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Research Article

Infection Related to Health Care in the Pediatric Intensive Care Unit

Yuneska Rodríguez Ochoa[1]*, Anisleydis Hodelín Taquechel[2], Ana Lidia Casanova[3] and Reinaldo A Llerena Cárdenas[4]

[1]Specialist in Intensive Care and Emergency, Instructor, Pediatric Teaching Hospital Juan de la Cruz Martínez Maceira, Santiago de Cuba, Cuba

[2]Specialist in Intensive Care and Emergency, Pediatric Teaching Hospital Juan de la Cruz Martínez Maceira, Santiago de Cuba, Cuba

[3]Specialist in First Grade in Pediatrics, Instructor, Pediatric Teaching Hospital Juan de la Cruz Martínez Maceira, Santiago de Cuba, Cuba

[4]Specialist in the First Degree in General and Integral Medicine, Resident in Intensive Care and Emergency, Pediatric Teaching Hospital Juan de la Cruz Martínez Maceira, Santiago de Cuba, Cuba

***Corresponding Author:** Yuneska Rodríguez Ochoa, Specialist in Intensive Care and Emergency, Instructor, Pediatric Teaching Hospital Juan de la Cruz Martínez Maceira, Santiago de Cuba, Cuba.

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Abstract

A descriptive and prospective study was conducted to describe the clinical and epidemiological characteristics of patients with related health care in the intensive care unit at Children's Hospital Professor Juan de la Cruz Martinez Maceira, Santiago de Cuba, Cuba infection in the period from October 1, 2016 to September 30, 2017. Of the 412 patients admitted to the unit, 28 (6.7%) met the infection criteria associated with health care. The infection developed more frequently in children under 1 year of age (82%). Male sex predominated (78.6%). Pneumonia associated with ventilation (35.7%) was the most frequent location. There was a predominance of gram-negative microorganisms (57.1%). The presence of a deep venous approach (78.6%) was the fundamental risk factor. The highest number of infections appeared after 14 days of hospitalization (60.7%).

Keywords: *Health Care; Pediatric Intensive Care Unit*

Introduction

Caring for critical patients in special high-tech units is an essential component of modern medicine. Although invasive procedures are essential for the diagnosis and treatment of these patients, they like most life support systems, alter host defense mechanisms, making them more vulnerable to infection related to health care (IRCS) [1].

The IRCS still maintain a high incidence in pediatric intensive care units (PICU), becoming one of the most important problems that occur. They are also associated with high mortality and morbidity in critically ill children and are associated with an increase in the average stay of patients and hospital costs [2].

Centers for Disease Control and Prevention (CDC) American defines IRCS as systemic whole clinical picture located or which is the result of an adverse reaction due to the presence of one or more infectious agents or their toxins, no evidence that was present or in the incubation phase at the time of hospital admission [3].

In the PICU these infections are sometimes a reason for admission in them and others, as a consequence of the stay in these. It is necessary, therefore, to establish a continuous surveillance system that allows to know the epidemiology, the risk factors for its development and the impact that these infections have on the critical patient in order to be able to establish prevention and control measures in each case unit to reduce its incidence and impact on the critical patient.

It is estimated that between 5 - 10% of all patients admitted to hospitals will develop one or more infections as a result of their admission or of the different diagnostic-therapeutic procedures received and in the ICU, the prevalence is between 30 and 40%. The most frequent IRCS include: urinary tract infections, infections of the lower respiratory tract, including pneumonia, surgical site infections (SSI) and bacteremia [4,5].

The World Health Organization (WHO) has promoted that the first challenge of the World Alliance for Patient Safety for the coming years is precisely the IRCS [6].

The risk of suffering from CKD and greater microbial resistance in intensive care units is due to the use of drugs, invasive techniques, the use of modern equipment, powerful antimicrobials for long periods of time; to the use of immunosuppressive treatments, the age and basic diseases of patients and the neglect of asepsis and antisepsis, among other factors.

For all the above we proposed the present work with the aim of describing the clinical and epidemiological characteristics of patients with infections related to health care in PICU.

Method

General characteristics of the investigation

A descriptive and prospective study of the patients with CRIT admitted to the PICU of the North Juan de la Cruz Martínez Maceira Children's Teaching Hospital of Santiago de Cuba, Cuba during the period from October 1, 2016 to September 30, 2017, was carried out. in order to characterize them according to some clinical epidemiological variables of interest for research.

Inclusion criteria

All patients diagnosed with an infection related to health care were included and the criteria of the Atlanta CDC were applied to each of them [7]. Of a total of 412 patients admitted to the PICU during the period indicated that 28 (6.7%) who met the criteria referred to above were included.

Operationalization of the variables: To achieve the proposed objectives, the following variables were studied

1. Age: The age groups studied were grouped in the following intervals:
    - 29 days - 11 months and 29 days
    - 1 - 4 years
    - More than 4 years.
2. Sex:
    - Male
    - Female.
3. Most frequent locations of the infection associated with health care: they were taken according to the Atlanta CDC diagnostic criteria [7].
4. Isolated microorganism according to the result of the indicated crops.
5. Risk factors:
    - Intrinsic: Age, immunodeficiencies, underlying disease.
    - Extrinsic: Bladder catheter, deep venous approach, tracheostomy, artificial mechanical ventilation, endotracheal tube, parenteral nutrition and nasogastric tube [8].
6. The time of onset of infection was expressed in days and was considered as the time from admission to the ICU until the appearance of the first clinical symptoms.

