Arch Argent Pediatr. 2025;e202510646

Second epidemiological study of pediatric sepsis and septic shock in Argentina (ESSPED-2)

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ABSTRACT

Introduction. Sepsis is one of the leading causes of pediatric mortality in Argentina. The aim was to describe the epidemiological characteristics of sepsis and septic shock (ESSPED-2 study) in pediatric intensive care units (PICUs) in Argentina and compare them with previous data from the Epidemiological Study of Severe Pediatric Sepsis (ESSPED).

Population and methods. An observational, cross-sectional, prospective study in patients with sepsis hospitalized in PICUs in Argentina from September 15, 2021, to December 15, 2021.

Results. A total of 3230 patients were admitted to 55 PICUs. We included 428 patients who had 476 events. The median age was 17 months (4.2-74.2). The prevalence was 14.7%, and the 28-day mortality rate was 16.5%; 36.7% of patients did not receive antibiotics within the first hour. Receiving more than 60 mL/kg of fluids in the first 60 minutes showed a negative trend in mortality. Patients with comorbidities, septic shock, acute respiratory distress syndrome (ARDS), dysfunction of 2 or more organs, and phenotype D had higher mortality.

The clinical characteristics and prevalence remained unchanged, whereas the administration of fluids and the use of vasoactive drugs changed, and mortality rates decreased significantly.

Conclusions. Sepsis is an event of high prevalence and mortality in Argentina. In the multivariate analysis, the variables lose relevance, except for the presence of dysfunction in 2 or more organs, septic shock, a Pediatric Mortality Index (PMI3) value greater than 15, or being an immunocompromised host.

Keywords: *sepsis; septic shock; pediatrics; pediatric intensive care units.*

doi: http://dx.doi.org/10.5546/aap.2025-10646.eng

To cite: Galván ME, Viqueira Guzmán C, Lanzavecchia E, Jabornisky R, Ruvinsky S, Kulik MV, et al. Second epidemiological study of pediatric sepsis and septic shock in Argentina (ESSPED-2). *Arch Argent Pediatr.* 2025;e202510646. Online ahead of print 31-JUL-2025.

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Funding*: Carolina Viqueira Guzmán and Estefanía Lanzavecchia received a Research Grant from the Hospital de Pediatría S.A.M.I.C. Prof. Dr. Juan P. Garrahan.*

Conflict of interest*: None.*

Received*: 1-17-2025*
Accepted*: 5-13-2025*

INTRODUCTION

Sepsis is a clinical entity characterized by a dysregulated immune response of the host in response to an invasive infection caused by various microorganisms.[1]

Globally, it is one of the leading causes of death in children.[2-4] In 2022, 4162 deaths in children under one year of age were reported in Argentina, 50 of them due to "septicemia".[5]

Other entities associated with sepsis, such as meningitis, pneumonia, bronchiolitis, etc., are accounted for separately in the report. If they were all included as sepsis, it would represent one of the leading causes of infant mortality.[6]

In 2008, the Epidemiological Study of Severe Pediatric Sepsis in Argentina (ESSPED, by its Spanish acronym) was conducted, showing a prevalence of 13.8% and a mortality of 31.6%.[7] Subsequently, the Emergency and Critical Care Committee (ECCri) of the Sociedad Argentina de Pediatría (SAP) undertook the task of raising awareness of sepsis and septic shock through courses (ECCri 2008, 2009, 2010, 2011, 2012, and 2013), participation in PRONAP (National Pediatric Update Program) 2013, and review publications and updates on the subject.[8-10]

The term "severe sepsis," used in 2008,[7] was replaced by "sepsis" in the Third International Consensus on Definitions for Sepsis and Septic Shock (Sepsis-3).[1] Thus, ESSPED-2 refers to the Study of Pediatric Sepsis and Septic Shock.

