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Research Article

Illness Risk Perceptions and Efficacy Beliefs Among Indonesian in the Course of COVID-19 Pandemic

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Abstract

COVID-19, a worldwide pandemic, has posed a significant challenge to public health systems worldwide. Health risk perception and efficacy belief are primary constructs influencing individuals' protective behavior due to the outbreak. Our study investigated each item of illness risk perception, efficacy belief, and its related factors concerning the COVID-19 pandemic. An analytical cross-sectional study was conducted among 227 respondents aged 17 to 70. Data collection was conducted using convenience sampling by distributing the web questionnaire between April and July 2020. Mann-Whitney or Kruskal-Wallis bivariate analysis was performed using SPSS version 21.0 to assess the relationship between individual characteristic factors, illness risk perception, and efficacy belief. The study established that respondents had a medium to a high level of illness risk perception and a reasonable efficacy belief in dealing with the COVID-19 pandemic. Region (p=0.027) and occupation (p=0.036) differences were significantly associated with the threat and severity perception, respectively. Smoking history (p=0.037), supplement use (p=0.029), and occupation (p=0.018) differences were significantly associated with self-efficacy. Meanwhile, gender (p=0.045) differences were significantly associated with response efficacy. Therefore, the public's illness risk perception and efficacy belief could be substantial in planning, modifying, and implementing a coordinated response for risk communication in current and future epidemics.

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INTRODUCTION

The novel coronavirus, SARS-CoV-2, was identified as a cluster cause of atypical cases of pneumonia in Wuhan, China[1]. World Health Organization (WHO) has declared this coronavirus disease (COVID-19) a global health emergency due to many confirmed cases in more than 70 countries[2]. Indonesia, the world's fourth most populous country, was reported as having confirmed two cases of COVID-19 infection on March 2, 2020. The number of COVID-19 cases remains rapidly increasing in this country[3]. Over the study period, the latest data regarding COVID-19 reported an increase significantly with an average of over 1790 confirmed cases, with 113 new cases, 170 dead cases, and 112 recovered cases[4].

The Indonesian government has issued several restrictive measures to curtail the spread of the virus across the nations. However, those policies affect an individual psychologically, which causes frustration, anxiety, and even the need to change their daily behavior[5-8]. A systematic review[9] reported that this pandemic has led to high mental disorder rates among the general population. Separate inline, another study[10] has also stated that quarantine measures could worsen a person's psychological condition, such as depression, anxiety, stress disorder, and health risk perception.

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Illness risk perception and efficacy beliefs are reliable predictors of preventive health behavior[11,12]. Illness risk perception is a subjective assessment to respond to fearful communications about a health threat. It could relate to the efficacy beliefs as individual capabilities in taking protective action behavior towards a potential threat[13]. Health behavior theories suggest that perceptions of illness risks relate to perceptions of vulnerability, severity, and threat[14]. Individuals perceiving significant risks were more likely to implement protective behaviors. These behaviors are significantly influenced by how much danger they perceive the event to be, how likely it is to occur, how effective their current coping behaviors are, and what they believe they can do to solve the problem[15]. Therefore, monitoring risk perceptions and efficacy beliefs is integral to public health emergency management.

The COVID-19 risk perception is considered an essential aspect of health and risk communication as its goal is to understand what risks of COVID-19 to the public and how the public addresses them[16]. During the COVID-19 pandemic, the public will have different efficacy beliefs that will influence how people react to risk[17]. Our previous study[18] found that the perceived risk of acquiring COVID-19 was low when there was no confirmed case among Indonesian. Meanwhile, the COVID-19 perceived threat was high at the beginning of outbreaks from March 3 to 27, 2020[19]. People are more considered COVID-19 to be a life-threatening danger to them at that point. Therefore, our study investigated the individual characteristic factors influencing COVID-19 risk perception and efficacy beliefs in different outbreak stages when the number of cases increased significantly. Those factors include sex, gender, region, education level, occupation, marital status, monthly personal income, income condition, direct cash assistance, health status, quarantine conditions, chronic illness, smoking history, and supplement use. In collaborating with the private sector, the Indonesian government has pursued comprehensive policies such as large-scale social distancing, work-from-home, region quarantine, self-isolation, face mask use, and social distancing to prevent the transmission of COVID-19[20]. Hence, understanding risk perception and efficacy belief will give public health authorities a vital reference for protective behavior among Indonesian. Furthermore, these results will determine the willingness of the Indonesians efforts and contribution to handling COVID-19.

MATERIALS AND METHODS

Materials

The instrument was designed based on previous SARS research[21], translated and modified to Indonesian[19]. Quantitative data was generated from a questionnaire containing closed-ended questions. The online questionnaire was distributed via a link to Google Forms: http://bit.Ly/WHOQOLID.

