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Original Research

# Mask-Wearing Behavior to Prevent Acute Respiratory Infections During The COVID-19 Pandemic Among Students in Jakarta

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**Abstract**

*Introduction:* The incidence of Acute Respiratory Infections (ARI) tends to be higher in urban areas, especially in Jakarta, the centre of activity in Indonesia. However, the COVID-19 pandemic forced people to wear masks in both urban and rural areas to prevent the virus from entering the respiratory tract. The purpose of this study was to identify the relationship between mask-wearing behaviour and outbreaks of acute respiratory infections during the COVID-19 pandemic among students in Jakarta.
*Methods:* The design of this study was cross-sectional. The consecutive sampling technique was used to select 328 students as the respondents. The independent variable was mask-wearing behaviour (knowledge, attitude, practice). The dependent variable was ARI. The data were collected using a Google Forms questionnaire and then analysed by using the Chi-square test and multiple logistic regression test with a significance level of $p < 0.05$.
*Results:* The result showed that respondents had good knowledge (57%), positive attitude (56.7%), good practice (50.6%), and did not have a history of ARI (64.3%). The predictive factors affecting ARI showed significant results in the attitude domain ($p < 0.05$; OR 1.907).
*Conclusion:* This study found a connection between mask-wearing behaviour and knowledge, attitude, and practice to prevent ARI. We propose normalizing the use of masks even though the number of COVID-19 infections is gradually decreasing to prevent respiratory infections caused by the high rate of air pollution in urban areas.

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## INTRODUCTION

Major pandemics and epidemics such as plague, cholera, influenza, severe acute respiratory syndrome coronavirus (SARS-CoV), and Middle East respiratory syndrome coronavirus (MERS-CoV) have already afflicted humanity [1]. However, the advanced technological development in the healthcare industry has changed the way pandemics are handled.

Acute respiratory infections (ARI) have resulted in significant morbidity and mortality cases worldwide. Many respiratory viruses are associated with ARI [2]. These include influenza viruses, rhinoviruses, and coronaviruses. Coronaviruses, especially human coronavirus NL63, 229E, OC43, and HKU1, are responsible for a significant proportion of ARI [3]. Acute respiratory infections (ARI) are manifested by coughing with short, rapid breathing that may result in death, especially if other comorbidities are present [4]. The disease is a major public health concern as it is the leading cause of death in developing countries. The prevalence of acute respiratory infections (ARI) diagnosed by health workers in 10 states showed that Papua (10.5%) has the highest rate of ARI cases, followed by Bengkulu (8.9%), West Papua (7.5%), East Nusa Tenggara (7.3%) Central Kalimantan (6.2%), East Java (6.0%), Maluku (5.6%), Banten (5.3%), West Java (4.7%), and Central Java (4.6%) [5].

Pathogens associated with ARI include pneumococcal bacteria [6] and tuberculosis, as well as influenza and parainfluenza viruses, rhinovirus, respiratory syncytial virus (RSV), and severe acute respiratory syndrome coronavirus (SARS-CoV) which are still a global health problem [7]. Coronavirus disease (COVID-19), which first appeared in China, has become a major health threat and works by attacking the immune system. It shows the same symptoms as ARI, including fever, cough, sore throat, shortness of breath, fatigue, and malaise [8]. This disease can cause casualties both in developed and developing countries, especially the ones with inadequate health facilities. Therefore, prevention is needed to limit the spread of COVID-19 [9][10].

The government recommends wearing masks or face coverings to reduce the risk of transmission and requires their use in certain environments, such as public transportation, restaurants, and other public places. There are several types of masks that are recommended, including surgical masks and medical masks with a respirator for health workers, and cotton masks for the general population with good health [11][12]. However, the protective effect of mask wearing with ARI on individuals remains unclear. Existing systematic reviews and meta-analysis have consistently found that masks are not effective in preventing episodes of ILI or influenza when worn by an uninfected person. However, a study examining the protective effect of wearing a mask against a secondary influenza attack in a home setting found a 70% decrease in reported attacks when participants complied with the mask requirement [13].

