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# Association between Individual Characteristics and Long COVID Severity among COVID-19 Survival in Jabodetabek

*Siti Li'wuliyya[1], Widaad Camilah[2], Etis Setiawati[3], Hoirun Nisa[4]*

[1,2,3,4] *Department of Public Health, Faculty of Health Sciences UIN Syarif Hidayatullah, Jakarta, Indonesia*

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CORRESPONDENCE

E-mail: hoirun.nisa@uinjkt.ac.id

**A B S T R A C T**

Long COVID has a prevalence of between 10 and 30 percent in patients with a history of SARS-CoV-2 infection and has different levels of symptom severity. This study aimed to determine the individual characteristics based on age and sex along with the severity of Long COVID in Jabodetabek. This study used a cross-sectional design and purposive sampling technique to determine the sample size. The inclusion criteria were COVID survivors who lived in Jabodetabek and had been exposed to COVID-19 based on examination by health workers. Furthermore, the analysis carried out in this study consisted of univariate and bivariate analyses. Data collection was collected online via social media using the Post (Long) COVID-19 Syndrome Questionnaire. The Chi-square statistical test results showed that of 399 respondents, there was a statistically significant relationship between gender and the severity of Long COVID, and women were 1.6 times more at risk of experiencing more severe Long COVID-19 symptoms than men. In addition, all symptoms such as fatigue, shortness of breath, chest pain, sleep disturbances, headaches, muscle aches, anosmia, dry cough, and concentration disorders are related to the severity of long COVID. The severity level based on sex and gender in this study could be used as the basis for providing intervention and prevention of COVID-19 according to the needs of each individual's body so that the proper intervention can help reduce the severity and control of COVID-19.

## INTRODUCTION

COVID-19 is causing a public health crisis by infecting millions of people and resulting in deaths globally (Neng et al., 2020). The number of COVID-19 cases globally is 613,410,796, with a case fatality rate of 1.06% as of September 2022 (Organization, 2022). The number of new cases of COVID-19 is still being reported. There are several countries with the highest cases of COVID-19, such as America (94,833,079), India (44,579,088), Brazil (34,638,288), and Indonesia (6,427,764) (Organization, 2022). These countries generally have a relatively dense population, especially Indonesia. The cities in Indonesia like Jakarta, Bogor, Depok, Tangerang and Bekasi have an accumulated number of COVID-19 cases of 1 million cases that contribute to the increase in COVID-19 cases nationally (Kementerian, 2021).

In general, survivors of COVID-19 still experience COVID-19 symptoms after passing through the acute phase (Sivan & Taylor, 2020). These symptoms include breathing difficulties, fatigue, headaches, and even anosmia (Kamal et al., 2021). If this condition occurs in survivors of COVID-19, it can be referred to as long COVID (Orrù et al., 2021). Long COVID is a term used to describe the presence of various symptoms after being infected by SARS-CoV-2 infection for weeks or even months (Ziauddeen et al., 2022).



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The National Institute of Health and Care Excellence (NICE) has defined long COVID-19 as symptoms that persist for more than four weeks after the onset of acute illness (Bai et al., 2022). These lingering symptoms of long COVID occur because the body takes a long time to recover from damaged organs due to an exaggerated inflammatory response to viruses that enter the body (Garg et al., 2021). In addition, the aggressive treatment of COVID-19 by giving more drugs to patients with severe and critical case can cause the long COVID (Asadi-Pooya et al., 2021).

Long COVID has 10–30% prevalence in patients with a history of SARS-CoV-2 infection (Buonsenso et al., 2021). The research results related to assessing and characterizing post-COVID-19 manifestations stated that only 10.8% of COVID-19 survivors did not experience symptoms after being declared cured (Kamal et al., 2021). A study conducted in Netherlands on 273,618 people who recovered from COVID-19, 57% had one or more symptoms of long COVID, recorded over 6 months (Taquet et al., 2021). A systematic review and meta-analysis of long COVID-19 in Italy reported that 80% of patients who contracted COVID-19 had at least one symptom of long COVID, the five most common of which were fatigue (58%), headache (44%), restlessness, and concentration (27%), hair loss (25%), and dyspnea (24%) (Parisi et al., 2021). However, the prevalence of long COVID in Indonesia is uncertainty (Asy'ari, 2022). Several factors that increase the chances of COVID survivors experiencing long COVID are individual characteristics. Research on long COVID-19 in England, Sweden, and the United States stated that individual characteristics, including age and gender, are associated with long-term COVID (Sudre et al., 2021).

The International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC) observed that older age is associated with a higher risk of long COVID symptoms (Ortona & Malorni, 2022). In addition, research in China found that women have a greater chance of experiencing long COVID (Huang et al., 2021). However, research conducted in Turkey found that men and the younger age group had more severe long COVID symptoms compared to women and those in the older age group (Ozgocer et al., 2022). The research shows that the incidence of long COVID varies by age and gender. However, little is known about the incidence of long COVID in Indonesia. Therefore, this study aims to examine the association of individual characteristics, namely age, and gender, with the severity of long COVID in Jabodetabek.

