ORIGINAL ARTICLE
Public Health and Preventive Medicine Archive (PHPMA) 2022, Volume 10, Number 1: 91-99
E-ISSN: 2503-2356

PHPMA
Published by
Department of Public Health and Preventive Medicine, Faculty of Medicine, Udayana University

The relationship of sociodemographic and clinical characteristics with the length of stay of COVID-19 patients at Dr. R. Soedjono Hospital, Selong, East Lombok

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ABSTRACT

Background and purpose: By December 2020, 678 confirmed cases of COVID-19 were recorded in East Lombok District, and more are anticipated. The capacity of the available healthcare institutions is now impacted by the inclusion of these cases. In this study, the duration of stay of COVID-19 patients at Dr. R. Soedjono Hospital in Selong, East Lombok will be described, as well as the association between sociodemographic and clinical factors with length of stay.

Methods: This is an observational study with a cross-sectional design using medical records of 409 patients who were confirmed positive for COVID-19 then treated in April-December 2020 and declared cured after completed the treatment period. The data collected included the date of admission and discharge of patients, age, gender, marital status, education, occupation, history of comorbidities and laboratory test results. Data analysis was performed using multiple logistic regression.

Results: The average length of stay for COVID-19 patients at Dr. R. Soedjono Hospital Selong, East Lombok was 16 days (SD±7,366) and the median was 14 days (IQR=7). Multivariate analysis shows factors for patients being treated for longer time (the average length of stay ≥17 days) were male (AOR=1.87; 95%CI: 1.21-2.86) and low education level (AOR=1.91; 95%CI: 1.19-3.06).

Conclusion: The average length of stay of COVID-19 patients in this hospital was quite long at 16 days. Male COVID-19 patients and those with low education have higher likelihood to stay longer in hospital. The hospital should consider this information to improve hospital planning for COVID-19 patients

Keywords: COVID-19, pandemic, sociodemography, length of stay

INTRODUCTION

The pandemic of coronavirus disease (COVID-19) that originated in Wuhan, China, has become a major challenge for global public health. COVID-19 is a new human coronavirus which is spreading with epidemic features in many countries worldwide. This novel coronavirus disease is associated with a respiratory illness that may lead to severe pneumonia and acute respiratory distress syndrome (ARDS).[1] The findings of genetic and epidemiological study show that COVID-19 is transmitted from animals to humans, followed by transmission from humans to humans, so it is stated that humans are the carrier vector. The main sources of infection are COVID-19 patients and carriers, as well as those without symptoms. The main transmission routes are through close contact, droplets <1 meter, aerosols and airborne. It can be transmitted at a distance of 1 meter or more in a room with insufficient ventilation.[2]

In Indonesia, the first positive case of COVID-19 was discovered on the 2nd March 2020 and the number of cases has increased since then. There were 26,473 confirmed cases and 1,613 deaths on May, 31st 2020. The most cases were found in DKI Jakarta Province with 7,348 confirmed cases and 517 deaths (7,1%).[3] The incubation period for COVID-19 is estimated by the time between symptom onset and hospitalization or diagnosis, with median length between symptom onset and hospitalization ranging between 3 and 10.4 days depending on the age of the patient.[4] But there is another evidence which shows that the incubation period can take up to 14 days or more and this duration is commonly used for medical observation. Based on this, patients who have been tested positive for COVID-19 should be able to recover faster if they receive treatment in a health care facility.[5,6]

The length of stay for COVID-19 patients is varied and the cause is unknown, therefore it cannot be averaged across all patients and cases. Several studies have shown that factors which affect the length of stay for COVID-19 patients include age, gender, education level, level of knowledge and the presence of comorbidities that can worsen the patient's condition.[3,7,8]

From the beginning of the pandemic until mid of 2020, the number of COVID-19 cases in West Nusa Tenggara, particularly East Lombok District, have continued to increase. As of December 24, 2020, there were 678 positive confirmed COVID-19 cases with details 56 patients were still under treatment, 595 were recovered, and 27 patients died. The increased number of cases has created challenges for the health-care services capacity of the Dr. R. Soedjono Hospital, Selong, East Lombok. The hospital has treated patients with symptoms and confirmed positive for COVID-19 as many as 414 cases, with an unknown average duration of stay.[9] It is expected that the available capacity will be insufficient to handle the growing number of COVID-19 patients.

