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Raja Merlinda Veronica
Universitas Indonesia, RSUPN dr. Cipto Mangunkusumo, merlindaveronica27101977@gmail.com

July Kumalawati
Universitas Indonesia, RSUPN dr. Cipto Mangunkusumo, july.kumalawati@ui.ac.id

Cleopas Martin Rumende
Universitas Indonesia, RSUPN dr. Cipto Mangunkusumo, cleopas.martin@ui.ac.id

Leonard Nainggolan
Universitas Indonesia, RSUPN dr. Cipto Mangunkusumo, leonard.nainggolan@ui.edu

Marcellus Simadibrata
Universitas Indonesia, RSUPN dr. Cipto Mangunkusumo, prof.marcellus.s@gmail.com

See next page for additional authors

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Multidrug-Resistant Organisms Infection on Mortality of Burn Patients at Public Hospital X in Jakarta: A Retrospective Study

Raja Merlinda Veronica[1,10,11]*, July Kumalawati[2], Cleopas Martin Rumende[3], Leonard Nainggolan[1], Marcellus Simadibrata[4], Hamzah Shatri[5], Em Yunir[6], Aditya Wardhana[7], Erni Juwita Nelwan[1], Musfardi Rustam[8,9]

[1]Division of Tropics and Infection, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia
[2]Division of Clinical Pathology, Department of Clinical Pathology, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia
[3]Epidemiology Unit, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia
[4]Division of Gastroenterohepatology, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia
[5]Division of Psychosomatics, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia
[6]Division of Endocrine and Metabolic, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia
[7]Division of Plastic, Reconstructive and Aesthetic Surgery, Department of Surgery, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia
[8]Faculty of Nursing, Universitas Riau, Pekanbaru, Indonesia
[9]Riau Province Health Officer, Pekanbaru, Indonesia
[10]Arifin Achmad Hospital, Pekanbaru, Indonesia
[11]Faculty of Medicine, Universitas Riau, Pekanbaru, Indonesia

Abstract

Susceptibility to infection and increasing antibiotic resistance put burn patients at risk of developing infections caused by multidrug-resistant organisms (MDRO). This condition can progress to sepsis, increasing morbidity and mortality. This retrospective cohort study employed the medical record data of patients treated at Public Hospital X in Jakarta, Indonesia, from January 2020 to June 2022. Of 160 subjects, most were aged <60 years (82.5%) and had comorbidities (16.88%). The most common cause of burns was fire (86.25%). The use of medical devices was 90.63%, with a 14-day median length of stay. The most common gram-negative MDRO pathogens were *K. pneumoniae* (29.91%), *Enterobacter sp* (22.32%), and *Acinetobacter* (20.54%); 45% of patients infected with MDRO died. The bivariate analysis found an increased risk of death due to MDRO infection in burn patients (RR 1.103; 95%CI 1.004-1.211, p-value = 0.046). After adjusting for role variables (age, comorbidities, total body surface area, use of medical devices, length of stay) and from multivariate analysis, the confounding variables for MDRO infection and mortality were length of stay and age. MDRO infection increases the mortality rate in burn patients. Mortality in burn patients due to MDRO infection is greater than non-MDRO.

Keywords: burn, mortality, multidrug-resistant organisms

Introduction

Burn cases increase every year, especially in developing countries. This increase can be seen in high rates of morbidity and mortality, which have a significant physical, psychological, and economic impact.[1–5] The World Health Organization estimates 265,000 deaths by burn occur every year. In developing countries such as Bangladesh, Columbia, Egypt, and Pakistan, 17% of children with burns experience temporary disability, while another 18% have permanent disability.[6] According to the 2013 Indonesian Basic Health Research, the prevalence of burns in Indonesia is 0.7%, with the highest incidence in Papua (2%) and Bangka Belitung Provinces (1.4%).[7]

Deaths from burns in Indonesia reach 195,000 cases annually. Public Hospital X in Jakarta receives more than 130 referral patients of burns from all over Indonesia each year, with the largest referrals coming from West Java Province and East Jakarta Municipality. Analysis of mortality data in adult patients of burns at the Public Hospital X in 2009-2010 showed a rate of 34% and 14.5% at a public hospital in East Java in 2007-2011. However, a 2017 study at the Public