The study aimed to describe the epidemiological, clinical, and evolutionary characteristics of patients with sepsis hospitalized in various PICUs in Argentina and to compare them with those observed in the ESSPED.[8]

POPULATION AND METHODS

In 2021, a second observational, cross-sectional, prospective cohort, and multicenter study was conducted to describe sepsis events in patients hospitalized in PICUs in Argentina.

The study period was from September 15, 2021, to December 15, 2021. All patients with clinical symptoms of sepsis or septic shock, aged between 1 month and 18 years, were included.

The diagnosis was made according to one or both of the following criteria:

- International Consensus Conference on Pediatric Sepsis (ICCPS).[11]
- Pediatric adaptation of Sepsis-3 or pediatric Sequential Organ Failure Assessment (pSOFA).[12]

Patients with limitation of therapeutic efforts were excluded or those with an alternative diagnosis excluding sepsis, or with a diagnosis of sepsis admitted to the PICU who presented their first episode after 90 days, and patients with incomplete follow-up during the study period.

We studied demographic, socioeconomic, and clinical characteristics, underlying diseases, clinical evolution, phenotypes, treatment modalities, presence of sequelae, and final evolution of each event up to the end of the study.[4,8,13-15] Clinical phenotypes were defined according to the calculator developed by Qin et al., based on the combination of 25 clinical and laboratory variables in the first 24 hours of hospitalization, categorizing four phenotypes: PedsSep-A, PedSep-B, PedSep-C, and PedSep-D.[16] Underlying diseases were selected according to the classification of Feudtner et al.[17] Sequelae were defined as the presence of oxygen dependency, neurological deficiency, renal failure, and/or nasogastric tube feeding at the end of the study period, which the patient did not have before the sepsis event.

The present protocol was approved by the Ethics Committees of each participating institution, with the main one being the Review and Research Ethics Committee (CREI) of the Hospital de Pediatría S.A.M.I.C., Prof. Dr. Juan P. Garrahan (approval number 1318, dated April 16, 2021). Two coordinators for each PICU collected the data. They were enabled to access the REDCap (Research Electronic Data Capture) platform hosted at Hospital Garrahan, the coordinating center of the study.[18,19]

Patients admitted to the PICU during the study period were registered and followed up until 90 days after admission. Patients who met the study criteria were followed until discharge from the PICU, death, or 28 days after admission. A new event was considered unrelated to the previous one, and a minimum interval of 28 event-free days was established.

Statistical analysis

Continuous variables were summarized as the mean and standard deviation (SD) or the median and range, depending on the distribution; categorical variables were summarized as percentages. The Student t-test or Wilcoxon test was used to compare continuous variables, and the chi-square test was used for categorical variables.

The association between the possible predictors and the primary endpoint (28-day mortality)

was evaluated by logistic regression analysis. A bivariate analysis was initially performed between each of the independent or predictor variables (x) and the dependent variable (y), 28-day mortality. Subsequently, a multivariate logistic regression analysis was performed with a multiple, manual, and parsimonious model. The discriminative ability of the final multivariate model was assessed by analyzing the area under the receiver operating characteristic (ROC) curve, also known as the AUC. AUC 0.7 was considered acceptable, ≥0.8 was good, and ≥0.9 was excellent.

The overall calibration of the final model was performed with the Hosmer-Lemeshow test, and a *p*-value <0.05 was considered statistically significant. The data were processed using the statistical package STATA 14.0™ (StataCorp, Texas, USA).

Ethical aspects

Access to the information collected complied with the requirements established by ethical and legal regulations (Law 25326). The data obtained was not used for any other purposes, and the identities of the PICUs and patients were preserved by dissociation (coded or reversibly encrypted data).