## METHOD

The research design used was an analytic observational study using cross-sectional. The participants in this study were survivors of COVID-19 who live in Jabodetabek. The sample size was calculated using a different proportion test with a prevalence value of long covid events in adolescents of 45% in previous

studies, and the precision value used was 5% with an absolute significance level of 95% (Lemeshow et al., 1990). Based on sample calculations, a minimum of 420 samples was obtained. The inclusion criteria in this study were COVID survivors who lived in Jabodetabek and had been exposed to COVID-19 based on examination by health workers. While the exclusion criteria were the subject who suffered serious ill and unable to participate in the study, had a chronic illness that had occurred long before the presence of COVID-19 such as respiratory disease, and other comorbidities, the subject did the vigorous physical activity within 15-30 minutes before the research was conducted, and did not stay in Jabodetabek during the research. The technique used to determine the sample size was the purposive sampling technique. As for those who participated in this study, there were 433 respondents. However, 34 respondents were excluded during the study because they did not meet the inclusion criteria so the number of participants who entered the study was 399.

The independent variables in this study are individual characteristics, including age and gender. Meanwhile, the dependent variable is long COVID symptoms as measured using the Post (Long-term) COVID-19 Syndrome Questionnaire. Long COVID is a condition in which a survivor of COVID-19 still feels symptoms of the disease (fatigue, shortness of breath, chest pain, sleep disturbances, headaches, muscle aches, anosmia, dry cough, and impaired concentration) after being declared cured of COVID-19. Symptoms experienced by respondents were measured using a Likert scale of 1-10 with nine questions. Among the nine questions related to perceived symptoms, they said they had no symptoms or felt mild symptoms if the Likert score was 1-5, while they had symptoms or felt severe symptoms if the Likert score was 6-10. Then the accumulated results of the nine symptoms are categorized as mild if the score is < mean (value of 0,5) and severe if the score is ≥ mean. Data collection was carried out from September-November 2022 online via social media.

The analysis conducted in this study consisted of univariate and bivariate analyses. A univariate analysis is intended to describe the distribution of each variable studied. Then, in this study, the bivariate analysis used the chi-square test and binary logistic regression to see the relationship between individual characteristics (age and gender) and the severity of long COVID. This research has obtained permission for the health code of ethics through the Ethics Commission of the Faculty of Health Sciences, UIN Syarif Hidayatullah Jakarta, with number Un.01/F.10/KP.01.1/KE.SP/07.08.050/2022

## RESULT

The analysis results of the description of the distribution of respondent characteristics and the long COVID event can be seen in Table 1.


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Table 1 Individual Characteristics of Long COVID Event in Jabodetabek

| Variable | Frequency (n) | Percentage |
|---|---|---|
| Gender | | |
| Female | 314 | 78.7 |
| Male | 85 | 21.3 |
| Age (Years) | | |
| 12-25 | 274 | 68.7 |
| 26-45 | 120 | 30.1 |
| >45 | 5 | 1.3 |
| Residence | | |
| Jakarta | 105 | 26.3 |
| Bogor | 68 | 17 |
| Depok | 90 | 22.6 |
| Tangerang | 105 | 26.3 |
| Bekasi | 31 | 7.8 |
| Severity Level | | |
| Mild | 195 | 48.9 |
| Severe | 204 | 51.1 |

Table 1 shows that 399 respondents (93.9%) experienced long COVID events. The distribution of female respondents (78.7%) is higher than that of males (21.3%). Respondents with long COVID were primarily young people aged 12 to 25 (68.7%). The respondents' average body mass index (BMI) is 20.5, which is normal. Meanwhile, based on domicile, two regions have the highest distribution of long COVID events with the same proportion (26.3%), namely Jakarta and Tangerang.

Table 2 Symptoms of Long COVID based on Severity of Long COVID

| Symptoms of Long COVID | *Long* COVID *Severity* | | | | P *value* |
|---|---|---|---|---|---|
| | Mild | | Severe | | |
| | Frequency | Percentage | Frequency | Percentage | |
| *Fatigue* | 158 | 44.1 | 200 | 55.9 | <0.001 |
| Dyspnea | 110 | 37.8 | 181 | 62.2 | <0.001 |
| Chest pain | 93 | 35.1 | 172 | 64.9 | <0.001 |
| Sleep Disorders | 107 | 35.7 | 193 | 64.3 | <0.001 |
| Headache | 81 | 30.0 | 189 | 70.0 | <0.001 |
| Muscle ache | 96 | 34.2 | 185 | 65.8 | <0.001 |
| Anosmia | 108 | 40.4 | 159 | 59.6 | <0.001 |
| Dry Cough | 78 | 32.5 | 162 | 67.5 | <0.001 |
| Disorders of Concentration | 83 | 32.0 | 176 | 68.0 | <0.001 |

Table 3 shows that each survivor of COVID-19 can feel symptoms with different levels of severity, such as fatigue, which is experienced by many long COVID survivors with a severe category of 200 (54.9%) and long COVID survivors with a mild category of 158 (44.1%). Based on the statistical test results, all symptoms have a significant relationship with the severity of long COVID.


