EMERGENCY APPROACH IN THE MANAGEMENT OF PEDIATRIC PATIENTS IN SEPTIC SHOCK: DIAGNOSIS AND PROTOCOLS

ABORDAGEM EMERGENCIAL NO MANEJO DE PACIENTES PEDIÁTRICOS EM CHOQUE SÉPTICO: DIAGNÓSTICO E PROTOCOLOS

ABORDAJE DE URGENCIA EN EL MANEJO DEL PACIENTE PEDIÁTRICO EN SHOCK SÉPTICO: DIAGNÓSTICO Y PROTOCOLOS

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ABSTRACT

Septic shock is a critical condition characterized by the combination of sepsis (a systemic inflammatory response triggered by an infection) and severe cardiovascular dysfunction, including hypotension resistant to volume replacement. In Brazil, the incidence of septic shock in children is high, with mortality rates ranging from 10.8% to 33.5%. Immediate and appropriate treatment, especially in the first 24 hours of hospitalization, is crucial to reduce morbidity and mortality, particularly in children. The primary objective of this literature review is to structure and gather data on septic shock in pediatric emergency rooms, aiming at early diagnosis and rapid and eficiente establishment of a course of action to reduce complications and, mainly, mortality. There are several methods used in emergency rooms to ensure rapid, systematic and organized care, such as the Manchester Scale, Pain Intensity Scale, and Pediatric Basic and Advanced Life Support (PALS) protocol. The diagnosis is confirmed based on the Phoenix Sepsis Score (PSS), considering the presence of severe hypotension and other criteria such as elevated lactate levels. The severity of septic shock depends on multiple factors, including the virulence of the pathogen, the patient's immunity, and the duration of the clinical picture. The methodology will be established by bibliographic reviews on the Scientific Library Online (SciELO) platform, FIOCRUZ, Brazilian Society of Pediatrics, Latin American Institute of Sepsis, II Brazilian Multidisciplinary Congress in Urgency and Emergency Online, and also the Sepsis Protocol of the Federal University of Pará together with the João de Barros Barreto University Hospital, over the last 24 years. It is expected that from the analysis of the information it will be possible to quickly identify the physiological state and initiate appropriate therapeutic measures, which are fundamental to reducing morbidity and mortality.

Keywords: Septic Shock. Pediatric Emergency. Sepsis.

RESUMO

O choque séptico é uma condição crítica caracterizada pela combinação de sepse (resposta inflamatória sistêmica desencadeada por uma infecção) e disfunção cardiovascular grave, que inclui hipotensão resistente à reposição de volume. No Brasil, a incidência de choque

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séptico em crianças é elevada, com taxas de mortalidade variando entre 10,8% e 33,5%. O tratamento imediato e adequado, especialmente nas primeiras 24 horas de internação, é crucial para reduzir a morbimortalidade, particularmente em criança. O objetivo primário desta revisão bibliográfica é estruturar e reunir dados sobre o choque séptico na emergência pediátrica visando o diagnóstico precoce e o estabelecimento rápido e eficiente de uma conduta para reduzir complicações e, principalmente, a mortalidade. Há vários métodos utilizados na emergência para garantir atendimento rápido, sistematizado e organizado, como a Escala de Manchester, Escala de Intensidade da Dor, Protocolo de Suporte Básico e Avançado de Vida Pediátrico (PALS). O diagnóstico é confirmado com base no Escore de Sepse de Phoenix (PSS), considerando a presença de hipotensão grave e outros critérios como níveis elevados de lactato. A gravidade do choque séptico depende de múltiplos fatores, incluindo a virulência do patógeno, a imunidade do paciente, e a duração do quadro clínico. A metodologia será estabelecida por revisões bibliográficas na plataforma Scientific Library Online (SciELO), FIOCRUZ, Sociedade Brasileira de Pediatria, Instituto Latino Americano de Sepse, II Congresso Brasileiro Multidisciplinar em Urgência e Emergência On-line, e também Protocolo de Sepse da Universidade Federal do Pará junto com o Hospital Universitário João de Barros Barreto, nos últimos 24 anos. Espera-se que a partir da análise das informações possa ser possível Identificar rapidamente o estado fisiológico e iniciar medidas terapêuticas adequadas são fundamentais para a redução da morbimortalidade.

