Relationship of Albumin Levels, Comorbidity and Vaccination History with Mortality Of COVID-19 Patients in RSUP. H. Adam Malik Medan

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Abstract

COVID-19 is a type of infectious disease caused by the SARS-CoV-2 virus. According to the results of previous studies, the risk factors for mortality in COVID-19 patients are often found in patients with low albumin levels, patients who have a history of comorbidities and patients who are not vaccinated. This study aims to determine the relationship between albumin levels, comorbidities and vaccination history with the mortality of COVID-19 patients in RSUP. H. Adam Malik Medan. This study used analytic observational with a cross-sectional approach carried out from June 2022-December 2020. Sample data were obtained from RSUP medical records. H. Adam Malik as many as 110 people. Sample data were analyzed using the Chi-Square statistical test. Subjects were male (53.64%), most subjects were ≥ 50 years old (80.91%), moderate subjects (55.45%), severe severity (24.55%) and critical severity (20%). The Chi-Square test showed that there was a significant relationship between albumin levels and mortality (0.003 <0.05). There is no significant relationship between co-morbidities and mortality (0.141 > 0.05). There is a significant relationship between vaccination history and mortality (0.002 <0.05). There is a significant relationship between albumin levels and vaccination history with the mortality of COVID-19 patients in RSUP. H. Adam Malk Medan. Meanwhile, there was no significant relationship between comorbidities and mortality in COVID-19 patients at RSUP. H. Adam Malik Medan. Further research is needed to assess the factors that predict mortality in COVID-19 patients.

Keywords: Albumin, Comorbidities, Mortality, Vaccination

INTRODUCTION

COVID-19 (*Corona Virus Disease* 2019) is a type of infectious disease caused by the *Severe Acute Respiratory Syndrome Coronavirus* (SARS CoV-2) virus. Coronavirus can infect birds and mammals, including humans. Human-to-human transmission is the cause of increasing incidents (Guan et al., 2020). Commonsymptoms of COVID-19 patients are fever, cough, shortness of breath to chest pain.The first positive case of COVID-19 appeared in the city of Wuhan, China, in late December 2019. In a short time, the number of COVID-19 cases took place quickly and spread to various countries. OnMarch 11, 2020, WHO designated COVID-19 as a global pandemic. Indonesia reported its first positive case of COVID-19 on March 2, 2020. Cases are increasing and spreading rapidly throughout Indonesia. On July 9, 2020, the Ministry of Health reported 70.736 confirmed cases of COVID-19 with 3,417 cases of death (CFR 4.8%) (Ministry of Health, 2020).

The number of positive cases of COVID-19 throughout North Sumatra Province has reached 164.427 people. Then 3.397 people died from the corona virus, 174 were active

positive or were still sick, and 160.856 people were declared cured (Dinas Kesehatan Provinsi Sumatera Utara, 2023).

COVID-19 positive patients have different time phases to recover. There are a number of patients who test negative after 14 days of treatment, 28 days of treatment, even months. One factor for the length of the healing phase is the severity of the patient such as asymptomatic; mild or uncomplicated; moderate or moderate; severe or severe pneumonia; and critical. Patients with mild symptoms reportedly recovered after 1 week. In severe cases, they will experience *Acute Respiratory Distress Syndrome* (ARDS), sepsis and septic shock, multiorgan failure, including kidney failure or acute heart failure to result in death (Burhan et al., 2022).

Hypoalbuminemia is predicted to be a prognostic factor in severe COVID-19 cases. From several findings, previous researchers reported that low albumin levels are a risk factor for mortality in sepsis patients. COVID-19 is an infection that causes inflammation and can reduce albumin levels (Sun et al., 2015). The results of a study Hakim (2022) on the relationship between albumin levels and the severity of COVID-19 disease showed that the average albumin levels of patients with severe severity was 2.86 g/dL while in patients with critical severity with a lower average albumin of 2.08 g/ L. There was a significant relationship between albumin levels and the severity of COVID-19 disease (p < 0.001).

