SEUP
SOCIEDAD ESPAÑOLA DE URGENCIAS DE PEDIATRÍA

EMERGENCIASPediátricas
Vol. 5. No. 3

Emergencias Pediátricas. 2026; 5(3): –

ORIGINAL ARTICLE

Clinical course of children with acute benign childhood myositis in the emergency department: a retrospective cohort study at a tertiary-care hospital

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Received September 30, 2025
Accepted October 1, 2026
Published November 20, 2026

Keywords:
Children
Benign acute childhood myositis
Muscle pain
Influenza virus
Myositis

Palabras clave:
Niños
Miositis aguda benigna de la infancia
Dolor muscular
Virus Influenza
Miositis

Abstract

Introduction. Benign acute childhood myositis (BACM) is a self-limited condition associated with viral infections, generally characterized by symmetrical pain in the lower limbs and elevated creatine phosphokinase (CPK). Myoglobinuria and acute kidney injury are rare. Objective. To describe the epidemiological characteristics and clinical course of patients with BACM. Materials and methods. A retrospective study of children aged 2–16 years seen at a tertiary university hospital and discharged with a diagnosis of myositis. Patients with clinical conditions that could account for elevated CPK, myoglobinuria, or kidney injury were excluded. Data were analyzed using STATA 14 and SPSS. Results. Seventy-six patients were included. Median age was 7 years (IQR: 6–9); 73.7% were boys. The most common reason for consultation was bilateral lower-limb pain (79%, 60/76), usually localized to the calves (50/60). Fever occurred in 84.2% of patients, and respiratory symptoms in 82.9%. Median initial CPK was 1,817 IU/L (IQR: 924.75–3,874.75). One child had myoglobinuria and another had elevated serum creatinine. Influenza was detected in nasopharyngeal secretions in 31.6% of patients. No significant associations were found between CPK level and the variables analyzed, including sex, fever, and influenza virus detection. Conclusion. In our study, the patients had a favorable clinical course. More methodologically robust research could help identify rational diagnostic and/or therapeutic interventions for patients with BACM.

EVOLUCIÓN CLÍNICA DE NIÑOS CON MIOSITIS AGUDA BENIGNA DE LA INFANCIA EN URGENCIAS: ESTUDIO RETROSPECTIVO EN UNA COHORTE DE UN HOSPITAL DE TERCER NIVEL

Resumen

Introducción. La miositis aguda benigna de la infancia (MABI) es una enfermedad autolimitada asociada a infecciones virales, caracterizada generalmente por dolor simétrico en miembros inferiores e incremento de la creatinfosfoquinasa (CPK). La mioglobinuria y el daño renal agudo son raros. Objetivo. Describir las características

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epidemiológicas y la evolución clínica de pacientes con MABI. Materiales y métodos. Estudio retrospectivo de niños de 2 a 16 años atendidos en un hospital universitario de tercer nivel con diagnóstico de egreso de miositis. Se excluyeron pacientes con situaciones clínicas que justificaran elevación de CPK, mioglobinuria o injuria renal. Los datos se analizaron con STATA 14 y SPSS. Resultados. Se incluyeron 76 pacientes. La mediana de edad fue 7 años (RIC: 6-9); el 73,7% (56/76) correspondió a varones. El motivo de consulta más común fue dolor bilateral en miembros inferiores (79%, 60/76), habitualmente localizado en gemelos (50/60). El 84,2% presentó fiebre y el 82,9% síntomas respiratorios. La mediana del valor inicial de CPK fue 1817 UI/L (RIC: 924,75-3874,75). Un niño presentó mioglobinuria y otro tuvo elevación de creatinina sérica. En 31,6% se detectó Influenza en secreciones nasofaríngeas. No se hallaron asociaciones significativas entre el valor de CPK y las variables analizadas como sexo, presencia de fiebre y aislamiento del virus Influenza. Conclusión. En nuestro estudio, la población estudiada presentó buena evolución. Estudios de investigación con mayor robustez metodológica podrían contribuir a determinar intervenciones diagnósticas y/o terapéuticas racionales en los pacientes con MABI.