The focus of this research is to identify the relationship between sociodemographic and clinical characteristics (comorbidities and laboratory test results) of COVID-19 patients with the length of stay in the hospital, as well as to provide an overview of the length of treatment required for patients to be declared cured. This finding could be one of the aspects that hospital management examines when deciding whether or not to add more rooms and beds to accommodate COVID-19 patients.

METHODS

This was a cross-sectional study which using medical record data from COVID-19 patients who were treated at Dr. R. Soedjono Hospital, one of the COVID-19 referral hospital in East Lombok District, between April-December 2020. The inclusion criteria in this study were patients who were recorded as a confirmed

COVID-19 cases, hospitalized, had complete data, and had been treated at the time of data collection. Patients who have passed away were excluded because the purpose of this study is to only focus on those cured or survived from COVID-19. After double-checking the 414 patient records from the data set that had been gathered, the researchers discovered that 3 patients had not listed their education level and 2 patients had not specified their employment, which resulted in 5 patients being excluded. Total sampling was then used, where all 409 records that met the criteria were included in the analysis.

The variables in this study included sociodemographic characteristics such as age, gender, marital status, education, history of comorbidities, and clinical characteristics in the form of laboratory test data (leukocyte, neutrophil, lymphocyte, monocyte, and platelet levels) and length of stay for COVID-19 patients.

Age is classified into three categories: children (0-17 years), adults (18-59 years), and the elderly (≥60 years). Gender is classified into male and female, while marital status is categorized into single/divorced and married. Level of education is classified into low education (lower than junior high school, which include: no/not yet in school, graduated from elementary school, graduated from junior high school) and high education (senior high school and above which include graduated from high school or graduated from diploma/bachelor). The employment status is classified into two categories; not yet working and working, while the comorbidity history is classified into two categories: with and without comorbidity. The laboratory test results are classified into two categories: Leukocyte levels (normal and leukocytosis), Monocyte levels (normal and monocytosis), Thrombocyte levels (normal, thrombocytopenia) and Neutrophil Limphocyte Rate (NLR) (≤4.5 and >4.5). By using the median length of stay of 17 days as the cut off point, the length of stay is grouped into ≥17 days (above the median) and ≤16 days (equal or below median).[7]

Data analysis was including descriptive, bivariate, and multivariate analysis using the computer program package for the Social Science (SPSS) version 22. Bivariate analysis was carried out by simple logistic regression to filter out the variables to be included in the multivariate analysis with a threshold value of $p<0.25$. Multivariate analysis was performed using multiple logistic regression using the backward LR method to obtain the Adjusted Odd Ratio (AOR) with a significance level of 5%.

The Ethics Commission of the Faculty of Medicine, University of Mataram, granted an ethical clearance to this study with No.50/UN18.F7/ETIK/2021. Data collection permit was received from Dr. R. Soedjono Hospital, Selong with No.070/010/RUSD/Diklat/I/2021 dated 12 January 2021 and research permit from BAPPEDA of East Lombok with No.070/005/PD-Prolitbang/I/2021 dated 05 January 2021.

RESULT

Of the 409 COVID-19 patients treated at Dr. R. Soedjono Hospital, Selong, the shortest length of stay was 4 days, the longest was 56 days, and the average duration of stay was 16 days. Table 1 indicates the percentage of patients treated at Dr. R. Soedjono Hospital, Selong, East Lombok, who are predominantly between the ages of 18-59 years old (77.0%) and female (65.5%). The majority of marital statuses were married (67.0%), graduated from junior high school (26.2%), and worked as housewives (40.8%). Patients without a history of comorbidities accounted for 81.9% of the total, having one comorbidity 15.9% and 2.2 percent having two or more. Diabetes mellitus was the most common type of disease suffered by patients (20 people (25.6%)) treated at Dr. R. Soedjono Hospital, Selong in East Lombok, hepatitis 4 people (5.1%), hypertension 37 people (47.4%), heart disease 12 people (15.4%), and tuberculosis 5 people (6.4%).

