

# Correlation Between Mortality Risk Factor and Death Rate of Icu Patient in H. Adam Malik Hospital in 2021

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## Abstract:-

**Introduction:**The Intensive Care Unit (ICU) is a special unit for treating life-threatening patients, follow-up, and life support are maintained. Patients taken care of in the emergency department ICU (EDICU) had a higher death rate of 75.4% than in the general ICU of 20.4% ( $P < 0.001$ ). ICU mortality had no significant difference ( $P = 0.54$ ) between women (24.4%) and men (21.1%). However, women have a 30 day mortality rate that is higher than men (44.9% vs. 30.5%;  $P = 0.02$ ). The mortality rates of patients in the ICU have been reported to vary in the literature study, between 20.5% and 43%, with the most common cause of death are sepsis, cardiac and pulmonary arrest, pneumonia, and arrhythmias.

**Methods:** This research is analytical in nature with retrospective research methods with secondary data sources obtained from ICU medical records at the HAM Hospital for the period January 2021 - September 2021

**Results:**In the relationship between gender and the mortality of patients in the ICU from 100 patients studied, 13 female patients and 22 male patients died less than 48 hours, and patients who died in more than 48 hours consisted of 29 women and 36 males ( $p: 0.470$ ). The relationship between causal diagnosis and mortality rate from 100 patients in the ICU was found that metabolic causes were the most common diagnosis, namely 12 people who died more than equal to 48 hours and 11 people who died less than 48 hours. Diagnosis of neurological causes was in second place, namely 17 people who died more than 48 hours and 6 people who died less than 48 hours. The lowest causal diagnosis was hematologic origin with a total of 1 person who died more than equal to 48 hours ( $p: 0.426$ ).

**Conclusion:**Based on the results, there are no variables that have a significant effect because all variables have a p-value of more than alpha (0.05). However, if we look at the p-value, the order of variables that are close to significant are APACHE scores, anemia, platelets, SOFA scores, delay in ICU admission, blood glucose levels, body mass index, and finally age.

## I. INTRODUCTION

Special care units called the intensive care unit (ICU), are places for patients got taken care of life-threatening health problems and are treated and followed up, also can be used for maintenance of life functions. Despite medical advances in patient management, ICU mortality remains high with great variation according to the variety of cases and patient care. Mortality is the main end point in epidemiological studies and interventions in the ICU. However, causes of death are not well reported (1).

Emergency department ICU (EDICU) had a higher mortality rate (75.4%) compared to the general ICU (20.4%) ( $P < 0.001$ ) (Aslaner et al., 2015). Analysis of patients based on the total of 28 days of admission was held in 7.265 patients over 65 years old patients (45,7%) as a representative sample, 26% of the total were found die within 28 days. 1.357 patients died between 28 days and 1 year was found from 5,367 patients who survived to 28 days of admission. The elderly should be considered as a significant independent risk factor for mortality caused in the ICU, especially those over 75 years old (2). Based on gender, there were no significant differences in ICU mortality between women (24.4%) and men (21.1%) ( $P = 0.54$ ), however, in 30-day mortality, there were significantly higher in women than men 44.9% vs. 30.5%;  $P = 0.02$ ) (3).

In Indonesia, there have been several reports of mortality in the ICU of Dr. Kariadi general hospital, Semarang, in the period from July to December 2014 obtained data on the number of patient deaths were 81 (17%) people out of a total of 493 patients (Suryadilaga et al., 2015). Research at the ICU Sanglah Hospital, Denpasar, in the period January - December 2015 found from 1,531 ICU patients, 24.8% (379/1531) patients died and 75.2% (1152/1531) were discharged alive. One hospital in West Java in May-August 2019 reported there were 117 patients of which 35 patients (29.91%) died and 82 patients lived (4).

Factors leading to death may differ according to the time elapsed since initial ICU admission. Early death following cardiac arrest may result from refractory shock and intractable multi-organ failure, whereas post-anoxic encephalopathy is responsible for further death. Changes in cause of death were also found in septic shock patients. Death due to multiorgan failure is found in the early phase of sepsis followed by mesenteric ischemia and unsuccessful CPR. Late-phase causes of death may be related to the decision to

end life, ICU-acquired infection, or health care-related complications (5,6).