Methods

Study design and data collection

The study has been reviewed for ethical considerations and obtained approval from Universitas 'Aisyiyah Yogyakarta Research Ethics Committee (No. 1305/KEP-UNISA/IV/2020). This cross-sectional online survey was conducted from April to July 2020. The target population was Indonesian active social media users who used specific platforms such as Facebook, Twitter, WhatsApp, and Instagram. The participants' eligibility criteria were Indonesian people aged 17 to 70 years old, active social media users who resided in Indonesia, and could give informed consent. We classified the participants into several age groups, such as adolescents (17 to 25 years old), adults (26 to 45 years old), elderly (46 to 65 years old), and geriatric (above 65 years old). Exclusion criteria were those non-Indonesian residents who did not complete responding to one or more online survey items. The minimum sample size of 220 participants was selected using the Survey System Sample Size Calculator (https://www.surveysystem.com/sscalc.htm), an online survey software package, with 95% confidence and a 5% significance level. This study was voluntary and anonymous. The individuals' consent was obtained before data collection.

Research instrument and study variable

Prior to the distribution of the questionnaires, reliability tests were carried out. The pilot test was conducted on a total of 30 study participants. The assessing instrument for risk perception and efficacy belief were reliable. The Cronbach's alpha and the validity test for risk perceptions were 0.806 and 0.782, while efficacy beliefs were 0.703 and 0.612.

The questionnaire comprised two sections: sociodemographic characteristics and risk perception with efficacy beliefs. The first section comprised questions on respondent sociodemographic characteristics: age, sex, region, education level, occupation, marital status, personal income, income condition, direct cash assistance, health status, quarantine conditions, history of chronic illness, smoking history, and the use of supplements. The second section consisted of a question about perceived risk and efficacy beliefs. Risk perception has three dimensions: perceived threat, vulnerability, and severity. In comparison, efficacy beliefs are associated with response efficacy and self-efficacy.

The measurement of risk perception is based on the construct of the protection motivation theory (PMT). The perceived severity assessed the severity of COVID-19 using a 10-point Likert scale, from 1 (not severe) to 10 (very severe). Meanwhile, the perceived vulnerability assessed the likelihood of acquiring this disease using a 5-point Likert scale, from 1 (very unlikely) to 5 (very likely). The questionnaire used in this study was adapted from a previous study, whereas each perceived dimension was rated on a different Likert scale. Furthermore, we calculated the perceived threat as the overall risk perception measure, which was determined by the formula as follows (the square root of the multiplication of severity/2 and vulnerability). In order to achieve a level of comparability between the scores, the severity score was initially divided by two. A square root transformation was performed to normalize the skewed distribution of the new variable, resulting in a scale ranging from 1 (low) to 5 (high) for measuring perceived threat 19. The perceived threat rating was on a scale from 1 to 5, with 1 being "low" and 5 being "high". The response efficacy was assessed by asking participants to respond to how confident they believe others around them would be in taking practical actions to prevent contracting COVID-19 using a 4-point Likert scale from 1 (not at all) to 4 (very much). Additionally, self-efficacy was determined by asking how confident people felt that they could prevent contracting the disease. The respondents were asked each question on a rating scale from 1 ("not confident") to 4 (very confident). Respondents completed a survey concerning these categories.

Data analysis

A descriptive statistical analysis was used to examine the frequency of data on socio-demographic characteristics, risk perception, and efficacy belief toward COVID-19. All the variables were tested for normality using the Kolmogorov-Smirnov test, and none were normally distributed. Therefore, the Kruskal-Wallis and Mann-Whitney tests were employed to determine significant differences in the categorical independent variable (socio-demographics) on the dependent variable of risk perception (perceived vulnerability, perceived severity, perceived severity) and efficacy beliefs (response efficacy, self-efficacy). We analyzed the data using SPSS version 21.0. Values of p less than 0.05 were considered statistically significant.

RESULTS AND DISCUSSION

The study sampled 232 eligible subjects who filled out the questionnaire with a response rate of 94.8%. After excluding five participants with incomplete data, a final sample of 227 subjects were required in the current study. The majority of participants who dominated the survey were female (56.8%), adult (60.4%), living in the western region (74.4%), holding higher degrees in education (63.9%), and married (67.4%). Overall, 89% of the participants had good health, 59% used supplements, and 4.8% had a prior history of chronic illness. Regarding income conditions, they still work outside the home daily (36.1%), whereas 52.0% have decreased income during the pandemic. Only 6.2% of participants provided direct financial aid from the government. The sociodemographics of the participant are listed in **Table I**.

