TRIGGER FACTORS OF LONG COVID (POST-COVID SYNDROME)

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TRIGGER FACTORS OF LONG COVID (POST-COVID SYNDROME)

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ABSTRACT

Background: Coronavirus disease 2 (SARS-Cov-2) is still a significant concern for the world because of the problem of infectious diseases that can cause severe acute respiratory disease with or without symptoms to be life-threatening. Even though it can be cured, in some cases, prolonged, persistent symptoms will appear after Covid, or is called Long Covid. The occurrence of long Covid can be seen from the persistence of residual symptoms after an acute infection occurs for more than 4 weeks This study aims to identify the trigger factors for Long Covid. **Methods:** Research design with a cross-sectional design. The sample is all covid survivors with residual symptoms willing to complete a questionnaire on Google form of 122 samples. **Results:** The results of the bivariate analysis showed that the BMI factor variable had a value of p=0.750, many sequelae p=0.000, treatment p=0.046, early symptoms p=0.000, active smokers p=0.981, passive smokers p = 0.328, and comorbidities p = 0.052. The initial symptom variable is the most dominant precipitating factor compared to other variables where the logistic regression test obtains OR = 2.103. **Discussion:** Symptom variable had the most dominant influence compared to the other variables, namely the number of sequelae and treatment. Thus among the other variables, it can be concluded that the initial symptom variable has the most dominant influence on the occurrence of Long Covid. explains that someone infected with covid in the first week with many symptoms tends to be at risk of experiencing long Covid syndrome.

Keywords: Infection disease, Long covid, Residual symptoms, Trigger factors

INTRODUCTION

Coronavirus disease 2 (SARS-Cov-2) is still a significant concern for the world of infectious diseases that can cause acute respiratory illness with or without symptoms to be life-threatening (Amenta et al., 2020). Even though it will be cured, in some cases, persistent symptoms will appear that are extended after Covid or are called Long Covid (Toro et al., 2021). Among patients who have recovered but experience symptoms persisting or recovering and even new symptoms during the clinical recovery period (Rajendran, Jayadevan, & Sashidharan, 2020). The most frequent symptoms in patients with Long Covid are fatigue, shortness of breath, and anhedonia (Sayed, Shokry, & Mohamed, 2021).

The world's confirmed cases of Covid-19 reached 290,959,019, died by 5,446,753 with a death rate of 1.9%. Indonesia amounted to 4,263,732, recovery reached 4,114,969, and died as much as 3.4% (PHEOC Kemkes RI, 2022). East Java 400,089, the number of deaths was

29,746 (Jatim Prov, 2022). Banyuwangi Regency had 13,703 confirmed cases, 11,999 recovered, and 1,701 died (Banyuwangi Kab, 2022).

The occurrence of long Covid can be seen from the persistence of residual symptoms after an acute infection occurs for more than four weeks (Gorna et al, 2020). The lung is the most affected organ, with various pathophysiological events that rapidly and progressively result in ongoing sequelae (Torres-Castroa et al , 2020). Rehabilitation of Covid-19 survivors is adjusted based on symptoms and individual needs in an integrated manner so that they can achieve the expected target (Huang et al., 2020).

It is common to find patients who have been declared cured of the Corona virus but are still experiencing ongoing symptoms (post covid syndrome). Not much information regarding Long Covid in Indonesia is still a serious problem. One of the information that is still difficult to know is the trigger factor for Long Covid. Observing the cases that many post-Covid sufferers complain about and based on similar research on Long Covid, researchers are interested in researching what triggers can cause Long Covid to occur in patients after being diagnosed with Covid-19 several Covid-19 referral hospitals in the Banyuwangi Regency area, with the aim of research identifying trigger factors for the occurrence of Long Covid.

