

The Impact of Intubation Time on Mortality Rate Among Covid-19 Patients in Dr. Soetomo General Hospital Resuscitation and ICU

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ABSTRACT

Background: The COVID-19 pandemic began to spread in Indonesia in March 2020 and continues to increase. Patients with severe symptoms are known to have impaired oxygenation leading to hypoxaemia. Severe oxygenation disorders can be seen from clinical symptoms of respiratory distress to examination of blood gas analysis with a low PF ratio. Patients with respiratory distress should be assisted by administering a High-Flow Nasal Cannula to mechanical ventilation. Patients who experience respiratory distress for a long time will cause a decrease in negative intrathoracic pressure which can cause interstitial pulmonary edema and will lead to an increase in mortality. Therefore, this study was prepared with the aim of analyzing the effect of intubation time on mortality of Covid-19 patients in a special resuscitation and infection room at a hospital in Indonesia.

Methods: This study is a retrospective analytic observational study with a sample of 35 subjects. This study uses the criteria for respiratory distress through the 3rd edition of the COVID-19 Management Guidelines with the RR criteria > 30 times per minute.

Results: The results showed that the median mortality of patients during intubation was 8 hours, while the median mortality of patients from the time the patient entered the intensive care unit until intubation was 6 hours.

Conclusion: It can be concluded that the shorter the intubation time and the time to enter the intensive care unit until intubation is carried out in Covid-19 patients, the lower the patient mortality rate.

Keywords: Time to Intubation; Mortality; COVID-19

INTRODUCTION

The Coronavirus (COVID-19) pandemic is known to have started to attack since December 2019 and spread throughout the world. This is certainly a big challenge for energy. As of March 20, 2020, 244,602 positive COVID-19 patients worldwide have been confirmed, and 10,031 or 4.1% of them have died (Sommerstein et al., 2020). Meanwhile in Indonesia, as of April 7, 2020, 2,738 people were positive for COVID-19 and 221 of them died. In East Java, as of April 7, 2020, there were 194 positive COVID-19 cases (84 cases in Surabaya City) and 16 people (8.25%) of whom died.

Taking steps to intubate a COVID-19 patient requires careful consideration by the doctor who treats the patient (Bernhard et al., 2012). The Chinese Society of Anesthesiology Task Force on Airway Management has published recommendations for the management of intubation in COVID-19 patients. Based on Pontoppi's recommendation, it was explained that patients would be intubated if they had a respiratory rate above 35 breaths per minute, poor oxygenation parameters (ratio PaO₂ and FiO₂ less than 200), and ventilation criteria PaCO₂ more than 60 (Scala & Heunks, 2018). This shows that intubation time is an important variable. in overcoming oxygen depth.

In performing intubation, it is also necessary to consider the risk of "ventilator inflicted lung injury" (VILI) where this mechanism damages the epithelium, endothelium, extracellular matrix and airway pathways so as to increase mortality.

To prevent VILI, as an anesthesiologist, you should not intubate too early to prevent this from happening (Chao et al., 2015).

It is also known that the state of the COVID-19 pandemic in Indonesia, especially in the city of Surabaya, is not much different from other places in terms of handling in the field of resuscitation, but data for the time of preparation for intubation still needs to be investigated further. Therefore, this study was prepared with the aim of analyzing the effect of intubation time on mortality of Covid-19 patients in a special resuscitation and infection room at a hospital in Indonesia.

METHOD

This study is a retrospective observational analytic study with a cross-sectional design which aims to determine the effect of intubation time on mortality of Covid-19 patients in the RES and RIK rooms at RSUD Dr. Soetomo Surabaya City. Then, it was discovered that the target population for this study was confirmed adult COVID-19 patients who were intubated. Furthermore, the affordable population for this study were confirmed adult COVID-19 patients who were intubated in the Isolation Room of RES and RIK RSUD Dr. Soetomo Surabaya for 3 months (June-August 2020). The collected data is then processed using IBM SPSS Statistics software.

RESULT**Characteristics of Research Subjects**

In a retrospective search of COVID-19 patients at RIK 1 from June to August 2021, a total of 35 patients were found, of which 25 were male and 10 were female. The mortality rate in 35 patients who were intubated was 28 (80%) and 7 patients (20%).

From the research sample disaggregated by age, it is known that the largest sample is the age group of 31-50 years, namely 11 samples, then 51-60 years, namely 9 samples, 61-70 years, namely 4 samples, over 71 years, namely 1 sample, age group 21-30 years, namely 2 samples. Medical record data also shows patient comorbid data. Hypertension is the most common comorbidity suffered by patients, as many as 13 patients. While other comorbidities suffered by many patients after hypertension were diabetes mellitus, which was as many as 10 patients. However, it is known that none of the patients had comorbid CKD in the study sample.