Table I. Demographic characteristics of respondents.

Variables	n	%
Sex		
Male	98	43.2
Female	129	56.8
Age		
Adolescent (17 to 25 years old)	50	22.0
Adult (26 to 45 years old)	137	60.4
Elderly (46 to 65 years old)	37	16.3
Geriatric (above 65 years old)	3	1.3
Region (Indonesian time zone)		
Western Region	169	74.4
Middle Region	56	24.7
Eastern Region	2	0.9
Education		
Primary education	12	5.3
Middle education	70	30.8
Higher education	145	63.9
Occupation		
Student	33	14.5
Private sector employee	48	21.1
Government worker	37	16.3
Entrepreneur	32	14.1
Others	77	33.9
Marital status		
Married	153	67.4
Single	59	26.0
Widow/Widower	15	6.6
Monthly personal income (IDR)		
Low income	9	4.0
Lower-middle income	56	247
Upper-middle income	92	40.5
High income	70	30.8
Income conditions		
Decreased income	118	52.0
Increased revenue	2	0.9
No changes	101	44.5
No income	6	2.6
Direct cash assistance		
Yes	14	6.2
No	213	93.8
Health status		
Healthy	205	90.3
Do not know	22	9.7
Quarantine conditions		
Full time activities at home	32	14.1
Still leaving the house 2-3x a week is not for work	51	22.5
Work outside the home every day	82	36.1
Work outside the home 2-3x a week	46	20.3
Others	16	7.0
History of chronic illness		
Yes	11	4.8
No	216	95.2
Smoking history		
Yes	47	20.7
No	180	79.3
Supplements Use		
Yes	134	59.0
No	93	41.0

Table II revealed a statistically significant difference between the efficacy responses between men and women ($p = 0.045$). Men participants had a significantly higher mean of response efficacy than women. Therefore, they are more confident in being able to take action in trying to prevent COVID-19. Moreover, men are physically stronger and emotionally more stable than women. Thus, they are more willing to take precautions to reduce their risk of COVID-19[22]. It is also likely because men have a lower immune system, which can be attributed to their differences in innate and adaptive immune responses. Sex-

specific responses result from X chromosome inheritance which contains genes associated with high immunity[23]. Therefore, men perceived a higher efficacy response to prevent them from contracting COVID-19 during a pandemic.

This study also showed a significant difference in perceived threat between regions (p = 0.027). Participants in the western region had a significantly lower mean of a perceived threat than those in the middle or eastern regions. People living in the western region perceive that they are less likely to be exposed to the COVID-19 threat. The highest number of cases in Indonesia is in the western regions. World Health Organization estimates that as of February 3, 2022, 65.8% of Indonesia's cumulative confirmed cases have been reported on Java Island. In contrast, Jakarta has the highest number of confirmed cases per one million, followed by East Kalimantan, North Kalimantan, the Special Region of Yogyakarta, and Central Java[24]. The low perception of threat among people in the Western Region could affect adherence to health protocols. These regions also have high mobility and population density, where many business industrial centers are still operating continuously. It will be a potential cause of the increasing number of confirmed cases in this area.

Occupation differences also have a statistically significant relationship with perceived severity (p = 0.036) and self-efficacy (p = 0.018). Those who work in government have a significantly higher perceived seriousness than those who work in the private sector or entrepreneurship. It means that if government workers suffer from COVID, it will severely threaten them. The potentially higher risk of severe outcomes for COVID-19 depends on the worker's characteristics in various occupations[25]. Previous research[26] has also demonstrated that government employees have the highest risk of serious adverse outcomes due to COVID-19. Furthermore, our study found that those in the private sector have a greater sense of self-efficacy than others. Private companies have stringent rules in issuing their employees' policies regarding work regulations and health protection due to the COVID-19 pandemic[27]. Therefore, private sector employees have more ability to defend themselves from the pandemic.

Our findings also revealed that smoking history and use of supplements were significantly correlated with self-efficacy (p = 0.037; p = 0.029, respectively). Non-smokers have a stronger belief in their capability to counteract the pandemic threat. Smoking can increase the likelihood of hand-to-mouth transmission of COVID-19. It can pose a significant threat to the COVID-19 spread since contaminated fingers and cigarette sticks will contact the smoker's lips[28,29]. A clinical study suggested that ACE2 may be the receptor being used by SARS-CoV-2 to gain entry into cells[30,31]. Meanwhile, cigarette smoke could induce mucosa, the primary source of ACE2 in the lungs. Smoking also increases ACE2 in the lungs, thus enhancing the individual's susceptibility to COVID-19[32]. This statement aligns with a study about tobacco smokers at high risk of developing severe co-infections due to impaired lung function, cross-infection, and vulnerable hygiene habits[29]. Furthermore, the mortality rate among smokers with COVID-19 infection is higher at 38.5% than non-smokers[33].