Research Huang et al., (2020), reported lower albumin levels in COVID-19 patients who had poor outcomes than COVID-19 survivors. A systematic review of 6,200 patients from 19 studies found that hypoalbuminemia increased risko mortality (OR:6,26:95% IC:3.26-12.04, p<0.001) and disease severity (OR 7,32:95% IC:3.94-13.59; p<0.001). In addition, hypoalbuminemia is also associated with poor clinical outcomes, namely 70% in the hypoalbuminemia group and 24% in the normal albumin group (Soetedjo et al., 2021).

COVID-19 patients with comorbidities have a higher mortality rate compared to patients without comorbidities (Parveen et al., 2020). This is supported by research that shows 88% of deaths in SARS-CoV-2 positive patients are caused by a history of comorbidities (Grippo et al., 2019). The comorbidities identified associated with COVID-19 are chronic kidney disease, cancer, chronic obstructive pulmonary disease, serious heart conditions, obesity and type 2 diabetes mellitus (Wang et al., 2020). The most common comorbid diseases found in COVID-19 patients are diabetes mellitus, hypertension, and obesity (Sanyaolu et al., 2020). The prevalence of COVID-19 patients with diabetes mellitus reached 41.7%, hypertension reached 56.6%, and obesity reached 41.7% (Caci et al., 2020).

Patients confirmed positive for COVID-19 with comorbidities are a vulnerable group. Comorbidities are the cause of most deaths of COVID-19 patients in East Java, Central Java and South Sulawesi. East Java Province, as many as 95% of COVID-19 positive patients died due to comorbidities. Types of congenital diseases include lung and heart diseases. From South Sulawei, the number of comorbid death cases is almost 97% (Ministry of Health, 2020). Comorbidities are one of the factors that can cause the severity and worsening of the condition in patients infected with COVID-19 even to the point of death (Hasanah, 2021).

Vaccination is the most effective and efficient public health effort in preventing several dangerous infectious diseases. History has recorded the great role of vaccination in saving the world community from illness, disability and even death due to diseases that can be prevented by vaccination (Ministry of Health RI, 2021).

According to the COVID-19 Task Force, the vaccination program is considered the key to ending the pandemic because it can be used to reduce morbidity and mortality rates and form herd immunity against the COVID-19 virus. COVID-19 vaccines are effective and essential for controlling the pandemic; however, no vaccine is 100% effective at preventing disease. Some fully vaccinated people will get sick, and some will even be hospitalized or die from COVID-19. However, there is evidence that vaccination can make illness milder for those who are vaccinated and still sick. The risk of infection, hospitalization, and death are all significantly lower in vaccinated people compared to unvaccinated ones (CDC, 2021).

METHODS

This type of research is observational analytic using a *cross sectional* approach. The study was located at H. Adam Malik Central General Hospital Medan.

The study took place from February 2022 – December 2022. This study was conducted on 150 COVID-19 patients hospitalized at RSUP H. Adam Malik Medan from June 2021 - December 2021.

The sampling technique in this study is Purposive sampling. Purposive sampling is a sampling technique with certain considerations (Sugiyono, 2019). The number of samples was 110 patients using *the Slovin formula.* Sample data collection is obtained from the results of medical records.

The study sample was all COVID-patients who met inclusion and exclusion criteria. Inclusion criteria are patients over 17 years old with positive RT-PCR test results. Exclusion Criteria are Patients with incomplete medical records; Pregnant women; Nursing mothers.

The variables in this study were albumin levels, vaccination history, comorbidities and mortality of COVID-19 patients. Data analysis in this study with univariately and bivariately analysis using Statistical Program for Social Science (SPSS) software version 26. Univariate analysis is used to analyze and determine the distribution and frequency of each variable and bivariate analysis using the chi-square test with a confidence level of 95%. The decision taken from this analysis test is by looking at the value of p <0.05 to see a significant relationship between two variables, namely the independent variable against the dependent variable.

RESULTS

Subject Characteristics

The characteristics of the subject are based on gender, age and degree of severity. Of the total 110 subjects, 59 people (53.64%) were male and 51 people (46.36%) were female. Thesubjects ranged from 20-79 years with mean ages of 52.44 ± 13.53 years.The age of the subjects was dominated ≥ 50 years The subjects of moderate severity were 61 people (55.45%), severe severity was 27 people (24.55%) and critical severity was 22 people (20%).

