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ORIGINAL RESEARCH INTENSIVE CARE

Compliance with the 2016 Surviving Sepsis Campaign Bundle and the 2018 Surviving Sepsis Campaign 1-Hour Bundle and patient outcomes in emergency presentation at a tertiary referral hospital

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ABSTRACT

Background & Objective: Sepsis is a life-threatening organ dysfunction caused by a dysregulated host response to infection. Sepsis has always been associated with high morbidity and mortality. Consensus committees of international organizations have recommended packages to reduce the high mortality. We evaluated the 2016 Surviving Sepsis Campaign (SSC) package with 3 and 6-hour sepsis packages and the 2018 SSC with 1-hour sepsis package on the mortality of septic patients who came to a tertiary referral hospital.

Methodology: We enrolled 164 retrospective cohort patients in the tertiary emergency referral general hospital resuscitation ward. The patients were followed up for 48 h of observation. Sepsis and septic shock criteria are based on the Third International Consensus Definition of Sepsis and Septic Shock (Sepsis-3) 2016. Patients were divided into 3 groups, based upon compliance with SSC 16 at 3 h, 6 h, and SSC 18 at 1 h, and the mortality was recorded before 48 h and after 48 h.

Results: Compliance rates at 1 h (27.4%), 3 h (39.6%), and 6 h (43.3%) were significantly associated with patient mortality ($P \leq 0.001$). Population patients who met the criteria for SSC, 73.3% had been referred from peripheral hospitals. The mortality rate was 76 (46.34%) for < 48 h and 37 (22.56%) for more than 48 h.

Conclusion: Compliance with sepsis management contributes to improved patient condition and a better prognosis when the Surviving Sepsis Campaign package is adequately implemented.

Abbreviations: SSC - Surviving Sepsis Campaign; SOFA - Sequential Organ Failure Assessment; qSOFA - quick Sequential Organ Failure Assessment; VIS - Vasopressor Inotropic Score

Key words: Sepsis; SSC Sepsis Bundle Compliance-2016; 1 Hour SSC Sepsis Package 2018; Death; Vasopressors; Outcome; Mortality

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1. INTRODUCTION

Sepsis is a clinical syndrome characterized by life-threatening organ dysfunction caused by a dysregulation of the body's response to infection. Sepsis and septic shock are the leading cause of in-hospital mortality in critically ill patients, especially in emergency departments and intensive care units (ICUs). Despite the progressive improvement in the management of sepsis patients, the mortality rate remains high.[1] Mortality due to sepsis is higher than that from other diseases, with the average mortality rate ranging from 30% to 80%. The mortality rates of sepsis patients without organ dysfunction (sepsis), with organ failure (severe sepsis), and septic shock are 10-20%, 20-50%, and 40-80%, respectively.[2]

Data on the incidence of sepsis in Asia based on the Management of Severe Sepsis in Asia's Intensive Care Unit (MOSAICS) that involved 150 ICUs from 16 countries, including Indonesia, reported a mortality rate of 44.5% (572) out of the 1285 adult patients with severe sepsis treated in the ICU in July 2009.[3] Mortality in septic shock patients is related to compliance with the implementation of a sepsis bundle. Compliance with the 3-hour and 6-hour sepsis bundles significantly decreased the mortality in comparison to non-compliance.

Preliminary research at the Dr Soetomo Surabaya referral hospital found that management in 46.88% of cases complied with the 2016 Surviving Sepsis Campaign (SSC) bundle, with a < 48-hour mortality rate of 15.62%.[4] Moreover, the increased mortality in sepsis patients is closely associated with high Sequential Organ Failure Assessment (SOFA) scores. Hospitalized patients with a SOFA score of ≥ 2 have a mortality risk of 10%, which is attributed to an infection.[5,6]

