Original research article

THE EFFECT OF HYDROCORTISONE ON OUTCOME AMONG PATIENTS WITH SEPTIC SHOCK IN INTENSIVE CARE UNIT WITH LARGE VOLUME THORACENTESIS

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Abstract: *This study aimed to determine the effect of hydrocortisone on the outcome of patients with septic shock in the intensive care unit (ICU). A case-control study was conducted at the Pulmonology Department of Pak Red Crescent Medical College & Teaching Hospital, Lahore, from November 2022 to April 2023 on 200 patients presenting with septic shock to the ICU. The patients were divided into two groups: cases (who received hydrocortisone) and controls (who received standard septic shock therapy). Mortality, vasopressor-free days, and mean ICU stay were assessed between groups. The mean age of the patients in the study was 43.55±14.08 years. The mortality rate was significantly lower in the cases group compared to the control group. In the cases group, the mean ICU stay was 8.14±0.817 days, while in the control group, it was 8.97±0.77 days (P = 0.001). In the cases group, the patients had significantly longer vasopressor-free days (9.95±0.82 days); in the control group, it was 8.97±0.85 days (P = 0.0001). The use of hydrocortisone can significantly reduce the ICU stay as well as the need for vasopressors in septic shock patients. The study also found that it has a significant reduction in mortality.*

Keywords: Hydrocortisone, Septic shock, mortality, ICU

Introduction

Sepsis, a life-threatening condition triggered by a systemic response to infection, represents a critical challenge in modern medicine. When sepsis progresses to septic shock, it reaches a critical juncture characterized by profound circulatory instability, multiple organ dysfunction, and a staggering risk of mortality (Cecconi et al., 2018). The management of septic shock is a complex and evolving field, constantly seeking innovative approaches to improve patient outcomes. One direction that garnered significant attention and debate is using hydrocortisone, a synthetic glucocorticoid, as part of the therapeutic arsenal for septic shock patients (Polat et al., 2017; Thompson et al., 2019).

The consideration of hydrocortisone therapy in the context of septic shock arises from its immunomodulatory and anti-inflammatory properties (Suffredini, 2018). Sepsis-induced dysregulation of the immune system often leads to an uncontrolled inflammatory response, contributing to tissue damage and organ failure. Hydrocortisone, with its potent anti-inflammatory effects, can temper this excessive immune reaction, potentially interrupting the vicious cycle of organ dysfunction and reducing mortality risk (Hussein et al., 2021; Venkatesh et al., 2018).

Septic shock has historically been a complex condition for clinicians to treat effectively. Even though there are many guidelines available, there will always be a challenge associated with establishing hemodynamic objectives and applying guidelines to accomplish those targets (Sherwin et al., 2017). Antibiotics, fluid replacement, and vasopressors have traditionally been the three cornerstones of adequate care for septic shock. Over the course of the past three decades, recommendations on the usage of anabolic steroids have undergone consistent shifts (Rothrock et al., 2020). A prospective, randomized, double-blind, placebo-controlled trial was carried out in 1987, and the results showed that steroids offered no benefit in the treatment of septic shock (Bone et al., 1987). In 2002, a placebo-controlled, randomized, double-blind, parallel-group trial was carried out on 300 patients over four years. The trial indicated an improved prognosis with the use of low-dose steroids, and the researchers attributed it to chronic adrenal deficit in septic shock (Annane et al., 2002).

By delving into the existing body of research, critically assessing clinical trials and observational studies, and considering the broader implications for clinical practice, this investigation aims to shed light on the therapeutic potential and the evolving landscape of hydrocortisone in septic shock management. Ultimately, understanding the place of hydrocortisone in this context holds the promise of enhancing patient care, refining sepsis treatment strategies, and advancing our understanding of sepsis pathophysiology.

Methodology

This case-control study was conducted at the Pulmonology Department, Pak Red Crescent Medical College & Teaching Hospital, Lahore, from November 2022 to April 2023 after taking an ethical clearance certificate. We included 200 patients of age above 18 years of either gender

presenting with septic shock in our study, and their basic demographics were noted. We then allotted 100 patients to the cases group. The case group patients received hydrocortisone 50 mg every 6 hours, while the control group patients received standard septic shock therapy. We assessed the outcomes regarding mortality, vasopressor-free days, and mean ICU stay between both groups.