Palavras-chave: Choque Séptico. Emergência Pediátrica. Sepse.

RESUMEN

El shock séptico es una afección crítica caracterizada por una combinación de sepsis (una respuesta inflamatoria sistémica desencadenada por una infección) y disfunción cardiovascular grave, incluyendo hipotensión resistente a la reanimación con líquidos. En Brasil, la incidencia de shock séptico en niños es alta, con tasas de mortalidad que oscilan entre el 10,8 % y el 33,5 %. El tratamiento inmediato y adecuado, especialmente en las primeras 24 horas de hospitalización, es crucial para reducir la morbilidad y la mortalidad, especialmente en niños. El objetivo principal de esta revisión bibliográfica es estructurar y recopilar datos sobre el shock séptico en el servicio de urgencias pediátricas, con el objetivo de lograr un diagnóstico precoz y establecer de forma rápida y eficiente un plan de acción para reducir las complicaciones y, especialmente, la mortalidad. En el servicio de urgencias se utilizan diversos métodos para garantizar una atención rápida, sistemática y organizada, como la Escala de Triaje de Manchester, la Escala de Intensidad del Dolor Pediátrico y el protocolo de Soporte Vital Básico y Avanzado Pediátrico (PALS). El diagnóstico se confirma con la Escala de Sepsis de Phoenix (PSS), considerando la presencia de hipotensión grave y otros criterios como niveles elevados de lactato. La gravedad del choque séptico depende de múltiples factores, como la virulencia del patógeno, la inmunidad del paciente y la duración del cuadro clínico. La metodología se establecerá mediante revisiones bibliográficas en la plataforma Scientific Library Online (SciELO), FIOCRUZ, la Sociedad Brasileña de Pediatría, el Instituto Latinoamericano de Sepsis, el II Congreso Brasileño Multidisciplinario de Urgencia y Emergencia Online, y el Protocolo de Sepsis de la Universidad Federal de Pará, en colaboración con el Hospital Universitario João de Barros Barreto, durante los últimos 24 años. Se espera que, a partir del análisis de la información, sea posible identificar rápidamente el estado fisiológico e iniciar las medidas terapéuticas adecuadas, fundamentales para reducir la morbilidad y la mortalidad.

Palabras clave: Choque Séptico. Emergencia Pediátrica. Sepsis.

1 INTRODUCTION

Septic shock is a clinical, critical and potentially fatal condition of a severe bacterial, viral, fungal, protozoal or parasitic infection that leads to dysfunctions of the cardiovascular and/or non-cardiovascular system associated with refractoriness to volume replacement.

The patient in this condition is characterized as a medical emergency due to the fact that it needs a quick and efficient intervention because of the rapid progression that affects several organs of the body, especially the heart, compromising the physiological flow of the systems.

Thus, this condition becomes alarming in pediatric patients due to factors such as greater vulnerability to dehydration and hydroelectrolytic disorders, immature immune system, difficulty in identifying symptoms, incomplete maturation of some organs, and low energy reserve.

For these reasons, the management of septic shock in pediatrics is a challenge for health professionals, since it requires specialized care, early diagnosis, and efficient treatment in order to minimize complications and reverse hemodynamic instability.

According to the Guidelines Manual of the Brazilian Society of Pediatrics, "Severe Sepsis and Pediatric Septic Shock". Surviving Sepsis Campaign (SSC) 2017", the early identification of septic shock and the following of protocols that have an immediate intervention with the rapid stabilization of the patient decreased the number of deaths from 4% to 2%. This shows the importance of following guidelines with scientific foundations for the management of septic shock in pediatric patients are pillars to maximize results and implement effective practices. Complications of septic shock in children include deficit, decreased cardiac output, increased dead space in the lungs, decreased immunity, tissue death, and multiple system failure.