The purpose of this research is to identify the trigger factors for Long Covid. This is very important because there is a need for good information to the public regarding the triggering factors for Long Covid

METHODS

This research is an observational study with an analytic cross-sectional design using a quantitative approach, measuring or observing all the dependent and independent variables simultaneously. The population in this study were patients with confirmed Long Covid. The sampling technique is accidental sampling by taking the available respondents according to the research context, with the inclusion criteria of patients who after being declared negative still have sequelae of more than 4 weeks, while the exclusion criteria were patients who were not willing to be respondents. The number of samples in this study was 122 respondents in various regions, namely East Java, Central Java, West Java, DKI Jakarta, Bali, West Sumatra, and West Nusa Tenggara. The research instrument according to the number of variables to be studied included age, gender, blood type, history of lung disease, appearance of many symptoms in the first week of infection, comorbidities and history of smoking and Long Covid. Data analysis was calculated using the chi-square test, using $\alpha = 0.05$ and 95% Confident Interval (CI), while multivariate analysis using logistic regression test which can describe the relationship between the independent variables and the dependent variable.

RESULTS

1. General data in the form of Respondent Characteristics Based on Gender, Age, Blood Type, BMI, Occupation, and Region of Origin as follows:

Table 1. Characteristics of Respondents Based on Gender, Age, Blood Type, BMI, Occupation, and Region of Origin (n=122). *Continue to page 65

Characteristics		Frequency	Percentage
Gender	Man	31	25.4%
	Woman	91	74.6%

Characteristics		Frequency	Percentage
Age	Teenager	24	19.7%
	Young adults	45	36.9%
	Old adult	28	23%
	Old	25	20.5%
Blood group	O	40	32.8%
	A	26	21.3%
	B	42	34.4%
	AB	14	11.5%
IMT	Underweight	13	10.7%
	Normal	54	43.3%
	Overweight	41	33.6%
	Obesitas	14	11.5%
Work	health workers	51	41.8%
	teacher	24	19.7%
	Private	17	13.9%
	student	15	12.3%
	Housewife	8	6.6%
	other	7	5.7%
Place of Origin	East Java	100	82%
	Central Java	2	1.6%
	West Java	3	2.5%
	Jakarta	5	4.1%
	Bali	2	0.8%
	West Sunatera	1	0.8%
	Nusa Tenggara Barat	9	7.4%

Based on the table above, it can be seen that the gender in this study was known that the majority of respondents were female, as many as 91 people (74.6%), respondents aged young adults 45 people (36.9%), respondents with blood type B were 42 people (34.4%), normal BMI as many as 54 people (43.3%), health workers as many as 51 people (41.8%), came from the East Java region as many as 100 people (82%).

2. Special data on the long covid factor as follows:

Table 2. The influence of elements on the occurrence of Long Covid (n=122).

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Triggers		Long Covid				Total	%
		Yes	%	No	%		
Body mass index	Underweight	7	5.6%	6	4.9%	13	10.7%
	Normal	36	29.5%	18	14.7%	54	44.3%
	Overweight	32	26.2%	9	7.4%	41	33.6%
	Obesitas	6	4.9%	8	6.5%	14	11.5%
Many Sequelae	There are not any	0	0	32	26.2%	32	26.2%
	1-3 symptom	76	62.3%	9	7.4%	85	69.7%
	>3 symptom	5	4.1%	0	0	5	4.1%
Maintenance	Hospital	14	11.5%	5	4.1%	19	15.6%
	Isolation House	5	4.1%	6	4.9%	11	9.01%
	House	61	50%	26	13.1%	87	71.3%
	Other	1	0.9%	4	3.3%	5	4.1%

Triggers		Long Covid				Total	%
		Yes	%	No	%		
Initial Symptoms	Heavy	10	8.2%	3	2.4%	13	10.7%
	Currently	42	34.4%	6	4.9%	48	39.3%
	Light	29	23.8%	32	26.2%	61	50%
Active smoker	Yes	10	8.2%	5	4.1%	15	12.3%
	No	71	58.2%	36	29.5%	107	87.7%
Passive smoker	Yes	62	50.8%	28	22.9%	90	73.8%
	No	19	15.6%	13	10.7%	32	26.2%
Comorbid	Yes	25	20.5%	6	4.9%	31	25.4%
	No	56	45.9%	35	28.7%	91	74.6%

Based on the table above, it is known that the average respondent who has a history of Long Covid disease with normal BMI, is 36 respondents (29.5%), the average respondent who had a history of Long Covid with symptoms 1-3 sequelae was 76 respondents (62.3%), the average respondent with Long Covid was treated carried out at home by 61 respondents (50%), the average respondent with Long Covid had moderate initial symptoms of 42 respondents (34.4%), the average respondent with Long Covid who did not have active smoking habits was 71 respondents (58.2%)), the average respondent with Long Covid had a history of passive smoking as many as 62 respondents (50.8%), the average respondent with Long Covid without a history of comorbidities was 56 respondents (45.9%).