In addition to the general public, the use of masks has also been encouraged in the university environment. This is because

students are at a transitional stage from adolescence to adulthood, where they conduct many activities that require close contact with each other, increasing the risk of virus transmission through droplets in the form of liquid or aerosol [14]. Different countries have encouraged the use of masks as a potential tool to curb the COVID-19 pandemic [15]. The evidence regarding the acceptance of wearing masks to prevent respiratory infections during epidemics is scant and contested [16]. Though prevention of COVID-19 transmission is already known, the link between preventive measures and the incidence of respiratory symptoms unrelated to COVID-19 has not been widely studied.

**METHODS**

This study used quantitative methods with a cross-sectional design. The research was carried out on August 4th-10th, 2022. The population of this research were 1550 students. Total sample was 328 students counted by Slovin's Formula. 178 participants from Binawan University and 150 participants from STIKes RS Husada. The sample taken with consecutive sampling with all the respondents who came and met the selection criteria were included in the study until the required number of respondents was met. Inclusion criteria included student from the Faculty of Health Sciences (nursing, midwifery, and nutrition program) which has undergone semester 3rd-7th, cooperation, willingness to be involved in research, good health, and student number to verify their active status. This study excluded students with genetic lung disease.

The independent variable was mask-wearing behaviour consisting of 3 domains (knowledge, attitude, and practice). The dependent variable was the incidence of acute respiratory infections. The data were gathered using a self-administered questionnaire via Google Forms. The questionnaire was divided into 2 sections. Section 1 included items to assess mask-wearing behaviour with 3 domains (knowledge, attitude, and practice).

The knowledge domain consists of 7 items with Guttman Scale "yes" or "no". The researcher developed this questionnaire from Laila (2021) and has been tested for reliability and validity, with Cronbach's alpha of 0.677 with a sensitivity ranging from 0.312 to 0.766. The attitude domain consists of 10 items with a Likert scale of "5=strongly agree", 4=agree", "3=neutral", "2=disagree", and "1=strongly disagree". The researcher developed this questionnaire from Laila (2021) and has been tested for reliability and validity, with Cronbach's Alpha of 0.721 with a sensitivity ranging from 0.427 to 0.706.

The practice domain consists of 12 items with a Likert scale of "5=always", 4=often", "3=sometimes", "2=seldom", and "1=never". The practice questionnaire has been tested for readability and validity, with Cronbach's alpha of 0.705 with a sensitivity ranging from 0.910 to 0.714. Section 2 included the ARI incidence with illness confirmation and health service visits.

The analysis of the research used IBM SPSS 27 software. The data were analysed by using frequency distribution of the residence's distance, age, gender, body mass index, type of education, disease history,

smoking behaviour, Chi-square test, and multiple logistic regression test with a significance level of p<0,05.

The study was carried out after obtaining approvals from the Binawan University and STIKes RS Husada and passing the ethical feasibility test from the Health Researcher Ethics Committee State Polytechnic of Health Malang with the number: 600/KEPK-POLKESMA/2022 on June 3rd, 2022.

**RESULTS**

The study found that the respondents had less knowledge (3.7%), enough knowledge (39.6%), and good knowledge (57%). Furthermore, respondents had negative (43.3%) and positive attitude (56.7%). Afterward, we presented that respondents had good practice (50.6%) and less practice (49.4%). The last, near around 60% respondents did not have a history of ARI but only 35,7% respondents have history of ARI.

Table 2 shows the relationship between mask-wearing behaviour and knowledge, attitude, and practice (p<0.05). The OR value of 1.907 means that the positive attitude is higher at 1.907 for students with no incidence of acute respiratory infections. Furthermore, good behavior using a mask has a 1.885 times greater probability of not experiencing an ARI incident.