Changes in the definition of sepsis (Sepsis-1 in 1991, Sepsis-2 in 2001, and Sepsis-3 in 2016) have implications for changes in sepsis management guidelines, with the issuance of the latest sepsis management guidelines in 2018 replacing those issued in 2016. The most crucial change in the SSC bundle-2018 is concerning patient management in the first 3 and 6 h in the 2016 SSC bundles that were changed to a single treatment in the first hour in the 2018 SSC bundle (1-hour bundle), with an emphasis on the earliest possible resuscitation and management with an expectation to reduce the mortality risk of sepsis patients further.[7]

A challenge in the implementation of sepsis bundles is the early detection of sepsis in patients. The Third International Definition of Sepsis (Sepsis-3) specified clinical criteria to help identify patients at risk of developing sepsis using the quick Sequential Organ Failure Assessment (qSOFA) score. In contrast, the clinical criteria for patients with sepsis can be identified with the SOFA.[6,8,9] The culture results evidenced the certainty of infection, although waiting for culture results would delay the treatment of patients with sepsis.

Consistent with previous guidance from the SSC sepsis bundles, "zero time" or "presentation time" is defined as the time in the emergency installation triage and follows an initial schematic representation that is consistent with all elements in the assessment of sepsis or septic shock and subsequent confirmation according to the flow in the algorithm for sepsis. In a series evaluation study of SOFA scores to predict outcomes in critically ill patients, an initial and highest score more than 11 or an average score more than 5 was associated with more than 80% mortality; moreover, an unchanging or increasing score was associated with a 37% mortality rate if the initial score was 2–7, and 60% if the initial score was 8–11.[10]

2. METHODOLOGY

The Medical Research Ethics Committee approved this study of Dr Soetomo General Hospital, Surabaya, Indonesia. This study was observational with a retrospective cohort design. The study included all adult patients (age >18 y) with a diagnosis of sepsis and septic shock based on the Sepsis-3 criteria in the resuscitation room and intensive care room of the Emergency Department at Dr Soetomo General Hospital Surabaya during a study period from January to December 2019.

This study aimed to assess compliance with implementing the 2016 SSC sepsis bundle guideline and the 1-hour SSC sepsis 2018 bundle concerning the impact on the mortality rate before and after 48 h of treatment. For this evaluation, we analyzed the odds ratio (OR) and 95% confidence intervals (CI) for the likelihood of mortality and survival based on treatment implementation in compliance with the sepsis bundle. Data were collected using a questionnaire and analyzed with the following statistical tests: t-test, chi-square test, Mann-Whitney U test, Fisher's exact test, and logistic regression test using IBM SPSS Statistics 21.

3. RESULTS

3.1. Study Subjects

Among 164 patients, there were 86 men and 78 women, 51 to 72 y of age. There were 94 septis and 70 septic shock patients. The highest source of infection was pneumonia 85, abdominal infections 33, urological infections 7, nerve infections 6, and skin and tissue tissue infections 33 cases. There were significant age differences (P = 0.011), Mean arterial pressure (MAP) (P = 0.011), and lactate levels between the two groups (P = 0.043) (Tables 1 and 2).

Table 1: General characteristics of study participants

Parameters	Sepsis (n = 94)	Septic Shock (n = 70)	P-value
Gender			
Male	48 (29.3)	38 (23.2)	0.753**
Female	46 (28.0)	32 (19.5)	
Age (y)			
18 – 28	10 (6.1)	2 (1.2)	0.011*
29 – 39	12 (7.3)	4 (2.4)	
40 – 50	14 (8.5)	7 (4.3)	
51 – 61	24 (14.6)	25 (15.2)	
62 – 72	30 (18.3)	19 (11.6)	
73 – 83	4 (2.4)	10 (6.1)	
84 – 94	0 (0.0)	3 (1.8)	
MAP (mmHg)	81.60 ± 16.292	70.23 ± 14.292	**≤** 0.001***
Respiratory rate (Breaths/min)			
12– 20	15 (9.1)	11 (6.7)	1.000**
>20	79 (48.2)	59 (36.0)	
Pulse (beats/min)	121.41 ± 23.907	120.99 ± 25.071	0.911***
Temperature (ºC)	37.321 ± 1.1476	37.069 ± 1.0145	0.178****
Lactate (mmol/l)			
< 4	29 (33.7)	9 (10.5)	0.043**
≥ 4	26 (30.2)	22 (25.6)	
Sofa Score Preliminary			
0– 6	13 (7.9)	10 (6.1)	0.578*
7– 10	47 (28.7)	40 (24.4)	
>11	34 (20.7)	20 (12.2)	
Patient Referral:			
Referral	66 (40.2)	56 (34.1)	1.000**
Not Referral	23 (14.0)	19 (11.6)	

