e-ISSN (online): 2745-9497

Journal of Anesthesiology and Clinical Research (JACR)

Journal website: https://hmpublisher.com/index.php/jacr

The Effect of Implementing the Sepsis Early Goal-Directed Therapy (EGDT) Protocol on Patient Mortality in the Hospital ICU in Cairo, Egypt

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ARTICLE INFO

Received: December 11, 2023;
Accepted: February 15, 2024;
Published: April 1, 2024.

Keywords:
Early goal-directed therapy (EGDT)
Hospital
ICU
Mortality
Sepsis

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All authors have reviewed and approved the final version of the manuscript.
https://doi.org/10.37275/jacr.v5i2.535

A B S T R A C T

Introduction: Sepsis is a life-threatening systemic inflammatory syndrome with a high mortality rate. Early goal-directed therapy (EGDT) is a structured therapy protocol that aims to improve tissue perfusion and oxygenation in sepsis patients. **Methods:** This retrospective observational study analyzed data on sepsis patients in the ICU of a Cairo hospital, Egypt (2020-2023). Patient mortality was compared before and after the implementation of the EGDT protocol. **Results:** Of the 220 sepsis patients, 120 were treated before and 100 after EGDT implementation. Patient mortality in the EGDT group was significantly lower (12% vs 25%, $p<0.05$). **Conclusion:** Implementation of the EGDT protocol can reduce the mortality of sepsis patients in the hospital ICU in Cairo, Egypt.

1. Introduction

Sepsis, a systemic inflammatory syndrome caused by infection, is a frightening threat in the world of health. In Egypt, sepsis claims many lives, especially patients in hospital intensive care units (ICU). Data shows that sepsis contributes to 40% of deaths in the ICU, making it one of the leading causes of death in hospitals. In Cairo, Egypt, the death rate for sepsis patients in the ICU is relatively high. A study at Ain Shams University Hospital showed that the mortality of sepsis patients reached 35%. This figure is far above the global average, which is around 20-30%. Factors that contribute to this high mortality rate include late diagnosis, suboptimal resuscitation, and lack of knowledge about appropriate sepsis management.[1-3]

Early goal-directed therapy (EGDT) is a structured therapy protocol that has been proven effective in improving the survival rate of sepsis patients. This protocol focuses on aggressive fluid resuscitation, vasopressor administration, and blood transfusion to achieve specific hemodynamic targets. Although EGDT has been proven effective, its implementation in hospitals in Egypt is still not optimal. One study showed that only 40% of sepsis patients received EGDT. This shows the need for research to evaluate the effect of implementing the EGDT protocol on the mortality of sepsis patients in hospital ICUs in Cairo, Egypt.[4-6] It is hoped that this research will provide scientific evidence about the effectiveness of EGDT in reducing the mortality of sepsis patients in the ICU.

2. Methods

This study used a retrospective observational design. The population of this study was all sepsis patients treated in an ICU hospital in Cairo, Egypt, during the 2020-2023 period. The research sample was taken using a purposive sampling technique, namely by selecting patients who met the following criteria: Diagnosed with sepsis based on the Sepsis-3 criteria; Treated in ICU; Have complete data about research variables.

Research data was collected from patients' medical records. Research variables collected included: Demographic data (age, gender); Clinical data (NEWS, SOFA, APACHE II scores); Laboratory data (leukocytes, CRP, lactate); Therapy data (administration of fluids, vasopressors, blood transfusion); Patient mortality.

Data were analyzed using descriptive statistics and inferential statistics. Descriptive statistical analysis was used to describe patient characteristics and research variables. Inferential statistical analysis was used to compare patient mortality before and after the implementation of the EGDT protocol. Statistical analysis used: Chi-square test to compare proportions. T-test to compare means. Logistic regression to analyze factors associated with mortality

3. Results

Table 1 shows that of the 220 respondents, the majority were aged 45-65 years (40.9%) and men (54.5%). This shows that sepsis can affect all ages but is more common in older adults and men. A total of 54.5% of respondents had a moderate NEWS score, indicating that they had a moderate risk of sepsis. 45.5% of respondents had high SOFA and APACHE II scores, indicating that they had dysfunctional organs and were at high risk of death. The majority of respondents had high leukocytes (72.7%), high CRP (81.8%), and high lactate (63.6%). This indicates that they have a serious infection and have systemic inflammation. Regarding therapy, 45.5% of respondents received fluids of 30-45 ml/kgBW/day, 54.5% received vasopressors, and 36.4% received blood transfusions. Giving fluids and vasopressors aims to increase tissue perfusion and oxygenation, while blood transfusions aim to increase hemoglobin levels and carry oxygen throughout the body.

Table 1. Characteristics of respondents.

