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Original Research

Analysis of wearing masks compliance during the COVID-19 pandemic based on the Health Belief Model

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Abstract

Background: Maintaining physical distance, washing hands, and wearing masks during the COVID-19 pandemic are very important in preventing the spread of the virus. However, although the use of facemasks is relatively easy to do, its compliance is considered low.
Objective: This study aimed to analyze compliance in wearing masks during the COVID-19 pandemic.
Methods: This cross-sectional study was conducted on 400 residents in Palembang, Indonesia, selected using simple random sampling from August to September 2021. Data were collected using online questionnaires and analyzed using descriptive statistics, Chi-square, and multivariate using logistic regression.
Results: The findings revealed that sex, education, and employment status were significant relationships to compliance to wearing masks ($p<0.05$), but age and family income were not significantly related ($p>0.05$). Multivariate analysis showed only perceived severity and cues to action had a significant relationship with compliance to wearing masks after it was controlled by the sex variable ($p<0.05$), with PR of 0.558 (95% CI 0.331-0.941) and 0.410 (95% CI 0.242-0.696), consecutively.
Conclusion: Perceived severity and cues to action are factors that influence compliance to wearing masks. Therefore, these two factors should be considered by public health practitioners as well as the government to increase the compliance wearing masks.

Keywords: Health Belief Model; compliance; wearing masks; COVID-19; Indonesia

Background

Since it was first identified in Wuhan City, Hubei Province, China, at the end of December 2019, Coronavirus disease-2019 (COVID-19) was later known to be caused by SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2), has rapidly spread all over the world. The fast distribution process has led the World Health Organization (WHO) to designate COVID-19 as a Public Health Emergency of International Concern (PHEIC) on 30

January 2020 (Dawood et al., 2020; Kementerian Kesehatan Republik Indonesia, 2020; Tosepu, Effendy, & Ahmad, 2020) and on 11 March 2020, WHO has declared COVID-19 as a pandemic (Liu et al., 2020; Tosepu, Effendy, Lestari, et al., 2020).

One year after being declared a pandemic by the WHO, COVID-19 has spread to more than 200 countries around the world. As of early February 2021, there were more than 105 million cases of COVID-19 worldwide, with more than 2.2 million deaths (Worldometer, 2021). The first case of COVID-19 in Indonesia was reported on 2 March 2020 (Pemerintah Provinsi Sumatera Selatan, 2021b; Sitorus et al., 2021) and rapidly increased and quickly spread throughout Indonesia, and on 26 January 2021, the number of COVID-19 cases in Indonesia had crossed the 1 million mark, to be exact there were 1,012,350 cases with 28,468 deaths (Case Fatality Rate / CFR 2.8%). In South Sumatra Province, the first case of COVID-19 was found on 24 March 2020, and on 26 January 2021, it had reached 13,911 cases with a total of 689 deaths (CFR 4.95%) (Pemerintah Provinsi Sumatera Selatan, 2021a)

SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2) can cause severe acute respiratory syndrome, although the spectrum of symptoms of COVID-19 infection is vast, ranging from asymptomatic, mild respiratory tract infection symptoms to the onset of symptoms, life-threatening sepsis. Transmission of COVID-19 occurs mainly through respiratory droplets from face-to-face contact, through contaminated surfaces, and spread by aerosol, but aerosol transmission in humans remains unclear (Wiersinga et al., 2020; Irnaningsih et al., 2021). While specific treatment for COVID-19 does not yet exist and the success of the COVID-19 vaccination has not been proven in stopping the spread of COVID-19, maintaining physical distance, washing hands, avoiding crowds, and wearing masks are still very essential in efforts to prevent transmission. COVID-19. Wearing a mask can provide additional protection in situations where physical distancing is difficult (e.g., in public transportation, shops, some workplaces, etc.). Some types of masks are even claimed to be able to reduce the transmission of COVID-19 by more than 95%, but the effectiveness of masks in inhibiting the transmission of COVID-19 also depends on their consistency and how they are used. Although the use of masks is a rational and easy choice to break the chain of transmission of COVID-19, the level of compliance with the use of masks consistently and correctly in Indonesia is still low. Vietnam, a country that is considered successful in suppressing the spread of COVID-19, has a wearing masks compliance rate of 99.5% (Nguyen et al., 2020), while the compliance rate of wearing masks in Indonesia and South Sumatra at the end of January 2021 was 87.66% and 70.44 % (Satuan Tugas Penanganan COVID-19 2021). Based on the available data, it can be understood why the spread of COVID-19 in Indonesia and South Sumatra Province, especially Palembang City, has not been controlled until now.