*Data presented as n (%); *Chi Square test, sig. P < 0.05; ** Fisher's Exact test, sig. P < 0.05; *** T test, sig. P < 0.05; **** Mann– Whitney test, sig. P < 0.0*

There was a significant difference in mortality by age (P = 0.018); there was a significant difference in mortality based on sepsis and septic shock (P = 0.000). There was no significant difference between the source of infection and the mortality or survival rate (P = 0.974). There was a significant difference in mortality at baseline qSOFA scores (P = 0.000). There was no significant difference in mortality at baseline SOFA score (P = 0.248) in Tables 1 and 2.

3.2. Septis bundle 3 compliance rate between septic and septic shock patients

When comparing compliance, there was a significant relationship between compliance 1 h, 3 h, and 6 h of sepsis bundle implementation with mortality (P = 0.000). Mortality rate < 48 h was 76 (46.34%) and 48 h rate was (22.56%) as shown in Table 3 and Table 4.

The level of compliance of each Sepsis Bundle 3 item based on the results of cross-tabulation and statistical analysis of Fisher's exact test at 1 h, 3 h, and 6 h had a significant relationship with mortality < 48 h, namely lactate levels (P = 0.000), blood culture examination (P = 0.000) and antibiotics (P = 0.000), but there was no significant relationship with mortality < 48 h, namely fluid administration ((P = 0.728) or vasopressors (P = 0.233) (Table 5).

The delay in compliance to bundle 3 sepsis, with logistic regression test, there was no significant relationship with mortality at 3 h (P = 0.637; OR 1,600) and 6 h (P = 0.637; OR 0.625) (Table 6).

While the acceleration of compliance to the implementation of sepsis bundle 3, the logistic regression test found a significant relationship with patient survival at 1 h (P = 0.000), but there was no significant relationship with patient survival at 3 h (P = 0.160) and 6 h (P = 0.056 (Table 7).

The average SOFA value based on the referral status

The mean SOFA score in referred patients was higher at 9.76 ± 2.784 (median = 10) than in non-referred patients (8.76 ± 2.497; median = 8); and the mean SOFA score in all patients (9.51 ± 2.741; median = 9). There was a significant difference in MAP values between patients with sepsis (81.60 ± 16.292) and septic shock (70.23 ± 14.292) because most of the 122 patients referred from other hospitals had been given vasopressors (Tables 1 and 8).

Predictors of death in the first 48 h can be seen from two parameters, namely SOFA scores and Vasopressor Inotropic Score (VIS). Using the Independent t-test, there was a significant difference in SOFA scores (P = 0.000) between the patients who died and the referred survivors. With the Mann-Whitney U test, there was a significant difference in VIS (P = 0.011) between

Table 2: Clinical characteristics of study participants

Parameter	Mortality (%)	Survive (%)	P-value
Gender			
Male	52 (31.7%)	34 (20.7%)	0.018*
Female	61 (37.2%)	17 (10.4%)	
Diagnose			
Sepsis	52 (31.7%)	42 (25.6%)	≤ 0.001*
Septic shock	61 (37.2%)	9 (5.5%)	
Source of infection			0.974**
Pneumonia	59 (36.0%)	26 (15.9%)	
Abdomen	21 (12.8%)	12 (7.3%)	
Neurological System	4 (2.4%)	2 (1.2%)	
Urinary tract			
Skin and Soft Tissue	5 (3.0%)	2 (1.2%)	
Blood Stream	20 (12.2%)	8 (4.9%)	
	4 (2.4%)	1 (0.6%)	
qSOFA	2.34 ± 0.475	2.35 ± 0.483	≤ 0.001***
SOFA	9.67 ± 2.895	9.14 ± 2.350	0.248***

