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EDITORIAL**Risk maps in Pediatric Emergency Medicine****Yordana Acedo Alonso, Marisa Herreros Fernández, Andrea Mora Capín, Vanessa Arias Constantí***SEUP Quality Improvement Working Group*

Over the past two decades, patient safety has become a key priority for healthcare systems due to the increased recognition of risks associated with medical care. Since the publication of the report of the Institute of Medicine in 2000, *To Err is Human: Building a Safer Health System*⁽¹⁾, which highlighted the profound impact of these risks, numerous efforts have been made in research, education, and collaboration among various organizations to promote safety^(2,3). Despite these efforts, however, as health care professionals, we know that medical errors and patient harm unfortunately remain prevalent.

Healthcare is becoming increasingly complex, with more professionals involved in the same medical procedures, new tests being requested, and emerging evidence constantly modifying our approach. Although these advancements offer opportunities for continuous improvement in patient care, they also increase the probability of failure due to the growing number of changes and variables⁽⁴⁾. Hospital Emergency Departments share several characteristics that make them high-risk areas for safety issues. The unscheduled influx of patients with varying levels of complexity, the need to make rapid decisions based on limited clinical information, and factors related to the healthcare providers, teamwork, and organization all contribute to potential errors in care. When we add the unique aspects of pediatric patients—such as their anatomical and physiological characteristics, limited ability to express symptoms at certain ages, and the need to individualize medication doses based on weight—it becomes evident why Pediatric Emergency Departments (PEDs) are particularly high-risk areas for adverse events⁽⁵⁻⁷⁾.

Today, it is known that risk management in healthcare services is a highly effective strategy to improve safety. Risk management includes all processes aimed at eliminating or reducing risks within a given area. Traditionally, risk management has been reactive, i.e., analyzing and addressing errors that have already occurred. However, to achieve real improvement, we must adopt a proactive approach, i.e., anticipating and continuously assessing the risk of failure. Risk Maps (RM) are dynamic tools that help detect potential errors a patient may be exposed to throughout the care process. Their purpose is to raise awareness among professionals and managers about high-risk activities and the importance of implementing preventive measures to reduce the likelihood of harm to patients⁽⁸⁾.

In 2014, the Spanish Society of Emergency Medicine (SEMES) RM Working Group (WG), designed and validated a general RM for EDs, with the aim of improving safety in these care areas⁽⁹⁾. At the pediatric level, several initiatives have been developed in pediatric emergency settings that validate the use of RMs as valuable tools to identify and manage patient safety risks in the PED. However, all of these initiatives are single-center in nature, and their use is not widely disseminated⁽¹⁰⁻¹³⁾.

In this context, the Spanish Society of Pediatric Emergency Medicine (SEUP) has shown interest in developing a common RM for pediatric emergencies to enhance and promote safety across different Pediatric Emergency Departments PEDs. A multicenter study was conducted, involving a core research group of four pediatricians with experience in patient safety and RM development, as part of the SEUP Quality Improvement WG. The study design was based on the methodology used by the SEMES RMWG and incorporated the Failure Mode and Effects Analysis (FMEA) tool. The FMEA identifies the possible failures of a process (in this case, emergency care) and their possible causes and effects, and prioritizes these failures. For the elaboration of the SEUP RM, a specific WG was created, consisting of 41 consultants from 22 PEDs of different levels of complexity. This group validated the initial RM proposed by the main research team. The total duration of the project was almost 2 years (November 2021-

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May 2023) and it was finally presented during the XXVIII SEUP Meeting in A Coruña.

A total of 104 potential errors, also known as failure modes (FM), were identified in the RM developed. Each FM was assessed and given a score by the WG based on its frequency, severity, and detectability, to prioritize them effectively. Consequently, three final documents were produced; a complete RM with all the failures, a recommended RM where only the FMs with a score above the median were included, and a core RM that included only the FMs with the highest score. The process phases associated with the highest accumulation of risks were the complementary testing and treatment phases. Many of the risks listed were related to working conditions, particularly the pressures faced by the PEDs to provide timely care.

Once the RMs were developed, the next goal was to make them available to our society as a useful tool and to facilitate their implementation. The three RMs can be adapted to the reality of different PEDs, allowing each of them to analyze the risks according to its resources and capacity. They are currently available for easy download on the SEUP website, in the Quality Improvement WG section ([available at: https://seup.org/gtcalidad/](https://seup.org/gtcalidad/)). In addition, a presentation guide is provided to assist in applying the RMs within the PED. We hope that this tool will advance risk management in PEDs, leading to preventive measures to avoid harm to our young patients and improve our daily care.

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ORIGINAL

Is lumbar puncture mandatory in febrile infants with a bulging fontanelle?

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Abstract

Introduction: Bacterial meningitis is a cause of fever and bulging fontanelle associated with high morbidity and mortality. Therefore, clinical guidelines recommend performing a lumbar puncture in patients with this clinical presentation. The aim of this study was to determine whether, in certain selected cases, performing a lumbar puncture might not be mandatory.

Material and methods: After conducting a retrospective review of patients evaluated at our center for bulging fontanelle and febrile syndrome, we performed a literature review using PubMed. The search criteria included (“bulging fontanelle” OR “bulging fontanel”) AND (“fever” OR “febrile”), and the main results from the selected studies were collected.

Results: We present the clinical characteristics, complementary tests, and outcomes of five infants with febrile syndrome and bulging fontanelle. In our series, respiratory viruses were the main etiology. The literature review included a total of 9 articles. Two studies concluded that the bulging fontanelle warrants a lumbar puncture; however, these studies were conducted in areas with high morbidity and mortality rates from bacterial meningitis. The remaining studies concluded that there is no single pathognomonic sign. They emphasized the importance of evaluating a constellation of signs, with particular attention to the child’s overall appearance, to guide management decisions.

Conclusions: In our setting, an isolated bulging fontanelle in a well-appearing febrile infant seems to have low sensitivity, specificity, and positive predictive value for the detection of meningitis. Respiratory viruses were identified as the primary causative agents of these symptoms.

¿ES NECESARIA LA PUNCIÓN LUMBAR EN EL LACTANTE FEBRIL CON FONTANELA ABOMBADA?

Resumen

Introducción y objetivos: La meningitis bacteriana es una causa de fiebre y fontanela abombada con una morbimortalidad elevada, por lo que las guías clínicas apoyan la realización de una punción lumbar a los pacientes con esta clínica. El objetivo de este estudio es determinar si podría no ser obligatoria su realización en algunos pacientes seleccionados.

Material y métodos: Tras realizar una revisión retrospectiva de los pacientes valorados en nuestro centro por fontanela abombada y síndrome febril, llevamos a cabo una revisión bibliográfica en Pubmed. Se usó como criterio de búsqueda (“bulging fonta-

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nelle" OR "bulging fontanel") AND ("fever" OR "febrile") y se recogieron los principales resultados de los estudios seleccionados.

Resultados: Presentamos una serie de casos con las características clínicas, pruebas complementarias y evolución de cinco lactantes con síndrome febril y fontanela abombada. En nuestra serie los virus respiratorios fueron la etiología principal. En la revisión bibliográfica se incluyeron un total de 9 artículos. Dos concluían que la fontanela abombada justificaba la realización de punción lumbar, sin embargo, eran estudios realizados en zonas con morbi mortalidad por meningitis bacteriana elevada. El resto concluían que no existe ningún signo patognomónico y que es necesario considerar una constelación de signos, entre los que destaca el aspecto del niño para decidir el manejo de estos pacientes.

Conclusiones: La fontanela abombada aislada en contexto febril en lactante con buen estado general parece tener escasa sensibilidad, especificidad y valor predictivo positivo para la detección de meningitis en nuestro medio, siendo los virus respiratorios los principales causantes de este cuadro.

INTRODUCTION AND OBJECTIVES

A bulging fontanelle is indicative of increased intracranial pressure in children whose cranial sutures have not fused. It can be a benign and self-limited finding; however, it is important to differentiate between entities that may require acute therapeutic management, such as hydrocephalus, tumors and trauma⁽¹⁾. Additionally, viral infections can cause bulging of the fontanelle⁽²⁾. Nevertheless, bacterial meningitis is a severe disease, and clinical guidelines recommend performing a lumbar puncture (LP) in patients with febrile syndrome and bulging fontanelle^(3,4), without specifying which patients may not need the procedure.

Taking into account the incidence of bacterial meningitis in Spain, which is below 10 cases per 100,000 inhabitants, and in addition to presenting our series of patients, the aim of this study was to review the existing literature on the need to perform lumbar puncture in this group of patients.

METHODS

We first conducted a retrospective review of the experience in our emergency department regarding the management of febrile infants with bulging fontanelle between January 2020 and December 2022. Clinical characteristics, complementary tests and outcome were collected through the electronic medical records. Verbal informed consent was obtained from parents/legal guardians via telephone call to conduct the review in an anonymized manner. Infants with suspected meningitis but without bulging fontanelle, as well as neonates under 28 days old, were excluded from the review.

The second part of the study consisted of a systematic review, conducted in accordance with the PRISMA 2020 guidelines. We reviewed the PubMed database from March 6 to March 10, 2023, using the following search terms: ("bulging fontanelle" OR "bulging fontanel") AND ("fever" OR "febrile"). The review was carried out by a pediatric resident and a pediatric attending physician. The process began with screening titles and abstracts, followed by a full-text review of the selected manuscripts for final inclusion in the review.

Articles evaluating the role of fontanelle bulging in the diagnosis of meningitis through case-control comparisons were included. Exclusion criteria were studies that included only children under 2 months of age, isolated case reports, and publications not in English or Spanish. In addition, articles with cohorts consisting only of bacterial meningitis cases without controls were excluded, as they analyzed only the characteristics of patients diagnosed with meningitis at the onset, rather than providing the comparative analysis that was the objective of our study.

The following information was collected from each study: the first author's surname, year of publication, country where the study was conducted, study design, scale of the study, number of patients, patient age, reason for performing lumbar puncture, lumbar puncture results, and study conclusions.

RESULTS

We present a series of five patients evaluated in the emergency department for fever and bulging fontanelle. Three were referred from primary care centers: two for fever and bulging fontanelle identified on physical examination, and one for bulging fontanelle and increased head circumference (from the 90th to the 97th percentile) without associated fever. Two patients came directly to our emergency department with febrile symptoms. LP was performed in four cases, all of which showed normal biochemistry. None of the patients had elevated acute phase reactants, except for one with a procalcitonin level of 1 ng/ml. All infants were admitted to the pediatric ward, with resolution of the bulging fontanelle within 24–48 hours. LP was not performed in one patient due to the presence of only low-grade fever in the emergency department, having been afebrile at home. Additionally, this patient showed oropharyngeal hyperemia on examination, and the epidemiological environment was positive. Nasopharyngeal swab samples confirmed the presence of respiratory viruses in all cases via reverse transcriptase polymerase chain reaction (RT-PCR). Two tested positive for SARS-CoV-2, two for influenza A, and one for influenza B, with all other microbiological results negative (Table 1).

TABLE 1. Patient characteristics.

Patient	Reason for consultation	Physical examination	Complementary studies ^{a,b}	Treatment and outcome
♀ 5 months	24-hour history of fever 38.5°C Bulging fontanelle, hypoactive	Altered appearance, hypoactive, Bulging fontanelle. Remaining examination normal	CRP 8, PCT 0.23 Hemograma normal Normal CSF study Influenza B+	Oral oseltamivir. Bulging of the fontanelle resolved 24 h
♂ 6 months Premature infant 25+6 weeks of gestation, bronchopulmonary dysplasia	10-hour history of fever 38.7°C, mucosity, irritability	Stable PAT, good general condition. Consolable irritability. Bulging fontanelle. Hyperemic oropharynx, mucus in the cavum. Remaining examination normal	CRP 15, PCT 0.27 CBC normal Normal CSF study COVID +	Admitted for observation. Bulging of the fontanelle resolved 24 h
♂ 6 months	24-hour history of fever 38.5°C. Mucosity, bulging fontanelle	Stable PAT, good general condition. Bulging fontanelle. Hyperemic oropharynx. Remaining examination normal	CRP 8. CBC: Leukocytes 2.07*10 ⁹ (ANC 170), remaining study normal. Influenza A+. Sediment, bacterial blood and urine culture and CRP negative. Normal CSF study	Piperacillin-tazobactam Bulging of the fontanelle resolved 48 h. Progression to severe neutropenia (ANC 10), positive autoimmune neutropenia study
♀ 5 months	24-hour history of fever 40,7°C. Cough, mucosity	Stable PAT, good general condition. Bulging fontanelle. Hyperemic oropharynx. Remaining examination normal	CRP 12, PCT 1. Normal CBC. Influenza A+. Chest X-ray normal. Bacterial blood culture and CRP negative. Sediment negative. Normal CSF study	Admitted for observation. Bulging of the fontanelle resolved 48 h
♀ 7 months	Bulging fontanelle. Mucosity, cough, afebrile	Stable PAT, good general condition. Low-grade fever 37.3°C. Bulging fontanelle. Head circumference p97 (previously p90) Hyperemic oropharynx. Remaining examination normal	COVID +. Normal Transfontanelar ultrasound. LP not performed	Discharge to home. Brain MRI was requested but not performed because the fontanel and head circumference normalized

^aCRP expressed in mg/L; PCT expressed in ng/ml. ^bThe CSF study included biochemistry, cellularity, multiplex PCR, and culture.

During this period, three infants between 1 and 12 months of age were seen at our center for bacterial meningitis, none of whom had bulging fontanelle, and therefore, they were not included in this series. All had elevated acute phase reactants and were ill appearing.

Our literature search initially yielded 61 articles. After reviewing the titles, 43 were discarded, and 9 more were excluded after reviewing the abstracts (Figure 1). Finally, nine articles were included in the review (Table 2).

Only two authors, Lehman et al.⁽⁵⁾ and Berkley et al.⁽⁶⁾, concluded that a bulging fontanelle in a febrile child warrants a lumbar puncture, with Lehman et al.⁽⁵⁾ suggesting it as an independent factor for diagnosing meningitis. The remaining studies found no single pathognomonic sign for meningitis, emphasizing the need to consider a constellation of clinical signs, particularly the overall appearance of the child⁽⁷⁻¹²⁾.

Only two of the studies were published in the last decade (Takagi et al.⁽⁷⁾; Shahada et al.⁽¹³⁾). The first study retrospectively analyzed 764 patients who had undergone LP, 304 of whom presented with fever and bulging fontanelle. Ten cases of bacterial meningitis with positive cultures for *S. pneumo-*

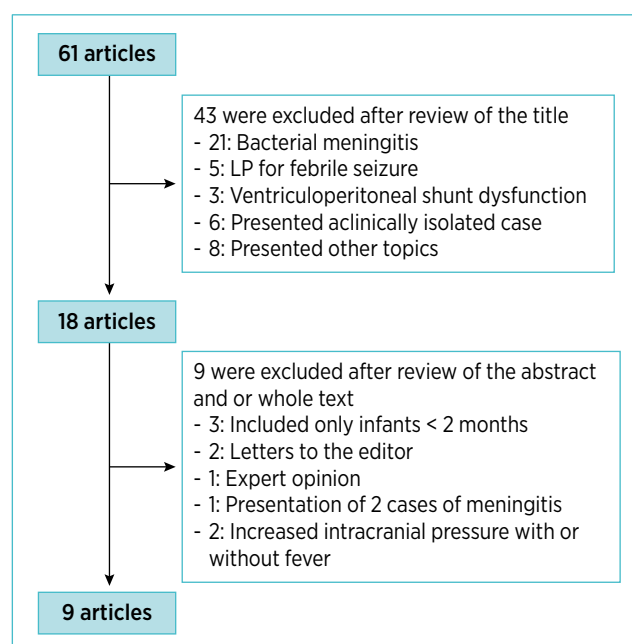


FIGURE 1. Flowchart of the study selection process.

