SURVIVAL ANALYSIS OF HEALTH RATE OF COVID-19 PATIENTS USING KAPLAN-MEIER METHOD AT ISLAMIC HOSPITAL IN SURABAYA A. YANI

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ABSTRACT

Corona Virus Disease2019 (COVID-19) is a disease that shocked the world at the end of 2019. Based on data, positive cases of Covid-19 in Indonesia on July 29, 2021 reached 3,331,206 people, with 3,240,654 Covid-19 patients recovering and 90,552 Covid-19 patients dying. Meanwhile in the city of Surabaya there were 52,782 confirmed cases with 50,894 patients recovered and 1,888 patients died. The high death rate shows that this virus is dangerous, but the cure rate is also high. A survival analysis is needed to determine the patient's survival time (cured) for Covid-19. This research was conducted non-reactively using secondary data in the form of medical records of Covid-19 patients at the Surabaya A. Yani Islamic Hospital in January-July 2021. The results of the study using the Kaplan-Meier method found that the survival time based on age was 12,423 days, the survival time based on gender was 12,078 days, the survival time based on Early Symptoms was 11,461 days and the survival time based on SpO_2 capacity was 16,787 days. The conclusions of this study indicate that, age affects the survival time of respondents where the 27-36 year interval has a better survival time than the other respondents' age intervals. The female sex has a better survival time than the male. Initial symptoms determine the severity and duration of recovery for respondents. SpO_2 capacity is directly proportional to the degree of patient safety, the higher the percentage of SpO_2 capacity, the greater the chance of survival and the lower the percentage of SpO_2 capacity, the lower the expectation.

Keywords: Covid-19, Survival Analysis, Kaplan-Meier

ABSTRAK

Corona Virus Disease 2019 (COVID-19) adalah penyakit yang menggemparkan dunia diakhir tahun 2019. Berdasarkan data, kasus positif Covid-19 di Indonesia pada tanggal 29 Juli 2021 mencapai 3.331.206 orang, dengan 3.240.654 pasien Covid-19 sembuh dan 90.552 pasien Covid-19 meninggal dunia. Sementara itu di Kota Surabaya terdapat 52.782 kasus konfirmasi dengan 50.894 pasien sembuh dan 1.888 pasien meninggal. Tingginya angka kematian tersebut menunjukkan bahwa virus ini berbahaya, namun angka kematian juga tinggi. Perlu dilakukan analisis survival untuk mengetahui waktu survival pasien (sembuh) Covid-19. Penelitian ini

dilakukan secara non-reaktif dengan menggunakan data sekunder berupa data rekam medis pasien Covid-19 RS Islam Surabaya A. Yani bulan Januari-Juli 2021. Hasil penelitian menggunakan metode Kaplan-Meier didapatkan waktu survival berdasarkan Usia selama 12,423 hari, waktu survival berdasarkan Gender 12,078 hari, waktu survival berdasarkan Gejala Awal 11.461 hari dan waktu survival berdasarkan Kapasitas SpO_2 selama 16.787 hari. Simpulan penelitian ini menunjukkan bahwa, Usia berpengaruh terhadap waktu survival responden dimana pada interval 27-36 tahun memiliki waktu survival lebih baik daripada interval usia responden lainnya. Jenis kelamin perempuan memiliki waktu survival lebih baik dibandingkan laki-laki. Gejala awal menentukan tingkat keparahan dan lama kematian bagi responden. Kapasitas SpO_2 berbanding lurus dengan derajat keselamatan pasien, semakin tinggi persen kapasitas SpO_2 semakin besar kemungkinan selamat dan semakin menurun persen kapasitas SpO_2 semakin kecil pula harapan.

Kata Kunci: Covid-19, Analisis Survival, Kaplan-Meier

INTRODUCTION

Corona Virus Disease 2019 (COVID-19) was a disease that took the world by storm at the end of 2019.Based on data, positive cases of Covid-19 in Indonesia on July 29, 2021 reached 3,331,206 people, with 3,240,654 Covid-19 patients recovering and 90,552 Covid-19 patients dying. Meanwhile in the city of Surabaya there were 52,782 confirmed cases with 50,894 patients recovered and 1,888 patients died. The high death rate shows that this virus is dangerous, but the death rate is also high. A survival analysis is needed to determine the patient's survival time (cured) for Covid-19.

Survival analysis is a collection of statistical procedures for analyzing data whose response variable is the time of occurrence of the event. Survival time can be measured in years, months, weeks, or days from the start of a person's follow-up until an event occurs. Events can be death, illness, recovery or any experience that may happen to a person. Survival time modelling consists of several methods, one of which is Kaplan-Meier. Kaplan-Meier method is a modification of the function that can be used to deal with incomplete data problems.

Kaplan Meier (1985) is very popular for survival analysis, especially when the sample size is small [1]. Based on previous research, survival analysis has been carried out on censored data using the Kaplan-Meier method and the Life-Table test to determine the risk factors that influence patient mortality. The results of his research using the Kaplan-Meier method compared to the Life Table method (time grouping) is that it can provide a definite proportion of survival because it uses the right survival time not based on interval class[2].