***Correspondence**:* *Raja Merlinda Veronica. Division of Tropics and Infection, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital Jakarta, Arifin Achmad Hospital, Faculty of Medicine, Universitas Riau, Pekanbaru, Indonesia.*
Email: merlindaveronica27101977@gmail.com Phone: +62 822-9898-9658

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Hospital X in Jakarta stated that the mortality rate for burn patients was 24%.[8–10]

The possibility of contracting an infection increases in burn patients due to damaged skin integrity and weakened immune system, thereby facilitating bacterial infiltration.[11] Susceptibility to infections and increasing antibiotic resistance put burn patients at risk of developing infections caused by multidrug-resistant organisms (MDROs). These conditions can progress to sepsis, which can increase morbidity and mortality.[12] Information and research regarding the clinical impact of MDRO infection in burns is still scarce. Therefore, this indicates the importance of conducting a study to analyze MDRO infections in burn patients, which could cause high treatment costs and the choice of antibiotics at an early stage to anticipate death. It is hoped that the results of this study will provide scientific data regarding the effect of MDRO infection on mortality in burn patients and assist the clinician in the rational selection of antibiotics (clinical pathway).

Method

This study was an observational study with a retrospective cohort design using medical record data. This study was conducted on the target population of burn patients treated at the Burn Unit of the Public Hospital X in Jakarta from January 2020 to June 2022. The accessible population concerned was burn patients treated at the Public Hospital X Burn Unit ≥48 hours with culture examination results (tissue or blood) and pathogen growth. The sample was part of the population reached and met the criteria.

Data collected were age, sex, history of the use of medical devices, records of comorbidities, total body surface area (TBSA), length of stay, records of the use of empirical and definitive antibiotics, records of sepsis, skin and soft tissue infections, Urinary Tract Infection (UTI), type of culture, day of admission, last culture collection, last culture results, MDRO, type of antibiotic resistance, and type of pathogen in culture. Data were analyzed using SPSS Version 22.0 (free version). For univariate analysis, data were presented as percentages for categorical data and mean with standard deviation or median with minimum and maximum values for numerical data. Bivariate tests were carried out using the Chi-square test for categorical data and Mann-Whitney for numerical data. Multivariate tests were carried out using logistic regression tests.

Results

Of 160 patients, 100 (62.5%) were males and 60 (37.5%) were females; 28 (17.5%) were aged ≥60 years, and 132 (82,5%) were aged <60 years, with a median age of 46 years. There were 27 (16.88%) burn patients with comorbidities based on the Charlson index and 133 (83.13%) without comorbidities. There were 101 patients (63.13%) with TBSA ≥30% and 59 patients (36.88%) with TBSA <30%. Major causes of burns were fire with 138 (86.25%), followed by electricity with 12 (7.5%), and hot oil/water with 10 patients (6.25%). Based on the source of transmission, 87 (54.4%) experienced skin and soft tissue infections, 64 experienced respiratory tract infections (40%), and 9 patients experienced UTI (5.6%). The use of medical devices in burn patients was 145 (90.63%), and 15 did not use medical devices (9.38%). The use of ventilators was 87 (54.38%), and the median length of stay was 14 days (in the range of 4 to 59 days).

Table 2 shows the MDRO pathogen based on the last culture of burn patients treated at the Public Hospital X Burn Unit, indicating that MDRO Gram-positive pathogens were found in 7 *Staphylococcus epidermidis* (3.13%) and *Staphylococcus aureus* (0.45%). Meanwhile, non-MDRO Gram-positive pathogens were found in 7 *Staphylococcus sp.* (26.92%), *Enterococcus faecalis* (15 .38%), *Staphylococcus saphrophyticus* (7.69%), and *Staphylococcus sp.* (3.85%). The most frequently encountered MDRO Gram-negative pathogens were *Klebsiella pneumoniae* (29.91%), *Enterobacter sp.* (22.32%), *Acinetobacter* (20.54%), *Pseudomonas aeruginosa* (16.52%), *Escherichia coli* (3.13%), *Enterobacter cloacea* (0.89%), *Enterobacter eurugenes* (0.89%), *Proteus vulgaris* (0.89%), *Serratia marcescens* (0.45%), *Burkholderia cloacea* (0.45%), and *Myroides* (0.45%). For non-MDRO Gram-negative pathogens, the most common were *Enterobacter sp.* (23.08%), *K. pneumoniae* (7.69%), *Acinetobacter sp.* (7.69%), *Proteus sp.* (3.85%), *Serratia sp.* (3.85 %).

