Jurnal Pharmascience, Vol. 12, Issue 2, October 2025, page: 441-454
ISSN-Print 2355 – 5386
ISSN-Online 2460-9560
https://dx.doi.org/10.20527/jps.v12i2.22557
Research Article

Analysing Factors Contributing to Length of Stay (LoS) Among Patients with COVID-19 in Indonesian Hospital Setting

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ABSTRAK

Penyakit COVID-19 masih menjadi ancaman konstan bagi kesehatan masyarakat global. Penggunaan obat dan lama rawat inap (LoS) merupakan indikator utama kualitas pelayanan di rumah sakit. Penelitian ini bertujuan untuk mengamati LoS dan faktor yang mempengaruhinya (termasuk karakteristik pasien dan penggunaan obat) pada pasien rawat inap COVID-19 di Rumah Sakit X di Surabaya, Indonesia. Penelitian observasional dilakukan dengan menggunakan rekam medis pasien rawat inap COVID-19 di Rumah Sakit X selama tahun 2022. Data karakteristik pasien dan profil obat dianalisis secara deskriptif. Kesesuaian terapi obat ditentukan berdasarkan pedoman terapi. Uji korelasi dilakukan untuk hubungannya dengan LoS. Total terdapat 203 pasien rawat inap COVID-19, meliputi: neonatus/anak/remaja (12,32%), dewasa (66,5%), dan lanjut usia (21,2%). Sebagian besar pasien laki-laki (54,2%) dengan keparahan sedang (80,8%), dan 36,4% memiliki komorbiditas. Kesesuaian terapi pada pasien neonatus/anak/remaja, dewasa, dan lanjut usia adalah: 12% (3/25), 76% (103/135), 60% (26/43), secara berurutan. Rata-rata LoS adalah 7,0±3,11 hari, dimana LoS terendah pada neonatus/anak/remaja (6,1±2,43 hari) dan tertinggi pada lansia (7,4±3,02 hari). Faktor yang secara signifikan mempengaruhi LoS adalah status vaksinasi (p= 0,000) dan tingkat keparahan COVID-19 (p= 0,002), namun tidak dipengaruhi oleh kesesuaian terapi (p= 0,864). Hasil penelitian merupakan data awal tuntuk mengembangkan strategi perbaikan kualitas layanan untuk pasien COVID-19 rawat inap.

Kata Kunci: COVID-19, Faktor Risiko, Penggunaan Obat, Lama Rawat Inap, Rumah Sakit

ABSTRACT

COVID-19 disease remains a constant threat to global public health. Drug use and Length of Stay (LoS) are among main indicators of service quality in hospitals. Object of this research were understanding of LoS and the contributing factors (including patient characteristics and drug use) among COVID-19 inpatients at Hospital X Surabaya, Indonesia. Observational research was conducted using medical records of COVID-19 inpatients at Hospital X in 2022. Data on patient characteristics and drug profiles were analyzed descriptively. Drug therapy conformity was determined based on guidelines. Correlation tests were used to determine factors associated to LoS. The results were 203 COVID-19 inpatients, including: neonate/child/adolescent (12.32%), adults (66.5%) and elderly (21.2%). Most patients were males (54.2%) with moderate severity (80.8%), and 36.4% had comorbidities. Therapy conformity in neonate/child/adolescent, adult and elderly patients were: 12% (3/25), 76% (103/135), 60% (26/43), respectively. The average LOS was 7.0±3.1 days, where neonate/child/adolescent was the lowest (6.1±2.43 days), and elderly was the highest (7.4 ± 3.02 days). Significant contributing factors to LoS included vaccination status (p= 0.000) and COVID-19 severity (p= 0.002), but not with therapy conformity (p=0.864). The study findings provide a preliminary data to guide the development of strategies to improve service quality for hospitalised patients with COVID-19.

