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Early Warning Scores as a Predictor of Mortality in Non-Comorbid COVID-19 Patient

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Abstract

There are several non-comorbid COVID-19 patients lead to mortality, but the risk factors that affect it have not been widely discussed in research. Treatment of COVID-19 patients focuses more on patients with comorbidities. This study aimed to check the effectiveness of Early Warning Scores (EWS) assessment to predict the mortality of non-comorbid COVID-19 patients. The method of the study was a case study research with a retrospective approach using secondary data, namely the patient's medical record status. This study took medical record data from 262 patients confirmed positive for non-comorbid COVID-19 who were hospitalized at Ngudi Waluyo Wlingi Hospital from July to September 2021. The multivariate data analysis used multiple linear regression tests to simultaneously test the relationship of the independent variables (age, gender, and Early warning score) to the dependent variable (mortality). The statistical analysis result showed the correlation between gender, age, and assessment with mortality, each of which has a p-value of 0.000, meaning that each of these variables has a relationship with mortality. If a simultaneous test (F test) is carried out, the p-value is 0.000, meaning that gender, age, and EWS simultaneously affect mortality. The coefficient of determination or R square of 0.773 means that gender, age, and EWS simultaneously influence mortality by 77.3%. Early Warning Scores (EWS) assessment influenced the mortality of non-comorbid COVID-19 patients. The highest contribution affecting mortality was the EWS assessment. The contribution of influence on sex and age is relatively the same.

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INTRODUCTION

The mortality of COVID-19 patients is a concern even though its percentage is relatively low compared to the number of cases. This is because the total number of COVID-19 cases is large and occurs almost all over the world so the mortality rate for COVID-19 patients cannot be ignored. The COVID-19 cases in July 2021 were the highest number of cases since the emergence of COVID-19 cases in Indonesia in March 2020. The COVID-19 cases in Indonesia from July to August 2021 were the peak of the second wave whose numbers were much higher than in January and February 2021 period, which were considered the first wave (Hikmawati & Setiyabudi, 2021). The number of COVID-19 cases per month in July 2021 was more than 1.2 million while in August 2021 were 680,143 cases in a month. In line with the number of cases, the mortality from COVID-19 cases in July – August was also the highest number of mortality since the COVID-19 cases in Indonesia. In July 2021 the mortality rate was more than 32,000 cases (2.7%), during August 2021 the number and percentage of mortality increased to 38,904 death cases (5.7%). The percentage of mortality is higher than the world average percentage of deaths, even in July 2021 Indonesia was ranked first in the highest cases of COVID-19 mortality (Hartantri et al., 2023).

Among COVID-19 mortality cases, patients with comorbidities have a higher prevalence of mortality. This is related to the severity of the disease in the patients with COVID-19 who have comorbidities are more likely to have higher severity levels than those who do not have comorbidities (Thakur et al., 2021). Comorbidities that have a significant effect on COVID-19 deaths include kidney disease, COPD, diabetes mellitus, cancer and cardiovascular disease (Masdalena et al., 2021). Research at Bhakti Husada Hospital in Surabaya showed that instead of the 66 COVID-19 patients who died, 83.3% had comorbidities. Even though COVID-19 patients who have comorbidities dominate the number of COVID-19 deaths, the number of COVID-19 mortality cases in patients who do not have comorbidities cannot be ignored because of the number was also quite large (Satria et al., 2020). Data at Ngudi Waluyo Hospital, Kabupaten Blitar, showed cumulative death rate of 633 people. Kabupaten Blitar was ranked third in East Java for COVID-19 death cases until June 2021 in which 35% of patients died without comorbidities.

The death of COVID-19 patients without comorbidities did not receive much attention. Most studies have focused on the mortality of COVID-19 patients with comorbidities. Factors that influence COVID-19 mortality cases besides comorbid factors are sex and age. Male patients had a significantly higher risk of death than females. Patients over 50 years of age also had 15 times increased risk of mortality compared to those under 50 years of age (Biswas et al., 2021). The 28-day predictors of mortality in COVID-19 patients in non-comorbidities were related to viral load, age, severity of respiratory failure, and renal impairment when infected (Novelli et al., 2021).

Worsening of clinical conditions often occurs in unstable COVID-19 patients, thereby increasing mortality. Recognition of the worsening condition of COVID-19 patients can be done with an Early Warning Scores (EWS) assessment. The EWS assessment system is to address patient health problems early. The EWS is based on an assessment of the patient's condition changes through systematic observation of all of the patient's physiological changes. This system is a concept of a proactive approach to improve patient safety and better patient clinical outcomes by standardizing the approach and establishing simple physiological parameter scoring (Kaeley et al., 2021). The EWS assessment was carried out based on seven parameters for assessing the patient's physiological response consisting of respiration, systolic blood pressure, temperature, pulse, oxygen saturation, additional oxygen, and the patient's level of consciousness (Martin-Rodriguez et al., 2021).