Table 3 shows antibiotic resistance by pathogens from the last culture. Methicillin-resistant *Staphylococcus sp.* was found in 5 (2.65%), Methicillin-resistant *Staphylococcus aureus* was found in 1 (0.53%), Broad Spectrum *Beta Lactamase* in 54 (28.57%), Carbapenem-resistant *K. pneumoniae* was found in 47 (24.87%), Carbapenem-resistant *Acinetobacter* was found in 34 (17.99%), Carbapenem-resistant *P. aeruginosa* was found in 23 (12.17%), Carbapenem-resistant *Enterobacteriaceae* was found in 23 (12.17%), Carbapenem-resistant *E. coli* was found in 1 (0.53%), and Carbapenem-resistant *Myroides* was found in 1(0.53%).

Based on the results of bivariate analysis, the relative risk was 1.103 (95% CI 1.004-1.211) with a p-value of 0.046. Those results made the risk of patients exposed to MDRO infection dying during hospitalization 10% higher compared to non-MDRO patients dying during hospitalization (Table 4).

Table 1. Characteristics of Burn Patients at the Public Hospital X Burn Unit

Variable	n=160 (%)
Sex, n (%)	
Male	100 (62.5)
Female	60 (37.5)
Age (year), mean (SD)	45.6 (15.2)
Age group, n (%)	
≥60 years	28 (17.5)
<60 years	132 (82.5)
Comorbid according to the Charlson index, n (%)	
Yes	27 (16.88)
No	133 (83.13)
TBSA, n (%)	
10-≥30%	101 (63.13)
<30%	59 (36.88)
Medical device, n (%)	
Yes	145 (90.63)
No	15 (9.38)
Ventilator usage, n (%)	87 (54.38)
Cause of burn, n (%)	
Fire	138 (86.25)
Electricity	12 (7.5)
Hot oil/water	10 (6.25)
Length of stay (days), median (IQR)	14 (4-59)
Definitive antibiotic	129 (80.63)
MDRO, n (%)	
Yes	146 (91.25)
No	14 (8.75)
Lab parameter	
Leukocyte, mean (SD)	17179 (9192)
Thrombocyte, mean (SD)	32228 (14879)
PCT, median (IQR)	99 (1-22190)
Mortality, n (%)	
MDRO mortality	72 (45)
Non-MDRO mortality	3 (21.43)
Source of infection	
Skin and soft tissue	87 (54,4)
Airway	64 (40)
Urinary tract	9 (5.6)
Sepsis	96 (54.9)

Notes: TBSA = total body surface area, IQR = interquartile range, MDRO: multidrug-resistant organisms, SD = standard deviation, PCT = procalcitonin

Table 2. Multidrug-Resistant Organisms Pathogen Based on Last Culture

	MDRO n(%)	Non-MDRO n(%)
Gram Positive		
Staphylococcus sp.	7 (3.13)	7 (26.92)
Enterococcus faecalis	0 (0)	4 (15.38)
Staphylococcus saphrophyticus	0 (0)	2 (7.69)
Staphylococcus aureus	1 (0.45)	1 (3.85)
Gram Negative		
K. pneumoniae	67 (29.91)	2 (7.69)
Enterobacter sp.	50 (22.32)	6 (23.08)
Acinetobacter sp.	46 (20.54)	2 (7.69)
P. aeruginosa	37 (16.52)	0
E. coli	7 (3.13)	0
Enterobacter cloacea	2 (0.89)	0
Enterobacter eurugenes	2 (3.13)	0
Proteus sp.	2 (0.89)	1 (3.85)
Serratia sp.	1 (0.45)	1 (3.85)
Burkholderia sp.	1 (0.45)	0
Myroides	1 (0.45)	0
	Total MDRO isolate=224, n (%)	Total Non-MDRO isolate =27, n (%)