The Health Belief Model is an instrument for understanding why people do not adopt disease prevention strategies and behaviors and refuse to engage in preventive behavior (Smith, 2020). This model has been widely used as a conceptual framework in behavioral research to understand individual health behaviors. HBM attempts to explain and predict behavioral outcomes based on two main aspects, the desire to avoid a health threat (e.g., infection or disease) and the perceived effectiveness of the behavior adopted to prevent the threat. Threat perception consists of the individual's perceived susceptibility and perceived severity to a particular disease or threat. The effectiveness of health behaviors depends on the interaction between the perceived benefits of the behavior and perceived barriers to taking action to reduce the threat or disease (Sesagiri Raamkumar et al., 2020)

The HBM includes four dimensions, (1) perceived vulnerability, (2) perceived severity, (3) perceived benefit, and (4) perceived barriers. Perceived susceptibility can explain that the more a person perceives the risk of a disease, the more likely it is to engage in behaviors to reduce that risk. Perceived severity includes some evaluation of the consequences of a disease based on medical information and knowledge and some beliefs about the negative effects of certain behaviors or diseases that may occur to the individual. The third dimension, perceived benefit, indicates that when people perceive the value and benefits of adopting a new behavior to minimize disease risk, they are more likely to adopt the new behavior based on their perception of reducing risk. The fourth dimension, perceived barriers, is the most powerful dimension of

the HBM, in which a person evaluates the barriers and difficulties they may face while adopting a new behavior. This dimension can result in a person giving up on adopting a new behavior. Individuals usually evaluate the benefits and consequences of a new behavior before leaving the old behavior (Smith, 2020).

Methods

Study Design

This cross-sectional study was conducted in Palembang, Indonesia, to analyze compliance in wearing masks among residents during the COVID-19 pandemic.

Participants

The sample size in this study was 419 Palembang residents selected using simple random sampling. The inclusion criteria of the sample were 1) aged ≥20 years old, 2) speaking Indonesian, and 3) willing to sign informed consent forms.

Instruments

The instrument of this study was a questionnaire consisting of two domains, the perception domain, and the compliance domain. The perception domain is based on the construction of the Health Belief Model (HBM) introduced by Rosenstock et al. in the 1950s (Kim & Kim, 2020), consisting of perceptions of vulnerability, perceived severity, perceived benefits, perceived barriers, and cues to action. The perception domain consists of 23 statement items, and the compliance domain using a mask consists of eight statement items. The questionnaire has been tested and considered valid and reliable using Pearson Product Moment Correlation and Cronbach's Alpha.

Data were collected by filling out online questionnaires distributed through Whatsapp™ from 19 August to 1 September 2021. The questionnaire consists of questions regarding the respondents' sociodemographics (age, sex, education, employment status, and family income) and statements about the Health Belief Model (HBM). Each response to the HBM component and compliance to wearing masks was scored using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) for the HBM, and 1 (never) to 5 (always) for compliance to wearing a mask. In addition, the HBM component is categorized into positive and negative perceptions, while compliance with using masks is categorized into compliant and non-compliant.

Data Analysis

Data were analyzed using the Chi-square test (95% confidence interval) to find the relationship between the independent variable and the dependent variable and multivariate analysis to determine the most dominant variable.

Ethical Consideration

This study was ethically approved by the Health Research Ethics Committee, Faculty of Health, Kader Bangsa University, Palembang, Indonesia, with approval number 57/UKB.FKES//TU.KPEK/ 2021.

Results

During fifteen days of distributing questionnaires through Whatsapp™, 478 responses were collected. Unfortunately, two people were unwilling to get involved in this study, thirty-five respondents were domiciled outside Palembang, and twenty-two respondents were under 20 years of age.

Table 1 Sociodemographic characteristics (n= 419)

Characteristic	n (%)
Sex	
Male	125 (29.8)
Female	294 (70.2)
Age	
Young age (≤45 years)	330 (78.8)
Old age (>45 years)	89 (21.2)
Level of education	
Low	149 (35.6)
Height	270 (64.4)
Employment status	
Working	271 (64.7)
Not working	148 (35.3)
Family income	
High	272 (64,9)
Low	147 (35.1)

Table 1 shows that female respondents are more than male (70.2% vs. 29.8%), younger age is more than old age (78.8% vs. 21.2%), higher education is more than low education (35.6 vs. 64.4%), working respondents more than not working (64.7% vs. 35.3%) and high family income more than low family income (64.9% vs. 35.1%).