3. Hypothesis test of the effect between BMI and the occurrence of Long Covid.

Table 3. The effect of BMI on the occurrence of Long Covid.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.891^a	3	.075
Likelihood Ratio	6.802	3	.078
Linear-by-Linear Association	.002	1	.967
N of Valid Cases	122		

Based on the table above, the results show that the p-value of 0.075 is more significant than $\alpha = 0.05$, so a conclusion can be drawn that there is no effect between BMI and Long Covid.

4. Hypothesis test of the influence of many sequelae and the occurrence of Long Covid.

Table 4. The influence of many sequelae on the occurrence of Long Covid.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	85.935^a	2	.000
Likelihood Ratio	98.338	2	.000
Linear-by-Linear Association	75.307	1	.000
N of Valid Cases	122		

Based on the table, the results show that the p-value of 0.000 is less than $\alpha = 0.05$, so it can be concluded that there is an influence between Many Residual Symptoms and the occurrence of Long Covid.

5. Hypothesis Test of Effect between Treatment and the Occurrence of Long Covid.

Table 5. The influence between Treatment and the occurrence of Long Covid

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.977ᵃ	3	.046
Likelihood Ratio	7.584	3	.055
Linear-by-Linear Association	.453	1	.501
N of Valid Cases	122		

Based on the table, the results obtained are a p-value of 0.046 which is smaller than α = 0.05, so it can be concluded that there is an influence between treatment and the occurrence of Long Covid.

6. Hypothesis Test of Influence between Early Symptoms and the Occurrence of Long Covid.

Table 6. The effect of early symptoms and the occurrence of long Covid.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.946ᵃ	2	.000
Likelihood Ratio	21.136	2	.000
Linear-by-Linear Association	13.356	1	.000
N of Valid Cases	122		

Based on the table, the results show that the p-value of 0.000 is less than α = 0.05, so it can be concluded that there is an influence of Early Symptoms with the occurrence of Long Covid.

7. Test the Effect of the Hypothesis between Active Smokers and the occurrence of Long Covid.

Table 7. Influence between Active Smokers and the occurrence of Long Covid.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.001ᵃ	1	.981
Likelihood Ratio	.001	1	.981
Linear-by-Linear Association	.001	1	.981
N of Valid Cases	122		

Based on the table, the results show that the p-value of 0.981 is more significant than α = 0.05, so a conclusion can be drawn that there is no effect between Active Smokers and the occurrence of Long Covid.

8. Test the Effect of the Hypothesis between Passive Smokers and the occurrence of Long Covid

Table 8. The effect of passive smoking on the occurrence of Long Covid

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.958ᵃ	1	.328
Likelihood Ratio	.940	1	.332
Linear-by-Linear Association	.950	1	.330
N of Valid Cases	122		

Based on the table, the results show that the p-value of 0.981 is more significant than α = 0.05, so a conclusion can be drawn that there is no effect between passive smoking and the occurrence of Long Covid.

9. Hypothesis Test of Influence between Comorbids and the occurrence of Long Covid.

Table 9. The influence of comorbidities on the occurrence of Long Covid.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.783a	1	.052
Likelihood Ratio	4.042	1	.044
Linear-by-Linear Association	3.752	1	.053
N of Valid Cases	122		

Based on the table, the results show that the p-value of 0.52 is more significant than α = 0.05, so it can be concluded that there is no influence between Comorbidities and the occurrence of Long Covid.

10. Analysis of the influence of the dominant factors that trigger the occurrence of Long Covid.

Table 1.10 The influence of the dominant factors that trigger the occurrence of Long Covid.