Our study stated that people who consume nutritional supplements have significantly greater self-efficacy than those who do not. It indicates that they have a lower sense of risk associated with the pandemic threat, as they take supplements regularly. Regular diet supplementation with vitamins and micronutrients can enhance the immune system. It is a different approach to preventing the transmission of COVID-19[34,35]. Sahebnasagh *et al*.[36] demonstrated that specific vitamins are vital in innate and adaptive immune responses. Vitamins A, D, E, C, and B have antioxidant and immunomodulatory properties which benefit the immune system. A study has shown that taking probiotics, omega-3 fatty acids, multivitamins, or vitamin D supplements can reduce the risk of positive COVID-19 test results[37].

According to our findings, participants' mean perceived threat and severity score was (3.28±0.86) and (8.50±2.05), respectively. Furthermore, we identified that most respondents had moderate to high levels of concern regarding the risks related to COVID-19. The majority of participants revealed that they were susceptible to COVID-19. As COVID-19 cases increase significantly in the field, public concern in Indonesia regarding the severity of the disease and population vulnerability is also growing[38].

Table II. Illness risk perceptions and efficacy beliefs toward COVID-19.

Independent variables	Dependent variables									
	Perceived vulnerability		Perceived severity		Perceived threat		Response efficacy		Self efficacy	
	$\bar{x} \pm SD$	*p*	$\bar{x} \pm SD$	*p*	$\bar{x} \pm SD$	*p*	$\bar{x} \pm SD$	*p*	$\bar{x} \pm SD$	*p*
Sex										
Male	2.76±1.09	0.370	8.38±2.04	0.245	3.30±0.91	0.675	3.49±1.03	**0.045***	4.13±0.74	0.980
Female	2.61±0.99		8.59±2.06		3.25±0.82		3.22±1.01		4.13±0.73	
Age										
Adolescent	2.60±1.09	0.228	8.76±1.51	0.605	3.29±0.80	0.203	3.20±1.16	0.848	4.16±0.62	0.283
Adult	2.74±0.98		8.42±2.27		3.30±0.87		3.36±0.95		4.08±0.79	
Elderly	2.49±1.17		8.38±1.85		3.13±0.93		3.46±1.12		4.30±0.62	
Geriatric	3.00±1.00		9.00±1.73		3.62±0.73		3.00±1.00		4.00±1.00	
Region										
Western Region	2.60±1.00	0.063	8.38±2.16	0.328	3.20±0.85	**0.027***	3.26±0.02	0.092	0.41±0.72	0.697
Middle Region	2.86±1.10		8.79±1.67		3.59±1.00		3.59±1.00		0.42±0.70	
Eastern Region	4.00±0.00		10.0±0.00		4.47±0.00		3.00±1.41		0.35±2.12	
Education										
Primary education	3.00±1.21	0.504	9.00±1.35	0.121	3.60±0.92	0.411	3.33±0.99	0.855	4.00±0.74	0.09
Middle education	2.64±1.04		8.96±1.44		3.35±0.74		3.44±1.06		4.13±0.74	
Higher education	2.66±1.02		8.23±2.29		3.21±0.90		3.29±1.01		4.14±0.73	
Occupation										
Student	2.58±1.00	0.771	8.85±1.66	**0.036***	3.29±0.74	0.952	3.24±1.17	0.161	4.15±0.57	**0.018***
Private sector employee	2.73±1.09		8.52±2.12		3.31±0.94		3.52±1.03		4.29±0.74	
Government worker	2.84±1.01		7.68±2.40		3.19±0.87		3.22±1.00		3.78±0.82	
Entrepreneur	2.53±1.05		9.19±1.23		3.31±0.75		3.63±1.16		4.28±0.77	
Marital status										
Married	2.73±1.01	0.297	8.46±2.19	0.881	3.31±0.88	0.135	3.39±0.99	0.139	4.12±0.74	0.734
Single	2.63±1.07		8.66±1.66		3.29±0.81		3.15±1.06		4.14±0.68	
Widow/ Widower	2.27±1.10		8.66±1.66		3.29±0.81		3.53±1.12		4.27±0.80	
Monthly personal income (IDR)										
Low income	3.00±1.41	0.547	8.56±2.24	0.215	3.48±1.08	0.690	3.11±1.36	0.691	4.33±0.71	0.539
Lower-middle income	2.70±1.04		8.52±2.05		3.31±0.90		3.50±1.03		4.09±0.64	
Upper-middle income	2.54±0.92		8.59±2.03		3.22±0.78		3.30±1.04		4.21±0.73	
High income	2.79±1.11		8.36±2.09		3.29±0.90		3.29±0.97		4.04±0.79	
Income conditions										
Decreased income	2.67±1.01	0.319	8.62±2.01	0.490	3.30±0.84	0.064	3.31±1.04	0.622	4.16±0.74	0.415
Increased revenue	3.50±0.71		9.00±1.41		3.96±0.71		4.00±0.00		4.00±0.00	
No changes	2.69±1.03		8.45±1.94		3.28±0.83		3.35±1.00		4.08±0.72	
No income	2.17±1.60		6.83±3.97		2.38±1.34		3.67±1.21		4.50±0.84	
Direct cash assistance										
Yes	2.71±1.27	0.884	8.57±1.83	0.966	3.29±0.95	0.988	2.93±0.92	0.101	4.00±0.68	0.416
No	2.67±1.02		8.50±2.07		3.28±0.86		3.36±1.03		4.14±0.73	
Health status										
Healthy	2.62±1.02	0.028	8.47±2.09	0.955	3.23±0.85	0.050	3.37±1.03	0.269	4.17±0.74	0.029
Do not know	3.19±1.08		8.67±1.71		3.68±0.91		3.10±0.99		3.81±0.60	
Quarantine conditions										
Full time activities at home	2.56±1.19	0.052	8.38±2.03	0.559	3.19±0.97	0.087	3.44±1.16	0.464	4.28±0.68	0.567
Leaving the house 2-3x per week not for work	2.65±0.87		8.86±1.71		3.35±0.68		3.16±0.93		4.16±0.67	
Work outside every day	2.94±1.13		8.44±2.14		3.43±0.95		3.39±1.03		4.12±0.79	
Work outside 2-3x per week	2.35±0.85		8.54±1.92		3.08±0.71		3.43±1.00		4.09±0.73	
Others	2.56±0.97		7.75±2.84		3.00±0.96		3.19±1.11		3.94±0.68	
History of chronic illness										
Yes	2.55±0.82	0.779	9.00±1.55	0.479	3.35±0.74	0.585	2.91±0.83	0.204	4.18±0.75	0.835
No	2.68±1.05		8.47±2.07		3.27±0.87		3.36±1.03		4.13±0.73	
Smoking history										
Yes	2.89±1.05	0.114	8.45±1.82	0.403	3.43±0.87	0.173	3.47±1.04	0.358	3.94±0.73	**0.037***
No	2.62±1.03		8.51±2.11		3.23±0.85		3.31±1.02		4.18±0.72	
Supplement use										
Yes	2.69±1.07	0.800	8.50±2.25	0.183	3.26±0.90	0.828	3.28±1.07	0.334	4.22±0.74	**0.029***
No	2.66±0.98		8.49±1.74		3.29±0.80		3.42±0.96		4.01±0.70	