Table 1. Subject Characteristics

Characteristic	n	%	Mean ± SB
Gender			
Man	59	53,64	
Woman	51	46,36	
Age:			52.44±13.53
20 - 39 years	21	18,18	
40 - 59 years	55	50,91	
60 – 79 years old	34	30,91	
Severity			
Keep	61	55,45	
Heavy	27	24,55	
Critical	22	20,00	

Mortality Based on Subject Characteristics

From table 4.5, it shows that the percentage of subjects is cured (64.5%) and dead (35.5%). Male and female subjects had almost the same percentage. Of the 59 male subjects,

21 died and 38 recovered. While the female subjects numbered 51 people, it was found that 18 people died and 33 people recovered. The number of dead and recovered subjects is dominated by the age group of 40-59 years. Deceased status subjects were found to be most in critical severity and severe severity. While the subject of cured status is most of a moderate degree of severity.

Table 2. Overview of Subject Mortality

Characteristic		Mortality				Total	
		Die		Recover			
		n	%	n	%	n	%
Gender	Man	21	53,8	38	53,5	59	53,6
	Woman	18	46,2	33	46,5	51	46,4
	Total	**39**	**35,5**	**71**	**64,5**	**110**	**100**
Age	20 - 39 years	7	7,9	14	19,7	21	19,1
	40 - 59 years	20	51,3	35	49,3	55	50,0
	60 - 79 years old	12	30,8	22	31,0	34	30,9
	Total	**39**	**35,5**	**71**	**64,5**	**110**	**100**
Degree Severity	Keep	5	7,7	56	78,9	61	55,5
	Heavy	14	35,9	13	18,3	27	24,5
	Critical	20	51,3	2	2,8	22	20,0
	Total	**39**	**35,5**	**71**	**64,5**	**110**	**100**

The results of univariate tests in table 3, it is known that patients died (35.5%) and patients recovered (64.5%). The results found that the patient's albumin levels ranged from 1.8 g / dL – 4.8 g / dL with an average of 3.44 ± 0.63 g / dL. The number of patients who had albumin levels ≥ 3.5 g/dL (53.6%) and albumin levels 3.5 g/dL (46.4%). The number of patients with albumin levels < 3.5 g / dL amounted to 51 people, 26 people died and 25 people recovered. Of the 59 patients with albumin levels ≥ 3.5 g/dL, 13 died and 46 recovered.

Patients without comorbidities (36.4%), patients who had 1 comorbid (44.5%) and patients who had ≥ 2 comorbidities (19.1%). Of the 40 patients without comorbidities, 8 died and 32 recovered. The number of patients who had 1 comorbid was 49 people, 22 people died and 27 people recovered. While the total number of patients who had ≥ 2 Comorbidities amounted to 21 people, there were 9 people died and 12 people recovered.

Vaccinated patients (61.8%) and unvaccinated patients (38.2%). Of the 68 patients vaccinated, 16 died and 52 recovered. Of the 42 unvaccinated patients, 23 died and 19 recovered.

Table 3. Albumin, Comorbid, Vaccination and Mortality Levels

Variable	Mortality				Total	
	Die		Recover			
	n	%	n	%	n	%

	Average±SD					3.44±0.63
Albumin Levels	< 3.5 g/dL	26	66,7	25	35,2	51	46,4
	≥ 3.5 g/dL	13	33,3	46	64,8	59	53,6
	Total	**39**	**35,5**	**71**	**64,5**	**110**	**100**
Comorbid	0 = Comorbid	8	20,5	32	45,1	40	36,4
	1 = Comorbid	22	56,4	27	38,0	49	44,5
	≥ 2 Comorbids	9	23,1	12	16,9	21	19,1
	Total	**39**	**35,5**	**71**	**64,5**	**110**	**100**
Vaccination History	Vaccination	16	41,0	52	73,2	68	61,8
	Not vaccinating	23	59,0	19	26,8	42	38,2
	Total	**39**	**35,5**	**71**	**64,5**	**110**	**100**

Relationship of Albumin Levels with Mortality

From table 4. It is known that from 51 COVID-19 patients with albumin levels < 3.5 g / dL, 25 people were found to have recovered status and 26 people who died status. Of the 59 COVID-19 patients with albumin levels ≥ 3.5 g/dL, 46 people recovered and 13 died. The relationship between albumin levels and mortality is known from the *Asymp* value. *Sig*. (2-*tailed*) of 0.003 < p = 0.05 means that the hypothesis is accepted. These results concluded that there was a significant relationship between albumin levels and mortality. Low albumin levels can increase mortality 3,680 times greater than normal albumin levels.