*Data given as n (%) or mean ± SD; *Fisher's Exact Test, sig if P < 0.05; ** Chi Square Test, sig if P < 0.05; ***T Test, sign if P < 0.05*

Table 3: Guidelines compliance for implementing the 2016 SSC Sepsis Bundle and the 2018 SSC Sepsis First– Hour Bundle and mortality

Compliance	Total	Mortality	Survive	P-value
1-h compliance				
▪ Fulfiled	45 (27.4)	13 (7.9)	32 (19.5)	**≤ 0,001***
▪ Not Fulfiled	119 (72.6)	100 (61.0)	19 (11.6)	
3- h compliance				
▪ Fulfiled	65 (39.6)	25 (15.2)	40 (24.4)	**≤ 0,001***
▪ Not Fulfiled	99 (60.4)	88 (53.7)	11 (6.7)	
6- h compliance				
▪ Fulfiled	71 (43.3)	30 (18.3)	41 (25.0)	**≤ 0,001***
▪ Not Fulfiled	93 (56.7)	83 (50.6)	10 (6.1)	

Data presented as n (%); Fisher's Exact test, sig. P < 0.05*

patients who died and survivors who were referred (Table 9).

4. DISCUSSION

The guidance on sepsis management was introduced in 2004 and subsequently updated in 2008, 2012, 2016,[11] and finally in 2018.[7] The latest sepsis management guidelines (2018) recommend that sepsis bundle management be implemented within 1 h, which was previously specified as within the first 3 and 6 h (in 2016). The management of sepsis remains a challenge in hospitals with limited facilities and funding, especially in poor and developing countries. Thus, sepsis bundle implementation in the first 3 and 6 h is low.[12] Rhodes (2015) reported 19% and 36% compliance with implementing all sepsis bundles in the first 3 and 6 h, respectively, despite clinical evidence that sepsis bundle implementation reduces the mortality risk.[12-14] Other studies suggest that compliance with the sepsis bundle in the first 3 h increased from 31.3% to 66.4%, whereas that in the first 6 h increased from 41.7% to 75.5%, which was accompanied by a decrease in mortality rates from 27.1% to 14.5%; however, the reduction in mortality rates was not significant between groups that complied or did not comply with the implementation of the sepsis bundle.[15]

Compared with previous studies, the compliance of sepsis bundle implementation in this study is low, with overall compliance rates of 39.6% and 43.3% in the first 3 and 6 h, respectively. Several possibilities or factors can explain the relationshi≤between compliance with the implementation of sepsis bundles and the possibility of increasing survival rates and the risk of mortality in patients with sepsis.[13-15]

First; compliance with implementing the first sepsis bundle, namely serum lactate examination, is a significant first step because it can describe the occurrence of tissue hypoxia, and elevated lactate levels are associated with worse patient outcome, including death.[16] Previous studies have found significant reductions in mortality in resuscitation using lactate-based guidelines.[5] Thus, the management of sepsis with lactate evaluation is needed; doctors who treat sepsis can more quickly determine whether the patient is in a hypoperfusion state and immediately take resuscitative actions based on the results of lactate measurements obtained in less than one hour after sepsis is identified.[5] In this study, the lactate examination observance value was low in the first hour - 86 (52.4%), but increased in the first 3 and 6 h to 65.2%. Compliance with serum lactate examination was compounded by an initial lactate level of more than 2 mmol/L in 48 patients (55.8%), mainly in those who died within 6 h (9.2%) with SOFA scores > 11 (32.9%).