The multivariate analysis with using logistic regression test involving the characteristics of the respondents and the independent variables as predictive factors affecting the ARI showed a significant result on the attitude domain (p <0.05) with an OR value of 1.907 (Table 3). The respondents who had positive attitude had 1.907 times higher risk of not experiencing acute respiratory infections.

**Table 1**

Frequency distribution of mask-wearing behaviour and incidence of acute respiratory tract infections during the COVID-19 Pandemic among students in Jakarta (n=328)

| Variables | Frequency | Percentage |
|---|---|---|
| **Mask-Wearing Behaviour** | | |
| **Knowledge** | | |
| Less | 12 | 3.7 |
| Enough | 120 | 39.6 |
| Good | 186 | 56.7 |
| **Attitude** | | |
| Negative | 142 | 43.3 |
| Positive | 186 | 56.7 |
| **Practice** | | |
| Less | 162 | 49.4 |
| Good | 166 | 50.6 |
| **Acute Respiratory Infection** | | |
| No | 211 | 64.3 |
| Yes | 117 | 35.7 |

**Table 2**

The association between mask-wearing behaviour and the incidence of acute respiratory tract infections (n=328)

| Variables | Acute Respiratory Infection | | | | Total | | OR (95% CI) | p-value |
|---|---|---|---|---|---|---|---|---|
| | No | | Yes | | | | | |
| | f | % | f | % | f | % | | |
| **Mask-Wearing Behavior Knowledge** | | | | | | | | |
| Less | 10 | 83.3 | 2 | 16.7 | 12 | 100 | - | 0.005 |
| Enough | 95 | 73.1 | 35 | 26.9 | 130 | 100 | | |
| Good | 106 | 57 | 80 | 43 | 186 | 100 | | |
| **Attitude** | | | | | | | 1.907(1.192 | |
| Negative | 103 | 72.5 | 39 | 27.5 | 142 | 100 | -3.051) | 0.006 |
| Positive | 108 | 58.1 | 78 | 41.9 | 186 | 100 | | |
| **Practice** | | | | | | | 1.885(1.190 | |
| Less | 116 | 71.6 | 46 | 28.4 | 162 | 100 | -2.984) | 0.006 |
| Good | 95 | 57.2 | 71 | 42.8 | 166 | 100 | | |

**Table 3**

The multivariate analysis of predictive factors associated with the ARI incidence during the Covid-19 Pandemic among students in Jakarta (n=328)

| Variable | B | p-value | OR (95%CI) |
|---|---|---|---|
| Attitude | 0.646 | 0.007 | 1.907 (1.192-3.051) |

**DISCUSSION**

Most of the respondents had a good score in each domain (knowledge, attitude, and practice) of the mask-wearing behaviour. This is because all of the respondents are majoring in health-related education, so they easily accept the information about health protocols and preventive measures against the pandemic. Health education can improve student knowledge of infectious diseases and promote the development of appropriate behaviours toward infectious disease prevention and control. Thus, their educational process should set them up to behave and act during the pandemic [17]. Along with other knowledge, attitude, and practice (KAP) studies conducted before, this KAP survey is also important to identify the respondent's basic knowledge, misconceptions, beliefs, behaviour, and attitude towards disease [18].

This study showed that more than 50% of respondents had good knowledge regarding mask-wearing behaviour. This finding is not in line with research conducted in East Java which reported that 52% of medical students had poor knowledge of COVID-19. However, nine items related to preventive measures in the survey had a

correct answer rate of more than 90% [17]. In relation to other studies, the awareness of proper mask-wearing behaviour among students was also high in Vietnam [19], China [20], and Ethiopia [21]. Respiratory infections during the COVID-19 pandemic led to a reduction in the incidence of previously common respiratory pathogens, such as influenza and streptococcus pneumonia [22]. This is in line with our findings that showed a decrease in the incidence of ARI, especially among students. The researchers of this study thought that mask-wearing behaviour was an important factor, but surprisingly there was no correlation.