Table 4. Cross-Tabulation of Albumin and Mortality

Albumin Levels	Mortality		Total	p *value*	OR (95% CI)
	Die	**Recover**			
< 3.5 g/dL	26	25	51	0,003	3,680 (1,613 – 8,396)
≥ 3.5 g/dL	13	46	59		
Total	39	71	110		

Comorbid Relationship with Mortality

From table 5, the total number of COVID-19 patients without comorbidities was 40 people, 32 people recovered status and 8 people died status. Meanwhile, the number of COVID patients who had comorbidities was 70 people, 39 people were cured and 31 people died. The relationship between comorbid amount and mortality is known from the *Asymp* value. *Sig*. (2-*tailed*) of 0.019 < (p = 0.05) means that the hypothesis is accepted. These results conclude that there is a significant relationship between comorbidity and mortality. Comorbidities can increase mortality 3,179 times greater than without comorbidities.

Table 5. Cross-Tabulation of Comorbid Numbers and Mortality

Comorbid Amount	Mortality		Total	p *value*	OR (95% CI)
	Die	**Recover**			

	Die	Recover	Total	p value	OR (95% CI)
Comorbid	31	39	70	0,019	3,179 (1,284 -7,875)
No Comorbids	8	32	40		
Total	39	71	110		

Types of comorbidities found in COVID-19 patients. There are 2 types of comorbid diseases that are most commonly found in patients, namely diabetes as many as 41 people (37.3%) and hypertension patients as many as 32 people (29.1%). In patients with death status, there were 2 types of comorbid diseases, the most namely diabetes as many as 18 people and hypertension as many as 14 people.

Relationship of Vaccination History with Mortality

From the results of cross-testing, it is known that from 68 patients who have been vaccinated, 52 people were found to have recovered status and 16 people who died status. Of the 42 unvaccinated patients, 19 recovered and 23 died. The relationship between vaccination history and mortality is known from the *Asymp* value. *Sig*. (2-*tailed*) of $0.002 < p = 0.05$ means that the hypothesis is accepted. These results show a significant relationship between vaccination history and mortality. Vaccinated patients have a 0.254 times lower risk of mortality than unvaccinated patients.

Table 6. Cross-Tabulation of Vaccination History and Mortality

Vaccination history	Mortality			p value	OR (95% CI)
	Die	Recover	Total		
Vaccine	16	52	68	0,002	0,254 (0,111- 0,581)
No Vaccine	23	19	42		
Total	39	71	110		

DISCUSSION

Characteristics of the subject

The results found that COVID-19 patients are more male than female. This finding is in line with research Karya et al., (2021) which found more COVID-19 patients were male. Furthermore, the findings (Wang et al., 2020) reported that men are at 7,224 times greater risk of developing COVID-19 than women.

According to Chen et al (2020), the cause of men is more at risk of confirmed COVID-19 due to chromosomal and hormonal factors. Women are more protected from COVID-19 because they have an x chromosome and sex hormones such as progesterone that play an important role in innate and adaptive immunity. One of the factors that causes COVID-19 patients to be more at risk of contracting the COVID-19 virus is because of work demands that

require men to leave the house more often than women so they are vulnerable to COVID-19 transmission.

COVID-19 patients are most commonly found in the age group of 40-59 and the age group of 60-79 years. The average age of COVID-19 patients is ≥ 50 years old. The results of this study are in line with research Karya et al., (2021) which found more COVID-19 patients at the age of ≥ 50 years. The age factor is closely related to COVID-19, people with advanced age are susceptible to having a weak body condition due to decreased immunity and predominantly suffering from comorbidities that cause easy infection with the COVID-19 virus. In addition, the elderly factor causes negligence in maintaining health protocols, thereby increasing the risk of developing COVID-19.