TABLE 2. Summary of the included articles presented in chronological order

Article	Inclusion criteria and N	Results / conclusions
Clinical indicators for lumbar puncture Rosenberg NM et al. (1988, USA) <i>Prospective study</i>	< 24 months of life LP performed due to suspected meningitis N= 381 (151 > 3 months)	<ul style="list-style-type: none"> • Patients categorized according to low or high risk of meningitis • 14 cases (10 > 3 months): 13 categorized as high risk. The 14th had previously received antibiotics. • Bulging fontanelle does not always imply meningitis. 14 of 23 LP normal • A constellation of signs should be considered
Diseases that mimic meningitis. Analysis of 650 lumbar punctures Levy M et al. (1990, Israel) <i>Retrospective study</i>	LP performed due to suspected meningitis N= 650 (233 of 2-24 months)	<ul style="list-style-type: none"> • 28 cases between 2 and 24 months (12%) • Bulging fontanelle in 20% of meningitis cases, and 13% of infants with normal CSF • The bulging fontanelle would be a nonspecific sign
Aetiology and clinical signs of bacterial meningitis in children admitted to Goroka Base Hospital, Papua New Guinea, 1989-1992 Lehmann D et al. (1999, Papua Guinea) <i>Retrospective study</i>	1-59 months LP performed due to suspected meningitis N= 697	<ul style="list-style-type: none"> • Bacterial meningitis was confirmed in 30% of cases • Bulging fontanelle as an independent factor for diagnosis
Indicators of acute bacterial meningitis in children at a rural Kenyan district hospital Berkley JA et al. (2004, distrito rural Kenia) <i>Retrospective study</i>	> 60 days of life LP performed due to suspected meningitis Endemic area Malaria N= 999	<ul style="list-style-type: none"> • 91 cases of meningitis, 32% deaths • Bulging fontanelle in 30 patients, 16 had meningitis • LP should be indicated in all cases of bulging fontanelle
Transient bulging fontanelle after vaccination: case report and review of the vaccine adverse event reporting system Freedman SB et al. (2005, Toronto) <i>Retrospective study</i>	Infants with bulging fontanelle and fever after vaccination (2-6 months of life) N= 18	<ul style="list-style-type: none"> • 18 vaccination for DTP or DTaP and other vaccines • Fontanelle bulging 4 hours to 5 days after vaccination • 83% presented with fever • CSF study was normal in all • Conservative management of infants with bulging fontanelle should be considered, even after vaccination
Bulging fontanelle in febrile infants: is lumbar puncture mandatory? Shacham S et al. (2009, Israel) <i>Retrospective study</i>	3-18 months Fever and bulging fontanelle N= 153	<ul style="list-style-type: none"> • 1 case of bacterial meningitis • No cases in infants with good or excellent appearance
Clinical features suggestive of meningitis in children: a systematic review of prospective data Curtis S et al. (2010) <i>Meta-analysis</i>	Prospective studies analyzing clinical parameters of meningitis N= 10 studies	<ul style="list-style-type: none"> • No single criterion is diagnostic on its own • A bulging fontanelle increases the risk by 3.5 times, while its absence lowers the risk slightly
Bulging fontanelle in febrile infants as a predictor of bacterial meningitis Takagi D et al. (2021, Israel) <i>Retrospective study</i>	2-18 months LP performed due to suspected meningitis N= 764	<ul style="list-style-type: none"> • 304 cases of fever and bulging fontanelle • 10 cases of meningitis, all ill-appearing or with seizure • 1 case of meningitis with bulging fontanelle. Also ill-appearing, vomiting and lethargy • Isolated bulging fontanelle has low specificity, sensitivity, and positive predictive value
Outcomes of children presenting to the emergency department with fever and bulging fontanelle Shahada J et al. (2022, Israel) <i>Retrospective study</i>	3-13 meses Pacientes con fiebre y fontanela abombada N= 40	<ul style="list-style-type: none"> • LP performed only in 13 patients • 2 positive cultures • LP would not be essential

nae were diagnosed. Only one patient had bulging of the fontanelle, in addition to an ill appearance, vomiting, and lethargy, while meningitis was not diagnosed in any infant with a good appearance. The authors concluded that bulging fontanel would have low sensitivity, specificity and positive predictive value for the detection of meningitis. They highlighted respiratory viruses as the main etiology in their sample, although they did not specify which viruses were most commonly identified. In 2022, Shahada et al.⁽¹³⁾ presented

their center's experience, where lumbar puncture was not systematically performed. In a sample of 40 patients with fever and bulging fontanelle, after assessing the infant's general condition, vaccination status, and history, they performed 13 LPs and obtained 2 positive cultures. Based on these findings, they concluded that conservative management could be appropriate for infants with a good appearance and no relevant history, while LP should be indicated for those who did not meet these criteria.

The review by Freedman et al.⁽¹²⁾ highlights the association of bulging fontanel and febrile syndrome in infants after vaccination. However, the authors warn that this adverse effect to vaccination may have been reported after the short median symptom presentation time of 18 hours and that caution should be exercised with this association. In some countries, vitamin A is administered to infants in the first months of life and hypervitaminosis A may cause benign intracranial hypertension in infants with bulging fontanelle⁽¹⁴⁾. Nevertheless, the study emphasizes the importance of a comprehensive assessment of signs and symptoms and supports the option of conservative management for infants with bulging fontanelle, even after vaccination.

DISCUSSION AND CONCLUSIONS

Meningitis is a relatively rare disease in our setting due to vaccination programs; however, it remains a potentially serious condition that always alarms pediatricians when encountering a febrile infant with a bulging fontanelle. Although LP is a commonly used procedure among pediatricians, it is without contraindications and risks. In addition, performing an LP sometimes requires neuroimaging tests or sedation.

After reviewing a series of five infants in our center with bulging fontanelle and fever, but with excellent general condition, without elevation of laboratory acute phase reactants and with a normal CSF study, we studied the need to perform a LP in all cases to rule out meningitis, which led us to review the literature.

The existing literature on this subject is very limited, possibly due to the generally appropriate management of these patients, where LP is performed to rule out meningitis, and the lack of clinical trials involving pediatric patients.

Based on our review, the presence of a bulging fontanelle in a febrile infant with a good overall appearance may have low sensitivity, specificity, and positive predictive value for detecting meningitis in our setting, where the incidence, morbidity, and mortality of meningitis are low, with respiratory viruses being the primary causes of the condition. Additionally, recent vaccination history may also be an important factor to consider in the patient's clinical history.

It should be noted that the articles that strongly support the need for LP in all patients with febrile syndrome and bulging fontanelle were carried out in areas with high morbidity and mortality due to bacterial meningitis^(5,6).

The main limitations of our study are those inherent to literature reviews. Additionally, due to the limited existing literature on the subject, there is significant variability in terms of publication year and sample origin, affecting the reported incidence of meningitis. This variability is important when evaluating the need to perform LP in febrile infants with bulging fontanelle. Many of the studies were conducted in low- and middle-income countries, where there is a need to establish clinical guidelines for meningitis screening given the lower availability of medical resources.

The overall appearance of the child, the regional incidence of bacterial meningitis, the vaccination schedule, and the clinical-laboratory evaluation of the infant should be emphasized as key factors in assessing the likelihood of

a potentially serious infectious condition. These factors are crucial in determining whether invasive and potentially risky complementary tests are necessary for this population.

Our case series is too small to recommend modifications to the standard management of febrile infants with bulging fontanelle. The usual and appropriate practice in these cases is to perform an LP to rule out meningitis and obtain CSF for analysis. In certain specific situations—such as in countries with a low prevalence of central nervous system infections, under the care of an experienced pediatrician, with close clinical observation, and the possibility of performing imaging studies or initiating specific treatments if the clinical situation changes—the option of not performing an LP may be considered.

New prospective studies are needed to develop a predictive model or algorithm for the identification of meningitis and to allow certain children to be managed conservatively with close clinical observation, thereby avoiding the invasiveness of neuroimaging and LP.

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ORIGINAL

Clinical and epidemiological characteristics of pediatric cancer presentation: A retrospective study in an Emergency Department

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Abstract

Introduction: The low incidence of cancer in children and nonspecific symptoms at onset may **delay early diagnosis and lead to a worse prognosis.**

AIM: To determine the **incidence of cancer presentation** in a Pediatric Emergency Department (PED) and to analyze **the frequency of different cancer types**, as well as to describe the clinical and epidemiological characteristics of the patients and to **identify** potential factors leading to diagnostic delay.

Methodology: This descriptive-observational retrospective study included patients younger than 18 years old with a suspected cancer diagnosis in the PED of a tertiary hospital between 2019 and 2020.

Results: Out of 180,124 admissions to the PED during this time frame, 175 cases of cancer presentation were found. The median age at onset was 5.5 years (IQR: 2.5–13.5). Solid tumors were diagnosed in 103 cases (58.9%), including 48 (27.4%) involving the central nervous system (CNS). Hematologic malignancies accounted for the remaining 72 cases (41.1%), of which 48 (27.4%) were leukemia. The median time to diagnosis (TD) was 50.5 days in adolescents, compared to 18.28 days in infants and 20.5 days in toddlers and children. The median TD was 19 days for hematologic malignancies and 39 days for solid tumors. Forty-one patients (23.4%) presented as oncological emergencies.

Conclusions: Cancer presentations accounted for 0.1% of admissions to the PED. CNS tumors and leukemia were the most common types of cancer observed. Onset during adolescence and the presence of solid tumors were associated with a longer time to diagnosis (TD). Additionally, around **a quarter of these cases** presented as oncological emergencies.

CARACTERÍSTICAS CLÍNICO-EPIDEMIOLÓGICAS DE PACIENTES CON DEBUT ONCOLÓGICO. ESTUDIO RETROSPECTIVO EN UN SERVICIO DE URGENCIAS PEDIÁTRICAS

Resumen

Introducción: La baja incidencia de cáncer en la infancia y la sintomatología inespecífica al debut **pueden dificultar un diagnóstico precoz y condicionar un peor pronóstico.**

Objetivos: Conocer la **incidencia de debut oncológico en un Servicio de Urgencias Pediátricas (SUP) y la frecuencia de los distintos tipos de cáncer**, describir las caracte-

ísticas clínico-epidemiológicas de los pacientes y describir factores relacionados con el retraso diagnóstico.

Metodología: Estudio descriptivo-observacional retrospectivo. Se incluyeron pacientes menores de 18 años con sospecha diagnóstica de debut oncológico en el SUP de un hospital de tercer nivel entre los años 2019 y 2020.

Resultados: Se incluyeron 175 debuts oncológicos de un total de 180.124 visitas a Urgencias en dicho periodo de tiempo. La mediana de edad al debut fue de 5,5 años (p25-75: 2,5-13,5). Se diagnosticó tumor sólido en 103 (58,9%) casos (48; 27,4% del sistema nervioso central [SNC]) y enfermedad oncohematológica en los 72 (41,1%) restantes (48; 27,4% leucemias). La mediana de tiempo al diagnóstico (TD) fue de 50,5 días en adolescentes vs. 18, 28 y 20,5 en lactantes, preescolares y escolares; de 19 días en enfermedad oncohematológica vs. 39 en tumores sólidos. En 41 (23,4%) pacientes el debut fue en forma de emergencia oncológica.

Conclusiones: Los debuts oncológicos representaron el 0,1% de las visitas en el SUP. Los tumores del SNC y las leucemias fueron los tipos de cáncer más frecuentes. El diagnóstico de tumor sólido y el debut en la adolescencia fueron factores relacionados con un mayor TD. Aproximadamente un cuarto de los debuts se presentó como emergencia oncológica.

INTRODUCTION

Survival of pediatric patients with cancer has increased significantly in recent years. According to data from the National Childhood Cancer Registry (NCCR) of the National Cancer Institute of the United States, the relative 5-year survival rate in the population under 20 years of age was 86.5% between 2013 and 2019⁽¹⁾. However, cancer remains the leading cause of mortality from non-traumatic causes and is one of the diseases with the highest morbidity in childhood⁽²⁾.

Diagnosis can be complex and delayed due to nonspecific or seemingly insignificant symptoms at the time of diagnosis^(2,3). The literature identifies various factors associated with diagnostic delay, including the type and aggressiveness of the cancer, the age of the patient, and access to health services (related to the sociocultural environment). A late diagnosis of cancer can negatively impact the patient's prognosis, leading to increased tumor burden, advanced staging, or greater complexity in the therapeutic process⁽³⁾.

It is therefore crucial to establish early diagnostic suspicion and perform appropriate complementary examinations. This requires adequate training for general pediatricians to recognize the main signs and symptoms indicative of an oncological process and to refer patients to a specialized center⁽²⁻⁶⁾. Improving knowledge of the clinical profiles of the most common tumor types and their presentations in the Pediatric Emergency Department (PED), in coordination with the Department of Pediatric Hematology and Oncology, will facilitate earlier diagnosis and improve morbidity and mortality outcomes⁽²⁾.

While extensive research exists in adult medicine due to the increasing incidence of the disease, studies focused on newly diagnosed pediatric cancer are less common. The objectives of this study were: first, to determine the incidence of cancer presentation in the PED of a tertiary hospital, as well as the frequency of different cancer types diagnosed; second, to describe the clinical and epidemiological characteristics of patients with cancer presentation in the PED studied; and finally, to identify factors related to the time to diagnosis (TD) of cancer.

MATERIAL AND METHODS

A retrospective, descriptive-observational study was conducted, following a previous study that assessed the impact of the SARS-CoV-2 pandemic on the detection of cancer cases in a PED⁽⁷⁾. The study took place in the PED of a tertiary maternal and children's hospital with a mean of 120,000 visits per year. This hospital is a referral center for pediatric hematologic and oncologic disorders, with an annual mean of 135 new cancer diagnoses in recent years.

Using the tumor database of the Department of Pediatric Hematology and Oncology at the hospital, cases from January 1, 2019, to December 31, 2020, were selected. The study included patients under 18 years of age who had a diagnostic suspicion of cancer established in the PED. Patients with an initial suspicion of cancer that was ultimately ruled out, those with a history of cancer who were diagnosed with relapse or disease progression, and those referred from another center with a confirmed diagnosis of cancer were excluded.

Patient data were collected from computerized clinical records and the emergency department reports. The data collected included: sociodemographic variables; symptoms at onset (retrospectively categorized); duration of symptoms and previous medical care; information from the emergency department (complementary tests and patient disposition at discharge); characteristics of the diagnosed or suspected cancer (type, location, and whether it presented as an oncological emergency); and the time lag from symptom onset to final diagnosis.

In this study, an 'oncologic emergency' was defined as any acute event in a cancer patient that, directly or indirectly related to the tumor, poses a life-threatening risk⁽⁸⁻¹²⁾. 'Time to diagnosis' (TD) was defined as the total time from the onset of clinical symptoms to the establishment of suspicion in the PED, plus the time from suspicion in the PED to diagnostic confirmation^(2,13,14).

The collected data were stored and processed using a Microsoft Access® relational database. Quantitative and categorical variables were tabulated and analyzed with SPSS® 27.0 statistical software. The Kolmogorov-Smirnov test was used

TABLE 1. Symptoms at debut in the PED (n= 170)

CLINICAL FEATURES*	n (%)	Solid tumors n= 98	Hematologic malignancy n= 72	p
Fever	45 (26.5)	14 (14.3)	31 (43.1)	< 0.001
Neurological symptoms	53 (31.2)	49 (50)	4 (5.6)	< 0.001
Headache	33 (62.3)	29 (59.2)	4 (100)	0.285
Neurological focus	30 (56.6)	29 (59.2)	1 (25)	0.305
Gait disturbances	12 (22.6)	11 (22.4)	1 (25)	1.000
Consciousness impairment	2 (3.8)	2 (4.1)	0 (0)	1.000
Gastrointestinal symptoms	67 (39.4)	49 (50)	18 (25)	< 0.001
Dysphagia	3 (4.5)	1 (2)	2 (11.1)	0.174
Vomiting	40 (59.7)	30 (61.2)	10 (55.6)	0.675
Abdominal pain	25 (37.3)	16 (32.7)	9 (50)	0.193
Abdominal distension	10 (14.9)	8 (16.3)	2 (11.1)	0.717
Altered bowel movement	8 (11.9)	7 (14.3)	1 (5.6)	0.433
Respiratory symptoms	14 (8.2)	2 (2.8)	12 (16.7)	< 0.001
Dyspnea	7 (50)	0 (0)	7 (58.3)	0.462
Cough	10 (71.4)	2 (100)	8 (66.7)	1.000
Cardiovascular symptoms	1 (0.6)	0 (0)	1 (1.4)	0.424
Bone-joint symptoms	32 (18.8)	16 (16.3)	16 (22.2)	0.331
Nephrological symptoms	6 (3.5)	5 (5.1)	1 (1.4)	0.244
Skin symptoms	18 (10.6)	4 (4.1)	14 (19.4)	0.001
Ophthalmological symptoms	18 (10.6)	18 (18.4)	0 (0)	< 0.001
Cachexia	58 (34.1)	13 (13.3)	45 (62.5)	< 0.001
Hemorrhagic symptoms	20 (11.8)	2 (2)	18 (25)	< 0.001
Lymphadenopathy	29 (17.1)	1 (1)	28 (38.9)	< 0.001
Other symptoms	24 (14.1)	16 (16.3)	8 (11.1)	0.335

*Of 170 patients with symptoms, 118 (69.4%) presented with more than one type of symptom.

to assess data distribution. To compare quantitative data, the Student's t-test, Mann-Whitney U test, and Kruskal-Wallis test were applied. For qualitative data, the Chi-square test, contingency tables, and Fisher's exact test were used. A p-value of less than 0.05 was considered statistically significant.

The study was approved by the Ethics Committee of the study center (PIC-83-21). Due to the retrospective observational design, informed consent from patients was not required. Data obtained were pseudonymized.

There were no conflicts of interest.

RESULTS

During the study period, there were 180,124 visits to the PED, of which 175 were cases of newly diagnosed cancer: 103 (58.9%) were solid tumors, and 72 (41.1%) were hematologic malignancies. The median age at diagnosis was 5.5 years (IQR: 2.5–13.5 years), and 92 patients (52.6%) were male. Of the 175 patients, 170 (97.1%) presented with clinical symptoms in the PED, while the remaining 5 patients (2.9%)

were asymptomatic, with cancer suspicion occurring incidentally during routine check-ups by their regular pediatrician. Among those with symptoms, 58 patients (34.1%) had cachexia, 45 (26.5%) fever, and 40 (23.5%) vomiting. Table 1 shows symptoms at presentation for the included patients, categorized by tumor type.

Among the 175 patients, 41 (23.4%) presented with oncologic emergencies at presentation, including 20 (11.4%) with metabolic emergencies (hyperleukocytosis in 8 and tumor lysis syndrome in 12), 20 (11.4%) with mechanical emergencies (spinal cord compression in 1, intussusception in 1, superior vena cava syndrome in 3, and increased intracranial pressure in 15), and one (0.6%) with an infectious emergency (febrile neutropenia).

Overall, 134 patients (76.6%) had previously visited the PED and/or primary care for the same condition, with a median of one visit (range: 0–8 visits). The median time from the onset of clinical symptoms to the initial suspicion of cancer in the PED was 19 days (IQR: 7–60 days).

Table 2 shows the distribution of cancer cases by their physical location, and Table 3 lists the specific diagnoses. A

TABLE 2. Tumor location at debut (n= 175)

Location	n (%)
Blood	69 (39.4)
Central nervous system	48 (27.4)
Abdominal	28 (16)
Musculoskeletal	18 (10.3)
Genitourinary	8 (4.6)
Ear, nose, and throat	3 (1.7)
Eye	1 (0.6)

total of 150 patients (85.7%) were admitted to the hospital, with 32 of them (21.3%) being admitted to the Pediatric Intensive Care Unit (PICU). The remaining 25 patients (14.3%) were referred to oncology outpatient clinics for further diagnosis and treatment.