We used SPSS 24 to assess the variables. Mean and standard deviation were used for numerical data, while frequencies and percentages were used for categorical data. We used the Chi-Square and Independent Samples T-test to test the association and difference between variables, keeping P value < 0.05 as significant.

Results

This study was conducted on 200 patients presenting with septic shock. The mean age at presentation of the patients was 43.55±14.08 years. The male patients were higher in number, 62.5%, while female patients were 37.5%. Regarding comorbid conditions, around 23.5% of patients had diabetes, while 32% of patients were hypertensive. Regarding the mortality rate, we observed that in the cases group, the mortality rate was significantly lower than the controls. In some cases, the mortality rate was 25%, while in the controls, it was 41% (P = 0.0001).

Regarding the ICU stay, we noted that in the cases group, the mean ICU stay was 8.14±0.817 days; in the control group, it was 8.97±0.77 days. In some cases, the mean ICU stay was significantly shorter than the control groups (P = 0.0001). Regarding the vasopressors-free days, we noted that in the cases group, the patients had significantly longer vasopressors-free days, 9.95±0.82 days, while in the control group, it was 8.97±0.85 days (P = 0.0001).
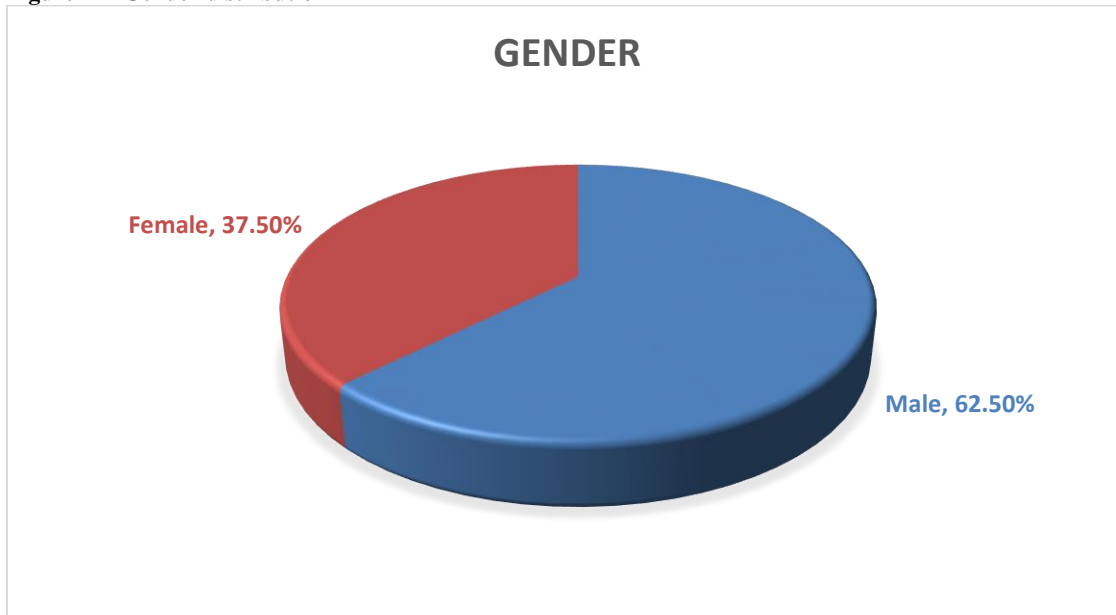
Figure 1   Gender distribution

Table 1   Mortality rate

		Mortality		Total	P value
		Yes	No		
Groups	Cases	25	75	100	0.01
		25.0%	75.0%	100.0%	
	Controls	41	59	100	
		41.0%	59.0%	100.0%	
Total		66	134	200	
		33.0%	67.0%	100.0%	

Table 2   Comparison of vasopressor-free days and ICU stay between cases and controls