RESULTS

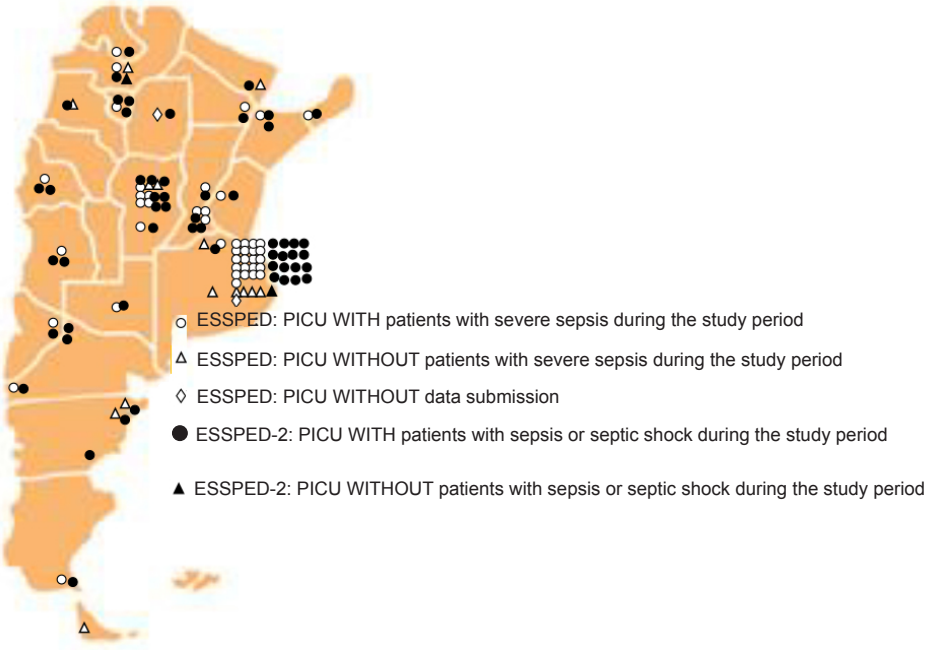
Fifty-five PICUs in Argentina were involved; 53 of these included patients in the study, and two did not have patients with sepsis (*Figure 1*). A total of 3230 patients in PICUs and 505 sepsis events in 457 patients (prevalence of 14.7%) were registered. Twenty-nine events in 29 patients were excluded (11 because they were admitted before or after the study period, 7 because they did not meet the admission criteria, and 11 because of incomplete data). Finally, we analyzed 476 events in 428 patients (48 presented more than one episode of sepsis) (*Figure 2*).

The general data and evolution of the patients are presented in *Table 1*. The clinical aspects and treatments performed are outlined in *Table 2*, and the infectious disease data are summarized in *Table 3*.

The diagnosis was made on admission to PICU in 225 events (47.9%); the time of diagnosis was not recorded in 6 events (*Table 3*), and there were no significant differences in mortality between groups (OR 0.6 [95%CI: 0.34-1.08], *p*: 0.06).

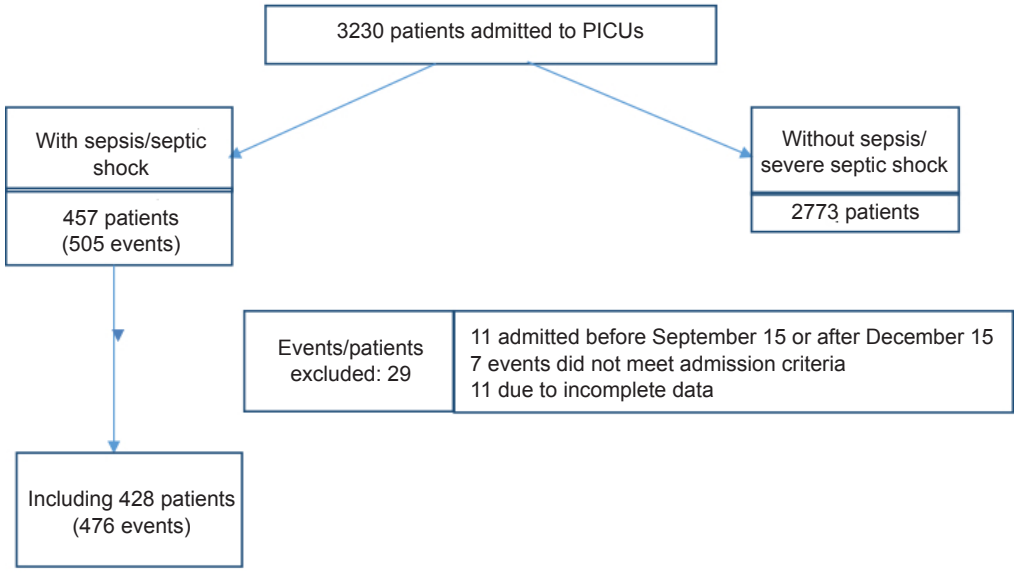
Of the sepsis events, 444 met all admission criteria (both ICCPS and pSOFA), while 12 events did not meet the criteria for ICCPS but did meet