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INTRODUCTION

Benign acute childhood myositis (BACM) is a usually self-limited condition affecting preschool- and school-aged children, generally associated with viral infections. It is characterized by a transient inflammatory process involving the muscles and a benign course[1].

Its incidence and prevalence have not been precisely established, although it is reported more frequently during periods of seasonal virus circulation, with an estimated 0.23 to 2.6 cases per 100,000 children under 18 years of age[2,3]. Several authors have reported associations with *Influenza B*[4] and other infectious agents, such as *Influenza A*, *Parainfluenza*, *Adenovirus*, Coxsackie virus, SARS-CoV-2, and *Mycoplasma pneumoniae*[5,6,7].

The etiopathogenic mechanisms have not yet been fully elucidated. It has been postulated that muscle damage may be attributable both to immune-mediated responses and to direct viral invasion of muscle tissue, triggering reversible injury to muscle fibers[1,8].

Rhabdomyolysis is described as a serious complication which, although uncommon, can lead to secondary renal dysfunction or injury[8,9]. Currently, evidence on the course of rhabdomyolysis and the degree of renal involvement in this context is limited.

The characteristic clinical presentation consists of symmetric muscle pain in the lower extremities and variable functional impairment, preceded or accompanied by upper respiratory symptoms and fever[10].

Muscle pain has an acute onset and predominantly affects the calves symmetrically. It is associated with elevated serum creatine phosphokinase (CPK) levels; other muscle enzymes, such as aldolase, lactate dehydrogenase (LDH), and aspartate aminotransferase (AST/GOT), may also be elevated. Traditionally, CPK has been the reference serum biomarker for diagnosing and monitoring myositis because of its high sensitivity for detecting muscle damage[10].

Myoglobinuria reflects the massive release of muscle components into the bloodstream secondary to acute myolysis, potentially predisposing to the development of acute kidney injury through renal vasoconstriction, direct tubular cytotoxicity, and obstruction caused by the formation of intramedullary casts[3].

The clinical course is usually self-limited within 7 to 10 days of symptom onset.[2]

The aim of this study is to describe the epidemiological characteristics, diagnostic and therapeutic strategies, and clinical course of a cohort of patients diagnosed with BACM.

MATERIALS AND METHODS

An observational retrospective study was conducted in the emergency department (ED) of a tertiary care university pediatric hospital, which sees approximately 120,000 visits annually for acute conditions.

Patients aged 2 to 16 years with a discharge diagnosis of myositis recorded in the electronic health records (EHRs) between January 2013 and December 2022 were included. Patients with chronic diseases or conditions that could explain elevated CPK levels, myoglobinuria, or kidney injury (for example, trauma; rheumatologic, neuromuscular, oncologic, endocrine, metabolic, nephro-urologic, or cardiomyopathic conditions; or use of myotoxic drugs) were excluded, as were those with alternative discharge diagnoses (such as sepsis, osteomyelitis, cellulitis, abscesses, or myositis ossificans).

Data were collected through a systematic review of the EHRs. Demographic variables, clinical manifestations, laboratory tests, virological findings in nasopharyngeal secretions (NPS), and clinical course variables, such as length of hospital stay and the need for admission to the pediatric intensive care unit (PICU), were analyzed.

Myositis was defined as the presence of acute-onset, intense muscle pain predominantly and symmetrically affecting the lower limbs and/or functional impairment secondary to pain, associated with elevated serum CPK levels. Functional impairment was defined as the transi-

ent loss or limitation of the previously acquired ability to walk.

Renal function impairment was defined as the presence of elevated serum creatinine levels for age.

Given the retrospective nature of the study, laboratory test results were obtained from the EHRs and corresponded to tests performed by the institutional laboratory as part of the patients' routine care.

CPK measurements were performed using the kinetic ultraviolet spectrophotometric method, following the recommendations of the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC), and serum creatinine measurements were performed using the kinetic colorimetric Jaffé method with blank compensation, traceable to isotope dilution mass spectrometry.