## II. METHOD

### ➤ Research Design and Sample

This study is an analytical research with retrospective research method. The secondary data sources were obtained from the medical records at H. Adam Malik (HAM) Hospital ICU for the period January 2021 – September 2021. The sample used for this study came from the medical records at HAM Hospital ICU and has met the criteria of inclusion and exclusion. The inclusion criteria used, namely (1) ICU patients who died in the ICU at HAM Hospital, (2) Patients with complete data that can be retrieved in the medical record section, and (3) Non-isolated adult ICU patients at HAM Hospital. The number of research subjects was calculated using the sample size formula and used as the minimum number of samples studied. The variables studied in this study were demographic sample (age, gender, body mass index), late ICU admission, APACHE II score, SOFA score, diagnosis of ICU admission, anemia, platelet count, blood glucose level and arterial blood gas test.

### ➤ Research Flow

Researchers collected data at the installation of medical records at the HAM General Hospital. The data taken when patient admitted to ICU, in the form of patient data includes name, gender, age, medical record number, address, religion, occupation, marital status, height, weight, ICU admission assessment, and results of laboratory examinations. The obtained data was only taken once when patients admitted to the ICU. The obtained result will be recorded on the data collection sheet. After the data is collected, the researchers then perform data processing and analysis.

The collected data are primary data, will be analyzed and presented as statistical analysis using Statistical Product and Science Service (SPSS). The processes carried out include editing, coding, entry, cleaning, and saving. The Kolmogorov-Smirnov test was used to analyze demographic data. Chi-Square analysis was used for categorical data while the T-test or Mann Whitney test was used for numerical data. The ANOVA test was performed to assess the comparison of risk factors with mortality among variables. Data were analyzed statistically by using SPSS for Windows version 22.0.  $P < 0.05$  was considered statistically significant.

## III. RESULTS

The total sample included 100 people, selected through consecutive sampling, i.e., all patients who died in the ICU at HAM general hospital during the period January 2021 – September 2021, from medical records as a source of secondary data that met the exclusion and inclusion criteria of the study.

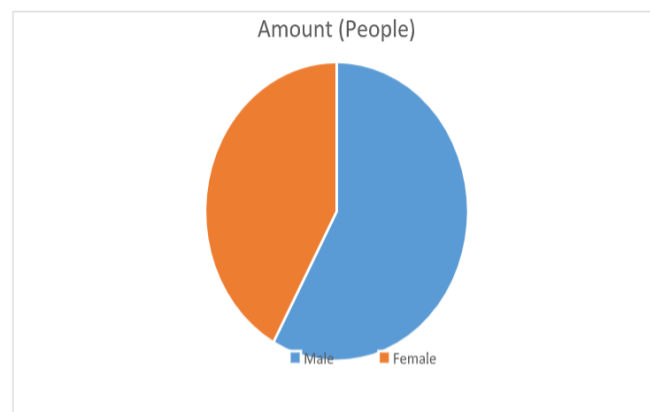


Fig 1 Characteristics of samples by gender

The majority of patients selected were 58% male and 42% female.

