

Benign Acute Childhood Myositis: Evaluation of Clinical and Laboratory Features

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What is known on this subject?

Benign acute childhood myositis (BACM) is a self-limited, post-viral condition, most often seen after influenza or other viral upper respiratory tract infections. It presents acutely with bilateral calf pain, difficulty walking, or inability to walk, often leading to concern about more serious conditions (e.g., Guillain-Barré syndrome). Neurological examination is typically normal, and immobility is pain-related, not due to weakness or neurological deficits. Elevated creatine kinase is a hallmark laboratory finding.

What this study adds?

The study retrospectively analyzed 14 pediatric BACM cases in a 3-month period at Ordu University, Turkey. This can be considered a high number for a three-month period. This study retrospectively analyzed 14 pediatric cases of BACM within a 3-month period at a university hospital in Turkey. This represents a notably high case count for such a short timeframe. In previous comprehensive studies conducted in Turkey, an average of 7 to 12 BACM cases over a 3-month period has been reported in major tertiary care centers. The relatively high number of cases in our study can be attributed to the fact that the data collection period coincided with the peak season of viral respiratory infections in our region. Seasonal clustering of viral infections is a well-known trigger for BACM, and these findings emphasize the importance of increased clinical awareness during such periods. 85.7% were male, which is a higher male predominance than typically reported. Neutrophil-to-lymphocyte ratio (NLR) values were low/normal, consistent with viral etiology. We did not encounter any other studies in the literature specifically investigating NLR values in BACM cases.

ABSTRACT

Objective: Benign acute childhood myositis (BACM) is a self-limiting condition often following viral upper respiratory infections, manifesting with leg pain, difficulty walking, and muscle tenderness. Although the symptoms are distressing, BACM typically resolves without specific treatment, and the prognosis is generally good. This study evaluates the clinical presentation and laboratory findings of 14 pediatric BACM cases to better understand their features and facilitate differentiation from serious neurological conditions like Guillain-Barré syndrome.

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Received: 18.05.2025 **Accepted:** 29.05.2025 **Epub:** 19.06.2025 **Publication Date:** 22.07.2025

Cite this article as: Altınok İ, Yurdakul Ertürk E, Kasar T, Yapar Gümüş C, Altınok V. Benign acute childhood myositis: evaluation of clinical and laboratory features. Cam and Sakura Med J. 2025;5(1):25-30



ABSTRACT

Material and Methods: This retrospective study included 14 pediatric patients diagnosed with BACM at Ordu University between February and May 2023. Patients were selected based on their presentation with leg pain and/or difficulty walking after a viral upper respiratory infection. Demographic data, clinical symptoms, laboratory results, and the course of the disease were analyzed.

Results: The mean age of the 14 patients was 8.92 ± 3.04 years, and 85.7% were male. Neurological examinations were normal in all cases. Symptoms included leg pain (57%), fever (35%), sore throat (28.5%), and cough (35.7%). The mean creatine kinase (CK) level was 3816 ± 1909 IU/L, and it decreased over 4.5 ± 3.9 days. Leukopenia was observed in 35.7% of patients. Most patients showed improvement within 48 hours, and recovery took an average of 2.46 ± 3.4 days.

Conclusion: BACM is commonly seen in children following viral upper respiratory infections, with the most frequent symptoms being leg pain, muscle tenderness, and difficulty walking. In our study, 85.7% of the patients were male, which aligns with prior reports indicating a higher prevalence in boys. Elevated CK levels were a hallmark of the condition, with levels returning to normal within days. The absence of neurological abnormalities in all patients and the presence of typical viral symptoms support the diagnosis of BACM. The neutrophil-to-lymphocyte ratio was consistent with a viral etiology, further supporting the viral origin of the condition.

Keywords: Benign acute childhood myositis, neutrophil-to-lymphocyte ratio, school-aged children, leg pain

Introduction

Benign acute childhood myositis (BACM) is a condition that typically follows a 1-5 day prodromal period after a viral upper respiratory tract infection, presenting with leg pain, inability to walk, or difficulty walking. Symptoms can vary greatly in severity, including fatigue, muscle pain, sensory sensitivity, and difficulty walking (1). Due to the acute onset and the distressing symptoms of immobility, this condition can raise anxiety in both parents and healthcare providers, sometimes leading to excessive testing and investigation. A normal neurological examination and the fact that immobility is often secondary to pain are characteristic features of the disease (1,2).