The results were interpreted according to the age- and sex-specific reference values established by the hospital laboratory.

Direct testing for myoglobinuria is not part of the institution's standard protocol. Therefore, its presence was inferred indirectly from a positive urine dipstick test for blood pigments (detection of the pseudoperoxidase activity of the heme group) in the absence of significant numbers of red blood cells in the urinary sediment, in a clinical context consistent with rhabdomyolysis or muscle injury[11].

Categorical variables were expressed as absolute frequencies and percentages. For quantitative variables, the median was used as the measure of central tendency and the interquartile range (IQR) as the measure of dispersion. Categorical variables were compared using the *Chi*^{2} test, whereas quantitative variables were analyzed using the nonparametric *Mann-Whitney U* test. Statistical significance was set at $p < 0.05$. Analyses were performed using the statistical software packages *STATA 14* and *SPSS version 26*.

The study was approved by the Review and Research Ethics Committee of the Associate Directorate of Teaching and Research.

RESULTS

A total of 184 medical records were reviewed for the period between January 1, 2013, and December 31, 2022. Of these, 163 patients met the diagnostic criteria for myositis; 87 were excluded, leaving a sample of 76 patients for analysis (Figure 1). The median age was 7 years (IQR 6–9). Males accounted for 73.7% (56/76).

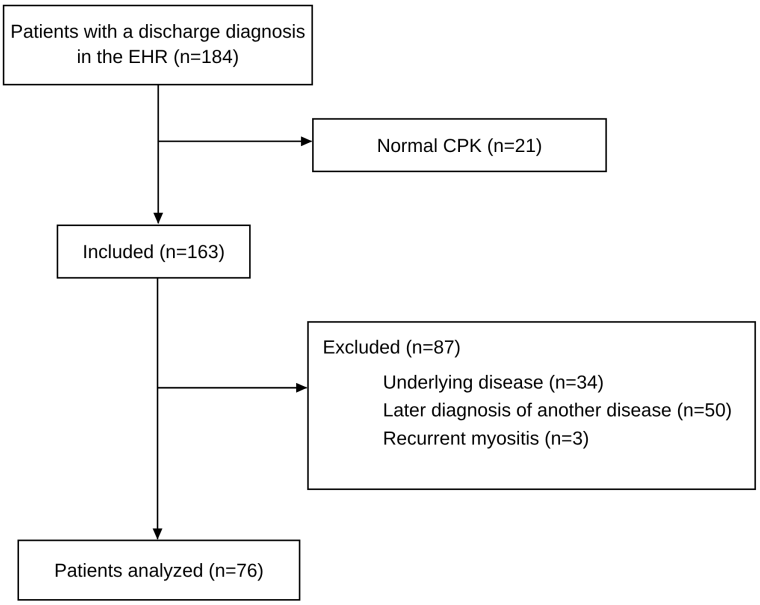

FIGURE 1. Exclusion flowchart (*): Rheumatological disease (n=11), neuromuscular/myopathy (n=6), hematological/oncological disease (n=7), renal/urological disease (n=3), immunodeficiency (n=3), among others. (**): Infections such as sepsis, osteomyelitis, cellulitis, and abscesses (n=29), myositis ossificans (n=10), among others. EHR: electronic health records.

The reasons for seeking care were bilateral lower-limb pain (79%, 60/76), functional impairment (17%, 13/76), and gait disturbance (4%, 3/76). Pain was predominantly localized to the calf muscles (50/60).

Among the associated symptoms, fever and respiratory symptoms were the most frequent findings, at 84% (64/76) and 83% (63/76), respectively. Most respiratory symptoms (60/63) involved the upper respiratory tract.

Among the additional tests performed, blood tests (complete blood count, urea, creatinine, and CPK), urinalysis, and virologic testing of nasopharyngeal secretions were documented in the EHR in 100%, 37%, and 51% of cases, respectively.

The median CPK level recorded on admission was 1,817 IU/L (IQR: 924.75–3,874.75).