The median time from suspicion in the PED to diagnostic confirmation was 6 days (IQR: 2–14 days), and the median TD was 31 days (IQR: 14–66 days). A longer TD was observed in adolescent patients and in patients diagnosed with solid tumors, particularly those located in the central nervous system (CNS). In Table 4 the potential factors related to TD are analyzed.

TABLE 3. Specific diagnoses according to the International Classification of Childhood Cancer Third edition (ICCC-3) (n= 175).

Diagnostic group and tumor type	n (%)
I. Leukemias, myeloproliferative and myelodysplastic diseases	55 (31.4)
Leukemias	48 (87.3)
<i>Lymphoid leukemias</i>	40 (83.3)
<i>Myeloid leukemias</i>	8 (16.7)
Histiocytosis	6 (10.9)
Myelodysplastic syndrome	1 (1.8)
II. Lymphomas and reticuloendothelial neoplasms	23 (13.1)
Hodgkin lymphoma	10 (43.5)
Non-Hodgkin lymphoma (except Burkitt lymphoma)	5 (21.7)
Burkitt lymphoma	7 (30.4)
Juvenile nasopharyngeal angiofibroma	1 (4.3)
III. Central nervous system (CNS) tumors and intracranial and intraspinal neoplasms	45 (25.7)
Ependymomas and choroid plexus tumors	5 (11.1)
Astrocytomas	14 (31.1)
Intracranial and intraspinal embryonal tumors	10 (22.2)
<i>Medulloblastoma</i>	6 (60)
Other gliomas*	13 (28.9)
Other intracranial and intraspinal neoplasms**	3 (6.7)
IV. Neuroblastoma and other peripheral nervous system (PNS) tumors	7 (4)
V. Retinoblastoma	1 (0.6)
VI. Renal tumors	6 (3.4)
VII. Hepatic tumors	5 (2.9)
VIII. Malignant bone tumors	8 (4.6)
IX. Soft tissue and other extrasosseous sarcomas	10 (5.7)
X. Germ cell tumors, trophoblastic tumors and neoplasms of gonads	10 (5.7)
Intracranial and intraspinal germ cell tumors	2 (20)
Extracranial and extraspinal germ cell tumors	2 (20)
Gonadal germ cell tumors	6 (60)
XI. Other malignant epithelial neoplasms and malignant melanomas	3 (1.7)
XII. Other and unspecified malignant neoplasms	2 (1.1)

*Other gliomas: diffuse intrinsic pontine glioma (7), gliomatosis cerebri (1), desmoplastic ganglioglioma (1), tectal glioma (1), thalamic glioma (1), low-grade glial tumor (2). **Other intracranial and intraspinal neoplasms: cerebellar hemangioblastoma (1), craniopharyngioma (1), meningioma (1).

TABLE 4. Factors related to time to diagnosis (n= 175).

FACTOR	n (%)	Median TD* (IQR)	p
Age			0.002
Infant (0-2 years)	22 (12.6)	18 (8-39)	
Preschool (2-6 years)	66 (37.7)	28 (15-61)	
School-age (6-12 years)	37 (21.1)	20.5 (11-63)	
Adolescent (12-18 years)	50 (28.6)	50.5 (22-85)	
Sex			0.972
Male	92 (52.6)	31 (16-61)	
Female	83 (47.4)	31 (13-70)	
Tumor type			< 0.001
Hematologic malignancies	72 (41.2)	19 (11-47)	
Solid tumor	103 (58.8)	39 (19-72)	
Location			< 0.001
Blood	69 (39.4)	19 (11-46)	
CNS	48 (27.4)	57 (24-124)	
Abdominal	28 (16)	18 (12-31)	
Musculoskeletal	18 (10.3)	48 (38-83)	
Other**	12 (6.9)	44 (23-66)	
Previous consultations			0.078
Yes	134 (76.6)	31 (16-63)	
No	39 (22.4)	22 (11-41)	

TD: time to diagnosis; CNS: central nervous system. *TD values are expressed in days. **Genitourinary location and location in the ear, nose, and throat and eye are included.

DISCUSSION

In the PED of the study center, a mean of one case of cancer presentation was detected every four days. This prevalence, approximately 0.1% of all PED visits, is similar to that reported by Jawaid et al.⁽¹²⁾, but higher than in other PEDs⁽¹⁵⁻¹⁷⁾. These differences may be related to the sociodemographic characteristics of the populations studied and the specific characteristics of the centers where the studies were conducted. The high number of cases with newly diagnosed cancer in our study may be explained by the fact that ours is a referral center for pediatric oncology. In fact, two-thirds of the patients were referred with a suspected diagnosis of cancer by other pediatricians.

In this study, two-thirds of the patients were diagnosed with leukemia, CNS tumors, or lymphomas, which is consistent with findings reported in the literature⁽¹⁵⁾. Statistically significant differences in symptoms were observed based on tumor type. Patients with solid tumors most frequently had neurological, gastrointestinal, or ophthalmological symptoms at the time of PED consultation. In contrast, those with hematologic malignancies most commonly presented with fever, cachexia, skin symptoms, hemorrhagic symptoms, and lymphadenopathies. The symptoms described should alert pediatricians to the possibility of onset of cancer, especially when patients present with repeated consultations for the

same symptoms^(2,3,18,19). Early suspicion of cancer is crucial to request appropriate complementary examinations and refer the patient to specialized services to expedite the diagnostic process.

Our study shows that diagnosing most childhood cancers is often neither rapid nor straightforward, and in some cases, it takes several months from the onset of clinical symptoms to reach a diagnosis. Some authors argue that a certain degree of delay in the TD is inevitable, as more common and prevalent conditions must first be ruled out⁽²⁰⁾. However, the present study indicates that other factors are also associated with a longer TD. It was observed that in younger children, the diagnostic suspicion tended to be established earlier, while adolescents experienced a delay of up to a median of one month compared to infants. This difference may be explained by the fact that as children grow older, they receive less parental supervision, but still have limited knowledge of their own health status and encounter obstacles in accessing the healthcare system^(13,19). On the other hand, statistically significant differences were observed in the TD based on tumor type. Hematologic malignancies were diagnosed in nearly half the time compared to solid tumors. This may be partly because a complete blood count is a basic and first-line complementary examination in the PED for the initial assessment of many conditions and is crucial for diagnosing most hematologic malignancies⁽²⁰⁾. Finally, differences in TD were found based on tumor location, with shorter TD observed in hematologic malignancies and abdominal tumors compared to those in the CNS or musculoskeletal regions. This variation in TD can be attributed not only to the clinical features associated with each organ or system but also to the biological characteristics of the tumors. Bone and brain tumors typically have slower growth rates than other tumor types, which may contribute to their later diagnosis^(14,19). Hematologic malignancies, on the other hand, usually present with acute and evident symptoms, which allows for faster detection.

The main limitation of this study is its retrospective design, which may have resulted in the loss of information and potential biases during data collection and interpretation. However, these losses are assumed to be minimal, as due to type of disease, the information collected at disease onset is usually very complete. In addition, the study was conducted at a tertiary-level hospital and pediatric oncology referral center, which, as previously mentioned, may have led to a bias due to the higher prevalence of new cancer diagnoses occurring in a higher-level PED compared to other centers.

CONCLUSIONS

Oncologic presentations are relatively common in the studied PED, as it is a referral center. Approximately half of the cases occurred in patients under 5 years of age, and leukemia and CNS tumors were the most commonly diagnosed types of cancer, consistent with reports in the classic pediatric literature. Cachexia is more common in hematologic malignancies, while gastrointestinal and neurological symptoms are more frequently associated with solid tumors. The diagnosis of CNS and musculoskeletal tumors, as well

as onset in adolescence, are factors that may contribute to a longer TD. Repeated consultations for the same clinical symptoms, as seen in other disease groups, should also be considered an alarm sign when cancer is suspected.

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REVIEW

Low ambient temperatures, seasonality, and testicular torsion: A scoping review

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Abstract

Introduction: Testicular torsion is a medical emergency that accounts for up to a quarter of all cases of acute scrotal syndrome and may result in organ loss if not treated within the first few hours. Although its etiology is unknown, recent evidence suggests that low environmental temperatures may be a predisposing factor for testicular torsion. This review aims to summarize the main findings in the literature regarding the relationship between ambient temperature, seasons, and testicular torsion.

Material and Methods: The search for studies was conducted in PubMed between August 16 and August 28, 2023. Of the 78 articles identified, 22 were included in the review (21 retrospective studies and one prospective study). The search was conducted following the recommendations of the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines.

Results: The main countries represented in the studies were Brazil (4), the United States (4), and Nigeria (3). Additionally, 10 articles (52.3%) evaluated both the seasonality of testicular torsion and its association with ambient temperature, while eight articles (30%) focused exclusively on seasonality and four (19%) only on temperature. Of the 18 articles on the seasonality of testicular torsion, 10 reported a statistically significant association. In contrast, of the 14 studies that investigated the relationship between ambient temperature and testicular torsion, 13 found sufficient evidence to confirm a correlation.

Conclusion: The available evidence strongly suggests that low temperatures are a predisposing factor for the development of testicular torsion, while the association with seasons presents conflicting results.

BAJAS TEMPERATURAS AMBIENTALES, ESTACIONALIDAD Y TORSIÓN TESTICULAR: REVISIÓN DE ALCANCE

Resumen

Introducción: La torsión testicular es una urgencia médica de etiología idiopática que, al no ser tratada en las primeras horas, puede conducir a la pérdida del órgano. Recientemente se ha apoyado la teoría que las bajas temperaturas son un factor predisponente en su etiopatogenia. El propósito del presente trabajo es exponer los principales hallazgos en la literatura de la relación entre la temperatura ambiente, las estaciones del año y la torsión testicular.

Materiales y métodos: La búsqueda de estudios se realizó en PubMed entre los días 16 a 28 de agosto de 2023 con base en las recomendaciones de la Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).

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Resultados: De un total de 78 artículos, 22 fueron incluidos (21 estudios retrospectivos, 1 prospectivo). Los principales países de estudio fueron Brasil (4), Estados Unidos de América (4) y Nigeria (3). Asimismo, 10 artículos (52.3%) investigaron la estacionalidad de la torsión testicular, y también su asociación con la temperatura ambiente; mientras que 8 (30%), solo estudiaron la estacionalidad y 4 (19%), únicamente la temperatura. De los 18 artículos sobre la estacionalidad de la torsión testicular, 10 encontraron una asociación estadísticamente significativa. Por otro lado, de 14 estudios sobre la temperatura ambiente y la torsión testicular, 13 observaron evidencia suficiente para corroborar su relación.

Conclusión: La evidencia disponible sugiere fuertemente que las bajas temperaturas son un factor predisponente en el desarrollo de la torsión testicular, mientras que su asociación con las estaciones tiene resultados contrastantes.

INTRODUCTION

Acute scrotal syndrome is a medical emergency characterized by the sudden onset of scrotal pain, edema, and redness^(1,2). Among its causes, testicular torsion (TT) accounts for up to 25%⁽²⁾ and is defined as spermatic cord torsion interrupting blood supply. TT is classified as intravaginal (94%) and extravaginal (6%)⁽³⁾. The incidence is approximately 1 in 4,000 boys under the age of 25, with a higher prevalence between the ages of 12 and 18^(2,4,5). Immediate intervention is crucial, as delays in diagnosis and treatment may lead to testicular loss, particularly since irreversible pathophysiological changes begin 4 to 6 hours after symptom onset⁽⁵⁾.

TT typically occurs in the absence of identifiable risk factors, with only 4-8% of cases associated with trauma. Other factors, such as anatomical anomalies, also play a role⁽⁶⁾. Low environmental temperatures have been proposed as a predisposing factor for TT, possibly due to the hyperactive reflex of the cremaster muscle.

At the time of this research, no comprehensive review on the association between low temperatures and the incidence of TT had been published; therefore, the primary objective of this study was to present and analyze the current knowledge on this phenomenon using a scientifically rigorous protocol.

MATERIAL AND METHODS

Study design

The study was designed as a scoping review to identify evidence from a diverse field of research, to synthesize the existing body of knowledge and identify gaps⁽⁷⁾. The search was conducted following the recommendations of the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews)⁽⁸⁾.

Search strategy and selection process

The search for eligible articles was conducted in PubMed between August 16 and August 28, 2023. The search strategy used was (testicular torsion) AND ([temperature] OR [seasonality]). The inclusion criteria for the articles were: (1) cohort or case-control studies, (2) published in Spanish or English, and (3) related to the association of TT with low

temperatures or seasons. Articles that were inconsistent with the topic, written in another language, or unavailable were excluded.

The procedure for the final selection of articles for analysis was as follows: First, all results from the search strategy were compiled into a single file, and duplicates were removed. Next, the title and abstract of each article were screened according to the selection criteria. Then, of the remaining articles assessed for eligibility, those whose full text was in a different language and could not be accessed, even after contacting the authors via email or ResearchGate, were excluded. Finally, the remaining studies were included in the review.

Analyses

The variables extracted from each article are listed in [Table 1](#), following the PRISMA-ScR guidelines⁽⁸⁾. The variables were selected to provide a comprehensive overview and to identify the limitations of the existing knowledge. Among the publication details (author, year, country, and title), the country where the research was conducted was considered particularly important due to its direct correlation with the area's temperature. The study design, data collection methods, and statistical analysis provide information on the methodology, while the main results address the initial question regarding the relationship between temperature and/or seasonality and TT. Data extraction and compilation into tables were performed by the first author over a period of three months and content completeness was assessed at four time points.

RESULTS

Description of the article selection process

A total of 78 studies were retrieved, of which 44 were excluded for being irrelevant to the topic. Of the remaining 34, five were excluded because they were in a language other than Spanish or English, four were excluded based on the type of article, and another three were removed due to lack of availability, leaving 22 articles to be included in the review ([Figure 1](#)). [Table 2](#) provides the information extracted according to the PRISMA-ScR guidelines⁽⁸⁾.

TABLE 1. Information extracted from the studies.

Type of information	Description
Related to publication	Author, year, country, and title
Study design	Type of study design used (e.g., retrospective, prospective) and main objective (association of TT with low temperatures and/or seasons)
Data collection methods	Meteorological data collection instruments and enrollment procedures
Statistical analysis	Statistical methods for quantitative and qualitative information
Main results	Presence of association and magnitude of effect

TT: testicular torsion.

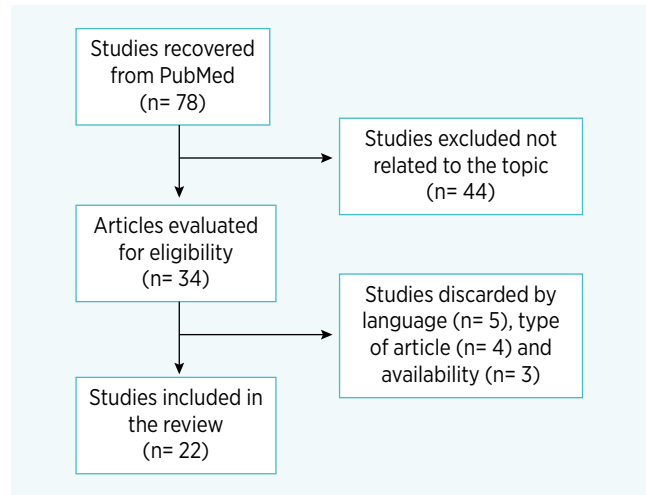


FIGURE 1. Flowchart of item search and selection.

TABLE 2. Characteristics of selected studies.

#	Author	Year	Title	Method of data collection	Country	Study design and statistical analysis	Main results
1	Al-Hunayan et al.	2004	Testicular torsion: a perspective from the Middle East	75 patients with a presumptive diagnosis of TT, conducted between January 1999 and December 2002; 63 patients (mean age 18.3 [11-45 years]) were confirmed by Doppler study or nuclear scan	Kuwait	A prospective study comparing the number of new cases during the year's four seasons. Statistical analysis was not performed	The mean number of new cases of TT was higher in the colder seasons than in the warmer seasons (in summer, the mean number of new cases per month was 4; in fall, 6; in winter, 6.7; and in spring, 5.5); the mean temperatures for each season were (spring, 13 to 30°C; summer, 40 to 50°C; fall, 15 to 32°C] winter, 5 to 17°C)
2	Cabral Dias Filho et al.	2018	Immediate and delayed effects of atmospheric temperature in the incidence of testicular torsion	218 patients with a single diagnosis of intravaginal TT confirmed by surgery in January 2012-January 2015, with a mean age of 15.8 (range, 14.1-18.5) years Records of mean daily ambient temperature and its minimum and maximum values were obtained from the World Meteorological Organization repository of weather stations	Brazil	Retrospective cohort study with nonparametric analysis (Wilcoxon test) and distributed lag nonlinear regression	Mean ambient temperatures of days with TT cases were lower than those without TT (20.9 vs. 21.4°C, p= 0.0002) Distributed lag nonlinear regression showed an increased risk of TT with low temperatures on the day of exposure (RR= 24 (95% CI: 2.2-266.83) at 15.6°C to 2.01 (95% CI: 1.03-3.99) at 19.4°C
3	Chiu et al.	2012	Seasonality of Testicular Torsion: A 10-Year Nationwide Population-Based Study	1,782 TT hospitalizations were retrieved from the National Health Insurance Research Database (NHIRD) between January 2000 and December 2009 Monthly mean ambient temperature records were obtained from the Taiwan Central Weather Bureau (CWB). In Taiwan, the seasons are spring (March-May), summer (June-August), fall (September-November), and winter (December-February)	Taiwan	This retrospective study used the Spearman correlation to explore the association between temperature and TT incidence, and the ARIMA method for statistical analysis to assess the seasonality of incidence	Monthly TT incidence negatively correlated with ambient temperature (r= -0.351, p< 0.01), and a similar seasonality pattern was observed across years using the ARIMA method

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TABLE 2 (Cont.). Characteristics of selected studies.