Keywords: COVID-19, Risk Factors, Medication Use, Length of Stay, Hospital

I. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and has been declared as a pandemic in March 2020 by the World Health Organization (WHO) (WHO, 2022a). WHO has categorized the SARS-CoV-2 virus into two groups, namely Variant of Interest (VOI) and Variant of Concern (VOC). In May 2021, WHO designated the Alpha (B.1.1.7), Beta (B.1.351), Gamma (P1) and Delta (B.1.671.2) variants as VOC variants; this was followed by the Omicron (B.1.1. 529) in November 2021 (Amalia, 2021; WHO, 2022). WHO designated Omicron as a VOC because of its high transmissibility and ability to avoid antibodies induced by vaccination or natural infection (Burhan & Rachmadi, 2022). As per 5 October 2022, the number of positive COVID-19 patients in Indonesia reached 6,439,292 cases with 158,165 deaths; while globally, there was more than 615,777,700 confirmed cases and 6,527,192 deaths (MoH-RI, 2021). Nowadays, even though COVID-19 is considered as manageable, the virus is capable of evolving and is going to remain a constant threat.

Hospitals are health facilities that have an important role in caring for

COVID-19 patients, especially in moderate to critical conditions (Burhan et al, 2022). In a pandemic situation, hospital burdens and health costs have increased significantly; but on the other hand, there are limited resources available in hospitals. Therefore, efficiency of hospital management warrants special attention. Length of Stay (LoS) is number of days in the hospital which is counted from the day of admission until discharge; and LoS is considered an important indicator for assessing the efficiency of hospital management and the quality of services provided to patients (quality patient care). The shorter the patient's length of stay, the more effective and efficient the service at the hospital is (Tai et al, 2020). In addition, shorter hospital stays reduce the burden of medical costs and increase bed turnover, and thereby increase hospital profit margins while lowering overall social costs (Guo et al, 2021). Therefore, it is important to map factors or characteristics that can shorten or lengthen patient LoS in hospitals.

To date, research evidence regarding factors influencing LoS in COVID-19 patients has been limited. In July 2022, the Centre for Disease Control and Prevention (CDC) released data on risk factors that influence the length of stay in hospitals for COVID-19 patients. Age has been considered as the strongest risk factor for worsening COVID-19. As of 23 May 2022 data, the proportion of deaths in the age group over 65 years was 42 times that of those aged 30-39 years. In addition, people from racial and ethnic minority groups have been at greater risk of hospitalization, ICU admission, and death from COVID-19 at younger ages. Comorbid groups that have had a high risk of worsening COVID-19 are asthma, cancer, cerebrovascular disease, chronic kidney or liver diseases, diabetes mellitus types 1 and 2, cardiovascular disorders, obesity, pregnancy and smoking (CDC, 2022). Apart from patient factors, research evidence shows that the quality of treatment and the type of drug chosen can also influence LoS in hospitals (Khosravizadeh et al, 2016), although this has not been specifically observed in COVID-19 patients.

Hospital X is a health facility with special ward for airborne infectious diseases, such as COVID-19, in Surabaya, East Java, Indonesia. While limited data is available on LoS and the contributing factors (i.e., patient characteristics and drug use) among COVID-19 patients in Indonesia, this research is conducted to provide a preliminary data to guide stakeholders and professional health workers in allocating health resources more effectively and efficiently, as well as in developing strategies to optimize the quality of services for hospitalised patients

with COVID-19, which remains a constant public health issue in Indonesia.

II. METHOD

A. Study design and Setting

This is an observational study conducted in Hospital X in Surabaya, East Java, Indonesia. Hospital X is a Type C private hospital which have special wards for airborne infectious disease, such as COVID-19. This study obtained approval from the Research Ethics Committee of Hospital X (No. 001/S/KET/KOMETIK/IV/2023).

B. Sample

This study included patients diagnosed with COVID-19 who was hospitalised in Hospital X during January-December 2022. COVID-19 diagnosis was confirmed with positive results on RT-PCR swab examination upon admission as recorded in medical records. Data was obtained from medical records which was stored at the Hospital Information System (SIMRS). Patients who were forced to return home or returned at their own request or referred to another hospital before considered recovered were excluded from this study. Patient data was followed from the day of admission until discharge from hospital (which was considered as recovered).