Table 1. Sociodemographic characteristics and comorbidities of patients

Variables	f (n=409)	%
Age (Mean±SD)	37±16.89	
Children (0-17)	46	11.2
Adults (18-59)	315	77.0
Elderly (≥60)	48	11.7
Gender		
Male	141	34.5
Female	268	65.5
Marital Status		
Single	96	23.5
Married	274	67.0
Divorced	39	9.5
Education		
No school/not yet in school	90	22.0
Elementary school	107	26.2
Junior high school	74	18.1
Senior high school	89	21.8
Diploma	9	2.2
Bachelor	40	9.8
Employment		
Not working/not yet working	22	5.4
Student	51	12.5
Housewife	167	40.8
Teacher	16	3.9
Government employee	17	4.2
Private employee	32	7.8
Entrepreneur	46	11.2
Merchant	30	7.3
Farmer	28	6.8
Cormorbidity		
No comorbidity	335	81.9
One comorbidity	65	15.9
More than one comorbidity	9	2.2
Type of comorbidity		
Diabetes mellitus	20	25.6
Hepatitis	4	5.1
Hypertension	37	47.4
Heart disease	12	15.4
Tuberculosis	5	6.4

Table 2 shows variables that statistically significantly increased the risk of patients being treated for ≥17 days were male at 1.86 times (OR=1.86; 95%CI: 1.21-2.86) likelihood of hospitalization for ≥17 days compared to female patients; low education level has 1.90 times (OR=1.90; 95%CI: 1.19-3.03) the possibility of being treated for ≥17 days from patients with higher education levels.

Meanwhile, the elderlies are 1.70 times more likely to be hospitalized for ≥17 days than the adult age group, and children is 1.11 times more likely to be hospitalized for ≥17 days than the adult age group. Marital status of not married/divorced is 1.14 times more likely to be hospitalized for ≥17 days than the married. Work status of not/yet working is 1.40 times more likely to be hospitalized for ≥17 days than working patients. Patients with a history of comorbidity are 1.37 times more likely to be hospitalized for ≥17 days than those without comorbidity. Patients with leukocytosis are 1.40 times more likely to be hospitalized for ≥17 days than those with normal leukocytes. Thrombocytopenic patients are 1.58 times more likely to be treated for ≥17 days than patients with normal platelet counts. patients with monocytosis are 0.73 times less likely to be treated for ≥17 days than those with normal monocyte counts and patients with NLR>4.5 are 1.22 times more likely to be hospitalized for ≥17 days than those with ratio ≤4.5. All of these variables were not statistically significant because they had a lower CI limit of less than one.

Table 2: Risk for duration of hospitalization among COVID-19 patients

Variables	Length of Stay		p	OR (95%CI)
	≥17 days (n=131)	1-16 days (n=278)		
Age group				
Adult (18-59)	93 (29.5)	222 (70.5)	Ref	Ref
Children (0-17)	18 (39.1)	28 (60.9)	0.802	1.111 (0.487 - 2.534)
Elderly (≥60)	20 (41.7)	28 (58.3)	0.093	1.705 (0.915 - 3.178)
Gender				
Female	73 (27.2)	195 (72.8)	Ref	Ref
Male	58 (41.1)	83 (58.9)	0.004	1.867 (1.214 - 2.869)
Marital Status				
Married	85 (31.0)	189 (69.0)	Ref	Ref
Single/divorced	46 (34.1)	89 (65.9)	0.543	1.149 (0.741 - 1.782)
Education level				
High/≥Senior high school	32 (23.2)	106 (76.8)	Ref	Ref
Low/≤Junior high school	99 (36.5)	172 (63.5)	0.007	1.907 (1.196 - 3.039)
Employee Status				
Working	103 (30.7)	232 (69.3)	Ref	Ref
Not/not yet working	28 (38.4)	46 (61.1)	0.202	1.408 (0.832 - 2.381)
History of comorbidities				
No comorbidity	103 (30.7)	232 (69.3)	Ref	Ref
With comorbidity	28 (37.8)	46 (62.2)	0.238	1.371 (0.432 - 1.232)
Leukocyte (x 10^9/L)				
Normal	38 (31.4)	83 (68.6)	Ref	Ref
Leukocytosis (>10)	93 (32.3)	195 (67.7)	0.861	1.042 (0.660 - 1.644)
Monocyte (x10^9/L)				
Normal	120 (32.7)	247 (67.3)	Ref	Ref
Monocytosis (>8)	11 (26.2)	31 (73.8)	0.393	0.730 (0.355 - 1.503)
Thrombocyte (x 10^9/L)				
Normal	116 (31.1)	257 (68.9)	Ref	Ref
Thrombocytopenia (<150)	15 (41.7)	21 (58.3)	0.197	1.583 (0.787 - 3.180)