Step	Lots	B	S.E	Wald	df	Sig.	OR	95% C.I.for EXP(B) Lower	Upper
	Symptom	-22.878	6029.575	.000	1	.997	.000	.000	-
	Residual Symptoms Initial symptoms	.776	.618	1.581	1	.209	.648	.648	7.293
	Constant	19.645	6029.575	.000	1	.997	340290 421.786		

Based on the table above, the initial symptom variable has the most dominant influence compared to the other variables, namely the many residual symptoms. The logistic regression analysis results obtained multiple coefficient values for each variable, including the initial symptom variable, which had an OR of 2.103 with a p-value of 0.231. Thus among the other variables, it can be concluded that the initial symptom variable has the most dominant influence on the occurrence of Long Covid.

DISCUSSION

SARS-CoV-2 infection is a major pandemic that has increased morbidity and mortality rates in all parts of the world. Nearly 80% of individuals infected with the virus have mild to moderate symptoms. The other 5% can develop into critical; some can be cured. However, some of them experience new or persistent symptoms that last for several weeks or even several months, which is called post covid syndrome or long covid (Raveendran, Jayadevan, & Sashidharan, 2021). More than a third of survivors of COVID-19 experience symptoms for nearly two years after acute infection. A cohort study found that 76% of Covid survivors felt completely recovered or left only one symptom at follow-up. They reported still having persistent symptoms but felt they had recovered completely. In comparison, 22% did not feel entirely recovered by having some sequelae, and Another 2% did not feel wholly cured because they still had all the symptoms when infected (Helmsdal, Hanusson, & Kristiansen, 2022).

Long covid has been associated with various symptoms and health effects. Having at least one symptom or more is statistically associated with a history of SARS-CoV-2 infection lasting more than 12 weeks after infection (Subramanian et al., 2022). Although acute phase COVID-19 infection symptoms are expected to occur for two weeks for mild cases and up to 12 weeks for severe cases, they are also

influenced by the number of initial symptoms that appear and the presence of comorbidities. The symptoms often include fatigue, dyspnea, headaches, myalgias, and cognitive dulling (Rodriguez-Sanchez, Manas, & Laosa, 2020).

Broadly speaking, until now, there is no established therapeutic regimen for post-covid treatment. Various therapeutic strategies, including oral corticosteroids with or without antifibrotic compounds, are being evaluated in research in randomized controlled clinical trials (Boutou, Asimakos, Kortianou, & Vogiatzis, 2021). Therefore suggesting treatment for long covid without first tracing the history of the disease previously suffered is an action that is not scientifically justified, so the patient must be registered first to carry out clinical trials whenever possible (Kumar, Tripathi, & Pinto, 2021)

1. The influence between BMI and the occurrence of Long Covid

Based on the results of the analysis test, it is known that the average respondent who experienced Long Covid with a normal BMI was 36 respondents (29.5%). With an Overweight BMI, there were 32 respondents (26.2%), and the results obtained were a p-value of 0.075 greater than $\alpha = 0.05$, so a conclusion can be drawn that there is no effect between BMI and Long Covid. Long Covid affects 10-20% of the population who have contracted Covid-19 with multiorgan symptoms and are so diverse that it requires more attention to pathological conditions (Rosa, Durantez-fern, & Olea, 2022) One of the predictors of long covid is symptoms in the acute phase, disease severity, and BMI with higher values (Hansdal et al., 2022).

Research conducted in the United Kingdom by Subramanian et al. found results that baseline BMI values with overweight or obesity ranges are closely related to an increased risk of persistent symptoms, namely BMI > 30 has an increased risk of persistent covid or long

covid syndrome by 10% compared to those with a BMI of 18.5-25 kg/m2 (Subramanian et al., 2022). A similar study conducted in Kuala Lumpur, Malaysia, found that BMI did not affect the occurrence of persistent covid or long covid syndrome with a p-value of 0.413 with a frequency of BMI 18.5-25 kg/m2 as many as 19.5% experienced long covid and 80.5 % did not experience long covid, whereas in overweight patients (BMI 25-30 kg/m2) as many as 20.7% experienced long covid and 79.3% did not experience it and as many as 25% experienced long covid and 75% did not experience long covid in those who are obese (BMI > 30 kg/m2) (Ming et al., 2022)