C. Data Collection

Data regarding patient characteristics (including age, gender, comorbidities, vaccine status, and degree of severity) and the drug therapy were obtained from patient medical record, and recorded in the data collection sheet per patient. The drug profiles were observed based on the 4th edition COVID-19 Management Guideline and the Hospital X guideline (Table 1 and 2). LoS was defined as number of days from admission to discharge from hospital as recorded in the medical record.

D. Data Analysis

Data on patient characteristics and drug therapy profiles were analysed descriptively. Drug therapy conformity was determined based on the 4th edition COVID-19 Management Guideline and Hospital X Guideline (Table I and Table II); it was considered 'conform' when the patient received all drugs listed in the guidelines, and 'not conform' if there was any drug which is not in accordance with the guidelines. Bivariate analysis was conducted to determine the associations between patient characteristic and therapy conformity (independent variable) with LoS (dependent variable).

Independent sample t-test was used to test the association between LoS and independent variables in the form of

categorical data if the data is normally distributed (Mann-Whitney U-Test if the data is not normally distributed), while Spearman's correlation was used for independent variables in the form of nominal/ordinal data. IBM SPSS Statistics version 25 was used to assist with the analysis.

Tabel I. Pharmacological Therapy Guidelines for Children with COVID-19 (Burhan et al, 2022; RS X, 2022)

Level of Severity	COVID-19 Therapy	Other Therapy
Mild	-	• Vitamin C • Zinc • Other supplements • Symptomatic treatment
Moderate	• Antivirus: Remdesivir or Favipiravir or Molnupiravir • Antibiotic*	• Vitamin C • Zinc • Corticosteroid* • Symptomatic treatment
Severe-Critical	• Antivirus: Remdesivir or Favipiravir or Molnupiravir • Antibiotic*	• Vitamin C • Zinc • Corticosteroid or other inflammatory agents* • Anticoagulant* • Symptomatic treatment

*given with careful considerations after discussing with COVID-19 team at hospitals

Tabel II. Pharmacological Therapy Guidelines for Adults with COVID-19 (Burhan et al, 2022; RS X, 2022)

Level of Severity	COVID-19 Therapy	Other Therapy
Mild	• Antivirus: Favipiravir or Molnupiravir	• Vitamin C • Vitamin D • Symptomatic treatment
Moderate	• Antivirus: Remdesivir or Favipiravir or Molnupiravir	• Vitamin C • Vitamin D • Anticoagulant* • Symptomatic treatment
Severe-Critical	• Antivirus - Remdesivir - Favipiravir or Molnupiravir • Antibiotic (infection/sepsis)*	• Vitamin C • Vitamin D • Vitamin B1 • Corticosteroid* • Anti IL-6 (Tocilizumab)* • Anticoagulant* • Additional therapy: IvIG (Regdanvimab)* • Symptomatic treatment

Abbreviations: IVIG, intravenous immunoglobulin; IL, interleukin
*given with careful considerations after discussing with COVID-19 team at hospitals

III.RESULTS AND DISCUSSION

A total of 203 COVID-19 patients were hospitalised at Hospital X in 2022; 15 patients were excluded as they were discharged on their own requests. Of 203 patients included in this study, the majority were adults (66.5%). The distribution of patient age groups can be seen in Table III.

Table III. The distribution of age among COVID-19 patients (N=203)

Age groups	n	%
Neonate/Child/Adolescent (N=25)		
Neonates (0-1 year)	5	20.0
Children (2-11 years)	8	32.0
Adolescent (12-18 years)	12	48.0
Adult (N=135)		
19-30 years	43	31.9
31-42 years	52	38.5
43-54 years	20	14.8
55-60 years	20	14.8
Elderly (N=43)		
61-69 years	17	39.5
70-78 years	18	41.9
79-87 years	6	14.0
88-98 years	2	4.6

It was reported by Statsenko et al. (2022) that adult and elderly patients with COVID-19 tended to experience hypercoagulation and clot formation because of higher levels of APTT, D-Dimer, and fibrinogen compared to the younger group ($p<0.001$). In addition, D-dimer levels deviated from clinical reference values (>0.5 ug/L) were seen only in older adults with COVID-19.