NLR				
≤4.5	70 (30.2)	162 (69.8)	Ref	Ref
>4.5	61 (34.5)	116 (65.5)	0.357	1.217 (0.801 - 1.848)

The variables that match the criteria are also put into the multivariate model. The length of stay of patients is known to be related with age group, gender, education level, employee status, history of comorbidities, and trombocyt levels with p≤0.05. Using the Backward Multiple Regression Analysis, the final model was developed and showed in Table 3.

Table 3: *Adjusted OR* for length of stay at the hospital among COVID-19 patients

Variable	AOR	95%CI		p
		Lower	Upper	
Gender*Male	1.869	1.211	2.855	0.005
Education Level*Low (≤Junior High School)	1.909	1.192	3.057	0.007

Notes: *multiple logistic regression* analysis with backward LRn method

From this analysis, it can be seen that there are two variables that statistically significantly increase the risk of patients being hospitalized for ≥17 days in Dr. Soedjono Hospotal, Selong, East Lombok. The variables are male gender with AOR=1.869 (95%CI: 1.211-2.855) and low education level with AOR=1.909 (95%CI: 1.192-3.057).

DISCUSSION

The length of stay (LoS) of a patient in a health facility is measured in days. The length of stay in the hospital is one of the factors that influence the health system; the longer a patient stays in the hospital, the more resources will be required.

According to this study, gender and educational level had an effect on the length of stay for COVID-19 patients at Dr. R. Soedjono Hospital, Selong, East Lombok. Male patients had a 1.689 times higher chance of being treated for a longer period of time (≥17 days) than female patients. Patients with a low level of education, on the other hand, were 1.909 times more likely than those with a higher degree of education to be hospitalized for ≥17 days.

Gender is known to have an effect on length of stay, this relationship is thought to exist because it relates to a healthy lifestyle between men and women which is quite different, males have a lower degree of health awareness than women, they tend to neglect their body health concerns and produce a less robust immune response, thus more susceptible to infectious agents.[10] A Chinese study on the impact of gender and age on respiratory support and length of stay found that 782 of 868 (90.1%) female patients were discharged during the 14 days length of stay, while the proportion of male patients discharged during the 14-day length of stay was lower (86.0% or 760 of 924 patients).[8]

This severity is because, at the beginning of infection, male patients tend to experience greater

inflammation or cytokine storm than women. Cytokine storms in the medical world are known as an excessive immune system response to viruses that can trigger respiratory disorders and organ failure in patients. Several studies analyzing the cytokine profile of COVID-19 patients suggest that cytokine storms are directly related to lung damage, multi-organ failure, and prognosis.[11,12]