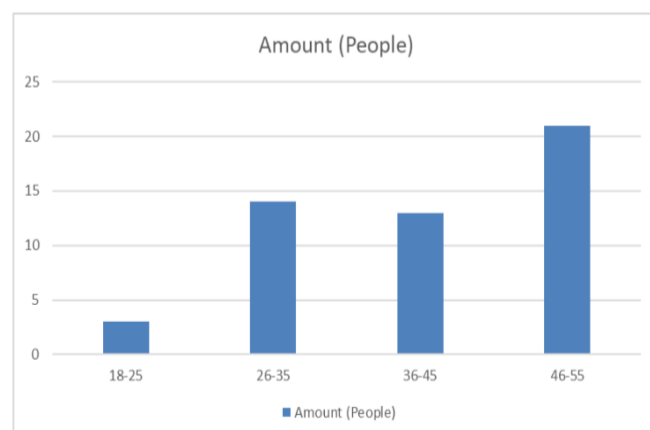


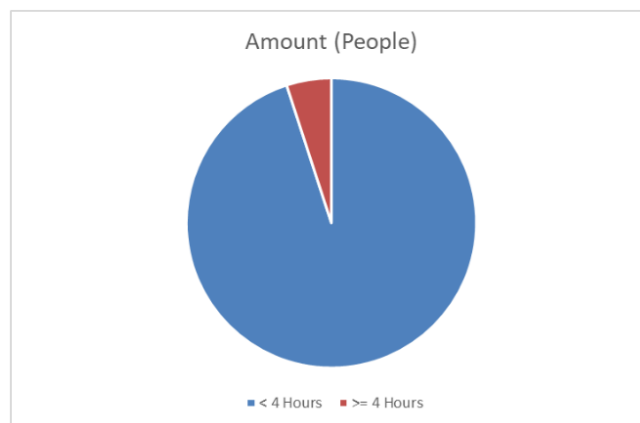
Fig 2 Sample characteristics by age

The research sample was aged from 23 years to 92 years with an average of 52.38 years, which were grouped into 6 groups, where the largest group was the 46-55 year age group (21%) while the least group was the 18-25 age group. years (3%).

**Table 1** Sample characteristics based on BMI

Category	Jumlah (Orang)	Persentasi (%)
Normal Body Weight	32	32
Normal	60	60
Overweight	1	1
Obesity	7	7

The study sample had a BMI from 12 to 29 kg/m<sup>2</sup> with an average of 19.46 kg/m<sup>2</sup>, which were grouped into 4 groups, where the largest group was the normal group (60%) while the least group was the overweight group (1%).



**Fig 3** Sample characteristics based on late ICU admission

The study sample had a delay in ICU admission from 1 hour to 454 hours with an average of 60.27 hours, which were grouped into 2 groups, where the group with the most was < 4 hours (95%).

**Table 2** Characteristics of the sample based on the main diagnosis

	Main Diagnosis								Total
	Cardio	Respi	Neuro	Metabolic	Gastro	Hemato	Sepsis	Post Op	
<b>Total</b>	5	18	23	23	10	1	2	18	100

The study sample consisted of 100 patients who died with the highest diagnosis of the first and second being metabolic, namely 23 (23%) people and the diagnosis of neurological causes as many as 23 (23%) people. While the lowest causal diagnosis was hematology with a total of 1 (1%) people.

The study sample had platelet levels from 41,000 to 542,000/ $\mu$ l with an average of 225,140/ $\mu$ l, which were grouped into 2 groups, where the group was more normal (81%).

**Table 3** Sample characteristics based on anemia

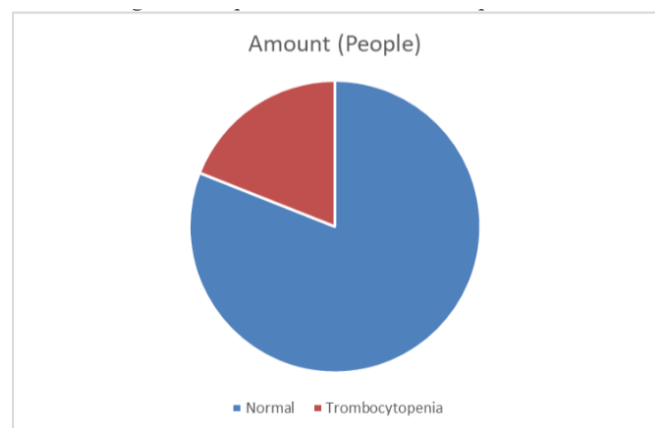
	Amount (People)	Percentage (%)
<b>Normal</b>	24	24
<b>Anemia</b>	76	76

The study sample had hemoglobin levels from 5.4 g/dL to 19.4 g/dL with an average of 10.74 g/dL, which were grouped into 2 groups, where the group with the highest percentage was anemia (76%).