In all age groups, a higher percentage of male patients compared to females (Table IV). Statsenko et al. (2022) reported that male patients had a longer disease duration, thus required a more intensive treatment ($p < 0.01$). Likewise, based on the C-reactive protein (CRP) value, which is a marker of the severity of COVID-19, a higher value was found in males than females ($p<0.05$). Apart from that, hormonal differences between males and females can also influence the COVID-19 patients' conditions. Wray & Arrowsmith (2021) stated that oestrogen can potentiate vitamin D' effects on immunity; on the other hand, male sex hormones might cause males more susceptible to COVID-19 and worsen the prognosis. Testosterone allegedly promotes viral entry by increasing the activity of the ACE2 receptor which is known to be the entry point for SARS-CoV-2. Testosterone also exerts immunosuppressive effects and can reduce the antibody response (Wray & Arrowsmith, 2021).

In this study, the majority of patients had received vaccination, at least the first dose (74.4%), and 36.4% had comorbidities (Table IV). Several studies show that vaccination can reduce morbidity due to COVID-19. Research by Li et al. (2022) involving COVID-19 patients aged ≥60 years reported that the risk of developing severe COVID-19 was greater

in the unvaccinated group compared to the vaccinated group. Furthermore, previous research shows that comorbidities, such as obesity, chronic kidney disease, diabetes, hypertension, kidney and cardiovascular disorders can potentially increase the risk of worsening COVID-19 (Russell et al, 2023). Use of medications among COVID-19 patients based on the age groups can be seen in **Table V**, while its conformity with the guidelines can be seen in **Table VI**. Conformity of COVID-19 therapy with the guidelines for all age groups was 65% (118/203). In the neonate/child/adolescent group, most therapies were not according to guidelines (88%, 22/25); while in the adult and elderly groups, most therapy were appropriate (76%, 103/135; and 60%, 26/43; respectively). Inappropriate therapy has been mainly dominated by not giving supplementation and vitamins, namely vitamin C, vitamin D and zinc.

Table IV. Characteristics of COVID-19 Patients based on the Age Groups

Characteristics	Neonate/ Child/Adolescent (N=25)		Adult (N=135)		Elderly (N=43)		Total (N=203)	
	n	(%)	n	(%)	n	(%)	n	(%)
Gender								
Male	15	60.0	73	54.1	22	51.2	110	54.2
Female	10	40.0	62	45.9	21	48,.8	93	45.8
Vaccination								
No data	13	52.0	30	22.2	9	20.9	52	25.6
1x vaccination	2	8.0	0	0.0	0	0.0	2	1.0
2x vaccination	8	32.0	61	45.2	17	39.5	86	42.4
3x vaccination	2	8.0	44	32.6	16	37.2	62	30.5
4x vaccination	0	0.0	0	0.0	1	2.3	1	0.5
Level of disease severity								
Mild	6	24.0	20	14.8	0	0.0	26	12.8
Moderate	17	68.0	110	81.5	37	86.0	164	80.8
Severe-Critical	2	8.0	5	3.7	6	14.0	13	6.4
Comorbidity*								
No comorbidity	24	96.0	86	63.7	19	44.2	129	63.5
With comorbidity (n=74):	1	4.0	49	36.3	24	55.8	74	36.4
Diabetes Mellitus	0	0.0	13	21.7	9	31.0	22	29.7
Hypertension	0	0.0	20	33.3	12	41.4	32	43.2
Respiratory diseases	0	0.0	11	18.3	1	3.4	12	16.2
Cardiovascular diseases	0	0.0	10	16.7	4	13.8	14	18.1
Renal diseases	0	0.0	2	3.3	0	0.0	2	2.7
Others (e.g. Parkinson)	1	0.0	4	6.7	3	10.3	7	9.4

* Each patient can have more than 1 comorbidity

The majority of neonate/child/adolescent patients were at moderate and severe levels of severity (19/25, 76%), where based on guidelines it was necessary to consider giving antivirals and antibiotics (Table I). Antivirals were given to 11 patients (44.0%), of which the majority were given Remdesivir (n=9). The use of Remdesivir for children under 12 years warrants special attention.