COVID-19 patients with moderate severity have a higher prevalence at the time of hospitalization compared to severe and critical severity. This finding is in line with research Karya et al., (2021) which reported that most COVID-19 patients experienced moderate symptoms while undergoing treatment. Research Herlina et al., (2021) found that the degree of non-severe severity (mild-moderate) is more than the degree of severity severe (severe-critical).

Relationship of Albumin Levels with Mortality

Based on the results of statistical tests, there is a significant relationship between albumin levels and mortality of COVID-19 patients in hospitals. H Adam Malik Medan. In this study, it was found that COVID-19 patients who had albumin levels <3.5 g/dL had a higher prevalence compared to patients who had albumin levels ≥3.5 g/dL. The results reported that low albumin levels were more common in COVID-19 patients with death status than recovered patients. COVID-19 patients who have low albumin levels have a risk of mortality that is 3.68 times greater than patients with normal albumin levels.

The results of this study are in line with research conducted Hakim (2022) which found a significant relationship between albumin levels and the severity of Covid-19 disease. The average albumin content of subjects with severe severity was 2.86 g/dL while in subjects with critical severity with lower average albumin was 2.08 g/dL.

Research Huang et al., (2020) found COVID-19 patients with hypoalbuminemia had a higher mortality rate than those in the normal albumin group. There is an inverse relationship between albumin levels and the risk of death in COVID-19 patients. The serum albumin level <3.5 g/dl when percentages independently increased the risk of death in COVID-19 patients at least 6-fold.

Research Abdeen et al., (2021) shows patients dying in hospital have lower levels of albimun than patients who survive in hospital, making albumin a potentially strong indicator for mortality in patients treated with COVID-19. According to Gull et al., (2022) lower serum albumin concentrations are significantly associated with disease severity and adverse outcomes in COVID-19 patients.

Based on the results of this study and previous studies, it shows that COVID-19 patients who have low albumin levels are more susceptible to die compared to normal albumin levels. COVID 19 is an infectious state accompanied by a systemic response in which there is an increased release of inflammatory mediators such as Interleukin-1 (IL-1), Interleukin-6 (IL-6), and tumor necrosis factor (TNF) and increased production of counter regulatory hormones such as catecholamines, cortisol, glucagon, growth hormones, thus causing an effect on the metabolic and nutritional status of patients. Nutritional status is a multidimensional phenomenon that requires several methods of assessment, including indicators related to nutrition, nutrient intake and energy consumption, such as *Body Mass Index* (BMI), serum albumin, prealbumin, hemoglobin, magnesium and phosphorus (Bassoli et al., 2020). The decrease in albumin levels is most likely due to liver damage and is most likely due to adverse drug reactions and systemic inflammation in critically ill patients with COVID-19 (Hakim, 2022).

Patients who have low albumin levels can be done by eating foods that contain protein, eating foods from animals (beef, fish such as catfish, cork, chicken, eggs, and milk contain high levels of protein), and eating foods that contain protein (such as milk, yogurt, cheese), and limiting the consumption of nuts because they contain high levels of potassium and phosphate, Especially for dialysis patients. Hypoalbumin patients can be given albumin protein, both albumin in the form of albumin capsules and serum albumin, and can be corrected with intravenous albumin (in the form of infusion). Albumin can return to normal or increased limits if the cause that decreases albumin or the cause of hypoalbumin is eliminated (Sardjito.co.id, 2019).

Comorbid Relationship with Mortality

From the results of statistical tests, there is a significant relationship between comorbidities and mortality of COVID-19 patients in hospitals H Adam Malik Medan. Based on the results of the *Chi Square* test , there is a significant relationship between the number of comorbidities and mortality. The mortality rate is most found in patients who have

comorbidities compared to patients without comorbidities. Patients who have comorbidities have a risk of mortality 3,179 times greater than patients without comorbidities.

The results of this study are in line with research Simatupang et al., (2020) which found a history of comorbidities to have a significant effect on the risk of death of COVID-19 patients. The findings Sitorus et al., (2021) reported comorbidity to be the most dominant factor in predicting mortality of COVID-19 patients at Mohammad Hoesin Hospital Palembang (62.1%, OR=3,780). According to Herlina et al., (2021), comorbidities are one of the factors that can cause the severity and worsening of the condition in patients infected with COVID-19 even to the point of death.