Table 4: Mortality rate at < 48 h And ≥ 48 h of all patients

N = 164	Mortality
< 48 h	76 (46.34%)
≥48 h	37 (22.56%)
Total	113 (68.90%)

Table 5: Cross tabulation number of compliance items 1– Hour Sepsis 2018 Bundle and 2016 SSC Sepsis Bundle with mortality < 48 H

Bundle Sepsis completion	SSC Bundle 18 (1 h)			SCC Bundle 16 (3 h)			6 h		
	Mortality	Survive	P-value	Mortality	Survive	P-value	Mortality	Survive	P-value
Serum lactate level exam									
Complete	23 (14.0)	63 (38.4)	**≤ 0.001***	33 (21.1)	63 (38.4)	**0.007***	36 (22.0)	66 (40.2)	**0.010***
Incomplete	48 (29.3)	30 (18.3)		38 (23.2)	30 (18.3)		35 (21.3)	27 (16.5)	
Blood culture sampling before antibiotic treatment									
Complete	23 (15.2)	57 (34.8)	**≤ 0.001***	28 (17.1)	63 (38.4)	**≤ 0.001***	30 (18.3)	66 (40.2)	**≤ 0.001***
Incomplete	48 (29.3)	36 (22.0)		43 (26.2)	30 (18.3)		41 (25.0)	27 (16.5)	
Broad-spectrum antibiotic treatment									
Complete	**41 (25.0)**	**81 (49.4)**	**≤ 0.001***	52 (31.7)	90 (54.9)	**≤ 0.001***	52 (31.7)	91 (55.5)	**≤ 0.001***
Incomplete	**30 (18.3)**	**12 (7.3)**		19 (11.6)	3 (1.8)		19 (11.6)	2 (1.2)	
Crystalloid fluid 30 ml/kg administration in hypotension or lactate > 4 mmol/l									
Complete	67 (40.9)	89 (54.3)	**0.728***	68 (41.5)	91 (55.5)	**0.653***	70 (42.7)	93 (56.7)	**0.433***
Incomplete	4 (2.4)	4 (2.4)		3 (1.8)	2 (1.2)		1 (0.6)	0 (0.0)	
Vasopressor									
Complete	45 (27.4)	68 (41.5)	**0.233***	47 (28.7)	69 (42.1)	**0.301***	47 (28.7)	69 (42.1)	**0.301***
Incomplete	26 (15.9)	25 (15.2)		24 (14.6)	24 (14.6)		24 (14.6)	24 (14.6)	

** Fisher's Exact test, significant if p < 0.05*

Table 6: Patient mortality risk if sepsis bundle is delayed

Sepsis Bundle	P-value	Exp(B)/OR	95% CI
3 h delay	0,637	1,600	0.080–1.516
6 h delay	0,637	0,625	0.046– 1.042

**Logistic Regression test, significant if p < 0.05*

respectively). This shows that compliance with blood culture tests can still be performed for the first 6 h.

Third; the provision for the administration of broad-spectrum antibiotics immediately is expected to weaken and reduce the number of pathogens that cause infection to modify the host response to infectious agents and thereby reduce the risk of organ dysfunction due to infection.[17] The leading infection in the resuscitation room at ourral hospital was pneumonia (51.69%). This is consistent with previous reports by Esper et al. (2006), which states that the source of infection primarily originates from the respiratory system by as much as 33%.[18] Vincent et al. (2009) reported that infections of the lungs and respiratory tract are the most typical source of infection (64%) in patients with sepsis.[19] In addition, Utariani et al. (2019) found that infection of the lungs was the most typical cause of sepsis (62.5%).[4] Other causes of infections identified in this study, based on the frequency, include abdominal infections, skin and soft tissue infections, urinary tract infections, and infections of the nervous system.

Second; compliance with blood culture tests should be instituted before administering antibiotics to optimally identify the pathogen, so that appropriate antibiotics can be administered.[17] However, in the blood culture examination, the same obstacles as lactate examination were found because of severe shock that necessitated resuscitation and often led to the patient's death within 6 h. In this study, compliance with examining blood cultures before administering antibiotics in the first hour was relatively low at 48.8% (< 50%). Compared to the first hour, compliance with blood culture examinations in the first 3 and 6 h increased (55.5% and 58.5%,

Fourth; fluid resuscitation to stabilize tissue hypoperfusion during sepsis or septic shock has been recommended.[17] In this study, the administration of fluid