Techniques and procedures

Obtaining information

An extensive literature review on the subject was made. The clinical histories of the patients studied in obtaining the primary data for this investigation were used.

Processing of information

Once the information was obtained, a database was made through the SPSS version 11.5 system with which the statistical tests were carried out that will be mentioned during the discussion of the results with a level of significance of less than or equal to 0.05 according to characteristics of the quantitative and qualitative variables. The final document was written in Word.

Development and synthesis of results

As a summary measure, the absolute numbers and percentage were used, presenting the data in tables and graphs. The Microsoft Office package, version 2007 for Windows, was used when preparing the tables and processing the text of the final report. The results were discussed and analyzed, and conclusions were drawn on this.

Ethical considerations

The ethical aspects were taken into account for the conduct of this research, respecting at all times the principles and values applied in all health research during the collection of information.

Results

During the studied period, 412 patients entered the PICU and 6.7% (28 patients) presented some type of CSII.

Table 1 shows how this was more frequent in children under one year 82% and male 78.6%.

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
29 days -11 months and 29 days	19	67.8	4	14.2	23	82.0
1 to 4 years	2	7.2	-	-	2	7.2
More than 4 years	1	3.6	2	7.2	3	10.8
Total	22	78.6	6	21.4	28	100

Table 1: *Frequency of patients with CKD according to sex and age in PICU. North Juan de la Cruz Martínez Maceira Children's Teaching Hospital. Santiago de Cuba. Cuba. 2016 - 2017. Source: Clinical history.*

The most frequent localization in our study, as shown in table 2, were VAP and pneumonia with 35.7 and 21.4% respectively. Followed by less frequent infections of the bloodstream 14.3% and by use of devices 10.7%.

Location	No.	%
Pneumonia associated with ventilation (VAN)	10	35.7
Pneumonia	6	21.4
Bloodstream infection	4	14.3
Infection due to the use of devices	3	10.7
Gastrointestinal infection	3	10.7
Urinary Tract Infection	2	7.2
Total	28	100

Table 2: *Frequency of patients with IRCS according to location. Source: Clinical history.*

The isolation of gram-negative microorganisms predominated (Table 3) with 57.1%.

Isolation	No.	%
Pseudomona sp.	4	14.2
Klebsiella sp	7	25
Candidas sp.	7	25
Staphylococcus epidermidis	5	17.9
Escherichia coli	3	10.7
Acinetobacter sp.	2	7.2

Table 3: *Frequency of patients with IRCS according microorganisms isolated. Source: Clinical history.*

Table 4 shows the risk factors related to the appearance of the IRCS. The deep venous approach and bladder catheterization were the most frequent with 78.5% and 42.8% respectively.

Risk factor's	No.	%
Deep venous approach	22	78.6
Urinary catheter	12	42.8
Nasogastric tube	10	35.7
Endotracheal tube	10	35.7
Parenteral nutrition	3	10.7
Invasive mechanical ventilation	10	35.7

Table 4: *Frequency of patients with CKD according to risk factors.*

Table 5 shows how the presence of CRFS was greater in patients with hospital stay greater than 14 days (60.7%).

Stay	Total	
	No.	%
17 days	8	28.5
8 - 14 days	3	10.7
More than 14 days	17	60.7
Total	28	100

Table 5: *Frequency of patients with IRCS time elapsed from the patient's admission to contracting the infection.*

Discussion

The IRCS fit within the definition of adverse events. Nowadays, the surveillance and control of these is considered as a critical component of clinical safety and a priority within the policies of quality and patient safety.

It is a frequent problem in the PICU, with an attributable mortality of up to 11%.

In pediatrics, children under one year of age and males have an increased risk of getting sick and dying and this is greater when IRCS is spoken. Their physiological immunodeficiency status, prenatal and birth-related events, nutritional status and lack of exclusive breast-feeding place them at a disadvantage compared to other age groups. In our study we also noticed that children under one year were all under 6 months. The male sex is the most affected without the cause being defined.

Classically, the most frequent was the UTI, which represented about 30% of all infections. However, an increase in respiratory tract infection has been detected in our area; pneumonias and NAV with 57.1%, which coincides with some studies reviewed [9].

Bacterial adherence to the orotracheal mucosa in the mechanically ventilated patient is facilitated by the reduction of secretory IgA and an increase in the production of proteases, exposure of the mucous membrane, the high pH of the airways and an increase in the number of Bacterial receptors in the airways due to acute disease and the use of antimicrobials [10].

Bloodstream infections and device-related infections followed in frequency to respiratory. In practice, both are considered to be intimately related in terms of diagnosis and management.

During critical illnesses, especially in patients admitted to the ICU, the normal flora changes dramatically to gram-negative organisms that were predominant in our study.

Some factors such as the previous administration of antibiotics, the time of hospitalization and the presence of associated diseases, can influence the probability of isolating a particular microorganism.

In fact, the most frequent infections are those related to medical devices such as mechanical ventilation, vascular catheters or urinary catheters, these procedures being frequent in the critical patient who also has a prolonged stay; by the process that motivated the admission or by the complications that were presented.

Health professionals are also a very important epidemiological agent in the transmission chain of the IRCS, and may be the reservoir and/or source of infection. They also have a major role in the prevention and control of the same, since the responsibility of guaranteeing adequate hospital hygiene and compliance with preventive measures rests on them.

Conclusions

The IRCS remain an important cause of morbidity in pediatric ICUs and is closely linked to bacterial resistance. In our hands part of the solution.

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