

Risk factors of COVID-19 disease confirmed cases in Solok District

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ABSTRACT

According to West Sumatra corona virus data, Solok Regency has the highest prevalence of positive confirmed cases of COVID-19 in West Sumatra, and one of the areas where the prevalence has increased significantly. Analysis of risk factors for COVID-19 cases in Solok Regency in 2021. We conducted a cross-sectional study analysis of secondary data from March to December 2020 with a mass randomized trial using the polymerase chain reaction (PCR) test in Solok Regency. Descriptive statistical analysis was used with secondary data relevant, and a logistic regression model was used to assess infection risk factors. A total of the 770 participants, 47.4% were women and 66% were aged 50-64 years. A total of 624 participants tested (81.03%) were identified as asymptomatic PCR SARS-CoV infection without symptoms, with 88% of participants with co-morbidities and 66% of participants without travel history. Based on the results obtained a significant relationship between history of comorbidities (p-value=0.00; AOR=0.16; 95% CI=0.08-0.32), clinical symptoms (p-value=0.00; AOR=0.04; 95% CI=0.03-0.08), and travel history (p-value=0.00, AOR=1.80, 95% CI=1.25-2.61). The majority of cases that were confirmed positive for COVID-19 based on the PCR test showed no symptoms, with co-morbidities and travel history. Confirmed positive cases of COVID-19 are associated with co-morbidities, symptoms and travel history.

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1. INTRODUCTION

Coronavirus disease (COVID-19) is a well-known disease that has high mortality and morbidity since the beginning of 2020 worldwide. In 2022, the global death rate due to COVID-19 is 6,190,349 people while positive confirmed cases are 500,186,525 people [1]. Furthermore, in 2021, the confirmed COVID-19 morbidity in Europe is 42% Europe while the mortality rate in Asia is 1,9. According to five patients who were treated for acute respiratory distress syndrome (ARDS) from December 18-29, 2019. Cases increased rapidly until early January 2020, when 44 cases were reported. Furthermore, in a short time this disease has spread to Thailand, Japan, and South Korea. Globally, Indonesia ranks fourth as a contributing country to the spread of positive confirmed cases of COVID-19 in 2022 [1]-[3].

In Indonesia, the increase in cases of death from COVID-19 has increased significantly since it was first discovered at the end of 2019, with 11,935 deaths [2]. However, confirmed positive cases decreased slightly to 6,037,742 in the country in 2022 [3]. Direct contact with COVID-19 sufferers [4], history of

co-morbidities [5], workplace [4], age ≥ 80 years [6], [7] presence of clinical symptoms [8], and sex [9] risk factors that have the potential to contract COVID-19. However, other studies have reported this age [4], [10], sex [6], and no clinical symptoms is not a risk factor that can trigger transmission and death from COVID-19.

COVID-19 has spread throughout Indonesia, including in West Sumatra. The first positive confirmed case of COVID-19 in West Sumatra was reported on March 23, 2020. To date, there have been 8,874 confirmed positive cases in West Sumatra with 181 deaths. From April to December 2020, the number of COVID-19 cases in NTB Province from April to December 2020 was 29,380, with Solok Regency taking first place with 859 cases (3%) [1], [2]. West Sumatra ranks 12th in the country with around 103,658 confirmed positive cases (1.7%). In 2022, the number of victims who died as a result of positive confirmation of COVID-19 was 2,328 people [3]. Solok Regency ranks nineteenth in terms of the prevalence of the spread of COVID-19 throughout Indonesia.

Futhermore, there are no comprehensive studies that contain the analysis of risk factors for COVID-19 cases. The other studies also found that risk factors for mortality due to COVID-19: a case study at a distric hospital [11]. The study in the west area of Iran measured predisposing risk factors for COVID-19 infection: a case-control study but was different methode analysis [12]. Another study in Indonesia has assessed relationship of smoking risk factors and comorbids with COVID-19 mortality: systematic review and meta analysis, the variation of the risk of COVID-19 but has not involved travel history variables and symptoms COVID-19 [13]. A study about knowledge, attitude, and practice towards COVID-19 among university students in Indonesia a cross-sectional study but was limited just for Student Population in Indonesia and measured about knowledge of COVID-19 [14].