On April 25, 2022, the FDA released a statement that Remdesivir can be used in paediatric patients aged 28 days or older at least 3 kilograms with positive results of direct SARS-CoV-2 viral testing who are hospitalized or non-hospitalized, and have mild-to -moderate COVID-19 and are at high risk for progression to severe COVID-19, including hospitalization or death (Samuel *et al*, 2023).

Tabel V. Medications use among COVID-19 patients based on the age groups

Medications	**Neonate/child/ adolescent (N=25)**		**Adult (N=135)**		**Elderly (N=43)**	
	n	**%**	**n**	**%**	**n**	**%**
Vitamin C	17	68.0	128	94.8	38	88.4
Vitamin D	0	0.0	124	91.9	35	81.4
Vitamin B1	0	0.0	118	87.4	36	83.7
Zinc	8	32.0	0	0.0	0	0.0
Antivirus						
Favipiravir	2	18.2	21	17.5	2	5.0
Remdesivir	9	81.8	73	60.8	33	82.5
Molnupiravir	0	0.0	15	12.5	1	2.5
Remdesivir → Molnupiravir	0	0.0	5	4.2	1	2.5
Remdesivir → Favipiravir	0	0.0	2	1.7	2	5.0
Favipiravir → Remdesivir	0	0.0	2	1.7	0	0.0
Molnupiravir → Remdesivir	0	0.0	2	1.7	1	2.5
Total	**11**	**44.0**	**120**	**88.9**	**40**	**93.0**
Antibiotic						
Meropenem	1	6.7	23	28.4	14	50.0
Azithromycin	6	40.0	9	11.1	2	7.1
Moxifloxacin	1	6.7	7	8.6	4	25.0
Cefixime	1	6.7	2	2.5	3	10.7
Levofloxacin	1	6.7	35	43.2	11	39.3
Ceftriaxone	9	60.0	15	18.5	4	14.3
Cefadroxil	0	0.0	1	1.2	0	0.0
Cefoperazone-Sulbactam	0	0.0	1	1.2	0	0.0
Metronidazole	0	0.0	1	1.2	0	0.0
Total	**15**	**60.0**	**81**	**60.0**	**28**	**65.1**
Corticosteroid						
Dexamethasone	7	87.5	19	57.6	10	66.7
Methylprednisolone	1	12.5	14	42.4	5	33.3
Total	**8**	**32.0**	**33**	**24.4**	**15**	**34.9**
Anticoagulant						
Edoxaban	1	50.0	7	50.0	8	38.1

Medications	Neonate/child/ adolescent (N=25)		Adult (N=135)		Elderly (N=43)	
	n	%	n	%	n	%
Rivaroxaban	1	50.0	2	14.3	2	9.5
Fondaparinux	0	0.0	3	21.4	1	4.8
Heparin	0	0.0	0	0.0	1	4.8
Enoxaparin/Heparin	0	0.0	1	7.1	1	4.8
Enoxaparin	0	0.0	1	7.1	3	14.3
Fondaparinux/Rivaroxaban	0	0.0	0	0.0	2	9.5
Fondaparinux/Enoxaparin	0	0.0	0	0.0	1	4.8
Enoxaparin/Rivaroxaban	0	0.0	0	0.0	1	4.8
Rivaroxaban/Edoxaban/Heparin	0	0.0	0	0.0	1	4.8
Total	**2**	**8.0**	**14**	**10.4**	**21**	**48.8**
Anti IL-6						
Tocilizumab	0	0.0	2	1.5	2	4.7
Monoclonal antibody						
Regdanvimab	0	0.0	2	1.5	0	0
Symptomatic treatment*						
Antiulcer	10	40.0	110	81.5	42	97.9
Antitusive	15	60.0	65	48.1	20	46.5
Antirhinitis	12	48.0	47	34.8	9	20.9
Laxative	5	20.0	7	5.2	2	4.7
Sedative	1	4.0	10	7.4	5	11.6
Analgesic-Antipyretic	15	60.0	54	40.0	23	53.5
Antiemetic	9	36.0	40	29.6	19	44.2
Antihistamine	1	4.0	9	6.7	4	9.3
Analgesic	5	20.0	34	25.2	6	14.0
Antidyspnea	11	44.0	13	9.6	4	9.3
Antipharingitis	3	12.0	22	16.3	5	11.6
Antimotility	3	12.0	4	3.0	1	2.3
	25	**100.0**	**135**	**100.0**	**43**	**100.0**