Only one patient, a 10-year-old, had elevated serum creatinine (0.89 mg/dL). On admission, the CPK level was 4,427 IU/L, urinalysis was normal, and *Influenza B* virus was detected in the nasopharyngeal secretion (NPS) sample. The patient remained hospitalized for four days, with a progressive decrease in CPK and creatinine levels until they normalized on the sixth day after the initial consultation.

Urine findings suggestive of myoglobinuria were observed in a single patient. At admission, the CPK level was 25,721 IU/L, while serum creatinine and urea concentrations were within the reference ranges.

No significant differences in CPK levels were found according to sex (female: median 1,993 IU/L [IQR 1,246-4,332] vs. male: median 1,536 IU/L [IQR 911-3,786], $p = 0.28$), presence of fever (no fever: median 2,156 IU/L [IQR 1,101-5,589] vs. fever: median 1,817 IU/L [IQR 911-3,808], $p = 0.41$), or the result of the virological testing of NPS (positive: median 3,800 IU/L [IQR 1,597-5,174] vs. negative: median 3,447 IU/L [IQR 1,396-6,788], $p = 0.86$).

The microbiological results obtained from NPS are described in Figure 2.

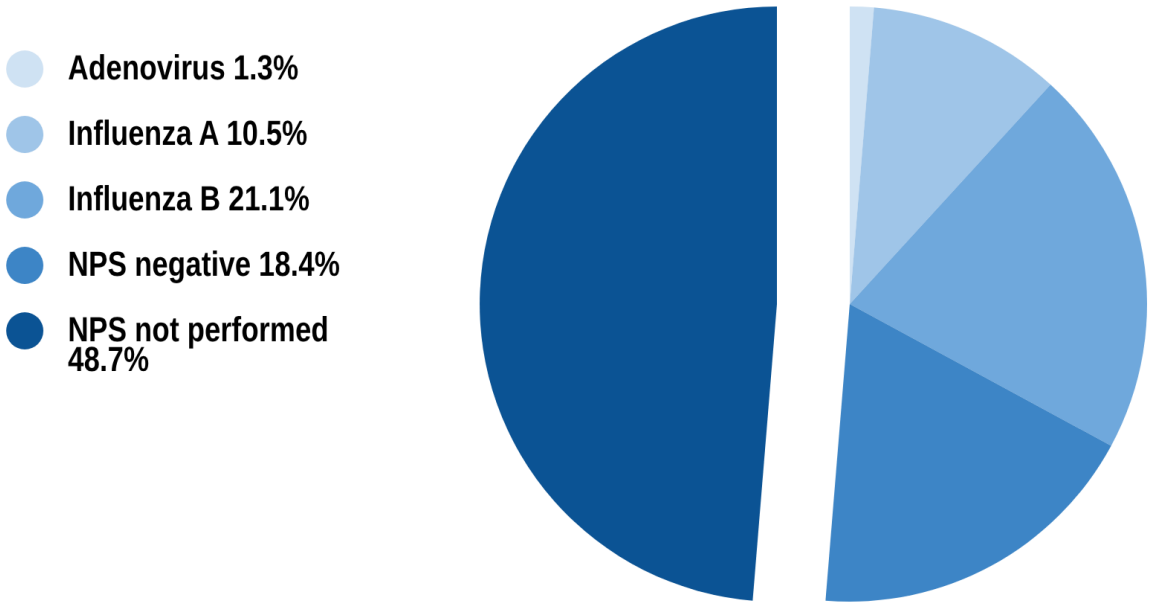

FIGURE 2. Results of virological testing of nasopharyngeal secretions

NPS: nasopharyngeal secretions.

Among patients discharged with a diagnosis of myositis, more than half (60%) were hospitalized for pain management and parenteral hydration. The median length of hospital stay was 2 days [IQR 2–3]. No patients required transfer to the PICU.

DISCUSSION

BACM is most frequently described in preschool- and school-aged children and adolescents, with a documented peak incidence between 4 and 11 years of age[2,8,12]. In children under 2 years of age, its clinical interpretation is often more challenging, which is why they were not included in this study.