Our research the objective is analysis data risk factors of spread COVID-19. Nevertheless, there is still a lack of the study in Indonesia that analyze the risks of COVID-19 transmission. Therefore, to suppress the spread of COVID-19, prevention efforts are being carried out by the local government, including mass screening. Mass screening activity is carried out in a certain period of time against disease infections in susceptible populations. This research is a mass screening conducted by the Solok District Health Office, West Sumatra, which was set for March to December 2021.

2. METHOD

2.1. Study design

The cross-sectional study design was done. The data used in this study is secondary data from mass screening conducted by the Solok District Health Office, West Sumatra. Polymerase chain reaction (PCR) swab test was performed [15] from March to December 2021 in Solok District. The data obtained included information on demographic characteristics, laboratory diagnoses, comorbidity status, travel history, and clinical symptoms.

2.2. Participant

This mass screening was carried out by the Solok District Health Office, where all participants had the same opportunity to take part in the COVID-19 examination. Therefore, the main data in this study is secondary. Patient demographics include aspects of gender (male or female), age group (18-49 years, 50-64 years, 65-79 years, and ≥ 80 years) [2], and travel history (traveling or not traveling to other areas).

2.3. Clinical criteria

Participants are considered to have clinical symptoms if they experience any of the following symptoms: cough, history of fever, fever, runny nose, weakness, sore throat, headache, shortness of breath, muscle cramps, nausea, abdominal pain, diarrhea, and chills [3]–[6]. However, in this study, participants who experienced clinical symptoms were divided into two groups: "Yes" if they experienced any clinical symptoms, and "No" if they did not experience any clinical symptoms. This categorization was carried out because the data available at the Health Service did not specifically include clinical symptoms.

2.4. Laboratory criteria

Diagnostic tests were carried out using the swab reverse polymerase chain reaction (RT-PCR) method, with nasopharyngeal and oropharyngeal specimens [7]. Therefore, the results of the swab test are divided into two, namely positive and negative. In addition of laboratory confirm, this research based on comorbidity status. Participants in this mass screening were recorded if they had infectious diseases, such as diabetes, hypertension, heart disease, stroke, kidney failure, lung cancer, liver cancer, blood cancer, and other medical history [8], diagnosed by medical personnel. Data are categorized into "with co-morbidities" and "without co-morbidities".

2.5. Static analysis

The Chi-square test or Fisher's Exact Test was carried out to determine the relationship between variables and the type of category scale seen from the value of $p < 0.05$. Multivariate analysis was then performed using a logistic regression test [9] to examine the most dominant risk factors for the occurrence of COVID-19. In the present study design, degree was measured by the adjusted odds ratio (AOR), with a 95% confidence interval (CI). The software application used for analysis is SPSS version 25. This research was approved by the Research Ethics Committee of the Republic of Indonesia Health Polytechnic with reference number 016/KEPK-J/IV/2022.

3. RESULT

Our research obtained a total of 770 COVID-19 cases, based on diagnostic tests were carried out using RT-PCR conducted by the Solok District Health Office, the results of the mass screening showed that 81% of positive cases of COVID-19 were identified as participants with the following characteristics: female (55.6%), aged 50-64 years (80.5%), without co-morbidities (88.1%), without clinical symptoms (80.5%), and without travel history (66.6%) as shown in Table 1.

Table 1. Demographic categories

Category	N=770	%	Category	N=770	%
Age			Clinical symptom(s)		
18-49 years	87	11.3	Yes	150	19.5
50-64 years	620	80.5	No	620	80.5
65-79 years	53	6.9	COVID-19		
≥ 80 years	10	1.3	Positive	624	81.0
Sex			Negative	146	19.0
Male	342	44.4	Travel history		
Female	428	55.6	Yes	257	33.4
Comorbidity			No	513	66.6
Yes	92	11.9			
No	678	88.1			

Based on the results of bivariate analysis with statistically significant were age (p-value=0.00, AOR=-; 95% CI=-), sex (p-value=0.001, AOR=1.857; 95% CI=1.290-2.672), comorbidities (p-value=0.00; AOR=23.416; 95% CI=13.808-39.709), clinical symptoms (p-value=0.00, AOR=39.383; 95% CI=-0.08), and travel history (p-value=0.02, AOR=0.554; 95% CI =0.383- 0.800) as shown in Table 2.