Observing the SOFA score data of the research subjects, it was found that the average SOFA score of patients who were intubated was 5.57, while patients who experienced mortality had an average SOFA of 6.10. The median SOFA score in patients who died was found to be higher than that of those who did not die.

The effect of intubation time since being consulted on the mortality of Covid-19 patients

In this study, the average intubation time was 6.14 hours with a standard deviation of 2.89 hours. If grouped by mortality, the average intubation time for patients who survive is 5.42 hours, while the average intubation time for patients who die is 6.32 hours. Data in RIK RSUD Dr. Soetomo showed a decrease in the duration of intubation time in March-May which was 7.3 hours and improved in June-August which had an average intubation time of 5.4 hours. If grouped by category of less than 8 hours and more than 8 hours, then 16 subjects died with intubation time of less than 8 hours, while there were 6 subjects who lived with intubation time of less than 8 hours.

The effect of intubation time since entering the intensive room (ICU admission to intubation) on the mortality of Covid-19 patients

In this study, the average intubation time since entering the intensive care unit was 41.14 hours with a standard deviation of 7.24 hours. If grouped by mortality, the average patient who survived had intubation time since entering the intensive care unit was around 5.42 hours, while the average for the group of patients who died was 51.92 hours. If grouped by category of less than 24 hours, 24 to 48 hours and more than 48 hours, 18 subjects died with intubation time to intubation less than 24 hours, while the lowest mortality was in the 24 to 48 hours group.

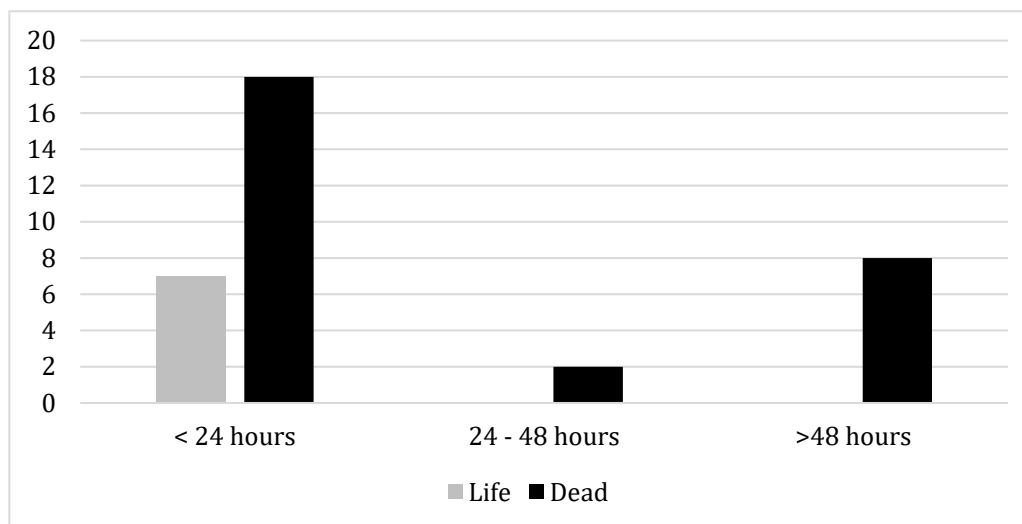


FIGURE 1: Diagram of intubation time since admission to intensive care unit based on mortality.

DISCUSSION**Characteristics of Research Subjects**

The main result of this study is the intubation time variable which is calculated on the patient during the intubation process. On exposure to the average intubation time, the average intubation time was 6 ± 2.89 hours. Along with the experience of health workers, screening and diagnostics, this makes Covid-19 patient services faster in carrying out assistance or interventions such as intubation for patients who are already experiencing respiratory distress (Heuer et al., 2012).

Through intubation services for COVID-19 patients, the mortality rate has also decreased significantly (Higgs et al., 2018). This can be seen in June-August the mortality rate decreased to 66% in patients who were intubated, whereas in the previous month the mortality rate was more than 80% in the group of patients who were intubated. This poses a challenge for clinicians to intubate patients who require mechanical ventilation so as to prevent prolong hypoxia and reduce mortality (Kangelaris et al., 2016).

In this study, the mean PF ratio of 35 patients before intubation was 107.53 ± 40.90 . The mean PF ratio in patients who died was 99.84 ± 36.98 while the mean PF ratio in patients who did not die was 138.28 ± 44.10 . The PF ratio of patients who died was lower than that of those who did not. Therefore, it can be seen that statistically there is a significant difference in the PF ratio between patients who experience mortality and those who do not experience mortality.