Consistent with the findings reported by Cardin et al.[8] and Cavagnaro et al.[2], most patients with BACM in this study presented with pain and functional impairment of the lower limbs. Likewise, most patients had fever and respiratory symptoms[2,8].

Although the diagnosis of this condition is primarily clinical, elevated serum CPK concentrations constitute a biochemical criterion that contributes to diagnostic suspicion. CPK concentrations up to 20 to 30 times the upper reference limit have been reported and may remain elevated for up to 2 weeks[1,2,8]; however, they are not usually accompanied by myoglobinuria or kidney injury[1,13,14]. In this cohort, only one patient had findings suggestive of myoglobinuria, with a peak CPK level of 37,283 IU/L during the hospital stay, but no evidence of impaired renal function.

As reported in the publication by Delavar et al.[14], no clinically significant impairment of renal function was observed in patients in this cohort. Only one patient initially presented with a transient elevation in serum creatinine (0.89 mg/dL; age-specific reference range: 0.39–0.73 mg/dL), with an unremarkable urinalysis; levels returned to normal within 24 hours after intravenous hydration.

Although rhabdomyolysis and acute kidney injury have been reported in patients with BACM, they appear to be uncommon[1,2,3,4,6,7,8,10,12,13,15].

Along the same lines, although BACM has a benign course, it leads to hospitalization in many affected patients. The findings of this study could contribute to discussions about the rational use of resources in patients with suspected BACM. For example, none of the results of the complete blood counts ordered justified therapeutic intervention; virtually no patients had significant renal involvement and, although screening for it was performed in only slightly more than one third of patients, findings suggestive of myoglobinuria were detected in only one child, who had markedly elevated serum CPK levels. In this context, the indications for hospitalization in these patients could also be reconsidered when they are well hydrated, tolerate and are willing to take oral fluids, and have adequate pain control with oral analgesics.

This study has several strengths. It provides regional information on a condition that is relatively uncommon and has been little studied in Latin America. It includes a cohort collected over a prolonged period of ten years at a high-complexity pediatric hospital with university affiliation and a high volume of consultations, allowing the clinical and biochemical characteristics of patients with BACM treated in the ED to be consistently described. Strict exclusion criteria were applied to minimize the inclusion of alternative causes of elevated serum CPK levels and renal impairment. Finally, the study specifically examines the presence of renal abnormalities and myoglobinuria, aspects that are relevant to clinical decision-making in the ED.

Nevertheless, the study has limitations. Its retrospective design carries an inherent risk of information bias related to the quality of the EHR records. The diagnostic and therapeutic approach was not protocolized; therefore, the ordering of additional tests and clinical and biochemical follow-up were left to the discretion of the treating medical team. Consequently, not all patients underwent systematic assessment of urinalysis, renal function, and serial serum CPK measurements. In addition, the indirect definition of myoglobinuria based on suggestive findings may reduce the diagnostic accuracy for this event.

Furthermore, the limited sample size reduces the statistical power to detect rare events, such as severe complications associated with rhabdomyolysis or acute kidney injury, thereby limiting the precision of the estimates.

The possibility of selection bias should also be considered, as only patients discharged with a diagnosis of myositis were included, potentially excluding mild cases or presentations coded under other diagnoses.

Regarding the viral testing of nasopharyngeal secretions, diagnostic methods varied, which could have influenced the results.

No systematic post-discharge follow-up was recorded to detect, for example, possible recurrences or sequelae.

Finally, because this was a single-center study conducted at a tertiary care hospital, the findings should be extrapolated to other care settings with caution.

CONCLUSION

In this cohort of pediatric patients with BACM seen in the ED, no cases of clinically significant kidney injury were observed. These findings support the typically benign, self-limiting nature of the condition.

Studies with greater methodological rigor are needed to identify factors associated with complications and optimize management strategies for patients with BACM.

