipment with the primary function of reducing the transmission of particles or droplets and other infectious agents (Fischer et al., 2020). The mask filters particles when the air is inhaled, and then there is capture and deposition of particles by the filter fiber on the mask. The use of a mask can prevent the possibility of respiratory system disorders due to exposure to air with high dust levels (Muthia & Hendrawan, 2017).

Based on those facts and problems, the authors want to conduct a study that aims to determine the relationship between personal protective equipment masks on respiratory symptoms disorders of online motorcycle taxis drivers In Malang.

METHODS

This research has earned ethical approval from the ethics committee of University of Muhammadiyah Malang (Certificate number: E.5.a/057/KEPK-UMM/VI/2021). This type of research is analytic observation with a cross-sectional design to determine the relationship between wearing PPE masks and the incidence of respiratory symptoms disorders of online motorcycle taxis drivers in Malang. The population in this study were online motorcycle taxis drivers in Malang.

The inclusion criteria were; respondents agreed to the informed consent to participate in the study, work at least five days a week, use a mask while working, and work for at least one year. The exclusion criteria was smoked. While the drop out criteria was unable to complete the questionnaire. The sample in this study was the part of the population used as research subjects who meet the inclusion criteria.

This study determined the sampling formula for calculating the relative bivariate analytical sample size (M. Sopiudin Dahlan, 2020). The sampling technique that will be used in this study is purposive sampling. The independent variable in this study was the habit of using PPE masks for online motorcycle taxis drivers in Malang. The dependent variable was the incidence of respiratory symptoms disorders of online motorcycle taxis drivers in Malang. The research sample was 108 online motorcycle taxis drivers in Malang. Questionnaires were distributed to online motorcycle taxis drivers to determine the relationship between wearing PPE masks and the incidence of respiratory



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symptoms disorders among online motorcycle taxis drivers in Malang. The technical analysis used in this study was SPSS 24 version. The univariate statistical analysis and bivariate analysis with chi-square test were used. The result would be significant if the p-value were <0.05.

RESULTS

The data was obtained based on the respondents' answers which aimed to determine the habit of using PPE masks on the incidence of respiratory

symptoms in online motorcycle taxi drivers in Malang City. This study used a questionnaire to assess the relationship between using PPE masks and the incidence of respiratory symptoms experienced by online motorcycle taxi drivers. There were no respondents who dropped out during the research process. Then it was processed according to the purpose of the study to determine the relationship between the habit of using PPE masks on the incidence of respiratory symptoms in online motorcycle taxi drivers in Malang.

Table 1. Distribution of the Number of Types of Masks

Type of Mask	Amount	Percentage (%)
Medical/Surgical Mask	17	15.7
KN 95 mask	0	0
Non-Medical/Fabric Mask	91	84.3
Total	108	100

Table 2. Distribution of Time for Replacement of Used PPE Masks

Mask change time	Amount	Percentage (%)
<4 hours	5	4.6
<12 hours	61	56.5
<24 hours	27	25
>24 hours	15	13.9
Total	108	100

Table 3. Distribution of the Number of Habits on How to Use PPE Masks

The habit of how to use PPE mask	Amount	Percentage (%)
Good	64	59.3
Quite good	24	22.2
Not good	20	18.5
Total	108	100



Table 4. Distribution of Number of Respiratory Symptoms

Respiratory symptoms	Amount	Percentage (%)
Cough	46	42.6
phlegm	43	39.8
Shortness of breath	6	5.6
Wheezing	10	9.3
Chest feels heavy	21	19.4
Cold	69	63.9
Sore throat	19	17.6

Table 5. The relationship between the type of mask, replacement time, and the habit of using PPE masks and the incidence of respiratory symptoms

Information	Chi-Square (χ^2) test	P value
The relationship between the type of mask and symptoms of respiratory disorders	7.598	0.006
The relationship between the habit of wearing a mask with symptoms of respiratory disorders	8.360	0.015
The relationship between the habit of changing masks with symptoms of respiratory disorders	13.108	0.004

Based on table 1, data was obtained from 108 online motorcycle taxis drivers in Malang who became respondents. Most types of masks were non-medical/fabric masks with a percentage of 84.3%, medical/surgical masks by 15.7%, and KN 95 masks by 0%.

Based on table 2, data shows that of the 108 online motorcycle taxis drivers in Malang who became respondents, the group with the most mask replacement time was <12 hours

with a percentage of 56.5%, <24 hours by 25%, >24 hours 13.9% and <4 hours by 4.6%.

Based on table 3, data was obtained from the 108 online motorcycle taxis drivers in the city of Malang who were respondents, the most groups of how to use masks, were good with a percentage of 59.3%, quite good at 22.2%, and not good at 18.5%. Classified to be good if the score was in the range of 75-100%, quite good 60-74%, and not good <60%.



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Based on table 4, data was obtained that from 108 online motorcycle taxi drivers in the city of Malang who became respondents, the most respiratory symptoms that occurred were colds with a percentage of 63.9%, coughing 42.56%, phlegm 39.8%, chest feels heavy by 19.4%, sore throat by 17.6%, wheezing by 9.3%, and shortness of breath by 5.6%.

In order to find out whether there is a relationship between the type of mask, the habit of wearing a mask, and the time of changing the mask with respiratory symptoms, it is necessary to form cross tabs that can describe the distribution of data in more detail, as presented in the following table.