Table 2 Health Belief Model components (n= 419)

HBM factors		n (%)
Perceived susceptibility	Positive	279 (66.6)
	Negative	140 (33.4)
Perceived severity	Positive	229 (54.7)
	Negative	190 (45.3)
Perceived benefits	Positive	255 (60.9)
	Negative	164 (39.1)
Perceived barriers	Positive	208 (49.6)
	Negative	211 (50.4)
Cues to action	Positive	323 (77.1)
	Negative	96 (22.9)

Table 2 shows that respondents with positive perceived susceptibility were more than respondents with negative perceived susceptibility (66.6% vs. 33.4%), which means most respondents felt vulnerable or at risk toward COVID-19. A total of 54.7% of respondents had a positive perceived severity, while 45.3% of respondents had a negative perceived severity, which means that most respondents believed that COVID-19 could threaten their health and life. Respondents with positive perceived benefits were 60.9%, while respondents with negative perceived benefits were 39.1%, meaning that most respondents believed that using a mask could protect them from being exposed to COVID-19.

As many as 49.6% of respondents had negative perceived barriers, while 50.4% had positive perceived barriers. It means that respondents who perceived barriers to wearing masks were fewer than respondents who considered there were no barriers to wearing masks. In addition, respondents with positive cues to action were more than respondents with negative cues to action (77.1% vs. 22.9%). It means that most of the respondents felt that they had received enough encouragement or information from the government, mass media, or family.

Table 3 Compliance wearing masks (n= 419)

Wearing masks compliance	n (%)
Compliant	235 (56.1)
Non-compliant	184 (43.9)

Table 3 shows that compliant respondents to wearing masks were more than non-compliant respondents (56.1% vs. 43.9%).

Table 4 The relationship between sociodemographic and HBM factors on compliance to wearing masks (n= 419)

Variable		Wearing masks compliance		p-value*	PR (95% CI)
		Compliant n (%)	Non-compliant n (%)		
Sex	Male	177 (60.2)	117 (39.8)	0.013	1.298 (1.052–1.601)
	Female	58 (46.4)	67 (53.6)		
Age	Young age	189 (57.3)	141 (42.7)	0.411	1.108 (0.723 –1.126)
	Old age	46 (51.7)	43 (48.3)		
Level of education	Low	163 (60.4)	107 (39.6)	0.023	1.200 (0.661–0.970)
	Height	72 (48.3)	77 (51.7)		
Employment status	Working	164 (60.5)	107 (39.5)	0.018	1.261 (1.040 –1.531)
	Not working	71 (48.0)	77 (52.0)		
Family income	High	160 (58.8)	112 (41.2)	0.152	1.153 (0.956 –1.390)
	Low	75 (51.0)	72 (49.0)		
Perceived susceptibility	Positive	177 (63.4)	102 (36.6)	0.000	2.453 (1.620–3.716)
	Negative	58 (41.4)	82 (58.6)		
Perceived severity	Positive	154 (67.2)	75 (32.8)	0.000	2.763 (1.855–4.116)
	Negative	81 (42.6)	109 (57.4)		
Perceived benefits	Positive	166 (65.1)	89 (34.9)	0.000	2.568 (1.716–3.843)
	Negative	69 (42.1)	95 (57.9)		
Perceived barriers	Positive	138 (66.3)	70 (33.7)	0.000	2.317 (1.561–3.439)
	Negative	97 (46.0)	114 (54.0)		
Cues to action	Positive	204 (63.2)	119 (36.8)	0.000	3.594 (2.216–5.831)
	Negative	31 (32.3)	65 (67.7)		

* Chi-square test with 95% CI

Table 4 shows that sex, level of education, and employment status were significantly related to compliance to wearing masks (p<0.05), but age and family income were not significantly related to compliance to wearing masks (p>0.05). Female respondents, young age, working, higher education, and respondents with high family income were more compliant to wearing masks with prevalence ratio (PR) values of 1.298 (95% CI 1.052–1.601), 1.108 (95% CI 0.723 –1.126), 1.200 (95% CI 0.661–0.970), 1.261 (95% CI 1.040 –1.531), and 1.153 (95% CI 0.956 –1.390), consecutively.

Respondent's perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action were significantly related to compliance with wearing masks (p<0.05). Respondents with positive perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action were more compliant to wearing masks with prevalence ratio (PR) values of 2.453 (95% CI 1.620–3.716), 2.763 (95% CI 1.855–4.116), 2.568 (95% CI 1.716–3.843), 2.317 (95% CI 1.561–3.439), and 3.594 (95% CI 2.216–5.831), consecutively.