As the knowledge domain about mask-wearing behaviour of the questionnaire was distributed, respondents mostly had positive answers to the statement "Lowering the mask to the chin is allowed while speaking," which could be assumed that they already knew wearing a mask properly might prevent the transmission of the virus. This finding is also in line with a study in the USA, which showed that the higher rate of mask-wearing behaviour resulted in a decrease in COVID-19 cases [23]. COVID-19 primarily spreads through respiratory droplets exhaled when an infected person breathes, talks, coughs, sneezes, or sings. Most of these droplets are less than 10 μm in diameter and are often referred to as aerosols. The closer a person is to the exhalation source, the greater the exposure. This is how masks prevent infected people from exposing others to SARS-CoV-2 by blocking the exhalation of virus droplets into the air [24].

Regarding what type of mask can protect a healthy person, CDC recommends using cloth masks to lower the odds of testing positive. Cloth masks can be reused or washed again as soon as they become dirty. The World Health Organization suggests wearing a cloth mask with at least three layers of different materials [25]. Cloth can block droplets and aerosols, and the added layers offer more protection. A 2020 study confirmed that some fabrics can block virus transmission, even for aerosols and in single layers; multiple layers improve protection [26]. An experiment was conducted when a mask was attached to the mannequin that released the virus. The result showed that both cotton and surgical masks blocked more than 50% of the virus transmission. There was a synergistic effect when both the virus receiver and virus spreader wore masks (cotton masks or surgical masks) to prevent the transmission of infective droplets/aerosols [27]. Efficacies in filtering efficiency between different types of masks have been looked into, with surgical masks being superior to cloth masks [28]. Comparing N95 and surgical masks, there was no significant difference in respiratory illness events and the safety profile of surgical masks in the setting of COVID-19 [29].

As many as 106 respondents with good knowledge of mask-wearing behaviour did not experience ARI during the COVID-19 pandemic. Consistent with the study conducted by Wang, wearing a surgical mask was useful to minimize the ARI incidence when outcomes were laboratory-confirmed episodes but harmful when outcomes were self-reported or clinically diagnosed [30]. Droplet precautions are intended to prevent the transmission of pathogens that spread through close respiratory or mucous

membrane contact with respiratory secretions. The mask is generally donned immediately prior to room entry, and health care personnel should wear a surgical mask when contacting an ill resident [31].

The study found that 56,7% of respondents had a positive attitude toward mask-wearing behaviour. This finding is almost similar to study reports from Ethiopia [9], Pakistan [32], and Japan [33], where 67.2%, 65.4%, and 68.5% of students had favorable attitudes, respectively. In line with other research, as much as 71.6% of respondents felt that mask-wearing is absolutely necessary for the prevention of COVID-19 transmission [34]. Most of our respondents (68.5%) had a perception that virus transmission was more common in hospitals than in other public places. A study conducted in Singapore emphasized that physical and environmental factors must be reinforced to limit the impact of any hospital transmission of COVID-19 on healthcare delivery, such as withdrawing students from clinical assignments and dividing meal times for healthcare workers [35].

Most respondents of this research answered “strongly agree” (52.7%) and “agree” (41.4%) when asked about the following statement: “Used masks must be disposed of in a closed container.” We found that age and education level had no significant impact on people’s attitudes toward wearing masks. Public health experts say that improperly discarded masks could potentially contain the virus, increasing the risk of infections if people come into close contact with them. The poor and inadequate waste management systems within developing and least developed countries contribute to a higher threat of COVID-19 infections among them [36]. A study in Ethiopia suggested the least we can do to prevent transmission is by keeping the used mask in cars, luggage, or plastic bags until we find a rubbish bin to safely dispose of them. Alternatively, we could throw them into a closed bin when returning home [37].