Table 7: Patient's chance to survive if the sepsis bundle is accelerated

Sepsis Bundle Acceleration	P-value	Exp(B)/OR	95% CI
On time	**≤** 0,001*	16,227	6.833– 38.536
Shorter 3 h	0,160*	2,864	0.660– 12.432
Shorter 6 h	0,056*	4,582	0.960– 21.875

**Logistic Regression test, significant if p < 0.05*

managing sepsis. Doctors can quickly screen and identify sepsis and septic shock patients even when faced with different clinical conditions for early sepsis and septic shock management.[21]

Fifth; based on the definition of SSC, 16 septic shock patients could be identified with clinical signs of sepsis with persistent hypotension (MAP < 65 mmHg) requiring vasopressors to

Table 8: The mean value of SOFA, VIS, and VDI as a predictor of mortality < 48 h in referred patients

Variable (N = 164	Referral (N = 122)		P-value	No referral (N = 42)		P-value
	Mortality < 48 h (N = 54)	Survive < 48 h (N = 68)		Mortality < 48 h (N = 17)	Survive < 48 h (N = 25)	
SOFA Score	10.76 ± 2.584	8.97 ± 2.699	**≤ 0.001***	9.06 ± 2.727	8.56 ± 2.364	0.532
VIS	13.796 ± 14.534	8.206 ± 11.667	**0.011****	6.471 ± 11.147	7.600 ± 10.218	0.622
VDI	0.1988 ± 0.1955	0.1258 ± 0.1930	**0.010****	0.0994 ± 0.1698	0.1048 ± 0.146	0.769

VIS - Vasopressor Inotropic Score; VDI - Vasopressor Dependency Index/; Data presented as Mean ± SD

recommended.[17] In this study, the administration of fluid resuscitation was more targeted because excessive administration would lead to the risk of fluid overload and acute pulmonary oedema. However, a lack of adequate fluids may cause the patient to remain in a state of prolonged shock and, thus, possibly require more extended organ support.[20] In this study of 164 patients diagnosed with sepsis, 57.2% (94/164) were categorized as sepsis patients without shock. Of the 94 samples, crystalloid (30 mL/kg/h) was not administered to 5.4% (9/94) of the participants because of lactate levels < 4 and MAP > 65 mmHg. Moreover, 45.7%. (43/94) of patients with sepsis became hypotensive or had lactate levels > 4 in the treatment process, and they were eligible for 30 mL/kg of fluid replacement according to the SSC 2016 guidelines. At the same time, 70 patients diagnosed with septic shock at admission received initial fluid resuscitation at 30 mL/kg/h. Therefore, in this study, the compliance rate of fluid resuscitation in the first hour is 95.1%, and 97% and 99.4% in the first 3 and 6 h, respectively. This is because fluid therapy is key to maintain a MAP > 65 mmHg. Referral patients who developed septic shock mainly required vasoactive drugs when referred to maintain a MAP > 65 mmHg (Tables 1 and 8). The drugs used mainly were norepinephrine (46.3%), norepinephrine and dopamine (11%), norepinephrine and adrenaline (1.2%), and dobutamine (3.7%). According to the 2016 SSC guidelines, norepinephrine is the first-line vasoactive drug to increase blood pressure, with adjunctive use of epinephrine and dopamine in patients with relative or absolute bradycardia or a small risk of developing tachyarrhythmia.[5] Compliance with vasoactive administration was mainly observed for patients who experienced sepsis or septic shock and in patients who presented in a state of septic shock in the first 1 hour (68.9%), first 3 h (70.7%), and the first 6 h (70.7%).