Figure 1. Distribution of participating pediatric intensive care units



PICU: pediatric intensive care unit.

Figure 2. Enrollment flow of the population studied



the criteria for pSOFA (*Table 2*). Seventeen cases of septic shock (according to ICCPS) were classified as sepsis by pSOFA. Twenty-five cases of severe sepsis (according to ICCPS) were classified as septic shock by pSOFA. The total number of patients diagnosed with septic shock, according to both definitions, was 58.3% for ICCPS and 58.6% for pSOFA.

The median age was 17 months (IQR 4.2-74.2), with 38.9 months for non-survivors and 16.2 months for survivors. The median length of hospitalization was 12 days (IQR 6-23), 13 days for non-survivors, and 6 days for the survivors.

Seventy-nine deaths were recorded in the first 28 days in the PICU (16.5%). Thirteen deaths were recorded in patients with more than one event. These did not present a statistically significant difference between those with more than one event and those who had one event; however, they tended to have a higher mortality rate (31.3%), which was double that of those with a single event (16.8%). Eight patients died after 28 days in the PICU (*Table 1*).

Mortality rates were lower in patients from rural areas than in those from urban areas (mean: 11.7% vs. 17.4%, respectively), although this difference was not statistically significant (*p:* 0.23) (*Table 4*).

Patients who received more than 60 mL/kg of fluids in the first hour (12.6%) showed a tendency toward higher mortality but without statistical significance (*Table 4*). Of the patients who died of septic shock, 87.7% had ICCPS criteria, and 89.4% had pSOFA criteria for shock. Both criteria presented *p*-values < 0.01 between survivors and non-survivors (*Table 1*).

In the univariate analysis, higher mortality was observed in those patients with comorbidities, immunocompromised hosts, presence of shock, acute respiratory distress syndrome (ARDS), dysfunction of 2 or more organs, and presence of pediatric sepsis phenotype D (*Table 4*).

No statistical differences were observed between survivors and non-survivors concerning the socioeconomic variables evaluated (housing with access to drinking water, housing with access to electricity, illiteracy of the survivors parents, overcrowded housing) (*Table 4*).

In the multivariate model, the independent predictor variables of mortality at the 28 days were the presence of dysfunction of 2 or more organs (OR 11.04 [95%CI 3.71-48.1], *p* <0.001), septic shock (OR 3.21 [95%CI 1.34- 7.51], *p*: 0.007), being at high risk (defined as the presence of a PMI 3[20,21] greater than 15 (OR 2.31, [95%CI 1.23-4.38], *p*: 0.009), being an immunocompromised host (OR 3.14 [95%CI 1.43-6,84], *p*: 0,004). This represented an AUC = 0.8.

DISCUSSION

PICUs from almost all national jurisdictions participated (*Figure 1*), which enabled the visualization of aspects of pediatric sepsis in Argentina and comparison with the ESSPED.