Table 2. Bivariate analysis

Variable	COVID-19 case				Total		p-value	RP 95% CI
	Positive		Negative		n	%		
	n	%	n	%	n	%		
Age (years)								-
18-49	77	10	10	1.3	87	11.3		
50-64	508	66	112	14.5	620	80.5	0.000	
65-79	32	4.2	21	2.7	53	6.9		
≥80	7	0.9	3	0.4	10	1.3		
Sex								1.857 (1.290-2.672)
Male	259	33.6	83	10.8	342	44.4	0.001	
Female	365	47.4	63	8.2	428	55.6		
Comorbidity								23.416 (13.808-39.709)
Yes	23	3.0	69	9.0	92	11.9	0.000	
No	601	78.1	77	10	678	88.1		
Symptom(s)								39.383 (24.261-63.933)
Yes	42	5.5	108	14.0	150	19.5	0.000	
No	582	75.6	38	4.9	620	80.5		
Travel history								0.554 (0.383-0.800)
Yes	192	24.9	65	8.4	257	33.4	0.002	
No	432	56.1	81	10.5	513	66.6		

Furthermore, based on the results of multivariate analysis with logistic regression test which were statistically significant were history of comorbidities (p-value=0.00; AOR=0.16; 95% CI=0.08-0.32), clinical symptoms (p-value=0.00, AOR=0.04; 95% CI=0.03-0.08), and travel history (p-value=0.00, AOR=1.80; 95% CI =1.25- 2.61) as shown in Table 3. One of the risk factors for COVID-19 infection is co-morbidities. Concomitant diseases can affect COVID-19 infection and develop into disease severity due to a possible

relationship with an increase in the amount of the ACE2 enzyme which functions as a receptor for the SARS-CoV-2 virus in penetrating host cells [10]. SARS-CoV infection is also influenced by viral and host factors. The cytotoxic effect of the virus and the ability to overpower the immune response determine the severity of the infection [11]. Clinical manifestations of COVID-19 patients range from asymptomatic to mild symptoms, pneumonia, severe pneumonia, ARDS, sepsis and septic shock. Approximately 80% of cases are categorized as mild or moderate, 13.8% serious, and 6.1% critical [12]. In addition, people without clinical symptoms have the potential to transmit COVID-19 [3], meaning that individuals without clinical symptoms but with positive PCR results for COVID-19 can unknowingly be the main factor in the spread of COVID-19 [13]. Nevertheless risk factors determined by the Centers for Disease Control and Prevention (CDC) are close contact, including living in the same house with a COVID-19 patient, and a history of travel [14].

Table 3. Demographic factors and characteristics of a diagnosis of spread COVID-19, N=770

Demographic factors	Characteristics of SARS-CoV-2		p-value	β	aOR (Exp β)	95% CI
	Positive (%)	Negative (%)				
Sex						
Male	259 (33.6)	83 (10.8)	0.36	-0.237	0.78	0.45-1.24
Female	365 (47.4)	63 (8.2)				
Age						
18-49 years	77 (10)	10 (1.3)	0.81	0.263	1.30	0.15-11.20
50-64 years	508 (66)	112 (14.5)				
65-79 years	32 (4.2)	21 (2.7)				
\geq 80 years	7 (0.9)	3 (1.9)				
Comorbidity						
Yes	23 (3.0)	69 (9)	0.00	-1.804	0.16	0.08-0.32
No	601 (78.1)	77 (10)				
Clinical symptom(s)						
Yes	42 (5.5)	108 (14.0)	0.00	-3.041	0.04	0.03-0.08
No	582 (75.6)	38 (4.9)				
Travel history						
Yes	192 (24.9)	65 (8.4)	0.00	0.591	1.80*	1.25-2.61
No	432 (56.1)	81 (10.5)				

SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

4. DISCUSSION

Solok Regency is one of the areas in West Sumatra which borders the tourist city of Tanah Datar Regency. Thus, many people visit the area and this has an impact on high community mobility so that it is vulnerable to the spread of COVID-19 cases. 99.9% of visitors are domestic tourists [15]. An increase in the number of tourists visiting an area can trigger the emergence of crowded places which result in an increase in tourist density in an area. Density has a significant impact on the spread of the virus. The greater the population density in an area, the greater the possibility of spreading the virus. The municipal government held a mass screening after receiving information on the first positive confirmation case of COVID-19 to suppress the spread of the virus [15]. Mass screening is very effective in preventing the spread of the virus. From the screening test using the PCR swab method, 770 participants were identified as infected with COVID-19. The results of the mass screening showed that 81% of positive cases of COVID-19 were identified as participants with the following characteristics: female, aged 50-64 years, without co-morbidities, without clinical symptoms, and without travel history.