In our analysis, the OR value of 1.907 meant that the positive attitude was higher at 1.907 among students with no incidence of ARI. Positive attitudes such as feeling comfortable while wearing masks, handwashing before and after holding a mask, and keeping the mask on when coughing and sneezing could be assumed as preventive measures against ARI during the COVID-19 pandemic. In contrast, nearly 80% of survey respondents in Singapore felt discomfort when wearing a mask for an extended period, citing breathing difficulty and unrecognized face as the main issues [34]. However, it remains advisable to encourage mask use as a preventive measure that may limit the spread of certain viral respiratory diseases, including COVID-19, consequently decreasing the rate of morbidity and mortality [38]. In addition, mask use needs to be accompanied by other efficient measures to stop the spread of viral diseases, such as washing hands, using gloves, and even limiting mobility through quarantine [39].

As shown in the results of this study, there was no significant difference related to the practice domain in mask-wearing behaviour. However, there were two statements most respondents agreed with, which were wearing masks when doing

activities outside the home (80.7%) and driving (88.1%). Wearing masks outdoors, particularly at large outdoor gatherings or other settings where it will be difficult to maintain a physical distance for a prolonged period, will bring benefits in reducing transmission risks during the pandemic phase of COVID-19. Any activity that prevents physical distancing is considered to have a high transmission risk, whereas activity that allows physical distancing but continues to involve multiple respondents in close proximity is considered to have a moderate transmission risk [40]. Previous studies found that only 14.32% of the respondents reported always wearing face masks properly when working or driving, while the rest wore their face masks only when a security officer ordered them to [41].

As many as 95 of 166 respondents who had good practice in mask-wearing behaviour had no ARI experience during the COVID-19 pandemic. In contrast with the Health Development data during the 2015-2019 period, ARI is still a major health issue in Indonesia and has caused morbidity and mortality among children under five years old [42]. Several factors that are associated with the incidence of ARI in children under five include nutritional status, immunization, exclusive breastfeeding, caregivers, exposure to cigarette smoke during pregnancy, occupancy density, income, smoking behaviour in the family, mother's education, use of fuel for cooking, and pesticides [4]. Acute respiratory illness can result from respiratory infections caused by a wide range of pathogens, which may vary by age group and time of year, as well as by other factors such as indoor and outdoor air pollution [43]. During ARI in COVID-19 cases, symptom in terms of decreased senses of smell and/or taste was higher, followed by fatigue, coughing, and the need to blow their noses [44]. On the other hand, WHO data showed that people living in urban areas were exposed to air pollution at levels exceeding WHO guideline limits, thus caused increased in mortality rates. Irregular climate change, rapid urbanization and increasing use of non-recyclable materials were causing the highest problems for the environment [45][46].

According to a previous study conducted in Jakarta, the effect of the climate on the respiratory tract, such as rainfall, is almost the same as the influence of humidity. When rainfall is low and the concentration of PM10 (a pollutant oxidant) is high, the case of ARI will be high. In contrast, when rainfall conditions are >200 mm PM10, the effect is subtle. Low humidity conditions could weaken the mucous membrane, so ARI could easily occur [47].

## LIMITATION

Data for this study were collected using a closed-ended questionnaire with limited response choices, so there may be other factors experienced by the respondent that are not included in the response choices. Questions regarding the type of mask used also did not include whether the mask used was a product made by a standardized company or an imitation.

## CONCLUSION

The COVID-19 pandemic has become a nation-

wide headline, causing ARI not to be given much attention. The general public's perception is that anyone who coughs or has symptoms of ARI is infected by COVID-19. Contrary to popular belief, the symptoms experienced by each person can be caused by a different virus or bacteria. Even when the COVID-19 pandemic ends, we hope that the community will take ARI seriously so that the use of masks can still be encouraged, especially in certain areas or cases.

It has discovered that the best mask for preventing ARI is a mask with 95% filtration. However, it is necessary to generate information on mask choosing to prevent the effects of air pollution whether it is enough to use a fabric mask or it is required to use a 3-layer mask to prevent viruses.

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**CONFLICT OF INTEREST**

The authors have no conflicts of interest to declare.

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