Notes: MDRO = multidrug-resistant organisms

Table 5 shows the relationship between confounding variables: age, comorbidities, TBSA, use of medical equipment, and length of stay, on the mortality of burn patients in the Public Hospital X Burn Unit. In the age category, there were 28 patients aged ≥60 years, of which 17 subjects (60.71%) died during hospitalization. The Mann-Whitney test showed a significant relationship with p-value = 0.106. A significant relationship was found between comorbidities and death in burn patients. Of the 27 subjects with comorbidities, 17 (62.96%) died during the hospitalization period. The Chi-square test shows a significant relationship with p-value = 0.066.

Table 3. Antibiotic Resistance Based on Pathogen from Last Culture

Antibiotic resistance	Total (%)
Methicillin-resistant *Staphylococcus sp.*	5 (2.65)
Methicillin-resistant *Staphylococcus aureus*	1 (0.53)
Broad Spectrum *Beta Lactamase*	54 (28.57)
Carbapenem-resistant *K. pneumoniae*	47 (24.87)
Carbapenem-resistant *Acinetobacter*	34 (17.99)
Carbapenem-resistant *P. aeruginosa*	23 (12.17)
Carbapenem-resistant *Enterobacteriaceae*	23 (12.17)
Carbapenem-resistant *E. coli*	1 (0.53)
Carbapenem-resistant *Myroides*	1 (0.53)
	Total Isolate 189, n (%)

Table 4. Analysis of Multidrug-Resistant Organisms Infection Mortality in Burn Patients at the Public Hospital X Burn Unit

MDRO	Mortality n (%)		RR (95% CI)	p-value
	Yes	No		
Yes	72 (45.00)	74 (46.25)	1.103 (1.004-1.211)	0.046
No	3 (21.43)	11 (78.57)		

Notes: MDRO = multidrug-resistant organism, RR = relative risk *significance p-value <0.05

The TBSA percentage showed a significant relationship with the mortality rate of burn patients. Of a total of 101 patients with TBSA ≥30%, 67 people (66.34%) died during the treatment period. The Mann-Whitney test showed a significant relationship with p-value <0.001. Of the 145 subjects using medical devices while being treated at the hospital, 74 subjects (51.03%) died while being treated at the hospital, with the results of the Chi-square test showing a significant relationship with a p-value of 0.01. Length of stay also showed a significant relationship with p-value <0.001. The chi-square and Mann-Whitney tests proved a relationship between mortality in burn patients at the Public Hospital X Burn Unit with confounding variables such as age ≥60 years, comorbidities, TBSA ≥30%, use of medical devices, and length of stay.

Table 5. Relationship of Confounding Variables to Patient Mortality

Variable	Mortality n(%)		p-value
	Yes	No	
Age group, n (%)			
≥60 years	17 (60.71)	11 (39.29)	0.106
<60 years	58 (43.94)	74 (56.06)	
Comorbidities, n (%)			
Yes	17 (62.96)	10 (37.04)	0.066
No	58 (43.61)	75 (56.39)	
TBSA, n (%)			
≥30%	67 (66.34)	34 (33.66)	<0.001
10-<30%	8 (13.56)	51 (86.44)	
Medical device use, n (%)			
Yes	74 (51.03)	71 (48.97)	0.01
No	1 (6.67)	14 (93.33)	
Length of stay (days), median (IRQ)	10 (4-41)	21 (6-59)	<0.001

Notes: TBSA = total body surface area, IQR = interquartile range

Variables with a p-value of <0.25 in the bivariate analysis were included in the multivariate analysis: TBSA, length of stay, use of medical devices, comorbidities, and age. In the multivariate analysis with logistic regression, the fully customized Odds Ratio (OR) was obtained between the categories of MDRO infection and worsening after adding confounding variables in stages, starting from the smallest p-value in the bivariate (TBSA, length of stay, use of medical devices, and comorbidities), then changes in age in the Adjusted OR for the occurrence of worsening outcomes with each additional confounding variable (Table 6). Thus, Crude OR = 3.568 (0.956-13.317), p-value = 0.046, and Adjusted OR = 3.692 (0.815-16.716), p-value = 0.090 were obtained. Length of stay and age are confounding variables.