In this study, 2 types of comorbidities were also found that were most common and commonly found in COVID-19 patients at RSUP. H. Adam Malik Medan namely diabetes mellitus and hypertension. The majority of deceased status patients come from patients who have comorbidities. There are 2 types of comorbidities that are most commonly found in patients with death status, namely diabetes mellitus and hypertension.

The results of this study are in line with the findings Rahayu et al., (2021) which states that the pathophysiological mechanism of comorbid hypertension and diabetes mellitus in COVID-19 patients increases the severity and risk of death. The results of the study Nanda et al., (2021) found that hypertension has a risk of being infected with COVID-19 by 2.109 times higher than patients who do not have hypertension, while diabetes mellitus has a risk of 0.307 times. Based on the results of this study and the results of previous studies, it shows that COVID-19 patients who have a history of comorbidities are more susceptible to die compared to those who do not have a history of comorbidities.

Diabetes mellitus patients when infected with COVID-19 can cause an increase in inflammatory mediators in the blood, namely lipopolysaccharides, cytokine inflammation and cause modulation of natural killer cells and IFNγ production which causes an increase in interstitial and vascular permeability that can activate pro-inflammatory, resulting in acute lung damage and ARDS. In addition, the state of hyperglycemia in diabetes mellitus patients is further exacerbated by the production of Reactive Oxygen Species (ROS) and viral activation from RAAS which aggravates insulin resistance and results in increased blood pressure, DIC, increased infectious processes. Patients with comorbid diabetes mellitus can experience infection due to high blood glucose levels and sudden hyperglycemia which can increase the risk of death and cytokine storms that aggravate the infection so that it can cause *Acute Respiratory Distress Syndrome* (ARDS) to respiratory failure (Nanda et al., 2021). People with

diabetes mellitus tend to be susceptible to infection due to impaired phagocytic cell ability. An analysis shows that diabetes mellitus patients have an increase in ACE-2 receptors so that this condition can increase the risk or aggravate COVID-19 infection (Karya et al., 2021).

In patients with comorbid diabetes mellitus can experience infection due to high blood glucose levels and sudden hyperglycemia which can increase the risk of death and cytokine storms that aggravate the infection so that it can cause ARDS to respiratory failure. So that diabetes mellitus patients infected with COVID-19 must check blood sugar more often and administer insulin according to the dose (Nanda et al., 2021).

The relationship between hypertension and COVID-19 is thought to be due to the administration of antihypertensive drugs, namely ACE inhibitors/ARBs, where in theory ACE-2 is a SARS-Cov-2 receptor. The use of ACE inhibitor drugs and ARBs increases the expression of ACE-2 and increases the severity of lung damage. In hypertensive patients ACE-2 production is increased and is found mostly in the lungs, arteries, heart and other organs. ACE-2 as a receptor of the corona virus, so that the corona virus more easily enters the host cell and then begins to multiply by mutating the gene to the host cell (Schiffrin et al., 2020).

ACE-2 is a key element of the *Renin-Angiotensin-Aldosterone System* (RAAS), which is involved in the pathophysiology of COVID-19 in hypertensive patients. SARS-CoV-2 infection is triggered when the viral S-protein binds to hypertension. SARS-CoV-2 infection is triggered when the viral S-protein binds to ACE2. SARS-CoV-2 shows its pathogenic activity by attacking type II alveolar epithelial cells that express ACE-2, where ACE-2 itself is type II alveolar epithelium that expresses ACE-2, where ACE-2 itself is immune, where its function is to catalyze the conversion of angiotensin II to angiotensin 1-7. Angiotensin 1-7 is a peptide that counteracts the pro-oxidative, vasoconstrictive and fibrotic properties of angiotensin II. The loss of ACE-2, caused by binding from SARS-CoV-2, can result in more angiotensinII and lower angiotensin-(1-7) (Chen et al., 2021).

In patients suffering from hypertension, ACEi and ARBs are often used as therapeutic options to maintain blood pressure (Kario et al, 2020). Currently, the recommended therapy recommendation for COVID-19 patients is to continue the previous antihypertensive therapy options because there have not been many studies that support this theory (Azer, 2020). In addition, hypertension can be prevented and controlled by measuring blood pressure correctly and regularly and keeping food healthy by limiting consumption of sugar, salt and soft and avoiding sweet foods.