Table 1. Characteristics of the population

Variable	N (%)
Gender *	
Female	F: 216 (45.4)
Male	M: 260 (54.6)
Age (in months)	
median (CI)	17.0 [4.2-74.2]
Health system *#	
Public	307 (64.5)
Social insurance	94 (19.7)
Private	14 (2.9)
Does not have	57 (11.9)
Unknown	4 (0.8)
History of surgery *	72 (15.1)
Emergency surgery	31 (43.0)
Elective surgery	41 (57.0)
Trauma history *	12 (2.5)
Comorbidities *	
With comorbidities	252 (52.9)
Neurologic disease	50 (10.5)
Cardiological disease	39 (8.2)
Respiratory disease	61 (12.8)
Renal disease	13 (2.7)
Gastrointestinal disease	24 (5.0)
Liver/biliary disease	6 (1.3)
Hematologic disease (non-oncologic)	4 (0.8)
Autoimmune disease	6 (1.3)
Primary immunodeficiency	8 (1.7)
Secondary immunodeficiency	5 (1.1)
Solid organ transplant	1 (0.2)
Bone marrow transplant	4 (0.8)
Oncological disease	52 (10.9)
Metabolic disease	8 (1.7)
Chromosomal/genetic disease	56 (11.8)
Non-categorized chronic disabling disease	31 (6.5)
Length of stay in PICU* (in days)	
Media	12.0 [6.0-23.0]
Sequelae ◊	
Yes	110 (28.5)
No	228 (59.1)
Unknown	48 (12.4)
Mortality *	
At 28 days	
Yes	79 (16.5)
No	397 (83.4)
Referred	0 (0)
Upon discharge from PICU	
Yes	87 (18.3)
No	386 (81)
Referred	3 (0.6)
After discharge from PICU	
Yes	4 (0.8)
Unknown	33 (6.9)

** Data analyzed on the total number of sepsis events (476).*

◊ Data analyzed on the total number of surviving patients discharged from PICU (total = 386). Some patients had more than one sequela.

kg: kilogram; PICU: pediatric intensive care unit.

#Health system: refers to the entity financing the care according to what was reported by the patient (public: persons without social security and without the capacity to pay; social insurance: persons with mandatory social security for workers; private: persons with private insurance or prepaid medicine companies; does not have: persons for whom the participating centers did not identify the financing entity; unknown: no information was provided by the participating centers).

Table 2. Clinical characteristics and treatments performed

	N (%)
Sepsis according to ICCPS/CICSP criteria[15] *	
Severe sepsis	199 (42.9)
Septic shock	265 (57.1)
(Unclassified)	12 (2.5)
Sepsis according to Matics and Sanchez-Pinto[16] *	
Sepsis	198 (41.6)
Septic shock	278 (58.4)
PMI III median (IQR)	28.2 [4.9-100.0]
Presence of organic dysfunctions according to Qin[17] criteria * ◊	
Presence of cardiovascular dysfunction	301 (63.2)
Presence of respiratory dysfunction	392 (82.4)
Presence of neurological dysfunction	117 (24.6)
Presence of renal dysfunction	73 (15.3)
Presence of hematological dysfunction	107 (22.5)
Presence of hepatic dysfunction	56 (11.8)
ARDS *	
Yes	170 (35.7)
Shock *	
Yes	278 (58.4)
Type of fluids used * ◊	
Isotonic saline solution	326 (68.5)
Gelatins	2 (0.4)
Starch	0 (0)
Albumin	32 (6.7)
Plasma [	12 (2.5)
Other	40 (8.4)
No bolus fluids were used	128 (26.9)
Use of vasoactive drugs * ◊	
Dopamine	22 (5.1)
Adrenaline	183 (40.0)
Noradrenaline	205 (44.4)
Dobutamine	2 (0.5)
Milrinone	91 (20.7)
Nitroglycerin	1 (0.2)
Phenylephrine	2 (0.5)
Vasopressin	31 (7.1)
Others	7 (1.9)
Did not use vasoactive drugs	108 (26.6)
ARM use * ◊	
Conventional	383 (80.5)
High frequency	11 (2.3)
NIV	21 (4.4)
Did not receive ARM	60 (12.6)
No data	1 (0.2)
Use of renal replacement therapies * ◊	
Peritoneal dialysis	8 (1.7)
Hemodialysis	5 (1.1)
Hemofiltration	4 (0.8)
Hemodiafiltration	3 (0.6)
Did not use renal replacement therapies	440 (92.4)
No data	16 (3.4)
Use of specific treatments in the first 72 hours * ◊	
Heparin	1 (0.2)
Albumin	21 (5.0
Immunoglobulin	16 (3.8)
Insulin	7 (1.7)
Low-dose corticosteroids	44 (10.5)
High-dose corticosteroids	24 (24.7)