REFERENCES

1. Padrón Hernández M, Vargas Latorre J, Ortegón-Ochoa S, Naranjo-Medina N, Pacheco B. Miositis viral, reporte de un caso pediátrico. Arch Argent Pediatr. 2019;117(5):e493–e496.
2. Cavagnaro S, Aird G, Harwardt R, Marambio Q. Miositis aguda benigna de la infancia: Serie clínica y revisión de la literatura. Rev Chil Pediatr. 2017;88(2):268–274.
3. Buss BF, Shinde VM, Safranek TJ, Uyeki TM. Pediatric influenza-associated myositis — Nebraska, 2001–2007. Influenza Other Respir Viruses. 2009;3(6):277–285.
4. Mall S, Buchholz U, Tibussek D, Jurke A, An der Heiden M, Diedrich S, et al. A large outbreak of influenza B-associated benign acute childhood myositis in Germany, 2007/2008. Pediatr Infect Dis J. 2011;30(8):e142–e146.
5. Agyeman P, Duppenthaler A, Heininger U, Aebi C. Influenza-associated myositis in children. Infection. 2004;32(4):199–203.
6. Chen H-W, Chang M-C, Wang T-L, Shia B-C, Wang S-R. Benign acute childhood myositis in the COVID-19 Era: how does it compare to influenza?. European Journal of Pediatrics. 2025;184(5). Available at: https://doi.org/10.1007/s00431-025-06116-6.
7. Brisca G, Mariani M, Bellini T, Cervello C, Di Jorgi M, Mesini A, et al. Increase in benign acute childhood myositis in the post-COVID era: a retrospective study from a tertiary pediatric center. Eur J Pediatr. 2025;184(9):599.
8. Cardin SP, Martin JG, Saad-Magalhães C. Clinical and laboratory description of a series of cases of acute viral myositis. J Pediatr (Rio J). 2015;91(5):442–447.
9. Nauss MD, Schmidt EL, Pancioli AM. Viral myositis leading to rhabdomyolysis: a case report and literature review. Am J Emerg Med. 2009;27(3):372.e5–372.e6.
10. Brisca G, Mariani M, Pirlo D, Romanengo M, Pistorio A, Gaiero A, et al. Management and outcome of benign acute childhood myositis in pediatric emergency department. Italian Journal of Pediatrics. 2021;47(1). Available at: https://doi.org/10.1186/s13052-021-01002-x.
11. Academy of Diagnostics & Laboratory Medicine and Association for Diagnostics & Laboratory Medicine's (ADLM's) Science and Practice Core Committee. Optimal Testing: the ADLM's Guide to Lab Test Utilization [Internet]. 2025 [cited 2026 Sep 27]. Available at: https://myadlm.org/advocacy-

and-outreach/optimal-testing-guide-to-lab-test-utilization/a-f/blood-and-urine-myoglobin.

12. García Ros M, Núñez Giralda A, Delgado Fuentes E. Miositis viral aguda: alrededor de ocho casos. Rev Pediatr Aten Primaria. 2017;19(76):363–365. Available at: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1139-76322017000500009&lng=es.
13. Yoon JW, Choi DY, Lee SH, Sin SR, Yu ST. Analysis of Clinical Manifestations and Laboratory Findings in Children with Influenza B-Associated Myositis: A Single Center Study. Korean Journal of Family Medicine. 2018;39(1):37. Available at: https://doi.org/10.4082/kjfm.2018.39.1.37.
14. Delavar M, Ebrahimi H, Borhani N, Karimian P, Ehsanipour F, Jafarnejad S, et al. Evaluation of the prevalence and clinical and laboratory features of acute viral myositis in children with influenza referred to the emergency department of Ali Asghar Tehran Hospital in 2019 and 2020. Journal of Family Medicine and Primary Care. 2022;11(6):2744–2749.
15. Kosmeri C, Papasavva ME, Kyrkou A, Gketsi V, Siomou E, Ladomenou F, et al. Influenza-Associated Benign Acute Childhood Myositis During the 2024-2025 Season: A Retrospective Multicenter Study. Children (Basel). 2025;12(10):1333.