Medical record Surabaya A. Yani Islamic Hospital explains the increase in death cases in the January – July 2021 interval. The increase in the number of confirmed patients cured made researchers to conduct research at the Surabaya A Yani

Islamic Hospital. Based on the description of the background of the problem above, the researcher is interested in conducting a thesis research entitled "Survival Analysis of the Death Rate of COVID-19 Patients Using the Kaplan-Meier Method at the Surabaya A. Yani Islamic Hospital".

METHODS OF THE STUDY

This type of research is a quantitative non-reactive research which is included in the type of research for secondary data. Non-reactive research itself, namely research that does not require a response from the subject under study, and there is no interaction between the researcher and the research subject. The data used is secondary data from the medical records of A Yani Islamic Hospital in 2021. The data analysis method used is survival analysis and used SPSS software. This research is declared ethically feasible as stated in the "No.007.EC.KEP.RSIAY.02.22" on Surabaya Islamic Hospital A Yani.

RESULTS AND DISCUSSION

The results of the study are obtained in the following table.

Table 1. Result of the study

Category	Frequency	Percent
Mature	19	12.6
Pre elderly	69	45.7
seniors	63	41.7
Total	151	100
Man	74	49
Woman	77	51
Total	151	100
Severe Symptoms	13	8.6
Moderate Symptoms	20	13.2
Mild Symptoms	118	78.1
Total	151	100
Low SPO2	21	13.9
SPO2 Normal	130	86.1
Total	151	100

Source: Medical Record Data of Surabaya Islamic Hospital A Yani

Table 1 shows that from 151 respondents at the Islamic Hospital Surabaya A. Yani, more than 1,500 respondents were mostly in the Pre-elderly category (45.7%) and the lowest category was Adult (12.6%). In the gender category, there were 77 (51%) female respondents and 74 (49%) male respondents. In the early symptom category, most of the respondents had mild initial symptoms (78.1%) and the lowest category was severe early symptoms (8.6%). In the SpO2 category, almost all respondents had a normal SpO2 capacity (86.9%) and the rest had a low SpO2 capacity (13.1%). In Table 2 shows the average survival time of 13.311 days. The best survival time was in the adult category with an average survival time of 17,009 days and an average median of 17,228 days. The survival time in the population shows that the adult category has the best survival time among other age categories.

Table 2. Survival Time (Survival) Based on Age

Category	mean			median		
		95% Confidence Interval			95% Confidence Interval	
	Estimate	Lower Bound	Upper Bound	Estimate	Lower Bound	Upper Bound
Mature	17.009	9.932	24,086	13,000	8,772	17,228
Pre elderly	12,387	10.393	14,381	13,000	10,883	15.117
Seniors	10,538	8.198	12.878	10,000	6,001	13,999
Total	13.311	10,522	14,210	11,000	9.151	12.849

Source: survival analysis of medical record data for Covid-19 patients at A Yani Islamic Hospital Surabaya, January-October 2021

The adult category has a survival time of 1.64 times better than the elderly category and 1.4 times better than the Pre-elderly category. In a study conducted by Audina et al. states that patients with an age interval of 40-49 years have a faster chance of recovering than other age intervals.(3) According to Aritonang et al. for the young age group and have a good immune system, this disease can be cured only by self-isolation.(4)

According to Multazamiyah et al. Those aged 60 years and under have a better chance of surviving or recovering from COVID-19 than patients over the age of 60.(5) Reinforced by research conducted by Fitriani Clinical severity is also associated with mortality in patients over 70 years of age (elderly).(6)(7).

Table 3. Survival Time (Survival) by Gender

Gender	mean			median	
	Estimate	95% Confidence Rate		95% Confidence Rate	
		Lowest Score	Highest Score	Lowest Score	Highest Score
Man	12.074	10,074	14,074	9.098	14,902
Woman	12.081	9.599	14,564	9.549	12,451
Total	12,078	10,522	14.21	9.151	12.849

Source: Survival analysis of medical record data for Covid-19 patients at A Yani Islamic Hospital Surabaya, January-October 2021

Table 3 shows the average survival time for men, which is 12,074, while the average time for women is 12,081. The female survival time is better than the male survival time. The survival time for men in the lowest population is 10,074 while the highest is 14,074, compared to the survival time for women in the lowest population, which is 9.544 while the highest is 14,599. The median survival time for males is also better than the median survival time for females, where the lowest median for males is 9.098 and females are 9.549, while the highest median survival time for males is 14,902 and females is 12,451.