Increased body mass index (BMI) is a risk factor for increased blood pressure, metabolic syndrome, abnormal blood vessel wall thickness, endothelial dysfunction and left ventricular hypertrophy, which can lead to obesity associated with changes in cardiac structure and increased blood pressure. Obesity is closely related to the number of fat cells in the blood and their distribution throughout the body which is caused by disruption of homeostatic mechanisms that control the energy balance in the body so that someone with a high-fat content or BMI of more than 25 kg/m2 will be more at risk of developing complications such as heart disorders and triggers metabolic disorders that result in oxidative stress which causes an imbalance between free radicals and antioxidants. If this continues for a long time, it will cause cell and tissue damage, thus triggering various degenerative diseases.

2. The influence of many sequelae and the occurrence of Long Covid

It is known that, on average, respondents with Long Covid had moderate early symptoms as many as 42 respondents (34.4%), and with mild symptoms, as many as 29 respondents (23.8%), and the results obtained were a p-value of 0.000 less than $\alpha = 0.05$, then the conclusion that there is an

influence of Early Symptoms with the occurrence of Long Covid. The number of initial symptoms that appear in someone with Covid-19 affects the severity of the disease. This study's results align with research conducted by Moy et al. that 11-17% of respondents were asymptomatic or with mild symptoms who experienced long covid. Moy said that the available evidence about the occurrence of post-covid symptoms in someone with mild covid infection was very minimal. Meanwhile, respondents with moderate to severe acute COVID-19 conditions have a higher chance, namely 3-3.6 times, of experiencing long COVID-19 compared to those who do not have many symptoms. This is influenced by the immune response to the SARS-CoV-2 virus, which stimulates the production of cytokinins and other inflammatory mediators with higher concentrations in those with severe COVID-19 (Ming et al., 2022).

Wu et al.'s study showed that symptoms appeared compared to patients with long covid or not long covid, so the prevalence of symptoms was higher in those with long covid with the highest symptoms during the infection period compared to pre-infection or post-infection. The most common persistent symptoms are headache, runny nose, abdominal pain, fatigue, and diarrhea, while the rare symptom is a high fever (Wu, Ailshire, & Crimmins, 2022). Another study reported that around 53-55% of Covid patients without hospitalization had prolonged Covid symptoms. However, these researchers also stated that the severity of Covid was not related to the number of sequelae that appeared (Sugiyama et al., 2022).

A report from a study conducted in Italy found that 87% of people who were declared cured of Covid-19 infection after being discharged from the hospital still showed persistence of at least one symptom for 60 days. Based on this number, 32% have one or two symptoms, while the other 55% have more than three persistent

symptoms (Raveendran et al., 2021). Even patients with mild COVID-19 infections who do not require additional oxygen or mechanical ventilation support are reported to have sequelae of around 49.5% (Sugiyama et al., 2022).

The number of persistent sequelae in covid-19 survivors is influenced by many factors, such as the severity of the disease, the immunity of each individual when infected, nutrition and comorbidities, and other factors. Therefore, the number of sequelae only sometimes results in long covid, depending on the most dominant factor when infected.

3. The influence between treatment and the occurrence of Long Covid

The frequency of Long Covid patients treated at their homes while infected with the Covid-19 virus was 50%, while those who were not with Long Covid were 13.1%. Long Covid was treated in hospitals as much as 11.5% and obtained a p = 0.046. Treatment while infected with the Covid-19 virus dramatically affects the occurrence of Long Covid. If a person is infected, the body's antiviral response will destroy the virus that replicates. If a person infected with Covid-19 experiences insufficiency and immune deficiency, it can increase viral replication, which results in tissue damage (Seyed, Riahi, & Nikzad, 2020).

Several treatments need to be carried out in Covid-19 infection by providing close observation and isolation to asymptomatic patients, while for patients with symptoms depending on the severity, such as closely monitoring vital signs and supporting treatment for symptoms that appear, antiviral therapy, as well as providing mechanical ventilation therapy and plasma administration in severe patients (Guo et al., 2020). Treatment of someone with long covid requires a multidisciplinary approach, including evaluation of treatment based on symptoms that appear, treatment of underlying problems that arise, physiotherapy,

occupational therapy, and psychological support (Raveendran, Jayadevan, & Sashidharan, 2020).