*Each patient can receive more than 1 type of symptomatic treatment

Tabel VI. Medication conformity with the guideline based on age groups and severity levels

Medication conformity	Levels of COVID-19 severity			Total
	Mild	Moderate	Severe	N (%)
Neonate/child/adolescent (n=25)				
Conform	3	0	0	3 (12.0)
Not conform	3	17	2	22 (88.0)
Adult (n=135)				
Conform	6	95	2	103 (76.0)
Not conform	14	15	3	32 (24.0)
Elderly (n=43)				
Conform	0	23	3	26 (60.0)
Not conform	0	14	3	17 (40.0)
All age groups (N=203)				
Conform	**9**	**118**	**5**	**132 (65.0)**
Not conform	**17**	**46**	**8**	**71 (35.0)**

In the adult patient group, the majority were at moderate and severe levels of severity (115/130, 85.1%); most patients (n=120) were received an antiviral, particularly Remdesivir (n=73). Based on the national guideline, Remdesivir is one of the antivirals of choice for adult patients with moderate or severe levels of severity (Table II) (Burhan et al., 2022; Awdisma et al., 2021). In this present study, antibiotics were administered to 60% of adult (mainly Levofloxacin) and paediatric (mainly Azithromycin) patients; administration of antibiotics should only be considered if there are indications of bacterial infection. Azithromycin is the antibiotic of choice if atypical pneumonia is suspected, however other types of antibiotics can be chosen according to the patient's clinical condition and the suspected cause of infection (Burhan et al., 2022).

Tabel VII. LoS of COVID-19 patients based on age groups

Length of Stay (LoS)	**Mean ± SD**	**Median (range, min-max)**
LoS neonate/child/adolescent (n=25), in days	6.1 ± 2.43	6 (3-15)
LoS adult (n=135), in days	7.1± 3.24	6 (3-25)
LoS elderly (n=43), in days	7.4 ± 3.02	6 (4-13)
LoS all age groups (N=203), in days	**7.0 ± 3.11**	**6 (3-25)**

The average LoS of all COVID-19 patients at hospital X was 7.0 ± 3.11 days; the highest average LoS was in the elderly group (7.4 ± 3.02 days) (Table VII).

Several previous studies showed a longer LoS of patients with COVID-19. Research by Oksuz et al. (2021) in Turkey involving 1,056 patients showed an average LoS of 8.0 days for hospitalized patients versus 14.8 days for patients in the Intensive Care Unit (ICU). Alimohamadi et al. (2022) reported that the >60 year age group had an average LoS of 16.60 days (95% CI 12.94-20.25), while the 40 year age group had the lowest LoS (10.15, 95% CI 4.90-15.39). Research by Baihaqi and Henny (2022) in Indonesia involving 48 COVID-19 patients hospitalized at Serui Hospital, Papua Province, reported that 26 subjects (54.2%) had a length of stay of >11 days. This present study might have lower LoS due to the better herd immunity formed with the increasing vaccination coverage.