Other research conducted by Hariadi stated that female patients had a faster chance of survival/chance to recover from Covid-19 than male patients.(8)(9) Research conducted by Salinas-Escudero et al. it was

found that male sex, older age, patients with comorbid chronic kidney disease, and patients undergoing inpatient services at the hospital had lower survival and became the dominant factor causing higher mortality.(10)

Research conducted by Mi et al. found that men showed more deaths than women.(11) According to Simatupang and Arcana male gender and have a history of comorbidities achieve a risk of death more than 2 times compared to female patients or have no history of comorbidities.(12)(13) According to God Women are more protected from Covid-19 than men.(15) This is because women have an X chromosome and sex hormones such as progesterone play an important role in innate and adaptive immunity.

Table 4. Respondents Survival Time Based on Initial Symptoms

Early Symptoms	mean			median	
	Estimate	95% confidence level		95% confidence level	
		Lowest number	Highest number	Lowest number	Highest number
Heavy	9,308	6.101	12,515	3.983	16,017
Currently	12,508	4.977	20,039	0	20.97
Light	12,569	10,902	14,237	9.876	14,124
Total	11,461	10,522	14.21	9.151	12.849

Source: Survival analysis of medical record data for Covid-19 patients at A Yani Islamic Hospital Surabaya, January-October 2021

Table 4 shows the mean survival time of initial symptoms was 11.461 days. The survival time for mild symptoms is the best survival time compared to the survival time for moderate and severe symptoms. The average and median survival times for mild symptoms in the population were the lowest 10,902 and 9,876, and the highest were 14,237 and 14,124. The average and median survival times for moderate symptoms in the population were 4.977 and 0, and the highest was 20.039 and 20.97. The mean and median survival times for severe symptoms in the population were the lowest 6.101 and 3.983, and the highest were 12,515 and 16,017.

In line with research Simatupang and Arcana Patients who have symptoms of shortness of breath and high severity reach a risk of death more than 4 times compared to those who do not have symptoms of shortness of breath or low severity.(12) Li et al. stated that fatigue, expectoration and nasal congestion were identified as prognostic symptoms of COVID-19 patients from multivariate analysis.(17) Fever occurred in 603/655 (92.1%) patients but was not associated with disease severity. Fatigue accounted for 28.1% of the patients and was linearly related to the severity of infection with statistical significance.(18)(19).

Table 5. Survival Time (Survival) Based on Respondents' SPO2 Capacity

SPO2 Kapasitas Capacity	mean			median	
	Estimate	95% Confidence Interval		95% Confidence Interval	
		Lowest number	Highest number	Lower Bound	Upper Bound
Mature	17.009	9.932	24,086	8,772	17,228
Pre elderly	12,387	10.393	14,381	10,883	15.117
Seniors	10,538	8.198	12.878	6,001	13,999
Total	13.311	10,522	14,210	9.151	12.849

Source: Survival analysis of medical record data for Covid-19 patients at A Yani Islamic Hospital Surabaya, January-October 2021

Table 5 shows the average survival time of capacitySPO2is 16.787 days. Capacity survival time Normal SPO2 is the best survival time compared to the capacity survival time SPO 2low. Mean survival time and median capacity SPO2normal in the population, the lowest were 19.949 and 0, and the highest were 23.956 and 0. The mean survival time and median capacity SPO2 low in the population, the lowest were 9.881 and 9.466, and the highest were 13.362 and 12.534. The main causes of death from COVID-19 are respiratory failure and multiple organ dysfunction syndrome. Respiratory failure, acute respiratory distress syndrome and septic shock are the most common serious complications. SpO2 capacity has a direct effect on patient mortality.

If the SpO2 capacity continues to decrease, it will be fatal.(20) According to Xie et al. stated that patients with SpO2 values less than 90% had a very high risk of death, while patients with SpO2 values more than 90% had a higher chance of survival.(21) Guihur et al. stated that death in COVID-19 patients was largely due to acute respiratory distress syndrome (ARDS), in which the alveolar cells of the lungs undergo programmed cell death.(22) In the most severe cases, the disease progresses to acute respiratory distress syndrome (ARDS), which is one of the top three complications after sepsis, leading to respiratory failure and death. ARDS occurs when protein-rich inflammatory edema fluid accumulates in the alveolar spaces as a result of lung damage, leading to non-cardiogenic pulmonary edema and decreased arterial oxygenation requiring mechanical ventilation. This incident resulted in the effect of oxygen content in accelerating the process of death of Covid-19 sufferers.

CONCLUSION

Based on the research on survival analysis of the death rate of Covid-19 patients using the Kaplan-Meier method at the Surabaya A. Yani Islamic Hospital that has been carried out, the following conclusions can be drawn:

1. Age affects the respondent's survival time where the adult category has a survival time of 1.64 times better than the elderly and 1.4 times better than the pre-elderly.

2. Gender affects the survival time of Covid-19 patients, in which case the female survival time is better than the male survival time.

3. Initial symptoms affect the survival time of Covid-19 patients, the more severe the symptoms, the less survival time and the lighter the patient's symptoms, the longer the patient's survival time.

4. SpO2 capacity is directly proportional to the degree of patient safety, the higher the percentage of SpO2 capacity, the greater the chance of survival and the lower the percentage of SpO2 capacity, the smaller the respondent's life expectancy.

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