A of the cases identified through this screening, there were two variables that showed high results for confirmed positive cases of COVID-19, namely women and the 50year old group, because the dominant number of these two variables. participate. in mass inspection. In addition, the majority of the group in this study were women. This can be seen from the number of female population which is more dominant than male [15]. The group without a history of co-morbidities, without clinical symptoms, and without travel history showed more positive confirmed cases of COVID-19. Until now, accurate data regarding the relationship between the high likelihood of suspected comorbidities compared to the general population for being infected with COVID-19 has not been found. The main problem faced by comorbid patients is the development of worse clinical symptoms, but the potential for greater viral infection has not been identified [7].

The disease begins with an incubation period of 3-14 days (mean five days). During this period, leukocytes and lymphocytes were normal or slightly lower, and the patient was asymptomatic [12]. Several case reports suggest that transmission from asymptomatic carriers is suspected, but the exact mechanism is unknown. Cases related to transmission from asymptomatic carriers have a history of close contact with COVID-19 patients [16]. Close contacts are defined as individuals who make direct physical contact without protective equipment, are in the same environment (eg, office, classroom, or home), or speak within 1 meter of a patient being supervised (low-risk close contact), probable or confirmation (high-risk close contact).

Contact occurred within two days before the case became symptomatic and up to 14 days after the case became symptomatic [17].

According to the CDC, a history of traveling to infected areas is a risk factor [18]. Mass screening is a preventive measure that needs to be taken in the health and community services sector, especially for travelers from countries/regions where cases of COVID-19 have been found. Asymptomatic travelers are required to self-monitor the possibility of symptoms appearing for 14 days after returning home. Travelers should limit unnecessary activities and maintain contact distance (≥ 1 meter) with other people. Those who do not have a travel history but have positive PCR results for COVID-19 will likely experience local transmission [13], [19].

The results of the bivariate analysis showed a statistically significant relationship between gender and age and COVID-19. Furthermore, the results of multivariate statistics revealed that gender and age had no significant effect on COVID-19. The result is uniform that gender has nothing to do with COVID-19 [7], [20]. In contrast to other studies, gender and age group have statistically significant values [21]. This can be caused by differences in individual behavior and attitudes towards health protocols, maintaining diet, individual immune systems, clean and healthy lifestyles, and different daily activities [22]. Everyone should avoid activities that increase their chances of contracting COVID-19. The study conducted shows parallel studies between men and women regarding the risk of death when suffering from COVID-19. These two studies are different. However, both measure risk-based activities associated with specific risk categories. The two studies concluded that both men and women are at risk of contracting COVID-19 and dying from it [23].

Another bivariate analysis found a statistically significant association between history of comorbidities, clinical symptoms, and travel history. Patients with a history of co-morbidities are 23.41 times more likely to contract COVID-19 than those without a history of co-morbidities. Research in Canada reports that diabetes mellitus (DM) and hypertension are diseases that contribute to death from COVID-19. The health conditions or complications most often accompanied by co-morbidities that cause death in the COVID-19 case are dementia or Alzheimer's (38%), pneumonia (33%), hypertension (15%), and diabetes (13%) [24]. Cardiovascular disease, hypertension, and diabetes were the most common comorbidities in COVID-19 patients, with COVID-19 compared to chronic obstructive pulmonary disease (COPD), chronic liver disease, and chronic kidney disease lower likelihood, with $p < 0.0001$. The prevalence of COVID-19 patients with cardiovascular disease is higher than the general population [18].

Patients with hypertension, cardiocerebrovascular disease and diabetes are twice as likely to be infected with COVID-19. Patients with COPD and chronic kidney disease (CKD) appear to have a low risk of contracting SARS-CoV-2. However, the infection tends to be severe. Long-term use of bronchodilators for COPD patients, such as inhaled steroids, beta agonists or anticholinergics, can partially inhibit coronavirus replication by reducing expression of coronavirus receptors, suppressing endosomal acid function, and modulating inflammation caused by respiratory tract infections. thereby reducing susceptibility to infection [18].