**Data analyzed over the total number of sepsis events (total = 476).*
◊ Some patients received more than one drug, or type of fluid, or type of respiratory support, or renal replacement therapy or had more than one organ dysfunction.
MRA: mechanical ventilation; ICCPS: International Consensus Conference on Pediatric Sepsis; PMI: Pediatric Mortality Index; ARDS: acute respiratory distress syndrome; NIV: noninvasive ventilation.

Table 3. Infectiological data

Variable	N (%)
Place of origin of infection *	
Nosocomial acquired in PICU	83 (17.4)
Nosocomial not acquired in PICU	70 (14.7)
Community	302 (63.5)
No data	21 (4.4)
Timing of sepsis diagnosis	
Before entering the PICU	225 (47.3)
In the first 12 hours in the PICU	131 (27.5)
PICU between 12 and 24 h	21 (4.4)
Between 24 and 48 hours	19 (4.0)
>48 hours	74 (15.5)
No data	6 (1.3)
Germ identification *	
With identification	386 (81.1)
Method used to identify the germ * ◊	
Culture	296 (76.7)
IgM	3 (0.8)
CRP	85 (22.0)
Other	83 (21.5)
No data	9 (2.3)
Germ identified *	
Gram-negative bacillus	130 (27.3)
Gram-negative cocci	25 (5.3)
Gram-positive cocci	99 (20.8)
Fungi	14 (2.9)
Virus	115 (24.2)
Others	3 (0.6)
No growth	90 (19.1)
Resistant germs ◊	
Total	99 (25.6)
Bacillus Gram-negative ESBL+	23 (6.0)
Bacillus Gram-negative ESBL-	30 (7.8)
Vancomycin-resistant *Enterococcus*	2 (0.5)
Methicillin-resistant *Staphylococcus*	28 (7.2)
Carbapenemase-producing Enterobacteriaceae	7 (1.8)
Resistant *Pseudomonas aeruginosa*	5 (1.3)
Acinetobacter baumannii	4 (1.0)
Time of administration of the first dose of ATB *	
Within 60 minutes of diagnosis of sepsis	295 (61.9)
After 60 minutes of sepsis diagnosis	161 (33.8)
No data	20 (20.0)
Adequate antibiotic ◊#	
Yes	272 (70.5)

** Data analyzed on the total number of sepsis events (total = 476).*
◊ Data analyzed on the total number of germs with identification (total = 386).
 # Antibiotic used at patient admission that matched the antibiogram of the germ subsequently identified.
ATB: antibiotic; ESBL: extended-spectrum beta-lactamases; IgM: immunoglobulin M; CRP: C-reactive protein; PICU: pediatric intensive care unit.

The main findings included a decrease in mortality, changes in the approach, the persistence of certain variables over the years, and the non-association of socioeconomic variables with mortality.

The prevalence was higher than that of ESSPED (14.7% vs. 13.1%). A PICU with more than 10 beds has the potential to treat at least one patient with sepsis every day of the year.[4]

Mortality decreased significantly (16.5% vs.