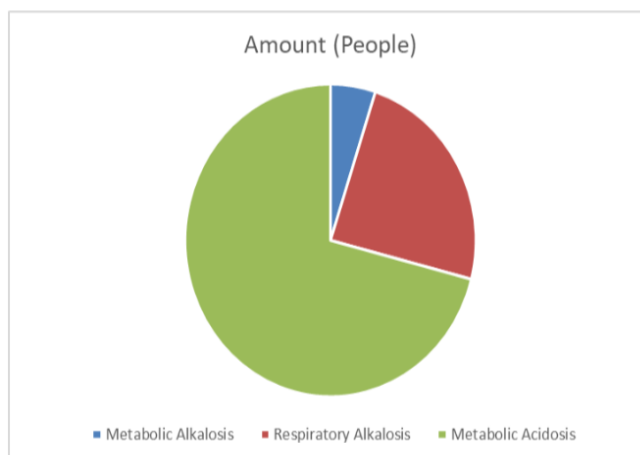
**Table 4** Characteristics of samples based on blod glucose

Category	Amount (People)	Percentage (%)
<b>Normal</b>	64	64
<b>Prediabetes</b>	20	20
<b>Diabetes</b>	16	16

The study sample had blood glucose from 50 to 703 mg/dL with an average of 148.68 mg/dL, which were grouped into 3 groups, where the largest group was the normal group (64%) while the least group was the diabetes group (16%).



**Fig 4** Sample characteristics based on platelets



**Fig 5** Sample characteristics based on ABG

The study sample was measured by Blood Gas Analysis (ABG), which was grouped into 4 groups, from 100 patients who died, it was known that there were 5 people who had a history of metabolic alkalosis, 24 people who had a history of respiratory alkalosis, 71 people who died had a history of metabolic acidosis.

**Table 5** Sample characteristics based on APACHE scores

Category	Amount (People)	Percentage (%)
0-4	1	1
5-9	1	1
10-14	6	6
15-19	28	28
20-24	9	9
25-29	13	13

The research sample had APACHE scores from 9 to 71 with an average of 33.01, which were grouped into 6 groups, where the largest group was the APACHE score group of 15-19 (28%) while the least group was the APACHE score group 0-4. (1%) and 5-9 (1%).

**Table 6** Characteristics of the sample based on SOFA scores

Category	Amount (People)	Percentage (%)
0-1	0	0
>=2	100	100

The study sample had SOFA scores from 7 to 13 with a mean of 11.26, which were grouped into 2 groups, where all samples belonged to the SOFA score group >=2 (100%).

**Table 7** Sample characteristic data

Characteristics	Amount (People)	Min	Max	Average	Variance
Age	100	23	92	52.38	231.268
BMI	100	12	29	19.46	8.726
Lateness	100	1	454	60.27	5805.755
APACHE Score	100	9	71	33.01	190.252
SOFA Score	100	7	13	11.26	1.790
Anemia	100	5.40	19.40	10.7460	9.634
Thrombocyte	100	41	542	225.14	12810.653
Blood Glucose	100	50	703	148.68	10028.563

Based on age characteristics data, it is found the oldest patient in the total sample is 92 years old while 23 years old is found as the youngest. The average patient is 53 years old with a variance or diversity is 231,268. To analyze the relationship of risk factors for caused mortality in ICU HAM general hospital, the data were processed using the help of IBM SPSS Statistics 22 software. The test aims to investigate if there is a correlation between independent variables. Therefore, the Chi-Square independence test was used for nominal or ordinal qualitative data, while the binary logistic regression test was used for numerical data.

**Table 8** Gender independence test with mortality

		Gender		Total	P
		Female	Male		
Death	< 48 Hours	13	22	35	0,470
	>= 48 Hours	29	36	65	
<b>Total</b>		42	58	100	

Table 8 above provides information that from 100 patients, 13 women and 22 men died in less than 48 hours. People who died more than 48 hours consisted of 29 women and 36 men. Analysis of the correlation between gender and mortality in patients in the ICU of HAM general hospital showed that there was no significant relationship.