Based on the test results in table 5, the chi-square value to determine the relationship between the type of mask and respiratory symptoms disorders, which is 7.598, with a significance value (p) of 0.006 ($p < 0.05$), so it can be concluded that between the types of masks and symptoms respiratory disorders have a significant relationship. For the results of testing the relationship between mask replacement time and symptoms of respiratory diseases, namely 13.108, with a significance value (p) of 0.000 ($p < 0.05$), so it can be concluded that the time of mask replacement with respiratory symptoms disorders has a significant relationship. For the results of testing the relationship between the habit of wearing a mask with symptoms of respiratory symptoms disorders, which is 8.360, with a significance value (p) of 0.015 ($p < 0.05$), so it can be concluded that between the habit of wearing a mask with symptoms of respiratory disorders has a significant relationship.

DISCUSSION

Health problems that are often encountered due to work are respiratory disorders that cause premature death every year. Exposure to pollution is harmful to health, and chronic exposure causes lung cancer and COPD. The use

of masks is an alternative in reducing exposure to pollution. This study aimed to determine the relationship between the use of personal protective equipment masks on respiratory symptoms disorders of online motorcycle taxis driver In Malang.

From the analysis result, we can conclude that the type of mask with respiratory symptoms disorders has a significant relationship. According to the International labor organization (2020), the type of mask also affected the incident because the cloth mask itself is not standardized and is not intended to be used to protect oneself from viruses. According to research conducted by (MacIntyre et al., 2015), the use of cloth masks is more at risk of developing respiratory infections than medical masks. Cloth masks perform poorly for motor vehicle combustion particles, with the filtration efficiency of cloth masks for particles emitted from motor vehicle combustion ranging from 15% to 57% for total particle concentration and 13% to 40% for total particle mass (Shakya et al., 2017). Cloth masks lack a protective function against aerosols or airborne particles with filtration effectiveness of three microns (Hapsari & Munawi, 2021).

Medical masks efficiently filter bacteria up to 98% with single-use surgical masks that can protect against airborne particles, droplets, liquids, viruses, or bacteria (Kemenkes RI, 2020; Theopilus et al., 2020). Medical masks have been standardized internationally and nationally to ensure their performance (Zhong et al., 2021). Medical masks effectively perform well for particulate combustion of motor vehicle materials with 78-94% (Shakya et al., 2017).

From the analysis result, we can conclude that the time of changing masks with respiratory symptoms disorders has a significant relationship. This can be happen because the filtration efficiency of cloth masks itself has



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a duration of use for 4-5 hours a day, while medical/surgical masks have a duration of use of 6 hours and have an efficiency in filtering bacteria up to 98% with single use but can experience a decrease in filtration efficiency. After 6 hours (Chughtai et al., 2019; Kobayashi et al., 2020) and according to Dwirusman, (2020), medical masks can protect against bacteria for at least 4 hours. After using it for more than 4 hours, it will increase the occurrence of contamination on the mask due to decreased filtration power (Barbosa & Graziano, 2006).

From the analysis result, we can conclude that the habit of wearing a mask with respiratory symptoms disorders has a significant relationship. According to research conducted by Brooks & Butler (2021), People who are not regularly/disciplined in using masks experience more respiratory problems than people who constantly use PPE with a breathing mask when working. The use of PPE masks must meet requirements such as being comfortable when worn, not interfering with the implementation of work, and providing effective protection against the kinds of hazards faced (Muhith, 2018). The habit of using a good mask tends to prevent the occurrence of respiratory symptoms in the wearer.

The protection from respiratory symptoms can happen because of several reasons. First, drivers wore a mask correctly by covering the mouth and nose when using a mask. So that dirt can be filtered and does not enter the respiratory tract (Machida et al., 2020; Muthia & Hendrawan, 2017). Second, drivers wore more than one layer of the mask, which increased filtering efficiency (WHO, 2021). The more layers of fabric and the density of the cloth weave, the filtering efficiency increases by more than 80% for small particles and more than 90% for large particles (Hapsari & Munawi, 2021). Third, drivers remove the

mask from the back and not touch the mask when used. It can prevent mask contamination (Machida et al., 2020). Fourth, drivers replace the mask when the mask is damp because there will be a decrease in mask performance if it becomes damp (Dwirusman, 2020; Machida et al., 2020). Fifth, drivers wash the cloth mask with soap before using it again. The use of PPE masks themselves must be appropriate both in terms of type, method of use, method of removal, and method of disposal or washing of masks, where the use of PPE masks is an aspect of prevention and self-protection from diseases including respiratory diseases (Kemenkes, 2020).

The limitations of this study were the absence of supporting tools other than a questionnaire to assess the status of the respondent's respiratory function and the lack of measurement of exhaust gas emission tests in Malang. So the recommendations for further study are to use supporting tools like spirometry, the medical record of online motorcycle taxis drivers must be known and excluded the respondents who had a history of chronic respiratory disease.

CONCLUSION

Regarding the description of the habit of using masks for online motorcycle taxis drivers in the city of Malang, most groups of how to use masks were in a good category. Based on the result, there is a significant relationship between the habit of wearing a mask, the habit of changing masks, and the type of mask on the incidence of respiratory symptoms among online motorcycle taxi drivers in Malang City.

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