Overall, in this study, a mortality of 7.9%, 15.2%, and 18.3% was observed for sepsis patients if the implementation of a sepsis bundle was done within 1, 3, and 6 h (P = 0.000, P = 0.160; and P = 0.056, respectively). Thus, the speed of implementation of the sepsis bundle can reduce the mortality rate, although it was not statistically significant for the first 3 and 6 h. Seymour (2017) found that implementing sepsis bundles in the first 3 h increased survival rates in patients with septic shock. However, an insignificant increase in

Table 9: The Average Value of SOFA, VIS, VDI as a predictor of Mortality < 48 h

Variable N = 164	Mortality < 48 h N = 71	Survive < 48 h N = 93	P– value
SOFA Score	10.35 ± 2.700	8.86 ± 2.607	**≤ 0.001***
VIS	12.042 ± 14.0808	8.043 ± 11.2452	**0.039****
VDI	0.1750 ± 0.1933	0.1202 ± 0.1812	0.100**

VIS = Vasopressor Inotropic Score; VDI = Vasopressor Dependency Index; Data presented as Mean ± SD

the survival rate was found in patients who were not in a state of septic shock.[8,22] Nonetheless, a delay in implementing the sepsis bundle recommendations, even if for < 3 h will cause a significant increase in the mortality rates.[23]

In this study, the mortality of sepsis and septic shock patients was very high, reaching 68.9%. There are several identifiable risk factors apart from the inappropriate implementation of sepsis bundle 3, such as a high mean SOFA score, a high median of VIS, and a high percentage of samples referred to referral hospitals. The mean SOFA value obtained at the time of initial presentation was 9.51 ± 2.74. The SOFA score is a good predictor of prognosis in patients with sepsis. Wicaksono, Utariani, and Kuntaman (2020) found that the SOFA score threshold to predict mortality in sepsis patients was 10.5, with a sensitivity of 88.2%, and specificity of 88.9%.[24] Other studies suggest that a SOFA score > 4.5 is a predictor of mortality in sepsis patients (sensitivity 44%, specificity 95%.[25] Patients with a SOFA scores > 11, 8–10, and 2–7 have a mortality risk of > 90%, 60%, and 37%, respectively.[10]

The high number of referred cases of sepsis in tertiary referral hospitals is a common finding. The majority of the patients included in our study were referred from other healthcare facilities. Based on the data shown in Table 1, we see majority of the referred patients already in a state of septic shock and had a median SOFA score of 10. Data in Table 8 imply that SOFA scores of 10.76 ± 2.584 were significantly correlated with a higher mortality rate in these patients within the first 48 h. Another risk factor that may have contributed to the high mortality rate in this study was the VIS. We found that a higher VIS (13.796 ± 14.534) was significantly correlated with higher mortality rates within the first 48 h among the referred patients (Table 9). This result is consistent with a study by Wicaksono et al., who concluded that a VIS >8.75 has an 88.9% sensitivity and is specific for predicting the mortality risk.[24]

The 1-hour sepsis bundle (2018) provides recommendations that still open the debate about a solution to the term "zero time".[22] Zero time starts with clinical findings consistent with sepsis or septic shock in the emergency department triage or a similar treatment unit.[7] This was difficult to ascertain at our study center, a referral and teaching hospital because most of the cases of sepsis and septic shock treated are referral cases that have received prior treatment, regardless of whether the therapy was carried out following the recommendations of the sepsis bundle. This explains the low compliance rates for sepsis bundles in the first hour of this study. In general, the obstacle faced in implementing the 1-hour sepsis bundle is challenging in identifying sepsis patients and initiating therapy at zero time.

5. LIMITATIONS

There were several limitations in our study; it was a retrospective study. In general, the obstacles faced in implementing the 1-hour sepsis package were identifying septic patients and starting therapy at zero time. There were several factors that could influence the high mortality rate; it is necessary to conduct a prospective study with a larger sample size to provide more substantial results that can be used to improve local conditions.

Large scale research at international level might enlighten us in a better way about the effect of education on guideline compliance and mortality assessment in patients with sepsis.

6. CONCLUSION

The mortality rate due to sepsis and septic shock in this study population was high, accompanied by low compliance to the resuscitation bundle and general sepsis management. This study indicates that sepsis management improves the patient's condition and better prognosis if compliance with the sepsis guidelines is high.

7. Data availability

The numerical data generated during this research is available with the authors.

8. Conflict of interest

Theauthors declare no conflict of interest.

9. Funding

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10. Authors contribution

All authors took equal part in the concept, conduct of the study, data collection, manuscript preparation and final approval of the manuscript.

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