Furthermore, a decline in the body's reaction to the creation of T cells in male patients with age can damage white blood cells that assist bind and kill virus infected cells, whereas women can still create an immune response at the age of 90 capable of combating viruses that enter the body.[13] In comparison to women, aging men experience a more dramatic decline in the numbers of total T and B cells and increased larger in effector memory cells $CD8^+$ T cells. Most of the three elderly men show the T cell ratio CD4/CD8 upside down compared to women of the same age. Secretion capacity proliferative and older male T-cell cytokines reduced more than women who older.[14] According to a study about saliva viral load is a dynamic unifying correlate of COVID-19 severity and mortality is result it was found that the salivary viral load was higher in patients who had risk factors for COVID-19, was associated with the severity of the disease and used as a marker of inflammation for COVID-19. The results of this study show that the quantity of viral load was different in men and women. Viral load was found to be higher in men, thus allowing longer treatment or it could also result in death.[15]

This study also discovered that education level has a link to the length of stay for COVID-19 patients at the DR. R. Soedjono Selong Hospital in East Lombok and is a risk factor for receiving prolonged treatment among patients with lower education level. In another study conducted in the Kalimantan community, it was stated that the community's self-efficacy is a description of the level of knowledge from the level of education about a disease's impact and how to handle it, where people who have good knowledge and understanding of COVID-19 have greater self-efficacy than people who do not understand the impact caused by COVID-19.[16]

Patients with a low level of education and knowledge combined with a high level of anxiety will require more treatment time than patients with a higher level of education and knowledge. This is influenced by the patient's ability to control his thoughts (self-efficacy) in fighting to survive from a disease. This capacity is the result of a person's education and knowledge which will later affect adherence, such as research on tuberculosis patients shows a significant relationship between patient knowledge such as risk factors for tuberculosis, taking medication, and the level of patient adherence in the treatment process.[17] In addition, the lack of knowledge about the dangers of disease will affect the decision to access health services. Research by Napirah et al. states that 73.9% of respondents with low education do not use health services while only 17.4% of higher education can affect the early detection of disease and the treatment provided.[18]

The level of education owned by the community also affects the ownership of health insurance in the form of JKN (national health insurance), private insurance, and others that are used to obtain health services. According to statistical data on Indonesia's Health Profile in 2019, the highest percentage of health insurance owners are people with a higher education level and are dominated by college graduates. According to research findings, there is a correlation between knowledge and participation in national health insurance. It is significant that while 73.99% of people with a bachelor's degree or more have private health insurance, 4.51% of them also have national health insurance. In contrast, only 0.75% of persons who did not finish elementary school or never attended a school had health insurance, leaving 49.24% of the population without national health insurance.[19]

The implication of this study's findings is that it can be used as input for policymakers, including the Ministry of Health and hospital management, to provide an overview of the length of stay for COVID-19 patients in hospitals in order to support accelerating the management of COVID-19 in the regions, including Indonesia, based on a study of the factors that contribute to this.

The limitation of this study is that the variation in the data collected is still limited; other factors that could theoretically affect the length of stay, such as patient smoking behavior, anxiety levels, and the intrusion of care received by patients, have not been studied due to data accessibility issues in hospitals. Furthermore, the rules for dealing with COVID-19 prevention and control are constantly revised, causing the criteria for returning patients to be collected differently from the beginning of the pandemic to the end of this research data. This has an impact on the choice to admit patients to the hospital, as well as the categorization of duration of stay during bivariate or multivariate data analysis.

CONCLUSION

The length of stay for COVID-19 patients at the DR. R. Soedjono Hospital, Selong, East Lombok, is affected by the patient's male gender and low level of education and is a risk factor for patients being treated longer (≥17 days). By looking at case developments, average length of stay of patients, and risk factors for length of stay, the hospital management and planning department can design room requirements, the number of beds, and logistics so that if the hospital's availability exceeds the provision of services, it can prepare or refer to another hospital that has been appointed as the provider of COVID-19 health service facilities.

ACKNOWLEDGMENT

We are grateful to the Director of Dr. R. Soedjono Hospital, Selong East Lombok, especially the employees in charge of the medical record room and laboratory, as well as all others who participated in this study.

AUTHOR CONTRIBUTION

MJ designed the study, conducted the data collection and analysis, and wrote the 1st draft of manuscript, AW and TA designed the study, supervised data collection and analysis, edited the manuscript

CONFLICT OF INTEREST

The authors declare to have no conflicting interest

FUNDING

The study was self-funded by the researchers

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