Statistical analysis conducted in this study found that patients with clinical symptoms had a 39.38 times greater risk of being infected with COVID-19 than those who did not have clinical symptoms. A case is declared positive if the laboratory results are positive for COVID-19 with one of the clinical symptoms. The main clinical manifestations are fever, tiredness and dry cough. In severe cases, symptoms such as nasal congestion, runny nose, pharyngalgia, myalgia, and diarrhea are relatively uncommon. Dyspnea or hypoxaemia usually occurs after the onset of the disease, and what is worse can rapidly progress to acute respiratory distress syndrome, septic shock, metabolic acidosis, coughing and bleeding dysfunction, and multiple organ failure [25].

PCR swab examination is used to determine whether a person is infected with COVID-19; However, recent research findings suggest that some cases may show persistent positive results even when there are no symptoms. According to a study conducted in Korea, although no viral replication was found three weeks after the onset of the first symptoms, SARS-CoV-2 ribonucleic acid (RNA) could be detected in the specimens of the RT-PCR investigation up to 12 weeks. Recent studies have also shown that there is a possibility of reinfection for COVID-19 survivors because the COVID-19 antibodies in the body are expected to disappear within 3 to 12 months [25].

Furthermore, the results of multivariate analysis revealed a significant association between history of comorbidities, clinical symptoms, and travel history and COVID-19. The beta (β) value in Table 3 is a variable that has positive significance (travel history) compared to other variables, meaning that each increase in value by the same multiple has a positive chance of a COVID-19 event and is supported by the AOR, it is obtained that there is a potential travel history of 20% with positive incidents of COVID-19 compared to people with no travel history.

The Previous Study Before In the west of Iran, assessed the COVID-19 risk factors with the case-control study analysis method that travel history has no correlation with the COVID-19 cases, but in that study the comorbid disease is a risk factor of COVID-19 [26]. Another study in China with a retrospective analysis method, the results of the majority of COVID-19 sufferers have no initial symptoms and they have comorbid

disease [27], [28]. Whereas in previous studies in Indonesia with the same analysis method, but in different populations obtain the same results with the results of this study, there is a history of travel with the incidence of COVID-19 [29], [30]. This study has research limitations because it only uses secondary data obtained from the Solok District Health Office, besides that it still does not explain the division of clinical symptoms and diseases possessed by patients in detail, this study only divides it in general. So that the need for more detailed research on these variables.

WHO guidelines, there are four transmission in the COVID-19 pandemic, including: i) areas there are no cases; ii) areas with one or more cases (sporadic cases), both imported and local cases, sporadic in a certain period of time, with varying frequency of disease, no clusters or groups are formed, and random distribution, such as in areas of transportation facilities, such as stations and airports; iii) areas with clusters of cases identified in time, geographic location, and source of transmission, and found to have formed in areas such as offices and schools; and iv) areas where there is community transmission, where the source of infection cannot be found due to the large number of infections [17].

In particular, it is now recognized that the main form of human-to-human transmission occurs via respiratory droplets expelled by infected individuals; therefore, coughs and sneezes spread SARS-CoV-2 into the air, putting uninfected people at risk of contracting the disease [16]. The greater the population density, the greater the potential for the spread of disease. Population density also affects air circulation in the environment which has the potential for contamination from outside which can increase the risk and intensity of transmission and can facilitate disease transmission [23]. WHO recommendation in dealing with the COVID-19 outbreak is to carry out basic protection, including routinely washing hands with alcohol or soap and water, keeping a distance from people who have symptoms of coughing or sneezing, practicing coughing or sneezing ethics, and seeking treatment. If you have a serious complaint. According to the suspect category. One meter is the recommended minimum distance [1]. This study contributes to the identification of people infected by people without symptoms of COVID-19. From the results of the PCR test, isolation can be carried out to suppress the spread of COVID-19 in Solok Regency, West Sumatra. However, this research has limitations, data on symptoms and comorbidities that are more specific have not been recorded in the anamnesis data.

5. CONCLUSION

Travel history increases the risk of transmission of COVID-19 infection, so preventive measures such as social distancing must be emphasized in the community. A person with one of the symptoms of COVID-19 is encouraged to self-isolate to ensure the spread of COVID-19. Therefore, it is mandatory to increase self-knowledge and behavioral habits through education and health promotion. Thus, the transmission of the disease and the magnitude of the pandemic can be suppressed.