Note: * Significantly different

Table II reported that respondents' mean score of perceived severity was male (8.38±2.04) and female (8.59±2.06). This high score indicated that the perceived severity of COVID-19 among males and females was severe and fatal. The general population's severity perception in Indonesia is higher than in the Myanmar-based study[39]. Similar results were found in a study in Hongkong[40], in which all participants agreed that the COVID-19 disease was very severe. Regarding the pandemic, the internet and other information sources can better influence people's thinking in applying protective measures[41]. A study reported that respondents in Indonesia had taken more protective behavior. People who often get information related to

COVID will have firmer self-efficacy beliefs[42]. Mya *et al*.[39] have reported that individuals would engage in more protective behavior due to easy access to mass media and social media.

A person perceiving the high risk of COVID-19 is likely to feel stress, panic, depression, and try to adapt to others' behavior. It is because strong negative emotions could encourage one to think about protective behavior in the face of this pandemic[43]. Nevertheless, the higher threat perceived by vulnerable groups may increase their self-protective behavior, which is beneficial in pandemic control. However, those with a low-risk perception of COVID-19 are less likely to engage in protective behavior. Thus, public health education is targeted at this group[44].

Understanding risk perception is a complex phenomenon created from various psychological, social, and cultural factors in different places and times. This phenomenon can be interpreted as a form of pandemic preparedness. Based on previous studies, risk perception can assess and evaluate an individual's response to a pandemic[45]. Though perceived risk acts as a trigger for preventive actions, it is also determined by a person's social networks, community beliefs, and the source of information about health behavior[46]. Social networks may amplify the spread of beneficial or dangerous behavior during this COVID-19 pandemic[47]. As a non-medical measure, personal protective practices are needed to control the COVID-19 pandemic by implementing health protocols, wearing masks, avoiding crowds, and maintaining social distancing. The community's willingness could play a vital role in successfully implementing government policies[48].