Relationship of Vaccination History with Mortality

From the results of the *Chi Square* test, there is a significant relationship between vaccination and mortality of COVID-19 patients in hospitals. H Adam Malik Medan. Vaccinated patients have a mortality risk 0.254 times lower than vaccinated patients or in other words, COVID-19 vaccination is a protective factor against mortality of COVID-19 patients.

The results of this study are in line with findings Watson et al., (2022) which reported that vaccination could prevent 14.4 million deaths from COVID-19 in 185 countries and territories from December 8, 2020–December 8, 2021. The estimate rises to 19.8 million preventable COVID-19 deaths during the first year of COVID-19 vaccination. By the time countries commit to developing the COVAX market, it is predicted that 41% of deaths could be avoided.

Research Muthukrishnan et al., (2021) showed that of the 1,168 patients involved in the study, as many (23%) patients were vaccinated with COVISHIELD® and as many (16%) were fully vaccinated. Overall (44.3%) patients had comorbidities and (28.4%) died. Fully vaccinated patients had (12.5%) deaths, while (31.45%) deaths had not been vaccinated. Two-dose vaccination from COVISHIELD® has lower mortality in hospitalized COVID patients with moderate to severe degrees.

The results of this study show that vaccination can reduce the mortality rate of COVID-19 patients. The results of this study are in line with the findings of RSPI Sulianti Saroso's research which states that vaccination can prevent the risk of death due to COVID-19 infection. The results of the study (Ministry of Health of the Republic of Indonesia, 2021) prove that vaccines can reduce the risk of being infected with COVID-19 and reduce treatment and death for health workers in DKI Jakarta. From the results of this study and the results of previous studies show that vaccination plays a role in slowing the risk of COVID-19 infection.

From the results of this study and several previous research results reported that vaccinated patients have relatively more resistance not to be infected with COVID-19 than unvaccinated patients. Vaccinated patients have a relatively short length of treatment compared to unvaccinated patients.

According to CDC (2021) SARS-CoV-2 vaccination is considered very effective in protecting yourself from SARS-CoV-2 infection as well as to prevent severe symptoms or hospitalization. mRNA-based vaccines contain mRNA molecules that code for protein antigens. One way to overcome mRNA instability is to place mRNA molecules inside lipid nanoparticles, where these nanoparticle delivery carriers also act as adjuvants and induce immune responses of B cells and T follicular helpers New vaccine designs with great

technological innovation continue to evolve to improve mRNA molecule stability and protein translation efficiency, which enhances the immune response (Zhang et al., 2019).

According to the Task Force COVID-19 (2020), there are 3 dangerous risks if you do not get the COVID-19 vaccine, namely: The immune system of unvaccinated people can respond and work against infection when exposed to the COVID-19 virus for much longer to weeks than people who get the vaccine. People who do not get the vaccine will be at risk of severe symptoms and death and more susceptible to *experiencing long* COVID conditions. Inhibits the formation of *herd immunity.*

CONCLUSIONS

Based on the results of the study, the conclusions obtained were that the subjects were male (53.64%), the age of the subjects was dominated ≥ 50 years and the majority of subjects had moderate severity. The results of the patient's albumin levels showed an average of 3.44 ± 0.63. g/dL with the lowest level of 1.8 g/dL and the highest 4.8 g/dL. Comorbid patients (63.6%) who are dominated by diabetes and hypertension. Unvaccinated patients (38.2%) and patient mortality (35.5%).

There is a significant relationship between albumin levels, comorbidities and vaccination history with mortality of COVID-19 patients in hospitals. H. Adam Malik Medan. Low albumin levels can increase mortality 3,680 times greater than normal albumin levels. Comorbidities can increase mortality 3,179 times greater than without comorbidities. Vaccinated patients have a 0.254 times lower risk of mortality than unvaccinated patients.

It is recommended to health workers to be able to provide valuable insights in the handling of COVID-19 patients and the role of vaccination in reducing mortality that can help in patient care and management during the pandemic.

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