METHODS

The method of study was a case study research with a retrospective approach using secondary data, namely the patient's medical record status. This study took medical record data from 262 patients confirmed positive for non-comorbid COVID-19 who were hospitalized at Ngudi Waluyo Wlingi Hospital from July to September 2021. Other criteria for the study sample included patients aged > 16 years, not pregnant, no congenital diabetes mellitus, stroke, and lung disease. The data of this study included age, gender, assessment of worsening clinical condition with early warning scores (EWS), and patient mortality taken from patient medical records. The EWS assessment is based on physiological parameters including respiration, oxygen saturation, temperature, urine output, systolic blood pressure, pulse, and level of

consciousness. The EWS assessment was categorized based on the total score of the physiological parameter assessment, namely normal (0-1), low (2-3), moderate (4-6), and high (≥ 7). Multivariate data analysis used multiple linear regression tests to simultaneously test the relationship of the independent variables (age, gender, and EWS rating) to the dependent variable (mortality). This research has received a certificate of ethical clearance from the health research ethics committee of Ngudi Waluyo Wlingi number 20/EA/KEPK/2022 date Januari 31, 2022.

RESULTS

Data in this study, namely mortality associated with age, gender, and the results of the assessment of the patient's condition in the form of an EWS assessment.

Table 1. Cross tabulation of age, sex, and Early warning score (EWS) Assessment with mortality in Covid-19 patients

	Mortality			
	Yes		**No**	
	∑	**%**	**∑**	**%**
Age (years)				
Teenager (11-19)	0	0.0	2	0.8
Adult (20-60)	118	45.0	63	24.0
Elderly (>60)	73	27.9	6	2.3
Total	191	72.9	71	27.1
Gender				
Male	117	44,7	16	6,1
Female	74	28,2	55	21,0
Total	191	72.9	71	27.1
Early Warning Score (EWS)				
Low	8	3.1	60	22.9
Medium	46	17.6	9	3.4
High	137	52.3	2	0.8
Total	191	72.9	71	27.1

Table 1 showed that the highest number of Covid-19 patients between the ages of 20-60 years, namely 181 people (69%). Of these, 118 died. While 73 of the 79 patients aged > 60 years died. The percentage of mortality in erderly is higher than in adults and teenager. The highest number of Covid-19 patient deaths was in male, namely 117 patients (44.7%). The total number of deaths in this study was 191 patients. the percentage of mortality in female was lower than male. Based on assessment of the physiological condition of Covid-19 patients when they initially entered the Covid-19 isolation room, it can be seen that patients whose EWS assessment were low (the patient's physiological condition was still good) experienced fewer deaths than patients with medium or high EWS assessment results. Likewise, those with a medium EWS experienced fewer deaths than those with a high EWS category (the patient's condition was already severe).

Table 2 Correlation Age, Gender and EWS Assessment with Mortality in COVID-19 Patients

Multiple Logistic Regression Test		**Sig.**
coefficient of correlation	Gender	0,000
	Age	0,000
	EWS Assessment	0,000
F test		0,000
R square		0,773

Table 2 shows the correlation between gender, age, and assessment with mortality, each of which has a p-value of 0.000, meaning that each of these variables has a relationship with mortality. If a simultaneous test (F test) is carried out, the p-value is 0.000, meaning that gender, age, and EWS simultaneously affect mortality.

Table 3 Comparison of the Effective Contribution of Age, Gender and EWS Assessment to Mortality in COVID-19 Patients

Multiple Logistic Regression Test		Sig.
effective contribution	Gender	6,26 %
	Age	8,38 %
	EWS Assessment	62,64 %

The coefficient of determination or R square of 0.773 means that gender, age, and EWS simultaneously influence mortality by 77.3%. Thus 22.7% is influenced by other variables which did not examined. Based on the calculation of the effective contribution, each variable showed that gender contributed effectively to death by 6.26%, age by 8.38%, and EWS assessment by 62.64%.

DISCUSSION

The results of this study showed the mortality data of 191 patients who died (72.9%) of the 262 patients studied. The research data was taken when the pandemic status in Indonesia entered the second wave and there was a mutation of the new COVID-19 virus, namely the delta variant. The characteristics of the COVID-19 variant of the delta have a higher infection rate and quickly cause a deterioration in the condition of infected patients. The SARS-CoV-2 B.1.617.2 genome or the Delta variant has a higher transmission rate, 60 percent higher hospitalization rates compared to other strains, and a higher viral load (Rashedi et al., 2022). The COVID-19 pandemic in Indonesia started in March 2020 and continued to increase constantly in the number of cases and deaths due to COVID-19. Many factors can occur in COVID-19 patients that can cause death. The risk of mortality cases of COVID-19 was significantly related to several factors, namely male, age over 60 years, having respiratory symptoms, and having a comorbid history of hypertension and CRF (Martin-Rodriguez et al., 2021). Based on the results of this study, 133 male subjects (50.8%) were more dominant than female with the mortality rate of 117 persons (44.7%). Sex was showed influence immune factors, female have a stronger immune response than male because of the different number of X chromosomes (Bunders & Altfeld, 2020). Men have weaker resistance and infection control than women (Dias et al., 2022). Clearance of viral RNA is more delayed in men with COVID-19 because the testes can harbor the coronavirus. women show a stronger immune system response to pathogens than men, resulting in higher viral loads, disease severity, and mortality in men (Doerre & Doblhammer, 2022). Differences in sex hormone milieus in women and men can also be a factor in causing corona virus infection. Estrogen has an immunoenhancing effect while testosterone has an immunosuppressive effect (Pradhan & Olsson, 2020).