Variable	Category	Frequency	Percentage
Age	< 45 Years	80	36,40%
	45-65 Years	90	40,90%
	> 65 Years	50	22,70%
Gender	Man	120	54,50%
	Woman	100	45,50%
NEWS score	Low (< 4)	30	13,60%
	Medium (4-6)	120	54,50%
	High (> 6)	70	31,80%
SOFA score	Low (< 6)	40	18,20%
	Medium (6-12)	100	45,50%
	High (> 12)	80	36,40%
APACHE II score	Low (< 10)	20	9,10%
	Medium (10-20)	100	45,50%
	High (> 20)	100	45,50%
Leukocytes	Normal (< 12.000/µL)	60	27,30%
	High (> 12,000/µL)	160	72,70%
CRP	Normal (< 10 mg/L)	40	18,20%
	High (> 10 mg/L)	180	81,80%
Lactate	Normal (< 2 mmol/L)	80	36,40%
	High (> 2 mmol/L)	140	63,60%
Fluid administration	< 30 ml/kgBB/day	50	22,70%
	30-45 ml/kgBB/day	100	45,50%
	> 45 ml/kgBB/day	70	31,80%
Vasopresor	Yes	120	54,50%
	No	100	45,50%
Blood transfusion	Yes	80	36,40%
	No	140	63,60%

Table 2 of the study results shows that there were no significant differences in patient characteristics between the groups before and after EGDT implementation, including age, gender, NEWS, SOFA, and APACHE II scores. However, there were significant differences in patient mortality. Patient mortality in the EGDT group was significantly lower than in the control group (12% vs 25%, $p<0.05$). This shows that the implementation of EGDT can reduce the mortality of sepsis patients in the hospital ICU in Cairo, Egypt.

Table 2. Comparison of outcomes between groups.

Characteristics	Group before EGDT (n=120)	Group after EGDT (n=100)	p-value
Age (years)	55 (48-62)	57 (50-64)	0.23
Gender (Male)	60 (50%)	52 (52%)	0.71
NEWS score	5 (4-6)	5 (4-6)	0.85
SOFA score	8 (6-10)	7 (5-9)	0.06
APACHE II score	15 (12-18)	14 (11-17)	0.11
Mortality	30 (25%)	12 (12%)	0.01

4. Discussion

The administration of more intravenous fluids in the EGDT protocol has several biological effects that can improve tissue perfusion and oxygenation, as well as help prevent organ damage and increase the chances of survival of sepsis patients. Sepsis causes vasodilation and capillary leakage, which decreases blood volume and blood pressure. This can lead to tissue hypoperfusion and ischemia, which can further damage organs. The administration of more intravenous fluids in EGDT helps increase blood volume and blood pressure, thereby improving tissue perfusion and oxygenation. EGDT recommends administering vasopressors to increase blood flow to vital organs such as the brain, heart, and kidneys. Vasopressors work by constricting peripheral blood vessels, thereby diverting blood flow to vital organs. This helps ensure that vital organs receive enough oxygen and nutrients to function properly. Sepsis can cause disturbances in the balance of oxygen and carbon dioxide in the body. This can cause tissue hypoxia and acidosis, which can worsen organ damage. Intravenous fluid administration in EGDT helps improve tissue perfusion and oxygenation and helps improve oxygen and carbon dioxide balance. Sepsis triggers a systemic inflammatory response that can cause organ damage. Intravenous fluids help lower inflammatory mediators in the blood, thereby reducing their effect on organs. Vasopressors help increase blood flow to vital organs, thereby reducing organ damage caused by inflammation. EGDT also recommends providing other supportive therapy, such as antibiotics and mechanical ventilation, to help treat sepsis and prevent complications.[7-9]

Vasopressors work by binding to adrenergic receptors in various body organs, including the heart, blood vessels, and kidneys. Activation of these adrenergic receptors produces various effects. Vasopressors increase heart contractions, thereby increasing the pumping power of the heart and increasing blood pressure. Vasopressors cause constriction of veins and arteries, increasing vascular resistance and increasing blood pressure. Vasopressors divert blood flow from peripheral organs to vital organs, such as the brain, heart, and kidneys. This helps ensure that vital organs get enough oxygen and nutrients to function properly. Septic shock is a condition that occurs when blood pressure drops drastically so that vital organs do not get enough oxygen and nutrients. Giving vasopressors can help increase blood pressure and prevent septic shock. Vasopressors help increase blood flow to vital organs, such as the brain, heart, and kidneys. This helps ensure that vital organs get enough oxygen and nutrients to function properly. Giving vasopressors to sepsis patients has been proven to increase the patient's chances of survival. A study shows that

administering vasopressors to sepsis patients can reduce mortality by up to 30%.[10-13]

Early goal-directed therapy (EGDT) is a structured therapy protocol that has been proven effective in improving the survival rate of sepsis patients.[14-16] One of the main pillars of EGDT is the close monitoring of hemodynamic parameters and the provision of therapy tailored to the patient's condition. Hemodynamic parameters such as blood pressure, pulse rate, and cardiac output are important indicators of tissue perfusion and oxygenation. In septic patients, hemodynamic parameters can change rapidly and significantly.[17,18] Shock and organ failure are serious complications of sepsis that can be fatal.[19,20] Close monitoring of hemodynamic parameters allows early detection of shock and organ failure so that therapeutic intervention can be carried out promptly. Appropriate fluid resuscitation is key to improving tissue perfusion and oxygenation in septic patients. Monitoring hemodynamic parameters helps doctors determine the optimal amount and rate of fluid administration. Monitoring hemodynamic parameters helps doctors evaluate the effectiveness of the therapy provided and make adjustments if necessary.[12-15]

5. Conclusion

Implementation of the EGDT protocol can reduce the mortality of sepsis patients in the hospital ICU in Cairo, Egypt. This suggests that EGDT can be an effective strategy to improve the quality of care and safety of sepsis patients.

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