Table 6. Multivariate Analysis of Variables Influencing MDRO Infection Mortality in Burn Patients

Variable	OR MDRO-Mortality (95% CI)	p-value	Coefficient B	Changes in Coef. B
Crude OR				
MDRO	3.568 (0.956-13.317)	0.046	1.272	
Adjusted OR				
+ TBSA	3.515 (0.824-14.980)	0.089	1.256	1.26%
+ Length of stay	6.713 (1.230-36.628)	0.028	1.840	46.49%
+ Medical device use	3.546 (0.796-15.791)	0.097	1.266	0.79%
+ Comorbidities	3.692 (0.815-16.716)	0.090	1.306	3.15%
+ Aged >60 years	3.228 (0.711-14.658)	0.129	1.172	10.2%

Notes: OR = odds ratio, MDRO = multidrug-resistant organisms, CI = confidence interval, TBSA = total body surface area,
Length of stay and age are confounding variables because the change in coef B >10%
Crude OR 3.568 (0.956-13.317). p-value = 0.046
Adjusted OR 3.692 (0.815-16.716). p-value = 0.090

Discussion

The biggest cause of burns in this study was fire, with as many as 138 (86.25%), followed by electricity (7.5%) and oil/hot water (6.25%). A similar finding also went to a study by Hamzaoui *et al.,*[13] reported that the most common causes were fire (52.38%), followed by hot water (28.57%), and electricity (7.93%). ALfadli *et al.*[3] also stated that fire was the most common cause of burns (62.69%), followed by hot water (27.86%). National Burn Respiratory 2017 reported that fire was the most common cause in burn patients (76% of the reported cases).[14,15] Fire burn sufferers experience damage to the skin, loss of physical barriers, and impaired immune function that allows pathogens to enter the body.[16] A total of 145 patients (90.63%) used medical devices, and more than 50% used ventilators. Similar results were also reported by Ellithy *et al.,*[17] in which more than 60% of burn patients treated in the intensive care unit (ICU) used a ventilator. Ressner *et al.*[18] in Iraq reported that 92% of bacteremia patients use ventilators and only 23% of non-bacteremia use ventilators. Meanwhile, Chen *et al*. reported that 62.2% of burn patients use ventilators. The use of medical devices is thought to be a source of infection. This is often found in inpatients, such as the use of peripheral and central venous catheters, urinary catheters, nasogastric tubes, and mechanical ventilators because medical devices can cause trauma to the skin or mucosa and allow bacteria to enter the blood.[19]

In this study, the first most common source of infection was the skin and soft tissue (54.4%), followed by the respiratory tract (40%) and the urinary tract (5.6%). Similar results were found in a study conducted by Chukamei *et al.,* stating that skin and soft tissue infections are caused by various microorganisms such as bacteria and fungi, viruses, mycobacteria, and protozoa.[20] Sepsis was found in 96 patients (54.9%), which was confirmed by Lin's study as having pathogenic bacterial infections (31%) and MDRO (18.2%), more often occurring in third-degree TBSA and caused by inhalation injury. It also reported that bacteremia patients had longer hospitalization (p-value <0.001), long-term use of mechanical ventilation (p-value <0.001), and sepsis (p-value <0.001).[21]

Samsarga *et al*.[1] found a relationship between MDRO infection and duration of antibiotic administration, sepsis, pneumonia, and death. They also found MDRO infection associated with sepsis OR 36.53 (95%Cl 2.05-652.45) and an increased risk of death with OR 57.09 (95%Cl 1.41-2318.87) and TBSA. Chen *et al*.[19] reported that the most common sources of hospital-associated infections (HAI) found in burn patients are bacteremia (bloodstream infection), UTI, pneumonia, tracheobronchitis, skin and soft tissue infections, and surgical site infections (SSI). This is related to the length of hospital stay, the number of surgical procedures performed, and some surgical procedures, which can increase the risk of death and the high cost of treatment.