Considering the factors presented, it is observed that it is necessary for health professionals to make an early diagnosis, adequate hemodynamic support, antibiotic therapy, infection control and adherence to treatment protocols are fundamental elements in the management of this fatal syndrome. Thus, this theoretical and informative review seeks to present updated and evidence-based recommendations for clinical practice in the management of septic shock in pediatric emergency care .

2 OBJECTIVES (GENERAL AND SPECIFIC)

2.1 GENERAL (PRIMARY)

The purpose of this review is to structure and gather data on septic shock in pediatric patients in the emergency room with a view to early diagnosis and specific procedures due

to the need for rapid intervention to reduce mortality, classify it, and perform specific procedures quickly and efficiently to minimize complications.

2.2 SPECIFIC (SECONDARY)

- To describe the pathophysiology and etiology of septic shock in pediatric patients in the emergency room.
- To clarify the treatment and prognosis of pediatric septic shock in an emergency situation.
- Clarify the complications of septic shock in pediatric patients in the emergency room.
- To highlight prevention methods in order to reduce the number of cases of septic shock in children in emergency care.
- Inform the public health repercussions of septic shock in pediatric patients in the emergency room.

3 MATERIALS AND METHODS (METHODOLOGY)

This project is a literature review using the most relevant articles, websites, and guidelines published between the years 2001 and 2024. For the elaboration of the systematic review, Boolean operators and key terms will be established for research that used ecological study and inductive and statistical approach, as well as methodological criteria, theoretical deepening, ethical aspects and research instruments, including studies by students from various areas of health, such as medicine, pharmacy and nursing. All the study material was read and the information present in it was extracted and organized in a systematic way to compose this scientific work. There will be no exclusion regarding the profile of the university (public or private) and the stage of training.

A part of the selected articles were searched in the Scientific Electronic Library Online (SciELO), and only 2 were chosen as part of the literature review. The descriptors used were: "sepsis", "septic shock" and "sepsis". The sites used were FIOCRUZ, the Brazilian Society of Pediatrics, the Latin American Sepsis Institute, the II Brazilian Multidisciplinary Congress on Urgency and Emergency Online, and also the Sepsis Protocol of the Federal University of Pará together with the João de Barros Barreto University Hospital. The investigation made it possible to collect instructions organized in alphabetical order registered in the "References" sector located on page 26.

4 DISCUSSION

Septic shock is the presence of sepsis (inflammation that spreads rapidly throughout the body by an infecting organism that raises blood pressure, causes failure of several organs, among other symptoms) plus cardiovascular dysfunction, hypotension refractory to volume. (SBP, 2019)

The term sepsis is defined as Systemic Inflammatory Response Syndrome (SIRS) resulting from infection by bacteria, fungi, protozoa, and viruses. The term shock, on the other hand, is characterized by the disparity between blood volume and vascular bed capacity, with systemic tissue hypoperfusion due to the decrease in cardiac output and/or reduction in effective circulating blood volume. (Failure, J.F, 2008)

This systemic inflammatory response is characterized by endothelial cell activation, tissue edema, disseminated intravascular coagulation, and metabolic derangements. (Robbins and Cotran, 2016). Such as hypermetabolism, with increased glycogenolysis and hepatic gluconeogenesis, increased lipolysis and muscle, intestinal and connective tissue protein catabolism. (Siqueira-Batista, R et al, 2011) In this way, these mechanisms lead to organ failure and death due to tissue hypoxia, lactic acidosis and cell death.

Septic shock becomes an emergency because it requires immediate care due to its rapid progression and is potentially fatal.

Thus, it is extremely important to use tools that aim to assist, organize, and speed up care, such as the Manchester Scale, which can help quickly and accurately identify the patient's level of severity and the recommended waiting time. This protocol uses a color chart, so each color represents the patient's level of severity (red: emergency / attended immediately; orange: very urgent / can wait a maximum of 10 (ten) minutes to be seen; yellow: urgent / can wait up to 50 minutes; green: little urgent / can wait up to 2 (two) hours; blue: not urgent / waiting time can be up to 4 hours. (Ministry of Health, 2014)

It is important to remember that pediatric patients have an age range (0 – 18 years) and thus express the feeling of pain in different ways, such as crying, screaming, cringing, pointing, moaning, among other ways. Thus, by using the Pain Intensity Scale, which ranges from 0 to 10, it is possible to better understand the patient's pain aspect. (São Paulo State Secretariat, 2022)

When the patient has already been triaged, a systematic evaluation of the child should be carried out, following a sequence already established by the Pediatric Basic and Advanced Life Support Protocol (PALS), which aims to make a quick and accurate assessment of airway, respiratory, circulatory, and neurological support to minimize complications and reduce the mortality rate in pediatric emergencies.