The Elderly are one of the populations at risk of experiencing health problems which can accelerate the worsening of conditions when infected with COVID-19. In this study, out of 79 COVID-19 patients aged over 60 years, 73 of those were died (92.4%). Whereas in teenagers (11-19 years) there were no deaths. In elderly, the reserve of homeostatic function decreased, thus positioning the elderly in unsupportive conditions to fight aggressive infections such as COVID-19. The elderly are also vulnerable to more severe clinical conditions due to immune and comorbid disorders that can cause respiratory failure and death. There were also morphological changes that affected the function of the respiratory system. By increasing age, the respiratory system showed a structural and functional decline resulting in an increase in the work of breathing compared to a young age (Perrotta et al., 2020). There is a significant relationship between age and mortality in COVID-19 patients where the older the age, the greater the risk of death (Nanda Nur Illah, 2021).

The results of the mortality study related to the EWS assessment were obtained from the mortality rate of 191 patients, 137 patients (71.7%) had a high EWS rating. Whereas 68 patients with low EWS ratings, only 8 (11.8%) patients experienced mortality. The results of a high EWS assessment

indicate a poor patient condition when first entering the isolation room based on 7 physiological parameters such as respiration rate ≥ 25 x/minute or ≤ 8 x/minute, oxygen saturation ≤ 90, urine output < 10 ml/hour, systolic ≥ 190 mmHg or ≤ 85 mmHg, pulse ≥ 131 x/minute or ≤ 40 x/minute, there is a decrease in consciousness. This EWS supports nurses to increase their knowledge and skills based on an assessment of changes in the patient's condition through systematic observation of all the patient's physiological changes (Covino et al., 2020). The accuracy of nurses in carrying out nursing care and EWS assessments in COVID-19 patients can help improve patient conditions and prevent patient mortality (Gao et al., 2020). The EWS assessment did not only stand alone as an instrument for determining patient mortality rates but also as an initial assessment related to the patient's clinical condition based on the patient's 7 physiological parameters (Su et al., 2021). The status of the EWS assessment can change at any time from the beginning of the first EWS assessment entering the Isolation Inpatient Room. The EWS score was in the high rank for the first time the patient entered the isolation room (Hu et al., 2022). There were 2 patients out of the 262 patients studied who did not experience mortality, because there was an improvement in the patient's condition due to a good immune reaction, and having a good support system from the family so that the patient's survival rate increased. Immunity in COVID-19 patients can be evaluated with laboratory tests, namely D-Dimer examination (Paliogiannis et al., 2020). The study found that an increase in D-dimer in COVID-19 patients was associated with abnormal immune mechanisms, increased disease severity, and increased mortality in COVID-19 patients, so it could be concluded that patients with D- Normal dimers show a good immune response (Li et al., 2020).

Apart from the factors of gender, age, and EWS assessment, there were other factors that contributed to the mortality of COVID-19 patients. Based on the R square value of the multiple linear regression test results from the research data, it was found that gender, age, and EWS assessment simultaneously (together) affected death by 77.3%. If the effective contribution value of each factor is calculated, it shows that the EWS assessment has the greatest influence on mortality (62.64%), then age (8.38%), and finally sex (6.26%). The EWS assessment showed the patient's condition when first entered the isolation room, if the EWS assessment results were high, it means that the patient's condition is in a bad category, and this condition will generally continue to worsen and resulting in death (Tsai et al., 2023). Improvement in conditions or worsening of conditions can occur influenced by other factors . The improvement in the condition of COVID-19 patients was also influenced by spiritual factors (Algahtani et al., 2022). Patients with high spirituality can help balance themselves and their health status and adapt to their illness, COVID-19 patients are prone to experiencing psychological disorders in the form of anxiety and fear (Rias et al., 2020). The causes of patients having excessive anxiety, especially their physical condition and patterns of interaction which are completely restricted in order to suppress the spread of the virus, such as COVID-19 patients having to be separated from their families, are placed in isolation rooms with physical weaknesses experienced by COVID-19 patients. These conditions can accelerate the deterioration of conditions (Jannah et al., 2020).

CONCLUSION

Age, sex, and Early Warning Score (EWS) assessment were factors that influence mortality in non-comorbid COVID-19 patients. The highest contribution affecting mortality was the EWS assessment. The contribution of influence on sex and age is relatively the same.

SUGGESTION

Management of non-comorbid COVID-19 patients is still required to carry out an EWS assessment to predict mortality so that anticipatory steps can be taken immediately.

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CONFLICTS OF INTEREST

The author states that in this research there is no conflict of interest with any party, whether financial, consultant, institutional or other relationships that could cause bias.

AUTHOR CONTRIBUTION

In this research, all authors contributed fully in every research process starting from planning, collecting, managing and analyzing data to publication by writing articles that have been adapted to journal guidelines.

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