This study revealed that the length of stay for patients in the burn unit was 4 to 59 days, and empirical antibiotics were given 160 (100%). Chen *et al*.[19] reported that the average length of stay of burn patients was 18 days. Samsarga *et al.*[1] reported that the median duration of antibiotics with MDRO infection was seven days, and the duration of antibiotics was not associated with length of stay and acute kidney infection (AKI). Almost similar results were also reported by Santos *et al.* that MDRO infection was not associated with length of stay and administration of antibiotics.[22] This shows the type of bacteria and duration of antibiotic administration is influenced by the patient's clinical response and surgical interventions, such as tangential excision and skin grafting.

In this study, various types of MDRO and non-MDRO bacteria were found to cause infections in burn patients. The majority of pathogens obtained from culture results were Gram-negative bacteria. From the results of the latest tissue or blood culture examination, the most common pathogens causing MDRO infections were *K. pneumoniae* (29.91%), *Enterobacter* (22.32%), *Acinetobacter* (20.54%), *P. aeruginosa* (16.52%), and *E. coli* (3.13%). In contrast, the most

common non-MDRO pathogen infections were *Enterobacter* (23.08%), *K. pneumoniae* (7.69%), and *Acinetobacter* (7.69%). The Gram-positive pathogens causing the MDRO infections in the tissue or blood culture are *Staphylococcus epidermidis* (3.13%), *Staphylococcus aureus* (0.45%), while for the non-MDRO Gram-positive pathogen is *Staphylococcus epidermidis* (26.92%). Chen *et al*.[23] reported that the most common Gram-negative bacteria in burn patients were *P. aeruginosa*, *Acinetobacter baumannii*, *Klebsiella spp.*, *Stenotrophomonas spp.*, *E. coli,* and *Enterobacter cloaceae*. It also reported that 30% were caused by MDRO infection, and most frequently encountered were Carbapenem-resistant *Acinetobacter baumannii* (14.6%) and Carbapenem-resistant *Klebsiella* (2.4%).[23]

The most common pathogens encountered during treatment days 8 to 28 were *A. baumannii, Chyseobacterium spp., and S. maltophilia*, but the most common pathogen in tissues was *P. aeruginosa* usually found on days of hospitalization <14 days and the MDRO infection by a Gram-positive pathogen was Methicillin-resistant *Staphylococcus aureus* (11.3%). Burn patients in the ICU have more predisposing factors for infection: wider and deeper TBSA, longer wound healing, impaired immune function, multi-organ dysfunction, and longer hospitalization. The ICU environment can increase the risk of pathogen transmission through equipment, bacterial colonization on equipment surfaces, medical waste and invasive procedures such as central veins, catheters, tracheotomy, bronchoscopy, and mechanical ventilation. An increased risk of MDR in injured patients may occur due to prolonged antibiotic use, repeated invasive procedures, and prolonged hospitalization.[24]

In this study, the mortality of burn patients with MDRO infection reached 45% (p-value = 0.046), with a relative risk of 1.103 (95%CI 1.004-1.211), making the risk of patients exposed to MDRO dying during hospitalization 10% higher when compared with patients without MDRO exposure to die during hospitalization. The Chi-square test results also showed a strong relationship between MDRO mortality and infection in burn patients. Santos *et al.* reported that the mortality of burn patients with MDRO infection (10.6%) was higher than the mortality of patients without MDRO infection (6.3%).[22] A study by Samsarga *et al.* found a significant relationship between mortality and MDRO infection in burn patients (OR = 9.75; 95%CI = 2.00-47.50) and that burn patients with MDRO were in the same condition of a much higher risk of death during hospitalization.[1] Similar results were found in the study by Tanuwijaya *et al.,*[2] which compared *bacteremia* due to MDRO with burn patients, in which higher mortality was found (RR = 18.6; 95%CI = 11.1-31.1; p-value <0.01).