The diagnosis of septic shock is established in children with sepsis who have at least 1 point in the cardiovascular component of the Phoenix Sepsis Score (PSS), i.e., severe hypotension for age, blood lactate >45 mg/dL, serum lactate > 5 mmol/L, or need for vasoactive medication). (SBP, 2024).

Usually, septic shock is caused by infections resulting from Gram-positive bacteria, Gram-negative bacteria, fungi, and protozoa, the most common being the former. Therefore, treatment is based on antibiotic therapy, volume replacement, vasodilators, oxygen supplementation (avoiding tissue hypoxia and maintaining blood pressure).

Complications resulting from septic shock in children are deficit of renal function due to lactic acidosis, decrease in cardiac output, increase in dead space in the lungs due to hypoventilation and hypoxemia, decreased immunity, tissue death, and system failure.

In emergency situations, identifying the physiological state and initiating initial therapeutic measures are the key points in reducing morbidity and mortality. (FIOCRUZ, 2024).

In addition, the severity and outcome of the clinical picture of septic shock are also dependent on the virulence of the infection, system involvement, levels of mediator production, patient's immunological status, presence of comorbidity, origin of shock and its duration. (Robbins and Cotran, 2016)

5 RESULTS

The analysis of the selected literature demonstrated that pediatric septic shock remains one of the main medical emergencies, with a high mortality rate, especially in the first hours of care. Studies indicate that most deaths are associated with delays in recognizing the condition and initiating therapeutic interventions.

It was evidenced that the early identification of signs of tissue hypoperfusion is the main factor for the initial diagnosis, highlighting tachycardia, changes in the level of consciousness, prolonged capillary refill, cold extremities, oliguria, and hypotension. It was observed that children often present nonspecific manifestations, which contributes to underdiagnosis and worse prognosis.

"Most deaths in children occur as a result of treatable diseases within the first 24 hours of hospital admission. Prompt and appropriate treatment significantly reduces morbidity and mortality in pediatric emergencies." (Hansoti et al., 2017; WHO, 2016.) and The incidence of septic shock in children in Brazil was approximately 53.7% in places with many resources and 81.3% with few resources and mortality was 10.8% and 33.5%, respectively (SBP, 2024). This highlights the need for health professionals to know the biological and psychological

peculiarities of pediatric patients, who are subject to aggravations resulting from iatrogenic events performed by the physician who was not properly involved in dealing with such a situation.

Regarding the initial management, the studies indicate volume resuscitation with crystalloid solutions as the first therapeutic approach, which should be performed immediately and with frequent clinical reassessments. Monitoring of vital signs, Glasgow Coma Scale, and urine output after each volume expansion was essential to assess the therapeutic response.

The results also showed that, in cases where there is no adequate response to volume replacement, the early introduction of vasoactive drugs is necessary to restore tissue perfusion. In addition, the increase in serum lactate and the need for vasoactive support were pointed out as important markers of severity.

Finally, the literature analyzed demonstrated that the adoption of clinical protocols and the training of emergency teams are directly associated with the reduction of complications, progression to multiple organ failure, and mortality in pediatric patients with septic shock.

6 CONCLUSION

Relevance of the study of septic shock in pediatric patients in the emergency room by health students, delving into its early diagnosis, pathophysiology, etiology, treatment, complications, prevention and prognosis.

Septic shock in children has a great impact on Brazilian public health, in terms of the number of admissions, rapid progression, severity, and lethality. Thus, the analysis of factors is extremely important to help doctors have an efficient conduct, immediate intervention and ensure the patient's well-being.

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