CONCLUSION

We concluded a moderate to high level of risk perceptions associated with COVID-19 in Indonesia's general population. Additionally, they had a relatively good efficacy response in adopting self-protection measures during the COVID-19 pandemic. The public's risk perception of a pandemic contributes to increasing participation in preventing the COVID-19 pandemic. Furthermore, these findings will contribute to the health authorities regarding COVID-19 pandemic risk communication management.

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AUTHORS' CONTRIBUTION

Lolita: study design, methodology, data collection, validation, and writing–original draft. **Azis Ikhsanudin**: data management, data collection, visualization, statistical analysis, and editing.

DATA AVAILABILITY

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. She J, Jiang J, Ye L, Hu L, Bai C, Song Y. 2019 novel coronavirus of pneumonia in Wuhan, China: emerging attack and management strategies. Clin Transl Med. 2020;9(1):19. doi:10.1186/s40169-020-00271-z

2. Cucinotta D, Vanelli M. WHO Declares COVID-19 a Pandemic. Acta Biomed. 2020;91(1):157-60. doi:10.23750/abm.v91i1.9397

3. Djalante R, Lassa J, Setiamarga D, Sudjatma A, Indrawan M, Haryanto B, et al. Review and analysis of current responses to COVID-19 in Indonesia: Period of January to March 2020. Prog Disaster Sci. 2020;6:100091. doi:10.1016/j.pdisas.2020.100091

4. World Health Organization. Coronavirus Disease 2019 (COVID-19) Situation Report-18. Jakarta, Indonesia: WHO Indonesia; 2020. Available from: https://www.who.int/docs/default-source/searo/indonesia/covid19/who-situation-report-18.pdf

5. Alam MM, Fawzi AM, Islam MM, Said J. Impacts of COVID-19 pandemic on national security issues: Indonesia as a case study. Secur J. 2022;35(4):1067-86. doi:10.1057/s41284-021-00314-1

6. Lusida MAP, Salamah S, Jonatan M, Wiyogo IO, Asyari CH, Ali ND, et al. Prevalence of and risk factors for depression, anxiety, and stress in non-hospitalized asymptomatic and mild COVID-19 patients in East Java province, Indonesia. PLoS One. 2022;17(7):e0270966. doi:10.1371/journal.pone.0270966

7. Akbar Z, Aisyawati MS. Coping Strategy, Social Support, and Psychological Distress Among University Students in Jakarta, Indonesia During the COVID-19 Pandemic. Front Psychol. 2021;12:694122. doi:10.3389/fpsyg.2021.694122

8. Abdullah I. COVID-19: Threat and fear in Indonesia. Psychol Trauma Theory Res Pract Policy. 2021;12(5):488-90. doi:10.1037/tra0000878

9. Xiong J, Lipsitz O, Nasri F, Lui LMW, Gill H, Phan L, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. J Affect Disord. 2020;277:55–64. doi:10.1016/j.jad.2020.08.001

10. Giallonardo V, Sampogna G, Del Vecchio V, Luciano M, Albert U, Carmassi C, et al. The Impact of Quarantine and Physical Distancing Following COVID-19 on Mental Health: Study Protocol of a Multicentric Italian Population Trial. Front psychiatry. 2020;11:533. doi:10.3389/fpsyt.2020.00533

11. Zewdie A, Mose A, Sahle T, Bedewi J, Gashu M, Kebede N, et al. The health belief model's ability to predict COVID-19 preventive behavior: A systematic review. SAGE Open Med. 2022;10:20503121221113668. doi:10.1177/20503121221113668

12. Karl JA, Fischer R, Druică E, Musso F, Stan A. Testing the Effectiveness of the Health Belief Model in Predicting Preventive Behavior During the COVID-19 Pandemic: The Case of Romania and Italy. Front Psychol. 2022;12:627575. doi:10.3389/fpsyg.2021.627575

13. Sobkow A, Zaleskiewicz T, Petrova D, Garcia-Retamero R, Traczyk J. Worry, Risk Perception, and Controllability Predict Intentions Toward COVID-19 Preventive Behaviors. Front Psychol. 2020;11:582720. doi:10.3389/fpsyg.2020.582720

14. Ferrer R, Klein WM. Risk perceptions and health behavior. Curr Opin Psychol. 2015;5:85-9. doi:10.1016/j.copsyc.2015.03.012

15. Schneiderman N, Ironson G, Siegel SD. Stress and health: psychological, behavioral, and biological determinants. Annu Rev Clin Psychol. 2005;1:607-28. doi:10.1146/annurev.clinpsy.1.102803.144141