Table 4. Association between clinical presentation or treatment and mortality

Variable	Totals*	Survivors◊	Non-survivors	Patients referred to other PICUs	OR [95%CI]	*p-value*#
Age in months median [IQR]	17.0 [4.2-74.2]	38.9 [6.8-119.2]	16.2 [3.5-62.3]			**<0.01****
Nutritional status n (%) ᐞ						
Adequate/mild malnutrition	337 (71.4 %)	288 (85.5 %)	47 (13.9 %)	2 (0.6 %)		
Moderate malnutrition	91 (19.3 %)	70 (76.9 %)	21 (23.1 %)	0 (0.0 %)		
Severe malnutrition	44 (9.3 %)	70 (76.9 %)	15 (34.1 %)	1 (2.3 %)		
No data		4 (0.9 %)				
Origin n (%) ᐞ						
Rural	77 (16.2 %)	68 (88.3 %)	9 (11.7 %)			
Urban	398 (83.6 %)	329 (82.6 %)	69 (17.4 %)			**0.23**
No data	1 (0.2 %)	0 (0.0 %)	1 (100 %)			
Concomitant disease n (%) ᐞ						
Yes	252 (52.9 %)	187 (74.2 %)	63 (25.0 %)	2 (0.8 %)	2.7 [1.6;4.6]	
No	224 (47.1 %)	199 (88.8 %)	24 (10.7 %)	1 (0.5 %)		**<0.01***
ICH n (%) ᐞ	67 (14.1 %)	43 (10.8 %)	24 (30.4 %)		3.6 [2.0;6.4]	**<0.01***
ARDS n (%) ᐞ						
Yes	170 (35.7 %)	126 (70.6 %)	49 (28.8 %)	1 (0.6 %)	2.7 [1.6;4.4]	**<0.01***
Septic shock n (%) ᐞ						
Yes	278 (58.4 %)	207 (52.1 %)	71 (89.9 %)		8.1 [3.8;17.4]	**<0.01***
Septic shock according to diagnostic criterion used n (%) ᐞ						
ICCPS	243 (58.3 %)	186 (52.8 %)	57 (87.7 %)		6.4 [2.9;13.7]	**<0.01**
pSOFA	251 (58.6 %)	192 (53.0 %)	59 (89.4 %)		7.5 [3.3;16.8]	**<0.01**
First dose of antibiotic within the first hour n (%) ᐞ	295 (61.9 %)	55 (70.5 %)	240 (61.9 %)		1.5 [0.9;2.5]	**0.15**
Patients who received >60 ml/kg of fluids in the first hour n (%) ᐞ	54 (12.6 %)	40 (11.2 %)	14 (19.7 %)		1.9 [1.0;3.8]	**0.06**
Patients wo >60 ml/kg of fluids in the first 6 hours n (%) ᐞ	97 (19.5 %)	18 (27.7 %)	79 (22.5 %)		1.3 [0.7;2.4]	**0.37**
Phenotype PedSep-D n (%) ᐞ	111 (23.3 %)	76 (19.1 %)	35 (44.3 %)		3.4 [2.0;5.6]	**<0.01***
Patients with organic insufficiency of 2 or more organs n (%) ᐞ	332 (69.7 %)	255 (64.4 %)	77 (97.5 %)		21.3 [5.2;88.0]	**<0.01***
Housing with drinking water n (%) ᐞ	422 (91.9 %)	74 (96.1 %)	348 (91.1 %)		2.1 [0.8;5.4]	**0.12**
Parental illiteracy n (%) ᐞ	81 (18.0 %)	14 (19.0 %)	67 (17.9 %)		1.0 [0.6;2.0]	**0.85**
Overcrowding in housing n (%) ᐞ	135 (30.2 %)	26 (34.7 %)	109 (29.3 %)		1.2 [0.7;2.0]	**0.43** ᐞ

Data analyzed on total sepsis events (total = 476).

◊ Data analyzed for survivors (397) and non-survivors (79) for the variables indicated.

 # p-value calculated from the percentage of non-survivors of the variables indicated.

** Chi-square/Fisher's test; ** Wilcoxon test.*

ICH: immunocompromised host (including primary immunodeficiency, secondary immunodeficiency, solid organ transplantation, bone marrow transplantation, oncologic diseases); PMI: Pediatric Mortality Index; ARDS: acute respiratory distress syndrome; ml/kg: milliliters per kilogram; PICU: pediatric intensive care unit; PedSep-D phenotype: pediatric sepsis phenotype d.