#	Author	Year	Title	Method of data collection	Country	Study design and statistical analysis	Main results
4	Chen et al.	2013	Diurnal temperature change is associated with testicular torsion: a nationwide, population-based study in Taiwan	65 patient records (mean age 16.2 years (range, 1 to 53) hospitalized for TT and surgically treated older than one year were obtained from the Taiwan Health Insurance Longitudinal Database 2000 between January 1996 and December 2008 Climatic information (mean, maximum, and minimum ambient temperature) was obtained from the Taiwan CWB	Taiwan	A retrospective study using the Kruskal-Wallis H test to analyze seasonal climatic variation and the Mann-Whitney U test to compare seasonal variation	The order of highest to lowest incidence by season was winter (31.1%), spring (26.2%), fall (23%), and summer (19.7%) ($p > 0.05$). Regarding the relationship with daily temperature change (DTC) (difference between maximum and minimum), a DTC $> 6^{\circ}\text{C}$ was the turning point in the increase of TT incidence ($p = 0.05$)
5	Cost et al.	2011	Pediatric testicular torsion: demographics of national orchiopexy versus orchiectomy rates	2,876 patients diagnosed with TT older than one year (mean age 11.9 years) were retrieved from the US Pediatric Health Information System database between 2003 and 2009 The object of the association was the seasons of the year in which the presentation occurred (spring [March-May]; summer [June-August]; fall [September-November]; winter [December-February])	United States	A retrospective cohort study using the χ^2 test to investigate the role of seasonal variations	Of the total number of cases, 792 (27.5%), 827 (28.8%), 616 (21.4%), and 641 (22.3%) occurred in winter, spring, summer, and fall, respectively ($p > 0.05$)
6	Driscoll et al.	1983	Cold weather and testicular torsion	134 patients had TT confirmed by surgery from 1973-1983 The distribution of months of the year by season was spring (March-May), summer (June-August), fall (September-November), and winter (December-February)	Scotland	A retrospective study using the χ^2 test to analyze the role of seasons	The distribution of cases by season was spring (28.3%), summer (18.6%), fall (26.1%), and winter (26.8%) ($p > 0.1$)
7	Ekici et al.	2018	Relationship of Low Temperature with Testicular Torsion	30 patients diagnosed with TT (mean age 14 [range, 10.8-17.0]), identified through the hospital system and surgery notes from June 2005 to December 2014 Groups of patients were studied according to the season of presentation: spring (March-May), summer (June-August), fall (September-November), and winter (December-February). Mean ambient temperature was obtained from online records of the state meteorological service	Turkey	A retrospective study using the χ^2 test to compare more than two groups and Spearman's test for correlation analysis	The distribution of the 30 TT cases by season was spring (23.3%), summer (13.3%), fall (16.6%), and winter (46.6%) ($p = 0.0126$) In the seasonal periods, the recorded temperatures were: winter, 1.4°C (-2.3, 5.2); spring, 9.5°C (6.7, 12.1); summer, 22°C (19, 26.8); fall, 1.3 (8.1, 13.5). There was a strong negative correlation between ambient temperature and TT cases ($r = -1.0$, $p = 0.033$)
8	Gomes et al.	2015	Cold weather is a predisposing factor for testicular torsion in a tropical country. A retrospective study	64 patients with a surgically confirmed diagnosis of TT (mean age 16 years [1.0-30.0]) were included; their clinical information was obtained from hospital records from April 2006 to March 2011 Symptom onset was tabulated according to month and season (spring, October to December; summer, January to March; fall, April to June; winter, July to September). Mean and minimum ambient temperatures were obtained from the Brazilian National Institute of Meteorology records	Brazil	A retrospective study using the χ^2 test was conducted to investigate the role of seasonal variation	The distribution of TT cases by season was spring (11%), summer (16%), fall (34%), and winter (39%). Thus, 73% of the cases occurred during the colder months (fall and winter), while 27% occurred during the warmer months (spring and summer) ($p < 0.001$) Eighty-three percent of the cases occurred when the minimum temperature was below 17.3°C , and only 17% when it was higher ($p < 0.001$)

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TABLE 2 (Cont.). Characteristics of selected studies.

#	Author	Year	Title	Method of data collection	Country	Study design and statistical analysis	Main results
9	Gutiérrez-García et al.	2010	Importancia del tiempo en el manejo de la torsión testicular	37 records of patients diagnosed with TT between 2002 and 2006 were retrieved from the hospital database The seasons of the year in Mexico are spring (March-May), summer (June-August), fall (September-November), and winter (December-February)	Mexico	This retrospective study divided the patients into two groups: Group A, which received medical care within 6 hours (n= 15), and Group B, which received medical care after 6 hours (n= 22)	Both groups had a predominance of TT cases in the fall and winter months (group A, 73%; group B, 77%)
10	Grushevsky et al.	2011	The seasonality of testicular torsion	768 patients (mean age 15.5 years [range, 11.7-20.8]) seen in the ED for TT between January 1996 and December 2009 The study seasons were summer (June-August) and winter (December-February). The method of obtaining ambient temperature was not specified	United States	A retrospective study in which the number of visits due to TT in winter and summer were compared using the Student's t-test. The Pearson correlation coefficient was also determined between the mean monthly visits due to TT and temperature	The probability of developing TT was 39% (95% CI, 24-57%) higher in winter than in summer. Similarly, there was a negative correlation between TT visits and mean monthly ambient temperature (R= 0.54; p= 0.01), with approximately 30% of patients who came for consultation with a monthly temperature below 3°C
11	Karakan et al.	2015	Seasonal preponderance in testicular torsion: is it a myth?	56 patients (mean age 18.8 ± 0.73) with a diagnosis of TT, confirmed by physical examination and scrotal Doppler ultrasound findings, were admitted to the emergency department from 2005-2014 The database of the General Meteorological Directory of the Republic of Turkey was used to determine the mean temperature at the time of diagnosis and the seasons of spring (March-May), summer (June-August), fall (September-November), and winter (December-February)	Turkey	A retrospective study was conducted in which X ² , Mann-Whitney U, and Wilcoxon tests were used for statistical analysis	The distribution of the 56 TT cases by season was spring (32.1%), summer (16%), fall (25%), and winter (26.7%) (p= 0.392) In contrast, the ambient temperature on admission was below 15°C in 71.4% of cases and above 15°C in 28.6% (p= 0.002)
12	Korkes et al.	2012	Testicular torsion and weather conditions: analysis of 21,289 cases in Brazil	21,289 hospital admissions for surgical treatment of TT were obtained from the Brazilian Public Health Information System database (DATASUS) in 1992-2010 Patients were classified based on month of diagnosis, year, and region. Of the five main areas of Brazil, the South has lower temperatures and more variations than the North	Brazil	A retrospective study was conducted in which the X ² test and ANOVA were used to compare groups	The corrected TT rate for the total population of each region remained similar in all areas studied (p= 0.38), and the temperature variation between regions was more significant between the North and South (3.1°C vs. 6.5°C; p< 0.0001) There was a significant increase in the number of TT in colder months (p= 0.002) and a substantial difference between incidence in warmer and colder months in both southern (OR= 1.4; p< 0.0001) and northern (OR= 1.1; p< 0.001) regions

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TABLE 2 (Cont.). Characteristics of selected studies.

#	Author	Year	Title	Method of data collection	Country	Study design and statistical analysis	Main results
13	Lyronis et al.	2009	Acute scrotum - etiology, clinical presentation and seasonal variation	140 patients with acute scrotum syndrome, of whom 35 had TT confirmed by physical examination and scrotal Doppler ultrasonography (mean age 5.66 ± 3.33 years) between January 1989 and December 2006 Cases were divided by age group and by season of symptom onset (spring, March-May; summer, June-August; autumn, September-November; winter, December-February)	Greece	Retrospective study in which clinical presentations and seasonal variations in the causes of acute scrotal syndrome were analyzed. X^2 test and ANOVA were used for statistical analysis	The distribution of TT cases by season was spring 14.2%, summer 12.5%, fall 34.2%, and winter 40% ($p < 0.047$)
14	Mabogunje	1986	Testicular torsion and low relative humidity in a tropical country	131 patients diagnosed with TT (80% in the age group 11-25 years) from 1972-1984 The monthly mean daily temperature was obtained from the Agricultural Research Institute, Zaria records. The seasons in Nigeria are usually divided into the hot and humid months (March-October) and the harmattan months (a dry trade wind in which humidity and temperature drop, November-February)	Nigeria	Retrospective study in which Edward's test was used to observe seasonality and Spearman's test for correlation	The presence of seasonality was observed in the incidence of TT cases ($p < 0.001$), and a non-significant correlation with temperature ($r = -0.47$, $p > 0.05$)
15	Mbibu et al.	2004	Acute scrotum in Nigeria: an 18-year review	A total of 178 patients with acute scrotal syndrome who underwent surgery, of whom 90 were for TT (mean age 23 years [range, 3 weeks-55 years]), were retrieved from the hospital registry during the period 1978-1997 (1984 was excluded) The source of information on the mean daily ambient temperature for each month was obtained from the Agricultural Research Institute, Zaria. The seasons in Nigeria are usually divided into the hot and humid months (March to October) and the harmattan months (a dry trade wind in which humidity and temperature drop, November to February)	Nigeria	A retrospective study was conducted to analyze the seasonality of TT cases in students' t-tests	TT was more frequent in the harmattan season, confirming seasonality ($p = 0.05$)
16	Molokwu et al.	2020	Cold weather increases the risk of scrotal torsion events: results of an ecological study of acute scrotal pain in Scotland over 25 years	33,855 reports of patients with acute scrotal syndrome (TT, testicular appendage torsion, and epididymo-orchitis) during 1983-2007 were obtained from the National Health Service (NHS) Information Services Division The mean ambient temperature was obtained from the United Kingdom Meteorological Office. The distribution of months of the year by season was spring (March-May), summer (June-August), fall (September-November), and winter (December-February)	Scotland	A retrospective study in which patients were divided into groups A (TT and testicular appendage torsion) and B (epididymis-orchitis). Friedman's test was used to analyze the variability of monthly frequency. The Mann-Whitney U test was used to compare cold and warm months, and the Spearman test was used for correlation	Of the cases, 23% were in group A, and 77% were in group B. The warmest months were from May to October ($4.8-9.6^\circ\text{C}$), and the coldest months were from November to April ($0.1-2.5^\circ\text{C}$). In group A, there was a higher frequency of episodes in the coldest months than in the warmest months ($p < 0.0001$) There was a negative correlation between the frequency of episodes in group A and ambient temperature ($r = -0.87$; $p = 0.0004$)

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TABLE 2 (Cont.). Characteristics of selected studies.

#	Author	Year	Title	Method of data collection	Country	Study design and statistical analysis	Main results
17	Paladino et al.	2021	Testicular torsion and climate changes in macroregions of São Paulo, Brazil	2,351 records of patients with intravaginal testicular torsion confirmed by surgery between January 2008 and December 2016 were obtained from DATASUS Brazil Each location's average ambient temperature information was obtained from the Agrometeorological Information Center (CIAAGRO). In addition, the year was divided into warm months (January-March and October-December, which correspond to summer and spring) and cold months (April-September, fall, and winter)	Brazil	A retrospective study was conducted in which patients were divided into the five macro-regions of Brazil, denominated A to E. The student's t-test was used for statistical analysis	In all areas studied, there was a significant difference in temperature variation between cold and warm months ($p < 0.05$). In macro-regions B, C, and E ($n = 2,130$), there were statistical differences in the association between TT and low temperatures ($p = 0.019$, $p = 0.001$, and $p = 0.006$, respectively). In contrast, there were no significant differences in zones A and D ($n = 221$) ($p = 0.066$ and $p = 0.494$, respectively)
18	Shukla et al.	1982	Association of cold weather with testicular torsion	46 records of patients with a diagnosis of TT confirmed by surgery were retrieved from the hospital database Mean ambient temperature information was obtained from the Irish Meteorological Service. The seasons of the year in Ireland are as follows: spring, March-May; summer, June-August; fall, September-November; and winter, December-February	Ireland	A retrospective study was conducted in which the distribution of cases of TT over the months and their comparison with the ambient temperature were studied using the X^2 test	87% of the cases occurred when the temperature was below 2°C , considering that only 23.6% of the days of the year were below this mark ($p < 0.01$)
19	Srinivasan et al.	2007	Climatic conditions and the risk of testicular torsion in adolescent males	58 patients were surgically diagnosed with intravaginal TT between January 1999 and December 2006 The date of symptom onset was recorded with the corresponding month and season of the year. Seasons in the United States of America were divided into summer (June-August) and winter (December-February)	United States	Retrospective study in which two stratifications were performed: the first was divided into two groups according to atmospheric temperature (group 1, $< 15^\circ\text{C}$ and group 2, $> 15^\circ\text{C}$); the second stratification was divided into three groups (group 1, $< 5^\circ\text{C}$; group 2, $6-15^\circ\text{C}$; and group 3, $> 15^\circ\text{C}$). X^2 , Mann-Whitney U, and Kruskal-Wallis tests, Spearman correlation, and multivariate analysis were used for statistical analysis	The distribution across the 4 seasons was not significant ($p > 0.05$), but the clustered incidence during spring and winter was 67.2% of cases compared to the fall and summer group ($p = 0.0007$). The mean temperature at symptom onset was 6.9°C ($12-23^\circ\text{C}$). In the first stratification, group 1 ($< 15^\circ\text{C}$) accounted for 81% of cases ($p < 0.001$) and in the second stratification, group 1 ($< 5^\circ\text{C}$), 48% ($p < 0.001$) Spearman's test showed a negative correlation between ambient temperature and TT incidence ($r = -0.94$; $p < 0.0001$). Similarly, multivariate analysis corrected for covariates such as age showed a negative correlation between temperature and TT incidence ($p < 0.05$)

.../...

TABLE 2 (Cont.). Characteristics of selected studies.

#	Author	Year	Title	Method of data collection	Country	Study design and statistical analysis	Main results
20	Takure et al.	2013	Torsion of the testis and factors that determine the choice of orchidectomy and unilateral orchidopexy	169 records of patients (mean age, 9 months-45 years) with a surgically confirmed diagnosis of TT between July 1998 and June 2010 were retrieved from the medical records of the urology department of each hospital Mean ambient temperature was obtained from the British Broadcasting Corporation (BBC) weather map. In Nigeria, the seasons are divided into the hot and humid months (March to October) and the harmattan months (November to February)	Nigeria	A retrospective, descriptive, and correlational study using Pearson's test for statistical analysis	The month with the lowest number of TT cases was June (9 cases), and the highest was September (23 cases); however, the mean ambient temperature was the same, 25.5°C. Overall, there was no significant correlation between the incidence of TT and ambient temperature ($r = 0.248$; $p = 0.437$)
21	Williams et al.	2003	Testicular torsion: is there a seasonal predilection for occurrence?	A total of 135 patients with surgically confirmed intravaginal testicular torsion during the period 1987-2002 were identified from the hospital registry The year's seasons in the United States of America were divided into summer (June-August) and winter (December-February)	United States	A retrospective study was conducted using the X^2 test to determine statistical significance	The distribution of TT cases by season was spring (23%), summer (22%), fall (30%), and winter (24%) ($p > 0.05$)
22	Williamson	1983	Cold weather and testicular torsion	A total of 293 patients (mean age 13 years) diagnosed with TT, of whom 275 were saved by the month in which the episode occurred, were studied from 1960-1974 The seasons of the year in Ireland are as follows: spring, March-May; summer, June-August; fall, September-November; and winter, December-February	Ireland	A retrospective study was conducted using the X^2 test for nonparametric statistical analysis	More cases were observed in November to February (late fall and winter) than in the warmer months ($p < 0.005$)

Location and year of publication

The association between low ambient temperatures and TT was first described in Ireland⁽⁹⁾ more than 50 years ago. Since then, numerous studies have assessed this association, with a peak in research activity in the last decade, resulting in 11 publications (Figure 2). Among the analyzed studies, the most frequently represented countries were Brazil (4 studies, 18.2%)^(1,4,6,10), the United States (4 studies, 18.2%)^(9,11-13), and Nigeria (3 studies, 13.6%)⁽¹⁴⁻¹⁶⁾. The majority of the studies were conducted in the Northern Hemisphere (18 studies, 81.8%).

Study design

Most of the studies were retrospective (21, 95.4%). Of the total, 10 studies (52.3%)^(1,6,14,17-23) examined the association of TT cases with both seasons and ambient temperature, whereas eight studies (30%)^(11-13,15,24-27) assessed only the association with seasons and four (19%)^(4,9,10,16) only the association with temperature.

Data Collection Method and Statistical Analysis

In terms of participants, the sample sizes of the studies ranged from 30 to 21,289 patients. Six studies (27.3%) used national databases, while 16 studies (72.7%) were based on hospital records. The diagnosis of TT was confirmed through surgical intervention in 13 studies (59.1%), through Doppler ultrasound and physical examination in three studies (13.6%), and six studies (27.3%) did not specify the diagnostic method. In addition, five studies (22.7%) did not report the age of the patients. Regarding meteorological data, of the 15 studies examining the relationship with ambient temperature, 11 reported mean monthly temperatures, while the remaining four provided mean daily temperatures.