**Table 9** Independent testing of causal diagnosis with mortality

		Cause Diagnosis								Total	p	
		Cardio	Respi	Neuro	Metabolic	gastro	Hematoma	Sepsis	Post Op			
Death	< 48 Hours	2	7	6	11			5	0	1	3	0.426
	>= 48 hours	3	11	17	12			5	1	1	15	
<b>Total</b>		5	18	23	23			10	1	2	18	

Table 9 above provides information that of the 100 patients who died, the highest diagnosis was metabolic, i.e., 12 people who died more than equal to 48 hours and 11 people who died less than 48 hours. Diagnosis of neurological causes was in second place, namely 17 people who died more than 48 hours and 6 people who died less than 48 hours. While

the lowest causal diagnosis was hematology with a total of one person who died more than equal to 48 hours. Analysis of the correlation between the cause of death and mortality rate in patients in the ICU of HAM general hospital indicated no significant relationship between the cause of death and mortality rate.

**Table 10** Independent trial on AGDA with mortality

		Metabolic Alkalosis	Respiratory Alkalosis	Metabolic Acidosis	Total	p
Death < 48 jam		2	8	25	35	0,958
Death >= 48 jam		3	16	46	65	
<b>Total</b>		5	24	71	100	

Table 10 Analysis of the correlation between arterial blood gas test and mortality rate in patients in the ICU of HAM general hospital showed that there was no significant correlation between arterial blood gas test and mortality death.

**Table 11** Analysis of the results of the binary logistic regression test

Characteristics	Beta	Standard Error	Wald Test	df	p
<b>Age</b>	.001	.015	.002	1	<b>.969</b>
<b>BMI</b>	.019	.074	.065	1	<b>.799</b>
<b>Lateness</b>	.002	.004	.225	1	<b>.635</b>
<b>APACHE Score</b>	.030	.019	2.514	1	<b>.113</b>
<b>SOFA Score</b>	- .100	.178	.317	1	<b>.573</b>
<b>Anemia</b>	- .090	.083	1.155	1	<b>.283</b>
<b>Thrombocyte</b>	.002	.002	.605	1	<b>.437</b>
<b>Blood Glucose</b>	.001	.003	.160	1	<b>.689</b>

Based on the table above, there are no variables that have a significant effect because all variables have a p-value of more than alpha (0.05). However, if we look at the p-value, the order of variables that are close to significant is the APACHE Score, Anemia, Platelets, Sofa Score (Delay in ICU admission, Blood Glucose Levels, Body Mass Index and Age.

#### IV. DISCUSSION

The results of the study according to demographic data showed that the gender variable obtained insignificant results between the mortality rate of male and female patients treated in the ICU of HAM general hospital for the period January 2021 - September 2021. Research conducted by Mahmood et al in 2012 reported similar results in the group of patients aged >50 years, i.e., there is no significant difference of mortality rate for sex differences in the ICU (7). Parallel to the study, the study by Holinger et al. in 2019 reported that there is no significant difference between mortality rates at one year with 28 days after ICU treatment between men and women (8).

In the causal diagnosis variable with mortality, the most diagnoses that died less than 48 hours and more than equal to 48 hours were metabolic, followed by neurology in the second position. While the lowest causal diagnosis was hematology with a total of 1 person who died more than equal to 48 hours. Analysis of the relationship between the cause of death and mortality rate in patients in the ICU of HAM

general hospital showed that there was no significant correlation between the cause of death and mortality rate.

Based on the data obtained, the oldest patient from the total sample is 92 years and 23 years is the youngest. The average is 53 years with a variance or diversity of 231,268. The results of the binary logistic regression test showed that age has no significant effect on mortality rate. This result was different from other research conducted by Peigne et al. in 2016 which showed the age of admitted patients to the ICU had an insignificant effect on the mortality rate. This was due to a decrease in the efficiency of resuscitation therapy carried out in elderly patients, but has not been clearly proven because many elderly patients request to do not resuscitate (DNR) hence will affect the success rate of resuscitation therapy given (9).