Analysis of risk factors contributing to LOS can be seen in Table VIII. Significant associations were reported for vaccination status (p= 0.000) and level of COVID-19 severity (p= 0.002). Previous studies have shown that factors associated with LOS vary widely. A systematic review in 2022 reported that patient age, gender, ethnicity, and number of comorbidities significantly influence the LOS of COVID-19 patients (Alimohamadi et al., 2022).

Further, research by Oksuz et al. (2021) in Turkey (n=1,056 patients) showed that level of COVID-19 severity significantly influenced LOS. Baihaqi and Henny (2022) in Papua, Indonesia, showed that the factor associated with the length of stay for COVID-19 patients was the patient's clinical condition, namely fever (p=0.003; OR 10.59; 95% CI 2.22-50.49) and Neutrophil-Lymphocyte Ratio - NLR (p=0.034; OR 4.55; 95% CI 1.12 -18.49); while age and gender did not significantly influence LOS. In parallel, Ramatillah et al. (2021) in Jakarta, Indonesia, reported that gender (p=0.450) and age (p=0.226) did not have a significant correlation with LoS or clinical outcomes for COVID-19 patients. Moreover, Triamyanti et al. (2022) in Bangil, Indonesia, found that the use of antibiotics and antivirals had no effect on the recovery rate of COVID-19 patients; while comorbidity showed a significant correlation with duration of treatment (p=0.002) and clinical condition (p= 0.014) of COVID-19 patients (20). An Indonesian multi-centres study with multifactorial approaches would be required to confirm these findings.

Study limitation. This study used a population approach to evaluate the medication use conformity where patients' drug therapy were generally compared with the drug of choice in the 4th edition COVID-19 Management Guideline, which was considered a benchmark in the management of COVID-19 patients with the dominant Omicron variant in 2022. Thus, the use of medications have not yet been evaluated for each individual patient, such as drug interactions, polypharmacy and Drug Related Problems (DRP). Further research would be required to evaluate the quality of drug use at the individual level. Apart from that, this research was conducted retrospectively using data from patient medical records, hence some missing data might be an issue. Hospital X, however, have used electronic medical records stored at SIMRS, thus minimum missing data are expected (this is particularly regarding patient data before entering the hospital).

Tabel VIII. Associations between patient characteristics and drug therapy conformity with LOS

Risk factors	Median LOS, in days (range min-max)	*p-value*
Gender		0.726[a]
Male (n=110)	6 (3-15)	
Female (n=93)	6 (4-25)	
Age groups		0.122[b]
Neonate/Child/Adolescent (n=25)	6 (3-15)	
Adult (n=135)	6 (3-25)	

Risk factors	Median LOS, in days (range min-max)	*p-value*
Elderly (n=43)	6 (4-13)	
Vaccination		0.000[b]
1-2x vaccination (n=88)	7 (4-15)	
3-4x vaccination (n=63)	6 (3-16)	
Level of severity		0.002[b]
Mild (n=26)	5 (3-13)	
Moderate (n=164)	6 (3-25)	
Severe-Critical (n=13)	9 (4-15)	
Comorbidity*		0.201[a]
Yes (n=55)	6 (3-19)	
No (n=148)	6 (3-25)	
Therapy conformity		0.864[a]
Conform	7 (4-25)	
Not conform	6 (3-15)	

*Comorbidites included: diabetes mellitus, hypertension, respiratory/cardiovascular/renal disorders
[a]using *Mann-Whitney U Test*
[b]using *Spearman's correlation*

IV. CONCLUSION

This study provided insights on the patients' characteristics and drug use contributing to LoS among COVID-19 patients in an Indonesian setting. Patients history of vaccination status and level of severity warrants considerations when treating patients hospitalised with COVID-19. In addition, optimising drug utilisation according to the guidelines should be encouraged. Findings from this study should provide a basis in improving services for hospitalised patients with COVID-19, which is still evolving and remains a constant threat.

CONFLICT OF INTEREST

All authors declare that there is no conflict of interest in this research.

ACKNOWLEDGEMENT

We would like to thank the Director as well as all the staff of Hospital X in Surabaya for their technical assistances during the data collection.

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