Table 5 Multivariate analysis

Variable	p-value	Adjusted PR	95% CI
Sex	0.169	0.726	0.461–1.145
Perceived susceptibility	0.399	0.807	0.490–1.329
Perceived severity	0.029	0.558	0.331–0.941
Perceived benefits	0.491	0.832	0.494–1.403
Perceived barriers	0.050	0.647	0.418–1.000
Cues to action	0.001	0.410	0.242–0.696

From the multivariate analysis, it is known that sex was a confounding variable that could affect the relationship between the dependent variable and the independent variable. After multivariate analysis of multiple logistic regression, only perceived severity and cues to action had a significant relationship with compliance to wearing masks after controlling for sex variables (p<0.05) with PR values PR of 0.558 (CI 95% 0.331-0.941) and 0.410 (95% CI 0.242-0.696).

Discussion

Many determinant factors affect people's attitudes whether wear or not to wear masks during the COVID-19 pandemic. A previous study on 206 students and employees of the University of Trier, Germany, found that the reasons for wearing masks are concerns about the current pandemic situation, self-protection, protecting others, and the existence of regulations that require the wearing masks, while the reasons for refusing to wear masks are thinking that wearing a mask looks weird and afraid of other people's judgment when wearing a mask (Rieger, 2020). Some literature state that compliance or non-compliance in the wearing masks during the COVID-19 pandemic depends on a person's perception of COVID-19, which is influenced by demographic characteristics such as sex, age, domicile, education, income (Abid, 2020; Haischer et al., 2020), people's habits (Rieger, 2020), and the obligation to wear masks set by the government (Haischer et al., 2020).

Women tend to be more compliant in wearing masks in the right way than men (Hopkins, 2020; Tso & Cowling, 2020). Research by Abid (2020) in three South Asian countries (Pakistan, India, and Bangladesh), the level of compliance to the wearing masks in women was 1.28 times higher than men). Haischer et al. (2020) in the results of his study in several areas of Wisconsin, United States, guess that there was a men perception about wearing masks as a sign of vulnerability or weakness, while women used masks to protect themselves and others because they handled most of the family matter (Haischer et al., 2020). Capraro (2020) also got similar results; most men considered wearing a mask to be embarrassing, uncool, and a sign of weakness.

In addition, Abid (2020) found that respondents with undergraduate and postgraduate education levels were more compliant in wearing masks when compared to respondents with lower education. In addition, respondents working 2,455 were more compliant than those who did not work (95%CI = 1.759-3.427) (Abid, 2020). This is consistent with the results of this study which found that respondents with high-level education and working were more compliant in wearing masks than respondents with lower education and not working.

Abid (2020) also stated that people with high incomes tend to be more compliant with wearing masks than people with lower incomes. People with monthly incomes below $100 have lower compliance rates for wearing masks compared to people with monthly incomes of $100-$300 and above $300 (Abid, 2020). According to Papageorge et al. (2021), people with low incomes are generally more difficult to afford the need for self-protection compared to people with higher incomes. However, the results of this study are not consistent with the results of research by Abid (2020). There is no significant relationship between family income and compliance to wearing masks. The compliance of Palembang residents in wearing masks is not influenced by their family income because the price of masks in Palembang is still affordable by their financial situation.

In this study, cues to action have a significant relationship with compliance to wearing masks. However, there are inconsistencies in the results of this study with previous studies, and each study got different results. For example, Kim and Kim (2021) found that only perceived benefits and barriers were related to compliance with wearing masks, while Sim et al. (2014) concluded that all HBM factors were significantly associated with adherence to wearing masks.

Perceived severity is an individual's subjective assessment of the severity of a health problem and its consequences. Perceived severity broadly includes beliefs about the disease itself as well as beliefs about its impact on work and social roles that are relevant to the individual. The higher a person's perceived severity, the higher the effort to reduce the risk of getting a disease, and vice versa (Kim & Kim, 2021). Perceived severity is related to compliance with wearing masks. High levels of anxiety can increase behavior change, and anxiety can also be a facilitator for preventive action (Mehanna, 2020). Cues to action in recommendations from families and health workers is an essential factor in improving preventive behavior. Mirzaei et al. (2021) stated that external influences such as social media could play a vital role in promoting individual internal awareness in preventing the transmission of COVID-19.

Conclusion

This study indicates that perceived severity and cues to action directly affected compliance with wearing masks during the COVID-19 pandemic. The Palembang residents who felt that COVID-19 could disrupt their health and daily life were more compliant in wearing masks. Therefore, the roles of the government, mass media, and family support are crucial to increase knowledge and change attitudes about COVID-19 and the benefits of wearing masks so that compliance with using masks can increase.

Declaration of Conflicting Interest
The authors declare no conflict of interest.

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Author Contributions
Concept generation, data collection (DW), writing and editing of the manuscript (DW, MM, and RJS), critically reviewed, writing, and revision (DW, MM, and RJS). All authors agreed with the final version of the article.

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