Providing appropriate initial treatment according to the symptoms that appear will prevent further complications, help increase immunity and reduce the risk of damage to surrounding tissues to prevent ongoing symptoms or post covid syndrome.

4. The influence of Early Symptoms and the occurrence of Long Covid

The analysis results revealed that, on average, respondents with Long Covid had moderate initial symptoms of 34.4% and mild symptoms of 23.8% and obtained a p-value <0.001 where initial symptoms were a factor causing Long Covid. The initial symptoms that appear the first time you are infected with the SARS-CoV-19 virus affect the severity of the disease (Sugiyama et al., 2022). According to research (Ochani et al., 2021), the fatality rate for Covid-19 cases reached 34.% for symptoms of fever, cough, dyspnea, diarrhea, pneumonia, and acute kidney problems that lasted 2-13 days, while other symptoms that occurred less than five days as a much lower fatality rate. The many clinical manifestations in patients infected with Covid-19 result in multiorgan damage, with many survivors who tend to experience Long Covid syndrome (Long Covid) (Yan, Yang, & Lai, 2021).

Symptoms of post covid syndrome or prolonged symptoms of Covid-19 are not affected by the severity of the initial infection or the duration of these initial symptoms. This study was conducted by (Rajan, Steves, & Mckee, 2021). The most substantial factors influencing persistent symptoms of Covid-19 19 are increasing age, the number of acute symptoms that appear comorbidity factors, and female gender. (Ludvigsson, 2020) conducted research on children infected with covid with an average age range of 9 to 15 years, with the female sex tending to experience Long Covid more. The symptoms

experienced are generally the same as mild-moderate symptoms and do not require treatment at the hospital.

The number of symptoms that appear in the acute phase affects the severity of the disease so that the situation worsens because severe Covid-19 causes a decreased immune response and more severe stock in storms which impact organ damage (brain, heart, and lungs). Often these symptoms will persist in the long term due to the gradual healing process resulting in long covid.

5. The influence of Active Smokers and the occurrence of Long Covid

It is known that the average of respondents with Long Covid who did not have active smoking habits was 58.2%, and those who had non-smoking habits were 8.2%. Whereas for passive smokers with Long Covid, it reached 50.8%, and for those who were not passive smokers but experienced Long Covid, as much as 15.6%. Covid-19 infection is less likely in smokers, but the probability of disease severity after infection may be higher (Ochani et al., 2021).

Research conducted by (Sugiyama et al., 2022) found that smoking status did not affect the occurrence of long covid; from this study, it was found that 52.6% of patients with long covid said they had never smoked, 15.3% were smoking, and reached 60.6% of patients with long covid who have a history of smoking in the past with a value of p = 0.1734. Meanwhile (Sayed, Shokry, & Mohamed, 2021) found that 66% of active smokers had a more extended prevalence of anhedonia and fatigue after being infected with Covid-19, which affected the duration of recovery and 34% for those who did not smoke but this was not statistically significant with a score p=0.640 for anhedonia and p=0.058 for fatigue.

A study (Huang et al., 2020) on 439 samples of patients infected with Covid-19 who did not require additional oxygen

found that 93% had a history of never smoking, 4% were active smokers, and 3% had a history of smoking. While patients who needed supplemental oxygen in 1,172 samples were found to be 92% of those who had never smoked, 6% of active smokers, and only 3% of ex-smokers. Meanwhile, in the group requiring mechanical ventilation with a total sample of 122, 87% were patients who had never smoked, 11% were actively smoking, and 2% had a smoking history.

Smoking is related to the risk of Covid-19 sufferers developing a severe degree and increasing the death rate; this is because cigarette smoke will enter the lungs and damage the alveoli of the lungs, which store the most oxygen as well as the target of the SARS-CoV virus which also attacks the par- lungs so, of course, it will make someone's condition worse.