Of the 18 articles that analyzed the seasonality of TT, most used the X^2 test (11), either alone or in combination with other statistical methods, including ANOVA, the Mann-Whitney test, or Spearman's correlation. Two studies focused only on descriptive analysis^(24,25). In contrast, for the relationship with

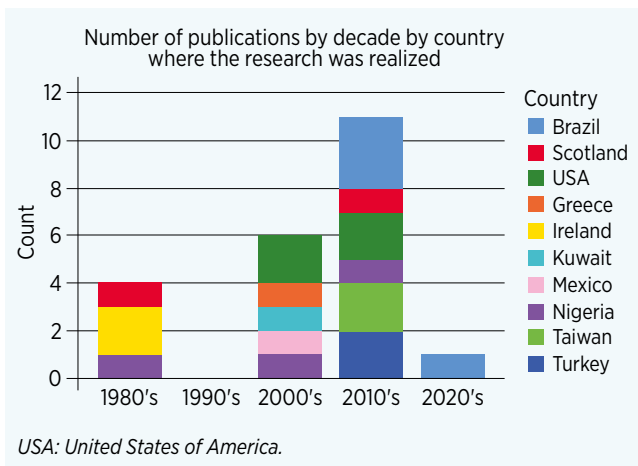


FIGURE 2. Number of publications per decade by country of research.

ambient temperature (14 articles), the most commonly used tests were Spearman's correlation (5 studies) and Pearson's correlation (2 studies). Four studies divided the data into two groups based on different temperatures and evaluated them using the X^2 test.

Main results

Of the 18 articles that examined the relationship between the incidence of TT and seasons, 10 reported a statistically significant association. On the other hand, 13 of the 14 studies that investigated the association between ambient temperature and TT found sufficient evidence to confirm a relationship.

DISCUSSION

Summary of the evidence

Here, we present the first up-to-date review of the available literature on the correlation between ambient temperature, seasons, and TT, with special emphasis on methodological aspects. Our review suggests that low temperatures are a strong predisposing factor for TT, while the seasonality of TT remains inconclusive, showing conflicting results. Nevertheless, the quality of these findings should be considered with caution due to potential methodological limitations, such as patient selection bias and the use of hospital administrative and meteorological databases. In addition, as testicular torsion is a multifactorial condition where temperature may play a significant role, further research is needed to better understand this relationship. Future studies should employ more rigorous methodologies, such as prospective designs, larger sample sizes, and broader geographical representation, especially considering the high prevalence of cases in the Northern Hemisphere. Moreover, further etiopathogenic studies are also necessary.

Limitations

Our review has two significant limitations that should be acknowledged. First, eight articles were excluded during the

selection process (five due to language barriers and three due to lack of availability), which may have limited the information available on the phenomenon studied. Second, the synthesis of the information was conducted by a single researcher, which introduces the potential for error, even though efforts were made to minimize this risk (the data collection was conducted over three months with four time points to evaluate content completeness).

Clinical implications

As TT is a medical emergency, delayed diagnosis and ineffective treatment may not only result in loss of the testis but also have legal implications for the treating physician⁽¹⁾. Therefore, it is important to consider risk factors associated with its occurrence to minimize these outcome. Although the current evidence is limited, establishing recommendations and public policies aimed at educating the general population and healthcare personnel about the association between TT and low temperatures could promote early intervention. This approach would encourage patients to seek immediate medical attention, especially during colder months⁽¹⁾, and ensure that emergency department professionals refer patients early to specialists with a presumptive diagnosis.

CONCLUSION

In conclusion, the available evidence strongly suggests that low temperature is a risk factor for the development of TT, although its association with seasonality remains unclear due to conflicting results. Our findings emphasize the need for further, more rigorous research to improve our understanding of the relationship between temperature and TT.

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SPECIAL ARTICLE

Current status of specialized pediatric and neonatal transport in Catalonia

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MODEL OF PEDIATRIC AND NEONATAL TRANSPORT IN CATALONIA

Interhospital transport of critically ill patients, particularly in the pediatric and neonatal setting, is a significant challenge within medical emergency systems (MES). These transfers are crucial to ensure that patients receive advanced therapies not available in less technologically complex hospitals. The specialization of these teams results in improved transport outcomes for these patients^(1,2). While most of these transfers can be performed with advanced life support units, the increasing use of complex devices such as ventricular assist systems and extracorporeal membrane oxygenation (ECMO) has increased the demand for specialized expertise to ensure the safe and effective transport of these patients.

For more than 29 years, the MES of Catalonia has developed a service specialized in the interhospital transport of neonatal and pediatric critically ill patients⁽³⁾, in a patient- and family-centered model. The initial model has evolved to the current one, which has two pediatric advanced life support (PALS) land units specialized in pediatric and neonatal transport, located at the Sant Joan de Déu University Hospital and the Vall d'Hebron University Hospital, operating 24 h/365 days. It also has a specialized pediatric air unit, operated by

personnel from the Parc Taulí University Hospital in Sabadell and the Santa Creu i Sant Pau University Hospital in Barcelona, and a pediatric intermediate life support unit during the winter months.

This service, with its comprehensive and highly specialized approach, is activated from the initial contact between the requesting center and the interhospital coordination desk, ensuring that the appropriate level of care is provided from the outset. The pediatric MES is composed of multidisciplinary teams of over 60 professionals, including physicians, nurses, and technicians, all of whom have specialized training in the care of critically ill neonatal and pediatric patients. The competency profiles of these professionals are in accordance with the recommendations of the corresponding scientific societies^(4,5). Given the relatively low number of pediatric and neonatal transfers compared to adults, maintaining the skills of these professionals presents a challenge. However, their continued education and dual roles within the MES and in highly complex intensive care units support the ongoing development and maintenance of their expertise in pediatric and neonatal transport.

PEDIATRIC MES CARE ACTIVITY IN CATALONIA

Since the establishment of the pediatric MES in 1995, over 30,000 patients have been transferred. The vast majority (95%) involve interhospital transports, where critically ill children are stabilized and transported to facilities with the appropriate level of care. In recent years, these teams have also expanded their scope to respond to emergencies in homes, public areas, or primary care centers, in coordination with local support units.

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The MES receives approximately 75,000 calls per year for interhospital transport, of which the pediatrician handles an average of 8,500 consultations per year for telephone support to the healthcare network or MES units.

Of the 8,500 interventions, an average of 1,400 transfers are generated by pediatric units each year. **Figure 1** shows the total number of interventions with mobilization of pediatric resources from 2021 to 2023. Thirty-eight percent of the patients transferred were under 1 month old, 38% were between 1 month and 3 years old, and the remaining patients were between 4 and 18 years old. The most common reason for transfer was respiratory disease, followed by neurological, infectious, cardiovascular, and traumatic conditions and prematurity. Between 2017 and 2021, 64,276 pediatric consultancy calls were attended, with 25,775 (4%) classified as priority 0. These critical cases were managed by the coordinating pediatrician, together with other consulting professionals, including physicians and nurses.

INCORPORATION OF THE PEDIATRICIAN INTO THE MES COORDINATION CENTER

The integration of a pediatrician into the MES Central Coordination Center (CECOS) in 2017 has been fundamental in optimizing resource coordination, enabling the provision of remote care support via telephone or video call. This role is essential in managing and coordinating the resources required for complex pediatric emergencies across the healthcare network, ensuring that transfers and treatments are performed with maximum efficiency and safety. The pediatrician's responsibilities include:

- Management of interhospital transport requests: coordination and consultation.
Transfers of patients aged 16 years or younger are managed directly. When a healthcare center requests the transport of a pediatric or neonatal patient, the call is first directed to a manager who collects essential affiliation details. The call is then immediately forwarded to a coordinating pediatrician, who evaluates the patient's condition, considers potential additional therapeutic measures, and determines the most appropriate destination center and transport resource. It should be noted that pediatric units do not always carry out the transport, as this depends on factors such as resource availability, travel time, and the patient's time-sensitive condition. The care model is outlined in **Figure 2**.
- Telephone support during emergencies.
Another key role of the coordinating pediatrician is to provide specialized assistance during consultations requiring expert guidance due to their complexity and severity. These calls are often initiated by citizens and have already been screened by the initial call handlers. Typically, they involve cases classified as "priority 0," where the primary concerns include unconsciousness, severe respiratory distress, or other life-threatening conditions. The coordinating pediatrician also supports MES teams managing pediatric patients and healthcare professionals from other medical centers (**Figure 3**).

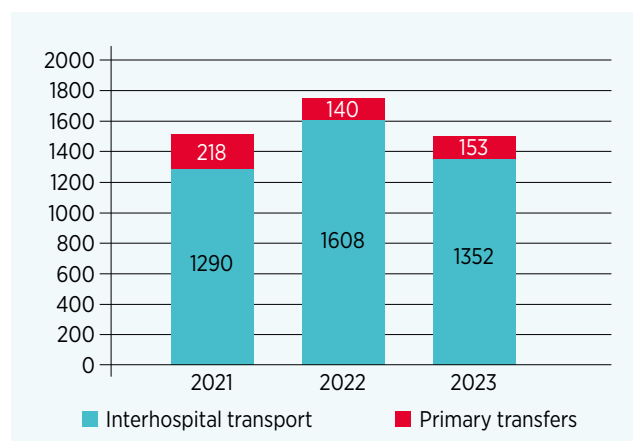


FIGURE 1. Interhospital and primary pediatric and neonatal transport conducted by pediatric MES bases between 2021 and 2023.

PROGRAM OF PEDIATRIC TRANSPORT ON ECMO

Extracorporeal Membrane Oxygenation (ECMO) is a technique that temporarily replaces the function of the heart and lungs. Although available in our country for over 20 years, its complexity limits its use to specialized centers, such as H. Universitari Vall d'Hebron and H. Sant Joan de Déu in Catalonia. In cases where a critically ill neonatal or pediatric patient in a facility without ECMO capabilities requires this support but cannot be safely transferred without it, consideration may be given to transferring the patient with ECMO support. This involves moving the ECMO team to the referring center, initiating therapy on-site, and transferring the stabilized patient to the specialized center. For these transfers, the MES utilizes all PALS units and the high-complexity transport unit (**Figure 4**).

Since 2019, the MES has significantly expanded its capacity to perform ECMO-supported transfers of pediatric patients in collaboration with the ECMO teams from Vall d'Hebron University Hospital and Sant Joan de Déu University Hospital. These advancements have been driven by the continuous evolution of neonatal and pediatric care and transport models. The ECMO pediatric transport service comprises one of the hospital-based ECMO teams, either from Vall d'Hebron or Sant Joan de Déu, consisting of two pediatric intensivists, a cardiac surgeon, and two nurses, all with over three years of ECMO experience. Additionally, the team includes professionals from one of the two PALS land units, which consists of two emergency medicine technicians, a nurse, and a pediatrician, all specialized in critically ill pediatric patient transport. In select cases, based on patient severity and transport distance, air transport is considered for the ECMO unit. For long-distance ECMO transports, when one PALS unit is activated, a third PALS team remains available to cover the territory while the transfer is underway.

The regulation of these processes is outlined in Order SLT/139/2013 by the Department of Health of Catalonia, which designates CECOS as the body responsible for managing and coordinating urgent or emergency care, including interhospital transport. Instruction 01/2024, effective since February 2024, further strengthens coordination across dif-

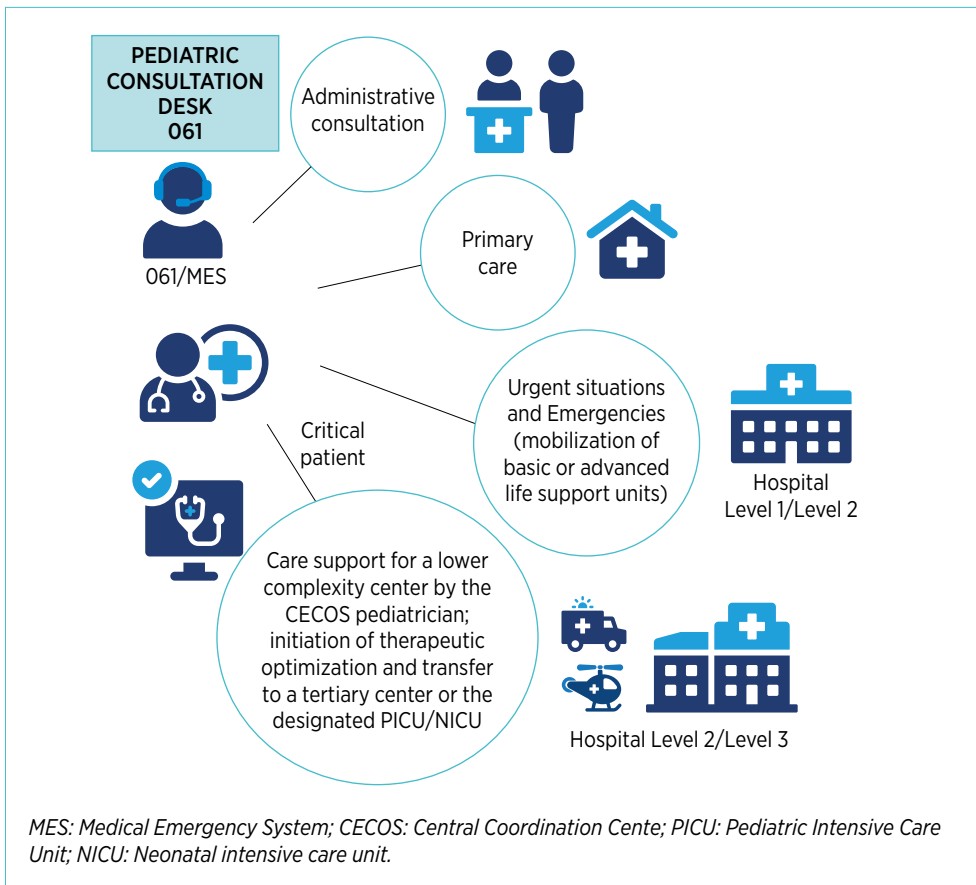


FIGURE 2. General care model of the MES for pediatric patients.



FIGURE 3. MES pediatrician in the coordination center.



FIGURE 4. MES high complexity unit.

ferent levels of care and specialized services for pediatric patients requiring highly complex procedures. This ensures equitable access to care throughout Catalonia and, when necessary, beyond the autonomous community.

This operational framework guarantees the quality of care and safety required for managing critically ill patients, ensuring that the appropriate material and human resources are in place to facilitate safe and effective interhospital transport, even in the most complex situations.

Since 2019, our units have performed 16 primary ECMO transports, of which only two were within Catalonia, while the remaining cases involved patient transfers from other autonomous communities (Islas Baleares n= 7, Navarra n= 2, Castilla-La Mancha n= 2, Castilla-León n= 1, Aragón n= 1, La Rioja n= 1). These patients were transported with extracorporeal

support to the ECMO center in Barcelona. Additionally, two secondary ECMO transfers were conducted within the city of Barcelona, involving patients in need of solid organ transplants who were transferred to Vall d'Hebron Hospital. Furthermore, transfers from Barcelona airport to Vall d'Hebron were carried out for ECMO patients from outside Catalonia (Andalucía n= 3 y Portugal n= 1), who required transplants and were flown to Barcelona by the medical teams from their originating centers.

CONCLUSION

The neonatal and pediatric transport system in Catalonia ensures high-quality care for critically ill children requiring

remote or in-person management during transfers to more specialized centers. The organization of transfers involving high-complexity and ECMO units offers a new dimension of territorial equity, enabling patients across Catalonia to receive enhanced care from specialized staff. Given the relatively low number of such transfers, maintaining the expertise of care teams is essential. This is achieved through continuous training and the integration of professionals into high-complexity units.

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CASE REPORT

Navel gazing

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Ombigo
Uraco

Abstract

Introduction: Umbilical disorders are a common reason for neonatal consultations in the emergency department. Although different conditions may present similarly, their management, complications, and prognosis can vary significantly.

Case Report: A 12-day-old neonate was referred to the Emergency Department due to a four-day history of serosanguineous umbilical discharge, along with one measurement of mild fever and a single episode of vomiting. Physical examination revealed an erythematous umbilicus without induration and a soft, non-reducible lump. As a complicated umbilical hernia was suspected, abdominal ultrasound was performed, which indicated the presence of an incarcerated umbilical hernia. The patient was admitted to the neonatal unit, where surgical intervention revealed a urachal diverticulum. The diverticulum was resected without complications, and the patient showed favorable clinical progress.

Comment: A thorough understanding of the differential diagnosis allows for an appropriate approach and treatment of our patients, avoiding delays in diagnosis and minimizing the risk of management errors.

MIRARSE EL OMBLIGO

Resumen

Introducción: La patología umbilical supone uno de los motivos de consulta neonatal más frecuente en nuestras Urgencias. Aunque la presentación de las diferentes entidades puede ser parecida, su manejo, complicaciones y pronóstico pueden ser muy amplios.

Caso clínico: Neonata de 12 días de vida que es derivada al Servicio de Urgencias por secreción serohemática umbilical de 4 días de evolución junto con un pico febricular y un vómito aislado. En la exploración física destaca un ombigo eritematoso, indurado y doloroso a la palpación, con tumoración blanda, no reducible. Ante sospecha de hernia umbilical complicada se solicita ecografía abdominal, con imagen dudosa de hernia umbilical incarcerada. Se decide ingreso en Unidad Neonatal donde se realiza intervención quirúrgica, diagnosticándose finalmente un divertículo uracal. Se realiza resección del mismo, sin incidencias y con correcta evolución clínica.

Comentario: Un correcto conocimiento del diagnóstico diferencial permite realizar un correcto abordaje y tratamiento de nuestros pacientes, evitando retrasos en el diagnóstico y errores en el manejo.

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INTRODUCTION

Neonates frequently present to pediatric emergency departments (PEDs) and the reasons for consultation are usually diverse. Retrospective studies from hospitals in Spain and Latin America estimate that neonates account for approximately 1.5% to 2% of all ED visits. Furthermore, conditions related to the umbilical cord are estimated to represent between 1% and 14% of consultations in this patient group⁽¹⁻⁵⁾. This case report aims to review the differential diagnosis and management of different umbilical disorders.