16. Cipolletta S, Andreghetti GR, Mioni G. Risk Perception towards COVID-19: A Systematic Review and Qualitative Synthesis. Int J Environ Res Public Health. 2022;19(8):4649. doi:10.3390/ijerph19084649

17. Diotaiuti P, Valente G, Mancone S, Falese L, Bellizzi F, Anastasi D, et al. Perception of Risk, Self-Efficacy and Social Trust during the Diffusion of Covid-19 in Italy. Int J Environ Res Public Health. 2021;18(7):3427. doi:10.3390/ijerph18073427

18. Nanda RO, Lolita L, Indayati W, Rusdiyanti I, Ikhsanudin A, Mareti S. Knowledge, precautionary actions, and perceived risk of COVID-19 among indonesian people. Int J Public Health Sci. 2021;10(1):8–15. doi:10.11591/ijphs.v10i1.20589

19. Nanda RO, Lolita L, Indayati W, Rusdiyanti I, Nurjannah, Ikhsanudin A, et al. Covid-19 risk perception among Indonesians in early stage of the outbreak. Int J Public Health Sci. 2021;10(2):249–57. doi:10.11591/ijphs.v10i2.20678

20. Lutfi M, Buntuang PCD, Kornelius Y, Erdiyansyah, Hasanuddin B. The impact of social distancing policy on small and medium-sized enterprises (SMEs) in Indonesia. Probl Perspect Manag. 2020;18(3):492-503. doi:10.21511/ppm.18(3).2020.40

21. de Zwart O, Veldhuijzen IK, Elam G, Aro AR, Abraham T, Bishop GD, et al. Perceived threat, risk perception, and efficacy beliefs related to SARS and other (emerging) infectious diseases: Results of an international survey. Int J Behav Med. 2009;16(1):30–40. doi:10.1007/s12529-008-9008-2

22. Umamaheswar J, Tan C. "Dad, Wash Your Hands": Gender, Care Work, and Attitudes toward Risk during the COVID-19 Pandemic. Socius. 2020;6:1-14. doi:10.1177/2378023120964376

23. Griffith DM, Sharma G, Holliday CS, Enyia OK, Valliere M, Semlow AR, et al. Men and COVID-19: A Biopsychosocial Approach to Understanding Sex Differences in Mortality and Recommendations for Practice and Policy Interventions. Prev Chronic Dis. 2020;17:E63. doi:10.5888/pcd17.200247

24. World Health Organization. Coronavirus Disease 2019 (COVID-19) Situation Report-41. Jakarta, Indonesia: WHO Indonesia; 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200301-sitrep-41-covid-19.pdf?sfvrsn=6768306d_2&download=true

25. van der Plaat DA, Madan I, Coggon D, van Tongeren M, Edge R, Muiry R, et al. Risks of COVID-19 by occupation in NHS workers in England. Occup Environ Med. 2022;79(3):176-83. doi:10.1136/oemed-2021-107628

26. Walsh B, Redmond P, Roantree B, Redmond P. Differences in risk of severe outcomes from COVID-19 across occupations in Ireland. ESRI Survey and Statistical Report Series Number 93. Dublin, Ireland: The Economic and Social Research Institute; 2020. doi:10.26504/sustat93

27. Lan FY, Wei CF, Hsu YT, Christiani DC, Kales SN. Work-related COVID-19 transmission in six Asian countries/areas: A follow-up study. PLoS One. 2020;15(5):e0233588. doi:10.1371/journal.pone.0233588

28. Kashyap VK, Dhasmana A, Massey A, Kotnala S, Zafar N, Jaggi M, et al. Smoking and COVID-19: Adding Fuel to the Flame. Int J Mol Sci. 2020;21(18):6581. doi:10.3390/ijms21186581

29. Ahmed N, Maqsood A, Abduljabbar T, Vohra F. Tobacco Smoking a Potential Risk Factor in Transmission of COVID-19 Infection. Pak J Med Sci. 2020;36(COVID19-S4):S104-7. doi:10.12669/pjms.36.covid19-s4.2739

30. Li W, Moore MJ, Vasilieva N, Sui J, Wong SK, Berne MA, et al. Angiotensin-converting enzyme 2 is a functional receptor for the SARS coronavirus. Nature. 2003;426(6965):450-4. doi:10.1038/nature02145

31. Ni W, Yang X, Yang D, Bao J, Li R, Xiao Y, et al. Role of angiotensin-converting enzyme 2 (ACE2) in COVID-19. Crit Care. 2020;24(1):422. doi:10.1186/s13054-020-03120-0

32. Polverino F. Cigarette Smoking and COVID-19: A Complex Interaction. Am J Respir Crit Care Med. 2020;202(3):471–2. doi:10.1164/rccm.202005-1646le