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REFERENCES

- [1] World Health Organization (WHO), "Corona virus Disease (COVID-19) Pandemic," 2022. [Online]. Available: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> (accessed: Mar 17, 2021).
- [2] D. A. Wohl *et al.*, "COVID-19 symptoms at time of testing and association with positivity among outpatients tested for SARS-CoV-2," *PLoS ONE*, vol. 16, no. 12 December, pp. 1–13, 2021, doi: 10.1371/journal.pone.0260879.
- [3] J. Paireau *et al.*, "Early chains of transmission of COVID-19 in France, January to March 2020," *Eurosurveillance*, vol. 27, no. 6, 2022, doi: 10.2807/1560-7917.ES.2022.27.6.2001953.
- [4] R. H. Al-Rifai *et al.*, "Epidemiological characterization of symptomatic and asymptomatic COVID-19 cases and positivity in subsequent RT-PCR tests in the United Arab Emirates," *PLoS ONE*, vol. 16, no. 2 February, pp. 1–14, 2021, doi: 10.1371/journal.pone.0246903.
- [5] E. Ochoa-Hein *et al.*, "Factors associated with COVID-19 and asymptomatic carriage in healthcare workers of a COVID-19 hospital," *Revista de investigacion Clinica*, vol. 73, no. 2, pp. 65–71, 2021, doi: 10.24875/ric.20000592.
- [6] J. T. Hicks, S. Das, A. Matanock, A. Griego-Fisher, and D. Sosin, "Characteristics of persons with secondary detection of severe acute respiratory syndrome coronavirus 2 ≥ 90 days after first detection, New Mexico 2020," *The Journal of Infectious Diseases*, vol. 224, no. 10, pp. 1684–1689, 2021, doi: 10.1093/infdis/jiab448.
- [7] F. Perez-Garcia *et al.*, "Severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection among hospital workers in a severely affected institution in Madrid, Spain: A surveillance cross-sectional study," *Infection Control and Hospital Epidemiology*, vol. 42, no. 7, pp. 803–809, 2021, doi: 10.1017/ice.2020.1303.
- [8] S. kyung Park *et al.*, "Detection of SARS-CoV-2 in fecal samples from patients with asymptomatic and mild COVID-19 in