Variables	Groups	N	Mean	Std. Deviation	P value
ICU stay (days)	Cases	100	8.14	.817	0.0001
	Controls	100	8.97	.771	
Vasopressors free days	Cases	100	9.95	.821	0.0001
	Controls	100	8.97	.858	

Discussion

Infections have the potential to induce a variety of symptoms that, when concomitantly present, can initiate a pathological state recognized as systemic inflammatory response syndrome (SIRS), more frequently referred to as sepsis. Sepsis is a pathological state that manifests through physiological, biological, and biochemical irregularities, predominantly arising from an unregulated inflammatory reaction to an infectious agent. There are several definitions of sepsis. However, the most recent and widely acknowledged one, SEPSIS 3, was released in 2016 (Sterling et al., 2017)[11]. According to this definition, sepsis is a critical impairment of organ function that poses a significant risk to life. This impairment arises from an unbalanced response by the host organism to an infection. Septic shock falls within the sepsis category and is characterized by notable circulatory, cellular, and metabolic abnormalities. This severe form of sepsis has a greater risk of mortality, with rates reaching up to 40%, in contrast to sepsis alone (Rhodes et al., 2017). Inadequately controlled sepsis has the potential to result in the development of multiple organ failure and, ultimately, mortality. The prompt commencement of sepsis therapy by well-qualified medical workers is paramount, as it mitigates organ failure, minimizes the likelihood of sequelae, and enhances overall survival rates. The prognosis of septic shock is contingent upon various aspects, including the virulence of the bacterial pathogen, the duration of time elapsed, and the patient's overall health status, including their immune system functionality and any pre-existing medical disorders. Consequently, the development of personalized treatment approaches that are specifically adapted to the unique circumstances of each case is imperative. Additional approaches to mitigate the body's dysregulated reaction to sepsis encompass the utilization of systemic steroids, ascorbic acid (commonly known as vitamin C), and thiamine (Rochwerg et al., 2018).

In instances marked by inflammation, there is a potential for insufficiency in the production of cortisol by the adrenal glands. In such circumstances, the administration of further corticosteroid therapy becomes imperative. According to the fourth version of the Surviving Sepsis Campaign, it is advisable to use hydrocortisone, particularly in cases where patients exhibit inadequate response to fluids and vasopressors (Sprung et al., 2008). In light of the most recent iteration of this campaign, two trials were undertaken to evaluate the advantages and drawbacks of corticosteroids in the adult population afflicted with septic shock. The first trial, known as the ADRENAL trial, focused on investigating the impacts of hydrocortisone. The second trial, the APROCCHSS trial, aimed to assess the effects of a combination therapy involving hydrocortisone and fludrocortisone. The findings from both experiments demonstrated a favorable outcome in reducing mortality rates among patients with septic shock by administering hydrocortisone and fludrocortisone (Annane et al., 2002).

The use of intravenous hydrocortisone at a dosage of 200 mg per day is widely regarded as the optimal pharmacological intervention for the reversal of shock in individuals diagnosed with septic shock, particularly in cases when the patients exhibit an insufficient response to fluid resuscitation and vasopressor therapy. It is noteworthy that the administration of steroids might result in many adverse effects, such as hyperglycemia and hypernatremia, despite the potential efficacy in preserving lives (Venkatesh et al., 2018).

In our study, we observed that the mortality rate in the cases group who were given hydrocortisone was significantly lower as compared to the control group, which received standard shock therapy. These results are compared to a study that reported a significant decrease in mortality in patients receiving hydrocortisone.

Regarding the vasopressor-free days and ICU stay, we found significant differences between both groups. The cases group had significantly higher vasopressor-free days compared to the control group while the ICU stay was significantly shorter in the cases group. These results are demonstrated by a study as well.

Conclusion

From our study, we conclude that using hydrocortisone can significantly reduce the ICU stay and reduce the need for vasopressor in septic shock patients. We also found that it has a significant reduction in mortality.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
Approved by the department Concerned.
Consent for publication
Approved
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Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

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