CASE REPORT

A 12-day-old neonate, born at term (41 weeks gestation) to a healthy mother in her second pregnancy, presented with no significant perinatal history. The mother had normal ultrasounds, negative serology except for immune rubella, a negative group B streptococcal vaginal culture, and experienced clear amniorrhexis for less than one hour. The infant's birth weight was appropriate for gestational age. Physical examination at birth showed no abnormal findings with a normal umbilical cord and unremarkable neonatal screening results. The infant was referred to the PED of a tertiary care hospital from her primary care center due to a 4-day history of umbilical serosanguineous discharge. The condition was initially diagnosed as a granuloma and had been managed with daily cleaning using chlorhexidine, as recommended by the pediatrician at the outpatient clinic.

The mother reported that the patient experienced a single episode of fever reaching 37.4°C, isolated vomiting after feeding the previous day, and irritability at night. She noted that the infant was generally well, with normal urination and bowel movements. She also reported that the umbilical area had previously healed well with dry dressing and the cord falling off at 7 days of life without any discharge or color changes. The infant had good weight gain with exclusive breastfeeding.

On physical examination, the patient had a stable pediatric assessment triangle and normal vital signs. The abdomen was soft, non-tender, and easily depressible upon palpation. The umbilicus was erythematous and indurated, without increased local temperature to the touch. There was serosanguineous discharge, which was not malodorous or purulent. Additionally, there was associated soft umbilical inflammation that was not reducible, and attempted reduction was painful (Figure 1).

Based on the clinical and examination findings, omphalitis was initially considered the primary diagnosis to exclude, due to the local inflammation, mild systemic symptoms, and risk for systemic involvement in neonates. However, in the presence of a wet umbilicus, differential diagnosis should also include malformations. In addition, a complicated umbilical hernia should be considered if there is a non-reducible mass. Given the appearance and progression of the umbilicus, the likelihood of a granuloma was considered low.

In view of these suspicions, a blood test was requested, which showed slightly elevated C-reactive protein levels (18.7 mg/L) and mild leukocytosis ($23.50 \times 10^9/L$) with neutro-



FIGURE 1. Assessment of the umbilical area during physical examination of the patient. (Author: Dra. Mireia Sensarrich).

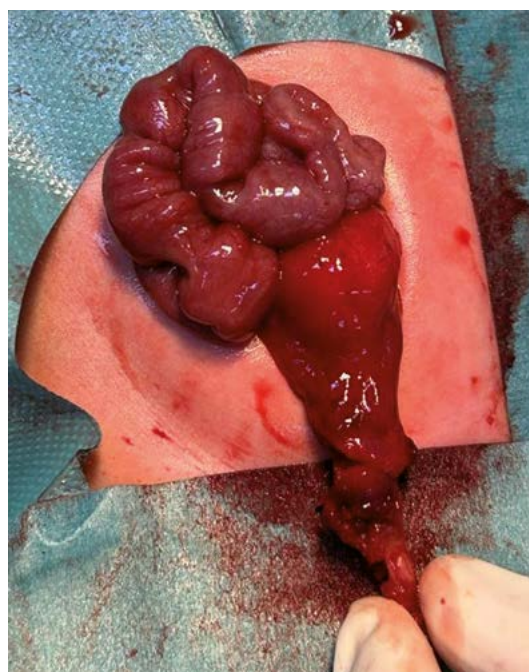


FIGURE 2. Urachal diverticulum identified during abdominal surgery. (Author: Dra. Núria Brun).

philia (62.6%), but below $15.00 \times 10^9/L$. Simultaneously, an abdominal ultrasound was performed, which suggested an incarcerated hernia after identifying a segment initially interpreted as thickened-walled intestine with a minimal amount of non-reducible fluid. Given the suspicion of a surgical abdomen and laboratory results without significant elevation of inflammatory markers, further infectious workup was considered unnecessary.

The patient was admitted to the neonatal unit, where a prophylactic dose of pre-surgical antibiotic therapy with amoxicillin-clavulanic acid (50/10 mg/kg) was administered. Surgery was performed under general anesthesia, revealing a diverticular structure connected to the bladder dome, leading to a diagnosis of a urachal diverticulum (Figure 2). The histopathological examination confirmed

TABLE 1. Differential diagnosis of umbilical disorders⁶⁻¹⁰.

	Incidence	Etiology	Presentation	Treatment
Granuloma	Most common umbilical mass ⁸	Scar tissue overgrowth	<ul style="list-style-type: none"> • Small, pink, moist, “velvety” nodule. • 3-10 mm • Serosanguineous discharge • Seen after cord separation 	75% silver nitrate cauterization Non-iodized common salt
Omphalitis	0.7-6%	Polymicrobial infection: <i>S. aureus</i> ⁹ > group A and B Streptococci, gram-negative bacilli > anaerobic bacteria	<ul style="list-style-type: none"> • Painful erythematous induration in the periumbilical region • Purulent and malodorous discharge • Systemic symptoms: fever, lethargy, decreased feeding 	Admission + antibiotic therapy (gram-positive cocci and gram-negative bacilli)
Umbilical hernia	Most common umbilical pathology 10% ⁸	Umbilical ring malformation	<ul style="list-style-type: none"> • Soft umbilical swelling • Different sizes • No associated discharge • Asymptomatic. If symptomatic, suspect incarceration or strangulation 	Watchful waiting in asymptomatic cases Surgery in case of complications
Urachal persistence	Urachal fistula	Failure of complete obliteration	Discharge of urine at umbilicus	Surgery
	Urachal cyst	Middle portion of urachus fails to obliterate	Periumbilical mass in childhood	
	Urachal sinus	Failure of obliteration of the distal portion	Periumbilical discharge	
	Urachal diverticulum	Failure of obliteration of the proximal portion	Usually asymptomatic	
Persistence of the omphalomesenteric duct	Mucosal polyp	Ectopic gastric or pancreatic mucosa	Umbilical raspberry-red mucosal tumor	Surgery
	Vitelline band	Remnant fibrous band of the duct	Complication causing intestinal volvulus, strangulation or intestinal obstruction	
	Umbilical fistula	Complete failure of duct obliteration	Umbilical fecal or biliary secretion	
	Meckel's diverticulum	Protrusion of the ileum due to failure of obliteration of the proximal portion	<ul style="list-style-type: none"> • Abdominal pain • Digestive bleeding • Intestinal obstruction • Diverticulitis 	
	Vitelline cyst	Failure of obliteration of the middle portion	Periumbilical mass	

the presence of a fistulous tract and ruled out malignancy, consistent with the surgical diagnosis. The patient was admitted for close observation and remained afebrile, with no new systemic symptoms and a gradual decrease in acute-phase reactants, so further infectious workup was not conducted. Nevertheless, if fever or other laboratory abnormalities had developed, screening for a urinary tract infection and cultures, such as blood culture and culture of the lesion, would have been indicated, followed by appropriate antibiotic therapy as needed. The patient's condition evolved favorably, and she was discharged home 4 days after surgery.

DISCUSSION

Accurate differential diagnosis of umbilical disorders is essential, as different conditions have varying implications for management and prognosis. To correctly understand these

conditions and their potential diagnoses, it is important to understand the anatomy of the umbilical region.

The umbilical cord is a vital transitional structure in intrauterine maternal-fetal communication, but its function ends after delivery.

During intrauterine life, the umbilical cord is composed of two umbilical arteries, one umbilical vein, the allantois, the omphalomesenteric duct, and intestinal loops, all of which are surrounded by Wharton's jelly and the amnion^(6,7). Incorrect involution of any of these structures will lead to abnormal communications in extrauterine life, while incorrect formation of the umbilical ring will lead to possible umbilical hernias. Beyond structural alterations, infections should also be taken into account.

This case involves differentiation between an infectious process (omphalitis), hernia, and malformation (primarily urachal persistence). Accurate diagnostic assessment is based on the recognition of the distinct symptoms and features of each condition (Table 1).

Once the differential diagnosis has been established, in case of diagnostic doubts or alarm signs (purulent suppuration, fever, irritability, etc.), complementary tests will guide the final diagnosis⁽¹²⁾:

- Laboratory tests (evaluation of acute-phase reactants, leukocyte count, and blood culture): when an infection is suspected.
- Contrast-enhanced abdominal X-ray: when umbilical hernias or persistent omphalomesenteric duct are suspected.
- Ultrasonography: in the differential diagnosis of abdominal masses.
- Cystography: when a urachal fistula is suspected.

COMMENTARY

This case report highlights the importance of accurate differential diagnosis of umbilical disorders in the PED. Understanding the variations in management, complications, and prognosis for different conditions is essential. To facilitate this process, we can rely on different complementary tests, of which blood analysis and abdominal ultrasound are the most appropriate and accessible to guide the diagnosis.

It is necessary to emphasize the value of health education for families in maternity wards, a tool to prevent complications and to focus on warning signs.

STATEMENT OF THE AUTHORS

The authors declare no conflicts of interest. Informed consent has been obtained from the family for the publication of this case.

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CASE REPORT**Acute behavioral disturbances and hyponatremia as the initial presentation of primary adrenal insufficiency**Guillem Brullas Badell¹, Araceli Domingo Garau², Sílvia Marín del Barrio³, Carles Luaces Cubells^{2,4}¹Department of Pediatrics, ²Emergency Area, ³Department of Endocrinology. Hospital Sant Joan de Déu. Esplugues de Llobregat, Barcelona. ⁴Universitat de Barcelona, BarcelonaReceived on January 11, 2024
Accepted on May 7, 2024**Key words:**Clinical case
Primary adrenal insufficiency
Addison's disease
Behavioral disturbance
Pediatrics**Palabras clave:**Caso clínico
Insuficiencia suprarrenal primaria
Enfermedad de Addison
Alteración del comportamiento
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We present the case of a 12-year-old male who experienced a three-hour episode of fluctuating behavior, accompanied by a fever that began the previous day. There were no other significant symptoms or identifiable triggers. On examination, the patient showed a Glasgow Coma Scale score of 13-15, irritability, fluctuating incoherent speech and drowsiness, and skin hyperpigmentation. The remaining physical examination was unremarkable.

Given the acute behavioral changes, blood tests were ordered, revealing isolated hyponatremia with normal potassium levels. Urine electrolyte and toxicology studies were normal, PCR for SARS-CoV-2 was positive, brain CT scan showed no abnormalities, and lumbar puncture revealed normal biochemistry. Empirical treatment with cefotaxime and acyclovir was initiated, together with 3% hypertonic saline to correct symptomatic isolated hyponatremia of unknown etiology. A subsequent laboratory test revealed persistent hyponatremia and the onset of hyperkalemia, leading to the suspicion of an Addisonian crisis (AC). Consequently, stress-dose hydrocortisone was administered, resulting in both clinical and laboratory improvement. The initial laboratory tests revealed low cortisol levels and elevated ACTH, confirming AC, likely triggered by SARS-CoV-2 infection in a patient with underlying primary adrenal insufficiency (PAI). Further etiological studies identified positive anti-adrenal antibodies, confirming autoimmune PAI. The patient responded well to treatment with maintenance hydrocortisone and fludrocortisone and was discharged with outpatient follow-up.

Although PAI is a rare condition, it may lead to acute behavioral disturbances.

ALTERACIÓN AGUDA DEL COMPORTAMIENTO E HIPONATREMIA COMO DEBUT DE INSUFICIENCIA SUPRARRENAL PRIMARIA**Resumen**

Se presenta el caso de un varón de 12 años con alteración del comportamiento fluctuante de tres horas, y fiebre iniciada el día anterior, sin otra sintomatología destacable ni claro desencadenante. Presenta una escala de Glasgow de 13-15, irritabilidad, discurso incoherente y somnolencia fluctuantes, e hiperpigmentación cutánea, con el resto de la exploración física anodina.

Dado el cuadro agudo de alteración del comportamiento, se solicita analítica sanguínea en la que solo destaca una hiponatremia aislada con potasio en rango, estudio de iones y tóxicos en orina que es normal, PCR para SARS-CoV-2 que es positiva, una TC craneal que no muestra anomalías, y se realiza una PL con bioquímica normal. Se administra tratamiento empírico con cefotaxima y aciclovir, y una corrección con suero

salino hipertónico al 3% por la hiponatremia aislada sintomática de etiología no filiada. En un control analítico posterior persiste la hiponatremia y aparece hiperpotasemia, orientándose como una crisis addisoniana (CA) por lo que se inicia tratamiento de estrés con hidrocortisona con mejoría clínico-analítica posterior. En el estudio realizado en la analítica inicial presenta niveles de cortisol bajos y ACTH elevado, confirmando la CA, probablemente desencadenada por infección por SARS-CoV-2 en un paciente con una insuficiencia suprarrenal primaria (ISRP) subyacente. En el estudio etiológico posterior presenta positividad para anticuerpos antiadrenales, confirmando una ISRP autoinmune. Mantiene buena evolución con hidrocortisona y fludrocortisona de mantenimiento, por lo que se da de alta con seguimiento ambulatorio.

La ISRP es una entidad poco frecuente pero que puede causar alteración aguda del comportamiento.

INTRODUCTION

Acute behavioral disturbances present a significant challenge for emergency pediatricians due to the wide range of differential diagnoses, including infectious, metabolic, neurosurgical, and psychiatric conditions, as well as their potential severity.

CASE REPORT

A 12-year-old boy was brought to the emergency department with a three-hour history of irritability, disorientation, fluctuating levels of somnolence, and fever with a maximum temperature of 38°C that began the previous day. He did not present with gastrointestinal symptoms, headache, coma, weakness, or any other notable symptoms. There was no reported exposure to drugs, toxins, or recent trauma.

His medical history included poor weight gain over the past two years, which was under investigation. A recent blood count was normal, but electrolytes were not measured, and an initial appointment with Endocrinology was pending. His vaccinations were up to date, except for SARS-CoV-2. There was no significant family history.

Upon initial examination, the patient had an altered Pediatric Assessment Triangle (PAT) with central nervous system dysfunction. Vital signs were as follows: heart rate 110 bpm, blood pressure 92/60 mmHg, oxygen saturation 99%, temperature 37.6°C, and blood glucose 107 mg/dl. Physical examination revealed a patent airway with no respiratory distress and normal pulmonary auscultation. Notable findings included mild skin hyperpigmentation, a capillary refill time of 2 seconds, a normal and rhythmic heart rate, and a Glasgow Coma Scale score fluctuating between 13 and 15. The patient showed irritability, incoherent speech, and fluctuating somnolence. Meningeal signs were negative, pupils were normoreactive, and no other significant alterations were observed.

Based on the above-described clinical features including acute behavioral disturbances and fever, possible causes (infectious, neurosurgical, metabolic, toxic, etc.) were investigated. A peripheral line was placed, and complete blood count, urine analysis with electrolyte and toxicology screen, and brain CT scan were requested. A volume load of 0.9% isotonic saline at 10 ml/kg combined with cefotaxime was

administered, and treatment with acyclovir at 20 mg/kg was initiated. The initial laboratory tests (Table 1: Laboratory tests 1) showed only hyponatremia with normal potassium levels. A rapid repeat blood test was performed (Table 1: Laboratory Tests 2) to confirm the electrolyte findings and to further evaluate the neurological symptoms. Isolated hyponatremia was confirmed and classified as symptomatic hyponatremia of unidentified etiology, prompting correction with a 3% hypertonic saline solution (HSS) at 2 ml/kg. Urine analysis showed normal electrolyte levels and was negative for toxins. A brain CT scan was also normal. While awaiting the results of additional laboratory tests, a lumbar puncture (LP) was performed, which revealed normal biochemistry. Treatment with acyclovir and cefotaxime was continued until the microbiological studies returned negative results. Due to the fever and epidemiological history, a SARS-CoV-2 PCR was performed, which came back positive. Given the suspicion of SARS-CoV-2 encephalitis, remdesivir was administered until a negative SARS-CoV-2 PCR result was obtained from cerebrospinal fluid (CSF). Due to persistent and severe irritability, the patient was admitted to the ICU for sedation.

In the laboratory tests performed in the ICU after the administration of HSS (Table 1: Laboratory tests 3), persistent high sodium levels and newly elevated potassium levels were observed, raising suspicion of an Addisonian crisis (AC). As a result, hydrocortisone was initiated at a maximum stress dose of 100 mg/day. When discussing the suspected diagnosis with the family, they mentioned that over the last 2 years the patient had intense salt cravings and skin hyperpigmentation. After initiating hydrocortisone treatment, the neurological symptoms resolved and electrolyte levels normalized (Table 1: Laboratory Tests 4), and the patient was discharged to the ward. In a subsequent laboratory study conducted on the initial sample, low cortisol levels (4.2 µg/dl) and high ACTH levels (744 pg/ml) were found, confirming AC, likely triggered by a SARS-CoV-2 infection in a patient with primary adrenal insufficiency (PAI) or underlying Addison's disease. The etiological investigation of PAI included an abdominal CT, which showed normal adrenal glands, a negative PPD and QuantiFERON test, and positivity for anti-adrenal antibodies, confirming the diagnosis of autoimmune PAI. During his stay on the ward, the patient continued to show good clinical and laboratory progress while receiving hydrocortisone at a maintenance dose of 20 mg/m²/day, fludrocortisone at 0.1 mg/

TABLE 1. Main laboratory parameters during the first 48 hours of admission .