The median SOFA score in patients who died was 6.0 (3.0 - 13.0) while the median SOFA score in patients who did not die was 3.0 (2.0 - 6.0). The median SOFA score in patients who died was higher than that of those who did not die. Therefore, it can be seen that there was a significant difference in SOFA scores between patients who experienced mortality and those who did not experience mortality, p value = 0.002 ($p < 0.05$). The group of patients who died had a higher SOFA score than the group of patients who survived, thus describing the condition of patients who had experienced Multiple Organ Dysfunction Syndrome at least 2 to 3 organ categories at the time of intubation and eventually died (Rawal et al., 2018).

TABLE 1: Relationship between PF Ratio and SOFA Score with Mortality.

Parameter	Mortality		P Value
	Yes (n=28)	No (n=7)	
PF Ratio	99,84±36,98	138,28±44,10	0,024
SOFA Score	6,0 (3,0-13,0)	3,0 (2,0-6,0)	0,002

In table 1, data with normal distribution are presented in the form of mean ± standard deviation, the test used is the t-independent test (t-independent test). Data that are not normally distributed are presented in the form of the median (minimum value-maximum value), the test used is the Mann-Whitney non-parametric test.

The effect of intubation time since being consulted on the mortality of Covid-19 patients

In this study, the data distribution was tested using the Kolmogorov Smirnov method, because the number of samples was more than 30.

The result was that the Time to Intubation variable had an abnormal data distribution (because the Sig value was less than 0.05). In the intubation time variable, the p-value found was 0.048 or smaller than 0.05 so that there was a significant effect between the intubation time variable and mortality.

TABLE 2: Mann Whitney Test Variable Intubation Time.

Mortality	N	Average Rank	Total Ranking	P value (CI 95%)
Not Died	7	14,14	113,00	
Die	28	18,46	517,00	
Total	35			0,048

Based on the Kaplan-Meier curve, the effect of referred intubation time on mortality was at a median of 8 hours (95% CI 5.66-10.33). This curve interprets as much as 50% of the subjects have died if the patient was intubated 8 hours after being consulted (Law et al., 2015). The increased mortality rate in patients who are not immediately intubated due to the combination of negative intrathoracic pressure (Overbeck, 2016) with increased pulmonary permeability occurs when the patient experiences respiratory distress and eventually interstitial lung edema occurs (Gattinoni et al., 2020).

The outcome of the June-August patient group showed that the mortality rate was reduced to 66%. Things like this can happen because at the beginning of the pandemic, from March to April, the diagnosis of COVID-19 was not what it is today (Natt et al., 2016).

On the one hand, the number of available intensive care facilities is considered to be far more adequate, especially at Dr. Soetomo Hospital.

The effect of intubation time since entering the ICU (ICU admission to intubation) on the mortality of covid-19 patients

From this study, 30 patients or 85% were previously intubated using HFNC (High Flow Nasal Canule) first, while the remaining 5 patients or 15% were directly intubated from non-rebreathing masks or Jackson rees. This was also seen in the study conducted by Hernandez et al where 72% required escalation from HFNC to mechanical ventilation. Then, on the intubation time variable, the p-value found was 0.036, smaller than 0.05 so that there was a significant effect between the time of intubation since entering the intensive room and mortality.

TABLE 3: Mann Whitney Test Variable Intubation Time.

Mortality	N	Average Rank	Total Ranking	P value (CI 95%)
Not Died	7	11,29	93,00	
Die	28	19,18	537,00	
Total	35			0,036

Based on the Kaplan Meier curve, the median patient mortality for all subjects was 6 hours (95% CI 3.09-8.90), meaning that 50% of the subjects died if the patient was intubated 6 hours after entering the intensive care unit. This is because the condition of the patient entering the intensive care unit is in a severe condition. This severe condition can be a respiratory distress condition with a decreased PF ratio, where the PF ratio of intubated patients in this study averaged 107.53 ± 40.90.

The mean from the time the patient entered intensive care until intubation was performed was 41.14 ± 7.24 hours. This shows that the patient after entering the intensive care room was given another oxygenation modality besides mechanical ventilation, namely High Flow Nasal

Canul. The HFNC modality can provide adequate oxygenation to the patient for almost 2 days because HFNC is able to reduce deadspace in the airway and also provides a positive pressure of 0.69 cm H2O when set to a flow of 10L/m.

CONCLUSION

From this study it can be concluded if a shorter decision to consult for intubation could affect mortality (p = 0.048, < 0.05) with a median of 8 hours. On the one hand, it also affects mortality while the patient is in the intensive care unit. Therefore, it can be concluded that there is a significant relationship between SOFA Score and PF ratio in intubation with mortality.

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