31.6%).[8] Multiple factors may have contributed to this decrease, including technological advances, a greater number of emergency specialists and pediatric intensivists, improved care and early detection of patients, increased awareness of the issue by scientific societies, and personnel

training programs.

We observed no differences in terms of admission criteria (ICCPS and pSOFA) and mortality due to septic shock, contrary to what was reported by Sankar et al.[22] Both criteria had approximately the same number and percentage of patients who died.

In contrast to ESSPED, rural origin was associated with lower mortality, although the difference was not statistically significant. Patients with comorbidities, especially immunocompromised hosts, continue to be the groups with the highest mortality risk.[7] The association between mortality and the presence of shock and ARDS continues to be significant,[23] perhaps represented by a clinical phenotype with higher mortality.[24,25]

The treatments used varied between the two cohorts (e.g., less use of dopamine and more use of noradrenaline and adrenaline), in accordance with the Clinical Practice Guidelines (CPGs) on management of the condition at the time.[26-28] Increased fluid administration in the first hour and in the first six hours was again associated with a higher number of deaths. However, this association was not maintained in the multivariate analysis, which was adjusted for severity of illness.

About the ESSPED study, we observed an increase in the number of patients who did not receive fluid boluses, possibly reflecting a current modality of the initial approach to sepsis management.[29,30]

The study design does not permit us to conclude that the observed decrease in mortality is associated with changes in the modality of care following ESSPED.

Bacterial predominance was observed in microbiological isolates (gram-positive *cocci* and gram-negative *bacilli*), with an increase in infections caused by resistant and multidrug-resistant microorganisms, as compared to ESSPED (25.6% vs. 18.3%, respectively). The observation of a higher number of antibiotic-resistant germs could reflect a global problem of the 21st century.[31] Data on the timing of antibiotic application reflect the debate on the optimal time of antibiotic use.[32,33]

Despite global and local initiatives regarding the initial management of sepsis, a high number of patients (36.7%) received the initial dose of empirical antibiotic treatment after the first hour of diagnosis.

Fewer sequelae were observed in patients compared to those in the ESSPED (28% vs. 37%), likely due to the implementation of strategies that ensure better patient care in the PICU.

Regarding the findings and their comparison with other series, a decrease in mortality was also reported by Souza et al.[13] in PICUs in Brazil (19.8%). Gonzalez et al. reported the same trend between 2010 and 2018 in the PICUs of Argentina (34.5% to 23.5%).[14] Unpublished data from the Quality Program of the Sociedad Argentina de Terapia Intensiva "SATI-Q" (SATI quality) indicate 13% mortality due to pediatric sepsis/septic shock in 2022 (Personal communication from Dr. Pilar Arias).

Qin et al.[16] reported the association between mortality and clinical presentations or phenotypes. The D phenotype was associated with increased mortality in that study. This is similar to the adult δ phenotype characterized in the SENECA study.[24]

Socioeconomic variables were investigated, but no significant associations with mortality were found.[15]

The study's strength lies in its access to data, which allows us to analyze pediatric sepsis in PICUs in Argentina and compare the findings with those of a previous study in the country. Thus, the data can enhance the quality of patient care by providing information that facilitates healthcare decision-making based on national guidelines.

The weakness is its essentially descriptive nature. Studies are needed to confirm or rule out the associations mentioned here to identify and establish effective measures to improve the morbidity and mortality of pediatric sepsis in our country.

CONCLUSIONS

The prevalence of sepsis and septic shock continues to be the same as in the ESSPED, although mortality showed a significant decrease compared to that study.

One-third of patients still do not receive antibiotics promptly, and the highest mortality remains in those who received more than 60 ml/kg of fluids in the first 60 minutes.

In the multivariate model, the independent predictor variables for mortality at 28 days were the presence of dysfunction in two or more organs, septic shock, being a high-risk patient (PMI 3 >15), and being an immunocompromised host.

Active programs should be continued to achieve a better approach, earlier detection, and timely treatment, thereby further reducing mortality.

Members of the ESSPED-2 Research Group

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