- Korea,” *Clinical Gastroenterology and Hepatology*, vol. 19, no. 7, pp. 1387-1394.e2, 2021, doi: 10.1016/j.cgh.2020.06.005.
- [9] M. S. Meena, S. Priya, R. Thirukumaran, M. Gowrilakshmi, K. Essakiraja, and M. S. Madhumitha, “Factors influencing the acquisition of COVID infection among high-risk contacts of COVID-19 patients in Madurai district: A case control study,” *Journal of Family Medicine and Primary Care*, vol. 11, no. 1, pp. 182–189, 2022, doi: 10.4103/jfmpc.jfmpc.
- [10] L. Semenzato *et al.*, “Risk, Antihypertensive drugs and COVID-19 patients, a cohort study of 2 million hypertensive,” *Hypertension*, vol. 77, pp. 833–842, 2021, doi: 10.1161/HYPERTENSIONAHA.120.16314.
- [11] G. Li *et al.*, “Coronavirus infections and immune responses,” *Journal Medical Virology*, vol. 92, no. 4, pp. 424–432, 2020, doi: 10.1002/jmv.25685.
- [12] World Health Organization (WHO), “Report of the WHO-China Joint Mission on coronavirus disease 2019 (COVID-19),” 2020. [Online]. Available: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf> (accessed: Mar. 17, 2022).
- [13] R. Laxminarayan, C. M. B, K. V. A. K. Vinay T G, B. Wahl, and J. A. Lewnard, “SARS-CoV-2 infection and mortality during the first epidemic wave in Madurai, south India: a prospective, active surveillance study,” *Lancet*, vol. 21, no. December, pp. 1665–1676, 2021, doi: 10.1016/S1473-3099(21)00393-5.
- [14] National Center for Immunization and Respiratory Diseases (U.S.) Division of Viral Diseases, “Interim US guidance for risk assessment and public health management of persons with potential coronavirus disease 2019 (COVID-19) exposures: geographic risk and contacts of laboratory-confirmed cases,” 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/php/risk-assessment.html> (accessed: Mar. 17, 2021).
- [15] (BPS). Badan Pusat Statistik, “Solok Regency in Figures 2021,” (in Indonesia), vol. 2, pp. 440–446, 2020. Available: <https://solokkab.bps.go.id/publication/2021/02/26/dab627a8187c57c29fc2a03d/kabupaten-solok-dalam-angka-2021.html>. (accessed: 20052020)
- [16] H. A. Gesesew *et al.*, “Risk factors for COVID-19 infection, disease severity and related deaths in Africa: A systematic review,” *BMJ Open*, vol. 11, no. 2, pp. 1–10, 2021, doi: 10.1136/bmjopen-2020-044618.
- [17] Directorate General of Disease Prevention and Control, “COVID-1 Scatter Data,” (in Indonesia), Ministry of Health of the Republic of Indonesia. [Online]. Available: <https://covid19.go.id/>. (accessed: 06032021)
- [18] T. Yin, Y. Li, and Z. Luo, “Prevalence of comorbidity in Chinese patients with COVID-19: systematic review and meta-analysis of risk factors,” *Infection Diseases*, vol. 21, no. 1, p. 200, 2022, doi: 10.1186/s12879-021-05915-0.
- [19] C. Mo *et al.*, “Association between COVID-19 incidence and outcome and national development levels: An ecologic analysis,” *ScienceAsia*, vol. 47, no. 2, pp. 211–219, 2021, doi: 10.2306/SCIENCEASIA1513-1874.2021.031.
- [20] B. L. Coleman *et al.*, “Study of the epidemiology of COVID-19 in Ontario elementary and secondary school education workers: an interim analysis following the first school year,” *Canadian Journal of Public Health*, vol. 113, no. 2, pp. 185–195, 2022, doi: 10.17269/s41997-022-00613-z.
- [21] L. Oshman *et al.*, “Whom should we test for COVID-19? performance of a symptom and risk factor questionnaire on COVID-19 test results and patient outcomes in an immediate care setting,” *Journal of Primary Care and Community Health*, vol. 11, 2020, doi: 10.1177/2150132720981297.
- [22] M. J. Mendoza-Jiménez, T. V. Hannemann, and J. Atzendorf, “Behavioral risk factors and adherence to preventive measures: evidence from the early stages of the COVID-19 pandemic,” *Frontiers in Public Health*, vol. 9, no. June, pp. 1–14, 2021, doi: 10.3389/fpubh.2021.674597.
- [23] S. Drefahl *et al.*, “A population-based cohort study of socio-demographic risk factors for COVID-19 deaths in Sweden,” *Nature Communications*, vol. 11, no. 1, pp. 1–7, 2020, doi: 10.1038/s41467-020-18926-3.
- [24] Kathy O’Brien *et al.*, “COVID-19 death comorbidities in Kanada,” 2020. [Online]. Available: <https://publications.gc.ca/site/eng/9.893582/publication.html> (accessed: May 17, 2021).
- [25] Indonesian Pediatrician Association, “Guideline of COVID-19,” in 4, 4th ed., Indonesian: Satuan Tugas Penanganan COVID-19, 2022. [Online]. Available: <https://covid19.go.id/artikel/2022/02/03/pedoman-tatalaksana-covid-19-edisi-4> (accessed: Mar. 24, 2021).
- [26] F. Shahbazi, M. Solgi, and S. Khazaei, “Predisposing risk factors for COVID-19 infection: A case-control study,” *Caspian Journal of Internal Medicine*, vol. 11, no. May, pp. S495–S500, 2020, doi: 10.22088/cjim.11.0.495.
- [27] Y. Bai *et al.*, “Presumed Asymptomatic Carrier Transmission of COVID-19,” *JAMA - Journal of the American Medical Association*, vol. 323, no. 14, pp. 1406–1407, 2020, doi: 10.1001/jama.2020.2565.
- [28] P. Y. Tao *et al.*, “Determination of risk factors for predicting the onset of symptoms in asymptomatic COVID-19 infected patients,” *International Journal of Medical Sciences*, vol. 17, no. 14, pp. 2187–2193, 2020, doi: 10.7150/ijms.47576.
- [29] A. Oluwaseun and O. Oluwole, “Coronavirus disease 2019 (COVID-19) transmission, risk factors, prevention and control: A Minireview,” *Journal of Infectious Diseases and Epidemiology*, vol. 6, no. 4, pp. 1–5, 2020, doi: 10.23937/2474-3658/1510145.
- [30] H. Xin *et al.*, “Risk factors associated with occurrence of COVID-19 among household persons exposed to patients with confirmed COVID-19 in Qingdao Municipal, China,” *Transbound Emergancy Diseases*, vol. 68, no. 2, pp. 782–788, 2020, doi: 10.1111/tbed.13743.

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