33. Alqahtani JS, Oyelade T, Aldhahir AM, Alghamdi SM, Almehmadi M, Alqahtani AS, et al. Prevalence, Severity and Mortality associated with COPD and Smoking in patients with COVID-19: A Rapid Systematic Review and Meta-Analysis. PLoS One. 2020;15(5):e0233147. doi:10.1371/journal.pone.0233147

34. Kumar P, Kumar M, Bedi O, Gupta M, Kumar S, Jaiswal G, et al. Role of vitamins and minerals as immunity boosters in COVID-19. Inflammopharmacology. 2021;29(4):1001-16. doi:10.1007/s10787-021-00826-7

35. Ahmed MH, Hassan A, Molnár J. The Role of Micronutrients to Support Immunity for COVID-19 Prevention. Rev Bras Farmacogn. 2021;31(4):361-74. doi:10.1007/s43450-021-00179-w

36. Sahebnasagh A, Saghafi F, Avan R, Khoshi A, Khataminia M, Safdari M, et al. The prophylaxis and treatment potential of supplements for COVID-19. Eur J Pharmacol. 2020;887:173530. doi:10.1016/j.ejphar.2020.173530

37. Mrityunjaya M, Pavithra V, Neelam R, Janhavi P, Halami PM, Ravindra PV. Immune-Boosting, Antioxidant and Anti-inflammatory Food Supplements Targeting Pathogenesis of COVID-19. Front Immunol. 2020;11:570122. doi:10.3389/fimmu.2020.570122

38. Handayani W, Insani TD, Fisher M, Gim THT, Mardhotillah S, Adam UEF. Effects of COVID-19 restriction measures in Indonesia: A comparative spatial and policy analysis of selected urban agglomerations. Int J Disaster Risk Reduct. 2022;76:103015. doi:10.1016/j.ijdrr.2022.103015

39. Mya KS, Aye SM, Hlaing WA, Hlaing SS, Aung T, Lwin SMM, et al. Awareness, perceived risk and protective behaviours of Myanmar adults on COVID-19. Int J Commun Med Public Health. 2020;7(5):1627. doi:10.18203/2394-6040.ijcmph20201530

40. Kwok KO, Li KK, Chan HHH, Yi YY, Tang A, Wei WI, et al. Community Responses during Early Phase of COVID-19 Epidemic, Hong Kong. Emerg Infect Dis. 2020;26(7):1575–9. doi:10.3201/eid2607.200500

41. Yıldırım M, Güler A. COVID-19 severity, self-efficacy, knowledge, preventive behaviors, and mental health in Turkey. Death Stud. 2020;46(4):979-86. doi:10.1080/07481187.2020.1793434

42. Sulistyawati, Rokhmayanti, Aji B, Wijayanti SPM, Hastuti SKW, Sukesi TW, et al. Knowledge, Attitudes, Practices and Information Needs During the COVID-19 Pandemic in Indonesia. Risk Manag Healthc Policy. 2021;14:163. doi:10.2147/rmhp.s288579

43. Serafini G, Parmiagini B, Amerio A, Aguglia A, Sher L, Amore M. The psychological impact of COVID-19 on the mental health in the general population. QJM. 2020;113(8):531-7. doi:10.1093/qjmed/hcaa201

44. Husnah, Salawati L, Sakdiah, Nazira N, Firdausa S, Nawawi YS. Perception and preventive behavior during COVID-19 pandemic among residents in Banda Aceh, Indonesia: a cross-sectional study. Med J Indones. 2021;30:290-6. doi:10.13181/mji.oa.215674

45. Cori L, Bianchi F, Cadum E, Anthonj C. Risk Perception and COVID-19. Int J Environ Res Public Health. 2020;17(9):3114. doi:10.3390/ijerph17093114

46. Ghio D, Lawes-Wickwar S, Tang MY, Epton T, Howlett N, Jenkinson E, et al. What influences people's responses to public health messages for managing risks and preventing infectious diseases? A rapid systematic review of the evidence and recommendations. BMJ Open. 2021;11(11):e048750. doi:10.1136/bmjopen-2021-048750

47. Liu PL. COVID-19 information on social media and preventive behaviors: Managing the pandemic through personal responsibility. Soc Sci Med. 2021;277:113928. doi:10.1016/j.socscimed.2021.113928

48. Ayuningtyas D, Haq HU, Utami RRM, Susilia S. Requestioning the Indonesia Government's Public Policy Response to the COVID-19 Pandemic: Black Box Analysis for the Period of January-July 2020. Front Public Health. 2021;9:612994. doi:10.3389/fpubh.2021.612994