In this study, after adjusting for confounding variables: TBSA (p-value <0.001), length of stay (p-value <0.001), use of medical devices (p-value <0.01), comorbidities (p-value <0.066), and age (p-value = 0.106). In multivariate analysis, the length of stay and age were confounding variables; non-confounding variables for mortality in burn patients with MDRO infection were TBSA, medical devices, and comorbidities. In this study, the OR (95%CI) after adjusting for TBSA was 3.515 (0.824-14.980), adding medical devices to 3.546 (0.796-15.791), and comorbidities to 3.692 (0.815-16.716).

After multivariate analysis, age was a confounding variable influencing the mortality of MDRO infection in burn patients with OR (95%CI) = 3.228 (0.711-14.658) and a change in Coef B of 10.2%. Old age (age group ≥60 years) was a risk factor for increased mortality in burn patients. This is consistent with the study by Galeiras *et al.,*[25] which reported that age and mortality are linearly proportional if the population of children under 18 years is not included. Moreau *et al.*[26] created AGESCORE, a score that has been validated in predicting mortality after experiencing thermal injury based on age. In this scoring, the risk of mortality in burn patients increases with age. This condition is caused by old age, and there is a decrease in the function of the respiratory and cardiovascular systems. Thus, the mortality of elderly patients when they experience injuries also increases due to the failure of compensation from the cardio-respiratory function.[27] Besides, old age is associated with the physiological decline of the skin. Therefore, the immune function in elderly patients tends to be lower than in adult patients.[23]

The median length of stay in this study was 14 days (4-59), and after multivariate analysis, length of stay was found to be a confounding variable also affecting MDRO infection mortality in burn patients with OR (95%CI = 6.713 (1.23-36.628) and changes in Coef. B 46.49%. A study by Van Yperen *et al*.[24] in the Netherlands reported that the length of stay of burn patients in the burn unit was an average of 13 to 16 days, and the patients treated came from referral health facilities. From an administrative perspective, long length of stay is associated with morbidity due to injury cost and quality of care. Chukamei *et al.*[20] reported that length of stay was influenced by antibiotic use, previous medical records, type of insurance, degree of burn, organ affected, and lower socioeconomic status associated with poor health status, more susceptibility to injury, and increased risk of hospitalization. Salehi *et al.*[27] reported the prevalence of comorbidities in burn patients (18.5%) and comorbidities with old age increased to 57%; diabetes and heart failure were the most frequent comorbidities.

This study examined the effect of MDRO infection on mortality in burn patients and used a cohort design in which the cohort design could explain the relationship between subjects and risk factors and their impact was the strength of this study. The independent and dependent variable data included in the analysis were complete and could be analyzed. This study also considered several confounding variables so that the relationship between MDRO infection and acquired mortality was independent. Meanwhile, the weakness is retrospective with data taken from medical records, and the authors could not control the condition, quality, and standardization of measurement of variables in previous studies, especially variables susceptible to recall bias.

Conclusion

The mortality of injured patients is influenced by MDRO infection, length of stay, and age. Therefore, an optimal treatment and management of such a condition is needed. Infections must be treated with a holistic approach, especially in managing infections, identifying pathogens, antimicrobial therapy, and preventing the spread of nosocomial infections.

Abbreviations

MDRO: multidrug-resistant organisms; TBSA: total body surface area; UTI: Urinary Tract Infection; IQR: interquartile range; SD: standard deviation; OR: odds ratio; ICU: intensive care unit.

Ethics Approval and Consent to Participate

This study has been approved by the Faculty of Medicine Universitas Indonesia No: KET-1023/UN2.F1/ETIK/PPM 00.02/2022, dated September 26, 2022.

Competing Interest

The authors declared no competing interest in this study.

Availability of Data and Materials

The data is available upon request.

Authors' Contribution

RMV, JK, CMR, LN, MS, HS, EY, AW, and EJN conceived and designed the study and led the data collection and statistical analysis. MR proofread the Indonesian and English languages and revised the manuscript. All authors have read and approved the manuscript. All author contributed to the final manuscript.

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