6. Influence between Comorbidities and the occurrence of Long Covid

The average number of respondents with Long Covid who did not have comorbidities was 45.9%, and those with comorbidities were 20.5%., with a p-value of 0.052 where comorbidities did not trigger the occurrence of long Covid in survivors of covid-19. Comorbidities do not affect the recovery of patients confirmed positive for Covid-19, but comorbidities are a triggering factor that makes individuals susceptible to contracting the SARS-CoV-19 virus. This is influenced by the decreased immunity of a person who is sick, so the formation of antibodies and cytokines decreases, which leads to decreased immunity. Resulting in decreased resistance to attacking diseases so that the body is easily infected (Nuzula & Oktaviana, 2022).

Comorbidities do not trigger the occurrence of long covid but worsen in individuals infected with covid. It was explained that 37% of patients infected with covid with hypertension comorbidities needed mechanical ventilation assistance, and as many as 12% for diabetes mellitus

and heart disease (Huang et al. al., 2020). In contrast to the opinion (Raveendran et al., 2020), explaining that comorbid causes prolonged symptoms that trigger long covid.

Confirmed patients were found to experience higher rates of severity and death in those with a history of hypertension (Sisnieguez, Espeche, & Salazar, 2020). Patients with comorbidities are most at risk for infection and can develop severe symptoms with a relatively high mortality rate (Ejaz et al., 2020). Comorbidities such as diabetes, hypertension, and heart disease are risk factors for worsening the infection, requiring critical care (Gasmi, Peana, Pivina, & Srinath, 2021).

Comorbidities do not result in the occurrence of long covid but have a significant role in worsening the condition of someone who is infected with the SARS-CoV Virus because someone with comorbid diseases has lower immune power than someone without comorbidities and because comorbid diseases usually have complications and damage to surrounding organs so that will make matters worse.

7. Analysis of the influence of the dominant factors that trigger the occurrence of Long Covid

The analysis found that the initial symptom variable had the most dominant influence compared to the other variables, namely the number of sequelae and treatment. The initial symptom variable has an OR value of 2.103 with a p-value of 0.231. Thus among the other variables, it can be concluded that the initial symptom variable has the most dominant influence on the occurrence of Long Covid. Research (Asadi-pooja, 2021) explains that someone infected with covid in the first week with many symptoms tends to be at risk of experiencing long Covid syndrome. Meanwhile (Toro et al., 2021) states that the factors influencing the occurrence of long covid syndrome are age, gender, and the

number of symptoms reported in the first week [43] infection.

A study conducted by (Amenta et al., 2020) found that asymptomatic Covid-infected patients with a prolonged infection of more than three weeks in the post-acute phase of Covid experienced multisystem inflammatory syndrome (MIS), while those in the acute stage with mild, moderate, severe and critical at the time of post-acute covid tend to experience persistent symptoms and for those who experience organ dysfunction in the post-acute phase experienced by those with severe and critical symptoms. SARS-CoV-2 infection is associated with many symptoms associated with various sociodemographic and clinical risk factors (Subramanian et al., 2022) [8]

Long-term Covid symptoms or complaints are significantly more common in women, those with respiratory problems at the start of infection, those in the ICU, and those who stay in the hospital longer (Asadi-pooja, 2021). The number of symptoms that appear in the acute phase affects the occurrence of long Covid syndrome with a value of p = [33]01 because the acute phase can predict the long-term effects of Covid-19 (Helmsdal et al., 2022) [35]

Clinical manifestations that appear in the acute phase of infection with the SARS-CoV-19-2 virus are closely related to the possibility of prolonged post-covid symptoms; this is influenced by the fact that when many symptoms appear when a person is infected, the body's immunity will be lower, triggered by intake which is reduced because the complaints obtained will result in the healing phase being longer and will even have an impact on further complications.

CONCLUSION

The conclusion is that the initial symptom variable has the most dominant influence compared to the other variables, namely many sequelae. The logistic regression analysis results obtained

multiple coefficient values for each variable, including the initial symptom variable, which had an OR of 2.103 with a p-value of 0.231. Thus among the other variables, it can be concluded that the initial symptom variable has the most dominant influence on the occurrence of Long Covid.

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