A study by Chen et al. in 2014 showed similar results, namely, age was insignificantly associated with mortality rates in admitted patients to the ICU with sepsis even though older patients had worse outcomes than younger patients (10). Several factors are the increase in life expectancy and the possibility of bias. The life expectancy of elderly patients is currently increasing in the last decade. Life expectancy was found lower in elderly patients who were admitted to the ICU 20 years ago than in today's patients, so it may affect the outcome of this study. In addition to life expectancy, the possibility of bias can occur because there are fewer elderly patients than younger patients who are critically ill (11) and less intensive therapy (12). However, data showing the intensity of therapy in elderly patients treated in the ICU are still inadequate, thus requiring further research.

One indicator that can play a role in patient recovery is the ICU admission time required for the critical-ill patients. However, in this study, it was found that late ICU admission did not significantly affect patient mortality. This result is supported by Erkuran et al in 2014 who found that there were no significant differences between survivors and nonsurvivors upon waiting time for ICU admission. It was also found that the number of queues of patients waiting to enter the ICU has increased on weekends, so that faster treatment is needed on weekends to avoid patients dying before getting intensive care (13).

A study conducted by Restrepo et al. in 2010 obtained different results from this study, i.e., the delay in ICU admission for patients with pneumonia was associated with increased mortality. The reason for the higher mortality rate is that pneumonia is the most common cause of sepsis which requires immediate intensive treatment (14). Hence, despite this study indicating that late admission to the ICU does not affect patient mortality, as a doctor, the time taken for patient

care is necessary to get attention, because the faster the patient's handling time, the lower the patient's mortality rate. It is also necessary to take into account the results of other studies and the possible bias of the conducted research.

The APACHE II scoring system have an excellent ability to predict outcomes for patients in ICU. This scoring system is developing rapidly and is widely used in patients in the ICU in various countries, especially developed countries. In this study, the average APACHE II score was 33 with the highest score being 77 and the lowest score being 9. APACHE score found, using the binary logistic regression analysis method, had no significant effect on the mortality rate of admitted patients to the ICU. This result was found to contradict with a study by Bahtouee that reported APACHE II scores to have a significant association with mortality rate. Patients with score less than 15 (80%) has survived and only 16% of patients survive with score more than 15. In addition, it is also found a significant correlation in the average APACHE II score and mortality rate between patients treated in the medical ICU and surgical ICU. The prognosis of patients admitted to the medical ICU patients is worse than the surgical ICU patients due to old age and chronic diseases suffered by admitted patients to the medical ICU (15).

Different results were also reported by Naved *et al.* who examined the correlation between APACHE II scores with mortality rate and period of stay in the ICU. Patients with APACHE II scores between 3 and 10, were found 90% of patients have discharged and 10% of patients had died, while APACHE II scores between 31 and 40 were found 84.6% of patients died (16).

The Sepsis-3 consensus recommends The Sequential (sepsis-related) Organ Failure Assessment (SOFA) to identify organ dysfunction in suspected critically ill patients having an infection. SOFA assessment component includes six main organ systems, namely respiratory, renal, hepatic, haematological, central nervous system, and cardiovascular (18). The increase of total score of SOFA representing the condition of the organ dysfunction.

The condition of organ dysfunction is represented by an increase in the total score of SOFA score 2 (19). This study found that SOFA score had no significant correlation on the mortality of admitted patient to the ICU. A study from Fuchs is contradicting this result which showed that a high SOFA score was correlated with poor outcomes in patients admitted to the ICU, both operative and non-operative patients due to severe organ dysfunction (20).

## V. CONCLUSION

1. There is no significant correlation between demographic factors and the mortality rate of patients in the ICU of HAM general hospital, in this study these variables of age, gender, body mass index, and delay in ICU admission, and admission diagnosis were found.
2. There is no significant correlation between laboratory values and the mortality rate of patients in the ICU of HAM general hospital. In this study, these variables were

anemia, platelets, blood glucose levels, and arterial blood gas analysis.

3. There is no significant correlation between APACHE II scores and SOFA scores with the mortality rate of patients in the ICU of HAM general hospital.

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