Laboratory tests 1	Hb 14 g/dl, HCT 38.3%, PLT 217,000/mm ³ , WBC 4,900/mm ³ , LYMP 1,600/mm ³ , NEUT 1,600/mm ³ , PT 1.21, APTT 1.2, FIB 5.2 g/L, pH 7.36, pCO ₂ 36.1 mmol/L, HCO ₃ 19 mmol/L, EB -5 mmol/L, Na 122 mmol/L, K 4.3 mmol/L, Cl 85 mmol/L, Ca 1.25 mmol/L, Glu 81 mg/dl, Urea 31 mg/dl, Cr 0.6 mg/dl, ALT 24 UI/L, AST 45 UI/L, CRP 88 mg/L, PCT 0.4 ng/ml, LDH 2.5 mmol/L
Laboratory tests 2	Na 123 mmol/L, K 4.7 mmol/L, Cl 87 mmol/L, Ca 1.22 mmol/L
Laboratory tests 3	Na 121 mmol/L, K 6 mmol/L, Cl 91 mmol/L, Ca 1.19 mmol/L
Laboratory tests 4	Na 133 mmol/L, K 4.1 mmol/L, Cl 97 mmol/L, Ca 1.31 mmol/L

day, and stress doses as needed for intercurrent illnesses. As the patient evolved favorably, he was discharged with outpatient follow-up at the Endocrinology department and remained clinically and analytically stable.

DISCUSSION

Acute behavioral disturbances are of significant concern in pediatrics due to the potential morbidity and mortality associated with some etiologies. In the management of these cases, initial patient stabilization using the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach is a priority when an alteration in the PAT is found. Once stabilized, a correct medical history and detailed physical examination should be conducted⁽¹⁾. Based on the suspected etiology, appropriate first-line diagnostic tests should be ordered (Table 2). Following the collection of these initial samples, empirical treatment—such as antibiotics, antivirals, and/or corticosteroids—should be initiated according to the suspected diagnosis and preliminary results. Additional second-line tests may include serology, specific antibodies, PCR, brain MRI, or EEG. Treatment should be adjusted based on definitive results⁽²⁾.

Acute behavioral disturbances may be triggered by multiple causes (Table 3)^(3,4). One of the main etiologies is encephalitis, an inflammation of the brain parenchyma that may manifest clinically with fever, seizures, behavioral disturbances and altered mental status, CSF pleocytosis, changes on neuroimaging, and EEG alterations⁽⁵⁾. It can be caused by infectious agents, mainly viruses⁽²⁾, or by autoimmune processes such as anti-NMDAR antibodies⁽⁶⁾. Among the viral etiologies of encephalitis, the SARS-CoV2 virus has been described to cause encephalitis through inflammatory, post-infectious, coagulopathic, or endothelial mechanisms, but not through direct neuropathogenesis of the virus⁽⁷⁾.

Other causes of acute behavioral disturbance are hypoglycemia, and dyselectrolythemia (as in the case described) with hyponatremia (Na < 135 mmol/L) being the main cause in clinical practice. This can present with a wide range of predominantly neurological symptoms and be due to multiple

TABLE 2. First-line complementary examinations to perform in pediatric patients with acute behavioral disturbance.

- **Laboratory testing:** complete blood count, electrolytes, arterial blood gases, blood glucose, AST, ALT, GGT, bilirubin, coagulation profile, creatinine, urea, CRP, PCT, lactate
- **Blood culture**
- **Urinalysis:** sediment, electrolytes, toxins
- **Brain CT,** preferably with contrast
- **Lumbar puncture:** biochemistry, Gram stain, culture, PCR for HSV, pneumococcal and meningococcal testing

TABLE 3. Main causes of acute behavioral disturbance in pediatric patients.

- **Viral encephalitis:** HSV1, HSV2, VZV, EBV, CMV, HV type 6, enterovirus, adenovirus, parechovirus, JC virus, parotitis, HIV, SARS-CoV-2, rabies, Japanese encephalitis, Central European encephalitis, West-Nile virus, Dengue, Chikungunya
- **Bacterial meningitis:** *N. meningitidis*, *S. pneumoniae*, *S. agalactiae*, *L. monocytogenes*, *M. pneumoniae*, syphilis, rickettsiae, sepsis
- **CNS tuberculosis**
- **CNS protozoal infections:** malaria, toxoplasmosis
- **CNS fungal infections:** cryptococcosis, histoplasmosis
- **Autoimmune disorders:** anti-NMDAR, anti-LGI-1, anti-Hu, anti-Ma, anti-GAD, acute disseminated encephalomyelitis, Bickerstaff's encephalitis
- **Inflammatory causes:** vasculitis, systemic lupus erythematosus, Behçet's disease, neurosarcoidosis
- **Metabolic disturbances:** hypoglycemia, hepatic encephalopathy, adrenal insufficiency
- **Brain tumors:** primary brain tumor, metastasis
- **Brain hypoxia**
- **Brain hemorrhage**
- **Seizure-related:** status epilepticus, post-ictal state
- **Electrolyte imbalance:** hyponatremia, hypernatremia
- **Toxicity:** alcohol, recreational drugs, medications
- **Psychiatric disorder**

causes (Figure 1). The treatment of hyponatremia will depend on the severity and etiology^(8,9).

A potential cause of hyponatremia (hypovolemic or euvolemic) and acute behavioral disturbances is Addison's disease or PAI. In this condition, the destruction or dysfunction of the adrenal glands leads to a deficiency in adrenal hormones (glucocorticoids, mineralocorticoids, and/or androgens) that are crucial to maintain water and electrolyte balance, energy regulation, and sexual development⁽¹⁰⁾. Its manifestations include fatigue, weight loss, hyperpigmentation (due to a compensatory increase in ACTH), excessive salt intake, dehydration, hyponatremia (exceptionally associated with cerebral edema), and hypoglycemia⁽¹¹⁾. In the context of an acute process, such as an infection, where an increased production of adrenal hormones is required, a potentially fatal condition known as an Addisonian crisis may be triggered⁽¹²⁾. In adults, the main etiology of PAI is autoimmune, primarily due to antibodies against the adrenal cortex and 21-hydroxylase⁽¹³⁾, followed by tuberculosis; in children, the cause is genetic. Diagnosis requires low cortisol levels (< 5 µg/dl) and elevated ACTH levels (twice the upper limit

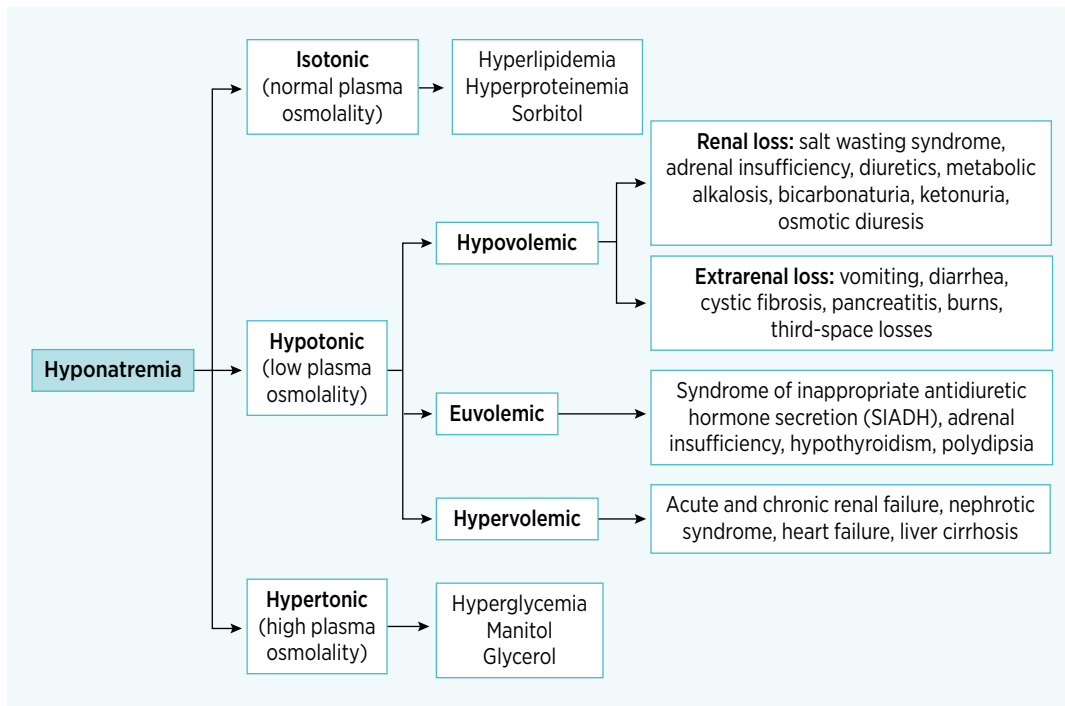


FIGURE 1. Classification of the potential causes of hyponatremia based on its characteristics.

for age) in a random sample taken before initiating glucocorticoid therapy. In addition, alterations in mineralocorticoids and/or androgens should be confirmed. Treatment consists of administering the deficient hormones and treating the underlying etiology, if possible^(10,12).

Other potential causes of acute behavioral disturbances that should not be overlooked include the voluntary or accidental use of drugs or toxic substances⁽¹⁴⁾, as well as psychiatric conditions⁽¹⁵⁾.

COMMENTARY

This challenging case and its discussion aim to provide the reader with significant insight into the management of acute behavioral disturbance and a rare condition, PAI, requiring a high degree of suspicion.

STATEMENT OF THE AUTHORS

The authors declare no conflicts of interest related to this study. Informed consent was obtained from the legal guardian and is available for review. No external funding was received for this study.

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THE FELLOW-MIR'S CORNER

Role of the respiratory physiotherapist and kinesiologist in Pediatric Emergency Medicine

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Abstract

Kinesiology, or physical therapy, is a dynamic and continually evolving discipline that has gained significant importance in healthcare. Its relevance became particularly evident during the polio epidemic of the 1950s, when respiratory therapy emerged and specialists began integrating into intensive care teams. However, their role in Pediatric Emergency Departments remains limited and less explored.

Objective: To highlight the collaboration between physical therapists and pediatric emergency care providers as a strategy to enhance the quality of care for critically ill patients.

Conclusion: Integrating pediatric physical therapists with specialized emergency care training could be a key factor in optimizing the management of Pediatric Emergency Departments.

ROL DEL FISIOTERAPEUTA-KINESIÓLOGO RESPIRATORIO EN URGENCIAS PEDIÁTRICAS

Resumen

La kinesiología o fisioterapia es una disciplina en constante evolución, cuya importancia ha crecido significativamente en el ámbito de la salud. La fisioterapia respiratoria adquirió relevancia en los años 50 durante la epidemia de poliomielitis y los especialistas se integraron progresivamente a los equipos de Cuidados Intensivos. Sin embargo, su participación en los servicios de Urgencias Pediátricas es limitada y menos explorada.

Objetivo: Difundir la colaboración entre fisioterapeutas y pediatras de Urgencias como estrategia de mejora en la calidad de atención de los pacientes en situaciones críticas.

Conclusión: Integrar al kinesiólogo pediátrico con formación en urgencias podría ser una decisión importante a ser considerada en la gestión de los Servicios de Emergencias.

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INTRODUCTION

Kinesiology, or physical therapy, is a continually evolving discipline that has gained significant importance in healthcare. Since its emergence in the 20th century, the profession has consistently adapted to meet the demands of changing historical and professional contexts⁽¹⁾.

In the 1950s, poliomyelitis affected millions of people worldwide, leaving many with severe motor and respiratory sequelae. This challenge led to the evolution of physical therapy, from a set of empirical techniques to a more structured and specialized professional practice⁽²⁾.

Over time, one of the most significant advancements was the formalization of kinesiology as an independent discipline. Universities began offering postgraduate programs, enabling students to form. This academic recognition marked a key milestone in the development and dissemination of the profession.

By the late 20th century, specialists became actively integrated into intensive care teams, focusing on the care and rehabilitation of critically ill patients. In several countries, including Argentina, chapters and committees were established within intensive care societies to further specialize these professionals⁽¹⁾.

This development and professionalization of kinesiologists in intensive care has been remarkable⁽³⁻⁵⁾. Nevertheless, their participation in Pediatric Emergency Departments (PED), where they can play a key role in the care of children with acute respiratory diseases, remains limited and under-explored. Greater awareness and recognition of the valuable contributions these specialists can offer in this setting are needed.

Global reports indicate that approximately 30% of emergency department visits involve children⁽⁶⁾. The particular vulnerability of these patients in their vital systems during emergencies, along with their differences from adults, warrants the development of optimal care standards and practices. Managing pediatric patients remains one of the most significant challenges in emergency medicine, requiring a healthcare team specifically trained to provide the highest level of care.

Respiratory therapy is a specialized branch of physical therapy focused on the treatment and rehabilitation of respiratory diseases. A respiratory kinesiologist, or respiratory physiotherapist (RPT)*, is a university-trained professional with expertise in evaluating, treating, and managing patients with respiratory conditions⁽¹⁾. These specialists, trained in pediatrics, play a crucial role in care, particularly in hospital settings, where they collaborate closely with other healthcare team members to provide comprehensive patient care.

In some PEDs, RPTs have become key members of the healthcare team for children with acute conditions. Beyond performing functional evaluations and administering respiratory therapies, they play an active role in clinical decision-making, manage respiratory support devices, and ed-

ucate both patients and their families. Their contributions are crucial in optimizing respiratory function in critically ill children, which improves recovery outcomes and reduces hospital stay duration.

At the Hospital de Pediatría Prof. Dr. Juan P. Garrahan in Buenos Aires, Argentina, which receives 120,000 consultations annually for children with acute conditions, RPTs have been integrated as essential members of the multidisciplinary emergency department team.

This article will discuss the importance of incorporating these professionals into the care of critically ill children, highlighting their roles and the significance of teamwork. Our aim is to promote the collaboration between RPTs and pediatric emergency medicine physicians as a strategy to enhance the quality of care for critically ill patients.

PEDIATRIC RESPIRATORY PHYSIOTHERAPIST TRAINING AND SCOPES OF PRACTICE

The university training program in kinesiology or physical therapy typically lasts 5 to 6 years, depending on the country⁷. The curriculum includes many subjects shared with medical programs, such as anatomy, physiology, histology, medical-kinesiological semiopathology, psychology, and chemistry, as well as other courses specific to the discipline. The degree awarded by the University of Buenos Aires, Argentina, is Bachelor in Kinesiology and Physiatry.

After graduation, professionals can opt for a specialty through a residency program or fellowship in various areas such as pediatrics and neonatology, neurorehabilitation, cardiorespiratory rehabilitation, traumatology, and intensive care. Other advanced training alternatives include postgraduate programs in vestibular rehabilitation, sports kinesiology, pediatric and adult intensive care, early stimulation, and psychomotor skills.

RPTs with a residency in pediatrics and neonatology have the knowledge, skills and capabilities to work with children, who have unique patterns and responses compared to adults. Proper evaluation of an acutely ill child requires specialized knowledge of anatomy, physiology, growth, and developmental stages. Traditional techniques for caring for adult patients may not be appropriate for use in the pediatric population⁽⁶⁾.

During their training, pediatric RPTs acquire knowledge and skills in: a) anatomy, pathophysiology, diagnosis and treatment of various pediatric diseases and clinical syndromes; b) basic vital function monitoring and cardiopulmonary resuscitation; c) airway management; d) oxygen therapy and aerosol administration; e) bronchial hygiene therapy; f) basic principles of mechanical ventilation, infection control, and pharmacology; and g) safety, comfort, and positioning measures.

Competencies for RPTs working in Intensive Care Units (ICU) have been well developed and many of them can be applied to PEDs (Table 1); for example, the competencies

*In the hospital setting and specifically in emergencies, the names of professionals specialized in physiotherapy or respiratory kinesiology may vary depending on the region. For example, in Spain it is known as a respiratory physiotherapist, in Mexico, a respiratory therapist, in Chile, a respiratory kinesiologist, etc. In summary, although terminology may vary, in the hospital and emergency context, these professionals are generally known as physiotherapists or respiratory therapists, depending on the country.

TABLE 1. Competencies of the RPT.

<p>Management of the high-flow nasal cannula (HNFC)</p> <ul style="list-style-type: none"> • Patient selection according to institutional guidelines • HNFC implementation: selection of the device, circuit, and cannula • HNFC programming: Flow and fraction of inspired oxygen (FiO₂) • Patient and device monitoring • Criteria for success and failure according to institutional guidelines
<p>Management of non-invasive ventilation (NIV)</p> <ul style="list-style-type: none"> • Patient selection according to institutional guidelines/protocols • Selection of device, circuit and interface, need for humidification and aerosols • Programming: ventilatory mode, FiO₂, inspiratory/expiratory pressures, inspiratory time • Patient monitoring: clinical, blood gases, vital signs, patient-ventilator interaction • Failure and success criteria
<p>Management of invasive ventilation (VI)</p> <ul style="list-style-type: none"> • Implementation of institutional guidelines/protocols • Device selection • Respiratory circuit selection, calibration, humidification and aerosol delivery • Programming and settings of ventilatory parameters: Mode, FiO₂, expiratory pressure, tidal volume, inspiratory time, inspiratory pressure • Monitoring: ventilatory mechanics, alarms, clinical, vital signs, capnography, and acid-base status

Modified from: Gogniat E, et al.⁽¹⁾

TABLE 2. Most frequent conditions and interventions managed by the RPT in the Emergency Department.