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Table 3 Relationship between individual characteristics and long COVID severity

| Variable | *Long* COVID *Severity* | | | | P *value* | OR (95% CI) |
|---|---|---|---|---|---|---|
| | Mild | | Severe | | | |
| | Frequency | Percentage | Frequency | Percentage | | |
| Gender | | | | | | |
| Male | 50 | 25.6 | 35 | 17.2 | 0.039* | 0.665 (1.025-2.706) |
| Female | 145 | 74.4 | 169 | 82.8 | | |
| Age (Years) | | | | | | |
| 12-25 | 131 | 67.2 | 143 | 70.1 | 0.720 | 1.665 (1.025-2.706) |
| 26-45 | 62 | 31.8 | 58 | 28.4 | | |
| ≥ 46 | 2 | 1.0 | 3 | 1.5 | | |

*= There is a statistically significant relationship

Table 3 shows that the Chi-square statistical test results showed a P value of 0.039, meaning that there was a statistically significant relationship between gender and the severity of long COVID in COVID-19 survivors in Jabodetabek in 2022. It is known that women are 1.6 times more at risk and experience more severe symptoms of long COVID-19 than men.

## DISCUSSION

The severity level felt by respondents in the severe category has a proportion of 51.1%. Each survivor of COVID-19 can experience symptoms with different levels of severity, such as fatigue, which is experienced by many survivors of long COVID with a severe category of 55.9% and survivors of long COVID with a mild category of 44.1%. The statistical test results show that all symptoms significantly correlate with the severity of long COVID. The results of similar studies state that there is a relationship between difficulty sleeping and coughing with the incidence of long COVID. However, this study showed no association with symptoms of fatigue, shortness of breath, chest pain, headaches, muscle aches, anosmia, and concentration problems. This is because most symptoms can heal over time (Asadi-Pooya et al., 2021). Regardless of the severity, survivors of long COVID often experience symptoms are fatigue, sleep disturbances, disorders of concentration, and muscle aches (Mińko et al., 2022). The pathophysiology of long COVID is not fully understood. This can be due to other influences, such as a history of obesity (Sykes et al., 2021). The statistical test results show a relationship between gender and long COVID. This is in line with previous studies, which found a statistically significant relationship between gender and the incidence of long COVID (Brodin, 2021; Fernández-de-Las-Peñas et al., 2022; Sudre et al., 2021). Other studies state that women are more at risk of experiencing a more severe long COVID than men (Asadi-Pooya et al., 2021; Ludvigsson, 2021; Simani et al., 2021; Yong, 2021). This greater risk in women is associated with differences in the body's immune response (Sylvester et al., 2022). In addition, differences in sex hormones also contribute to the risk of long COVID based on gender because woman, the symptoms of long COVID co-occur with perimenopause and menopause (Stewart et al., 2021).


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The age characteristics of the individuals in this study indicate that there is no relationship with long COVID as proven in statistical tests. This is because there are more subjects in this study aged 12-25 years. Meanwhile, other studies have shown that older people are more susceptible to persistent symptoms after COVID-19 infection (Mińko et al., 2022). Complaints of persistent symptoms of COVID-19 that older individuals often report are disturbance in carrying out daily activities, while younger individuals experience intensive mental health disorders (Mińko et al., 2022). Symptoms of persistent anosmia and taste disturbance are often experienced by younger people (<65 years) (Akbarialiabad et al., 2021). In addition, a study used a telephone survey to evaluate 292 young patients (mean age: 42.5 years) who experienced mild COVID-19 after being diagnosed for 16 days. There were 35% of adults who still had residual symptoms of COVID-19 within 2-3 weeks with the main symptoms being cough, fatigue, and shortness of breath (Tenforde et al., 2020).

The strength of this research is that topic raised is one of the topics that has yet to be done much in Indonesia. However, this study has limitations such as the sampling technique that uses something other than probability sampling so this study cannot be generalized to a broader population. The study design used could not see a causal relationship, and clinical trials did not confirm the collection of data related to perceived symptoms.

## CONCLUSION

The results of a study conducted on 399 respondents showed that the gender characteristics of the respondents had a relationship with the severity of long COVID, while age had no relationship. The female sex is 1.6 times more at risk of experiencing more severe symptoms of long COVID-19 than men. The symptom of long COVID that respondents often experience is fatigue, which occurs at both mild and severe levels of severity. For future researchers, a case-control design can be used to identify casual relationships. In addition, so that research can be generalized to a wider population, a sampling technique with probability sampling can be used. The results of this study are also expected to provide information regarding the risk of long COVID so that this assessment can support decision-making or policy. The severity level based on individual characteristics in this study can be the basis for providing intervention and prevention of COVID-19 according to the needs of everyone's body so that the proper intervention can help reduce the severity and control of COVID-19.

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