D I S O R D E R S	Bronchiolitis	<ul style="list-style-type: none"> • Clinical assessment • Bronchial hygiene • Oxygen therapy and ventilation management
	Asthma	<ul style="list-style-type: none"> • Clinical assessment • Management of aerosol therapy • Breathing exercises • NIV and IMV according to need
	Neuromuscular disease	<ul style="list-style-type: none"> • Respiratory and muscular assessment • Assisted bronchial hygiene • Prevention of complications • Optimization of chronic NIV
	Cystic fibrosis	<ul style="list-style-type: none"> • Aerosol therapy and/or nebulization management • Secretion culture • Oxygen therapy • Specific techniques for bronchial hygiene
	Tracheostomy	<ul style="list-style-type: none"> • Clinical assessment • Oxygen therapy • Humidificación de secreciones • Cannula change and caregiver education • Bronchial hygiene • MV according to need

NIV: noninvasive ventilation; IMV: invasive mechanical ventilation; MV: mechanical ventilation.

outlined by the Argentine Society of Intensive Care y Gogniat et al.⁽¹⁾

PARTICIPATION OF THE RPT IN THE EMERGENCY MEDICINE TEAM

It is important to note that RPTs are consulted when the pediatric emergency physician determines, through an objective evaluation, that specialized intervention is needed. The most frequent reasons for consultation involve acute respiratory conditions and exacerbations of chronic neuromuscular and neurological disorders. Commonly observed conditions include (Table 2):

- **Bronchiolitis:** While respiratory physiotherapy is not a standard treatment for bronchiolitis, RPTs may collaborate with the healthcare team to assess the severity and determine the most appropriate therapeutic approach. When needed, they may perform bronchial hygiene techniques, manage high-flow nasal cannula (HNFC) placement, and/or recommend the initiation of NIV.
- **Asthma exacerbation:** RPTs assess the severity of an asthmatic crisis using a standardized severity score, ensure the correct administration of aerosol therapy, and educate patients and their caregivers. In addition, they use respiratory exercises to enhance mucociliary clearance, including active respiratory cycling and manual techniques to support exhaled airflow. For children that are unresponsive to initial measures, the RPTs proceed

with the setup, programming, and application of NIV or IV, as required.

- **Neuromuscular diseases (NMD):** Both acute NMD in previously healthy patients and chronic conditions presenting with respiratory distress are managed in the emergency department.

In children with acute conditions, such as Guillain-Barré syndrome, botulism, or acute myelitis, the initial assessment focuses on respiratory mechanics, vital signs, and the potential need for NIV or mechanical ventilation. General muscle strength is measured using assessment scales, including the Medical Research Council (MRC) scale, together with evaluation of swallowing function and the risk of bronchial aspiration. Identifying appropriate bronchial hygiene techniques is essential to stabilize these patients and prevent complications, such as atelectasis.

In chronic conditions, such as spinal muscular atrophy, Duchenne muscular dystrophy, myasthenia gravis, and congenital muscular dystrophies, evaluation and treatment focus on the management of respiratory exacerbations and prevention of complications. This involves a comprehensive assessment of respiratory function and tailoring bronchial hygiene therapy to the specific needs of each patient. Interventions also include optimizing chronic and/or home NIV and re-evaluating the bronchial hygiene techniques used at home to ensure the best possible care.

- **Cystic fibrosis (CF):** During respiratory exacerbations, the patient's need for oxygen, aerosol therapy, specific nebulization

ulizations, and bronchial hygiene techniques is carefully assessed. Additionally, secretion samples are collected for culture to guide appropriate treatment.

Special attention should be given to children with tracheostomies, as this artificial airway requires careful evaluation. Excessive secretions can lead to respiratory distress and hypoxemia. RPTs assess the need for oxygen therapy, selecting passive or active humidification with oxygen as appropriate. They also perform cannula changes and play an active role in educating caregivers on proper airway management.

INTERVENTIONS IN THE EMERGENCY DEPARTMENT

The following interventions should be performed according to institutional care guidelines and protocols:

- 1a. Participation in the initiation of HFNC: Despite ongoing debate, many children with bronchiolitis are started on HFNC systems in the emergency department if initial measures, such as comfort care, prove ineffective. RPTs are responsible for monitoring and triaging patients in accordance with institutional protocols
- 1b. Initiation of NIV: In recent decades, the use of NIV for patients with severe acute respiratory failure in the emergency department has become more common. Timely initiation of NIV can enhance prognosis and reduce the need for invasive ventilation, which is associated with higher comorbidity rates (Figure 1). The role of the RPT in this process is outlined in Table 1.
- 1c. Initiation of invasive mechanical ventilation: In cases where NIV fails, sensory impairment or imminent respiratory failure occurs, and orotracheal intubation (OTI) is considered necessary, it is crucial to prepare all elements required for airway management. This includes verifying the correct size of the resuscitation bag and mask, ensuring the operation of the secretion aspiration system, setting up and programming the ventilator, and monitoring capnography (Table 1). The RPT also participates in ensuring the safe transfer of the patient to the ICU, maintaining continuity of respiratory support throughout the process.

Bronchial hygiene

Bronchial hygiene is a critical and multifaceted intervention in the management of pediatric patients in the PED⁽⁶⁾. The techniques used aim to optimize mucociliary clearance, facilitate expectoration, and improve ventilation, and they can be applied individually or in combination. The most frequently utilized and accessible techniques in the PED include the following:



FIGURE 1. An emergency physical therapist/kinesiologist assists in the initiation of non-invasive ventilation (NIV) for a child with neuromuscular disease.

- Aspiration of secretions: performed in patients who are unable to clear them effectively, such as those with bronchiolitis, an artificial airway, or a diminished or absent cough reflex. The procedure is performed using an aspiration tube, with careful attention to prevent complications such as hypoxia or airway injury.
- Peripheral techniques: these techniques help mobilize secretions from the peripheral to the central airways, facilitating their expulsion. These techniques are particularly beneficial for patients with chronic respiratory diseases and can be categorized into two types: manual and instrumental. Both types share the same goals—improving ventilation, clearing secretions, and promoting their movement toward the central airways. The most commonly used techniques in this context include manual methods such as expiratory flow acceleration and assisted autogenic drainage^{**⁽⁸⁻¹⁰⁾}.
- Cough assist: Cough assist is essential for patients with muscle weakness and can be performed manually or with mechanical devices such as the ‘CoughAssist’ or mechanical cough assistant (MCA). Manual assistance involves the therapist applying pressure in sync with the patient’s cough. To execute this effectively, pressure is applied consistently and rapidly, with one hand positioned at the abdomen and the other on the rib cage near the sternum.

***The expiratory flow acceleration (EFA) technique involves the RPT positioning their hands on the patient’s rib cage. Initially, the RPT assesses the patient’s breathing pattern. During expiration, the RPT accompanies the chest movements by applying light pressure. This maneuver increases respiratory airflow, which is crucial for effective mobilization of secretions. EFA is a versatile technique that is especially useful in the management of respiratory conditions. Assisted Autogenous Drainage (AAD) is a passive technique used in infants and young children. It involves external compression of the chest wall to manipulate lung volume and maximize expiratory flow. During the procedure, the RPT applies gentle manual pressure to the thorax with each inspiration. As the respiratory cycles progress, the RPT progressively restricts thoracic expansion during the inspiratory phase. This approach encourages the patient to exhale longer and more forcefully in each cycle, thereby facilitating secretion mobilization.*



FIGURE 2. Manual cough assistance in a girl with spinal muscular atrophy.



FIGURE 3. Team of emergency physical therapists providing inspiratory support with a resuscitation bag for a girl with a tracheostomy and acute respiratory infection.

Depending on the patient's cooperation, either a voluntary cough can be instructed or a reflex cough effort can be detected. The MCA, in contrast, is an electronic device programmed by the therapist to adjust settings such as pressures, usage modes, inspiratory and expiratory times, and flow rates. It operates with a circuit that includes an antibacterial filter, tubing, and a silicone mask tailored to the patient's size. The device provides a sequence of positive and negative pressure to simulate and assist with an effective cough⁽¹⁰⁾ (Figure 2).

- Inspiratory assist: this technique, although extensively documented in patients with NMD, can benefit any patient with limited inspiratory capacity.⁸ The primary aim of this technique is to enhance lung volumes, optimize airflow, and improve overall lung capacity. It can be administered using various methods, including manual bag hyperinflation, MCA, and NIV (Figure 3)^(1,8).
- Active cycle of breathing technique (ACBT): this technique consists of three key components to aid in the mobilization and clearance of secretions: diaphragmatic breathing, thoracic expansion, and forced expiration. The technique is applied in cycles, with the duration of each component adjusted according to the patient's needs. ACBT can be introduced as a game from the age of 2 years, but is applied as a bronchial hygiene technique from the age of 8-9 years. ACBT can be performed in different decubitus positions and, in some cases, may be combined with NIV⁽¹⁾.

The team of the PED of the Hospital J. P. Garrahan in Argentina includes two RPTs. In 2023, they cared for 1,031 patients, with a peak in admissions occurring between May and September. Of these patients, 54% had complex chronic conditions, with the most common being respiratory diseases (16%), neurological disorders (15%), genetic diseases (12%), and NMD (4%). Notably, due to their unique care and therapeutic needs, 30 patients with CF, 10 with spinal muscular atrophy, and 138 children with tracheostomies were of particular significance. Of these, cannula changes were per-

formed for 55 patients, either on an emergency or scheduled basis. RPTs were actively involved in the implementation, monitoring, and therapeutic management of 301 patients receiving HFNC therapy, 44 patients on NIV, and 18 patients undergoing intubation.

CONCLUSION

Incorporating a respiratory physiotherapist with training in emergency medicine could be a significant enhancement in the management of PEDs. Their specialized expertise in performing targeted assessments and treatments contributes to optimizing patient care and recovery. Our experience may serve as a model for achieving higher standards of care.

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WORKING GROUP

Activities of the Mental Health Working Group of the Spanish Society of Pediatric Emergency Medicine

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In recent years, there has been a growing trend in the deterioration of mental health among children and adolescents, demonstrated by an increase in depressive symptoms, self-injury, and suicidal behaviors⁽¹⁾. While this problem has been worsening since the 1990s, it has been significantly exacerbated in recent years following the onset of the SARS-CoV-2 pandemic. Several studies indicate that since the initiation of the pandemic, the prevalence of mental disorders in children aged 4 to 14 has tripled, and Pediatric Emergency Departments (PEDs) have reported a 47% increase in consultations related to mental health disorders compared to pre-pandemic levels⁽²⁾. Alarmingly, according to the Suicide Observatory in Spain, 22 deaths by suicide were recorded in children under 15 years old in 2021, and in 2022, the number of suicides among adolescents aged 15 to 19 rose from 53 to 75 cases compared to the previous year⁽³⁾. These figures highlight the urgent need to prioritize child and adolescent mental health, making it essential for pediatricians to receive comprehensive training in this area.

In this context, at the end of 2021, the Mental Health Working Group (WG) of the Spanish Society of Pediatric Emergency Medicine (SEUP) was created. It is a heterogeneous and multidisciplinary WG, with professionals from different fields, including emergency pediatricians, primary care pediatricians, pediatric and mental health nurses, psychologists, and psychiatrists. Since its formation, the group has developed various initiatives aimed at enhancing the

tools available to emergency pediatricians for addressing mental health issues.

Our first project was carried out in 2022, with the project “How to approach a patient with a psychiatric condition” to improve the quality of care. It was carried out following the indications of the SEUP Safety and Quality WG, using the Delphi method, resulting in 11 recommendations presented in [Figure 1](#).

In 2022, within the SEUP, the use of mental health-related diagnoses in 16 pediatric emergency departments (EDs) was analyzed, comparing the pre- and post-pandemic periods. The results of this study showed an increase of up to 56% in the diagnosis of suicide/suicide attempt/suicidal ideation, a 40% increase in the diagnosis of eating disorders (ED) and a 10% increase in the diagnosis of aggressive crisis/psychomotor agitation⁽²⁾. Based on these findings, our second project consisted in the development of a SEUP protocol on the “Main psychiatric emergencies in Pediatric Emergency Departments.” This protocol consists of three sections: attempted self-harm, ED, and psychomotor agitation, and will soon be available at <https://seup.org/protocolos/>.

Similarly, the WG recently presented the “Quick Guide to the Care of Mental Health Patients in the Emergency Department”⁽⁴⁾, focusing on conditions such as ED, anxiety, suicidal ideation and attempts, psychomotor agitation, autism spectrum disorder, and sensory-perceptual disturbances. These guidelines were developed as an initial framework for assessing patients with these disorders, acknowledging the diverse realities of PEDs across the country and the varying profiles of professionals involved in the care of minors with mental health conditions.

The purpose of these guidelines is to provide a structured framework for initial assessments and basic management, based on the most common reasons for consultation. The aim is to enhance care and improve strategies for approaching these patients. Each guide includes both general sections and sections specific to the particular reason for consultation.


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QUÉ HACER ANTE UN PACIENTE CON PATOLOGÍA PSIQUIÁTRICA


- 1 Propiciar un ambiente íntimo y tranquilo, minimizando interrupciones y dedicando el tiempo suficiente a la consulta.
- 2 Descartar la presencia de patología física que justifique los síntomas antes de categorizarlos como psiquiátricos por defecto.
- 3 Validar las emociones del paciente y evitar mostrar reacciones negativas.
- 4 Tener en cuenta al menor durante la entrevista clínica.
- 5 Minimizar las valoraciones en una misma visita.
- 6 En los casos de agitación, realizar contención verbal en primer lugar y siempre que sea posible.
- 7 La vía de elección en la contención farmacológica es la oral.
- 8 Dirigir y supervisar la contención mecánica.
- 9 El paciente con intento de suicidio siempre debe ser valorado por Psiquiatría.
- 10 Ante paciente con intento de suicidio, no debemos quitar importancia al intento y debemos centrar la entrevista en el riesgo suicida.
- 11 Mantener la medicación crónica prescrita por los profesionales de Salud Mental, hasta nueva valoración por psiquiatría.



Accede a la versión extendida a través de este QR

Elaborado por el Grupo de Trabajo de Salud Mental de la Sociedad Española de Urgencias de Pediatría. Avalado por la Sociedad Española de Urgencias de Pediatría.

FIGURE 1. Approach to a patient with a psychiatric condition in the Pediatric Emergency Department.



Trastorno de la conducta alimentaria (TCA)

Ítems a recoger y aspectos a tener en cuenta, una vez comprobada la estabilidad del paciente:

1. Nombre e identificación correcta del paciente.
2. ¿Alergias/intolerancias?
3. ¿Motivo de consulta?
4. ¿Antecedentes médico-quirúrgicos y/o de salud mental, diagnósticos filiados?
5. ¿Antecedentes familiares de trastornos de salud mental?
6. ¿Seguimiento en algún dispositivo de salud mental (de carácter público/privado)?
7. ¿Tratamiento farmacológico? ¿Buena adherencia? ¿Cambios recientes en el tratamiento?
8. ¿Consumo de tóxicos?

Entrevista específica:

9. Datos antropométricos (peso, talla e IMC).
10. Constantes vitales (TA, FC, T° y glicemia).
11. Fecha de última menstruación y regularidad del ciclo.
12. ¿Dieta pautada? ¿suplementos?
13. Tiempo de evolución de la sintomatología.
14. Conductas purgativas (vómitos, laxantes, diuréticos, etc.) y su frecuencia.
15. Frecuencia de ejercicio físico.
16. Presencia de atracones, frecuencia y cantidades aproximadas.
17. Registrar ingestas de las 24h-48h anteriores:
 - Preguntar por las 5 ingestas (desayuno, comida, merienda, cena, resopón/media mañana).
 - Cantidades y calidad de los platos (plato postre, plato normal, ½ plato, 5 galletas, etc.).
 - Preguntar si productos light/desnatados.
 - Preguntar si tiene alimentos prohibidos (por él/ella misma, ej. no bollería, o no patatas, etc.).

RECOMENDACIONES

- Pesar con ropa interior y de espaldas a la báscula.
- Valorar la necesidad de realizar pruebas complementarias (analítica, EKG, etc.).
- Pautas de manejo a cuidadores principales:
 - Las ingestas deben estar supervisadas por un adulto responsable. Evitar conductas no apropiadas con la manipulación de alimentos o ejercicio compensatorio tras la ingesta.
 - No excluir alimentos ni tipos de elaboraciones a excepción de alergias o intolerancias.
 - Tras ingestas no deben acudir al baño inmediatamente (1 hora tras ingestas principales y 30' tras las no principales), si es necesario se debe realizar supervisión durante su uso por parte de los cuidadores principales.
 - Evitar conversaciones y discusiones relacionadas con la comida, aspecto físico o estado de salud.
 - Es recomendable no tener báscula en casa ni realizar ningún peso en domicilio o farmacia, los controles se realizarán por parte del equipo asistencial.
 - Se debe limitar la actividad física a no ser que por indicación médica pueda realizar ejercicio, así como valorar indicar realizar reposo tras las ingestas.

Elaborado por el Grupo de Trabajo de Salud Mental de la Sociedad Española de Urgencias de Pediatría. Pendiente aval de la Sociedad Española de Urgencias de Pediatría.

FIGURE 2. Quick guide to the care of the patient with eating disorders in the Emergency Department.

Figure 2 illustrates one such guide, and all of them can be accessed at the following link: <https://seup.org/wp-content/uploads/2024/05/Tarjetas-de-bienvenida-unificadas-AVAL.pdf>.

Additionally, over the past year, other activities have been conducted, such as the online seminar held in May 2024, titled “Psychiatric emergencies: a challenge for pediatricians. Clinical cases,” which will soon be available at <https://seup.org/seminarios-online/>.

Another important point to highlight is that, since the formation of the WG, we have been collaborating with other organizations, such as the Mental Health Committee of the Spanish Association of Pediatrics (Asociación Española de Pediatría, AEP), to improve the care provided to pediatric patients with mental health disorders across the entire continuum of care.

Finally, we would like to share our latest projects. We are currently working on finalizing and disseminating a survey on basic structures (both human and material) for the care of patients with mental health disorders. Additionally, we are developing an observatory to analyze trends in PED consultations related to child and adolescent mental health.

Through these and our future projects, we aim to develop tools that will enhance our training and enable us to

provide the highest quality care to children and adolescents with mental health problems. It is essential to remember that treatment must be comprehensive, incorporating primary, secondary, and tertiary prevention strategies.

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