BACM is most commonly associated with influenza virus infection and appears after symptoms of a respiratory tract infection. Prevalence and incidence data on BACM are limited. The typical laboratory finding is elevated serum creatine kinase (CK) levels, which peak within the first 2-5 days and then gradually decrease (2). Most symptoms and laboratory findings improve within one week without specific treatment, although supportive therapy may be required. The most significant complications from a clinical perspective are rhabdomyolysis and subsequent kidney failure. Ensuring proper hydration is critical to avoid the risk of myoglobinuria (3).

Familiarity with the clinical and laboratory findings of BACM is essential for distinguishing it from serious conditions such as Guillain-Barré syndrome (GBS) and transverse myelitis, which require more extensive investigation and treatment. For this reason, we present the clinical and laboratory features of 14 cases of BACM diagnosed in the last three months.

Material and Methods

Fourteen cases of BACM which presented to the pediatric outpatient clinics and emergency department of Ordu University with leg pain and/or sudden onset of difficulty walking between February 20 and May 20, 2023 were included in the study. The patients' demographic data, reasons for hospital visit, laboratory findings, and course of clinical and laboratory features were retrospectively analyzed. Ethical approval was obtained from the Ordu University Clinical Research Ethics Committee with the decision number 2023/162, date: 09.06.2023.

Statistical Analysis

The data were summarized as mean and standard deviation or median and interquartile range, depending on the distribution of the variables. The normality of the data distribution was assessed using the Shapiro-Wilk test. Depending on the data distribution, either parametric or non-parametric significance tests were used for statistical analyses. A p value of <0.05 was considered statistically significant. All analyses were performed using IBM SPSS Statistics version 26.0.

Results

The mean age of the 14 pediatric patients evaluated in our study was 8.92 ± 3.04 years, and 85.7% ($n=12$) were male. Neurological examinations were normal in all cases. A total of 57.1% ($n=8$) of the patients were hospitalized due to severe symptoms or markedly elevated CK levels. All patients received intravenous hydration.

At that time, respiratory polymerase chain reaction (PCR) testing for viral etiology was not available in our hospital; therefore, we presumed a viral origin in most patients based on their clinical symptoms. Three of our patients had undergone respiratory PCR testing at an external center, and all were found to be positive for influenza virus. In one patient, *Streptococcus A* was identified through a throat culture. The specific causative agent in the remaining cases was unknown.

At admission, 2 patients (N/A %) did not report neither leg pain nor difficulty walking. In 4 patients (28.5%), both complaints were present, while 8 patients (57%) reported only leg pain. Additionally, at admission or within the week prior, the following accompanying symptoms were noted: fever in 5 patients (35%), nasal discharge in 6 (42%), sore throat in 4 (29%), cough in 5 (36%), abdominal pain in 2 (14%), vomiting in 3 (21%), and diarrhea in 3 (21%) (Table 1).

The mean leukocyte count at admission was $5608 \pm 3357/\text{mm}^3$. Leukopenia was observed in 5 patients (35.7%), while leukocytosis was present in 1 patient (7.1%). The mean neutrophil-to-lymphocyte ratio (NLR) was 1.69 ± 2.75 , with a median value of 0.81. No cases of thrombocytopenia were recorded.

The mean serum CK level was 3816 ± 1909 IU/L. CK levels began to show a significant decline within an average of 4.5 ± 3.9 days (range: 2-12 days) from the onset of symptoms. The mean aspartate aminotransferase (AST) level was 166 ± 135 IU/L, and the mean alanine aminotransferase (ALT) level was 40 ± 22 IU/L. Serum creatinine levels were within normal limits in all patients.

Although findings began to improve in most patients within 48 hours, the mean time to complete recovery was 2.46 ± 3.4 days (range: 1-13 days). Demographic characteristics, presenting complaints, clinical courses, and key laboratory parameters of the patients are presented in Table 2.

Discussion

BACM is a clinical condition that commonly occurs after viral upper respiratory tract infections and is characterized by pain in the lower extremities, difficulty walking, or an inability to walk. It usually resolves spontaneously. This disease is more frequent in school-aged boys, and due to the sudden onset of symptoms, can be confused with serious neurological conditions (1,2,3). Therefore, it is important for clinicians to be able to recognize BACM to avoid unnecessary advanced testing and invasive procedures.

In the present study, 14 cases of BACM were identified over a 3-month period, which is a notably high number when compared to the incidence rates reported in the literature. According to a study by Al Qahtani et al. (4), conducted in Saudi Arabia, the incidence of BACM was estimated at 3.17 per 100,000 children over a five-year period. Similarly, Costa Azevedo et al. (5) retrospectively reviewed five years of data on pediatric patients presenting with elevated creatine phosphokinase levels and found that 100 out of 174 cases were consistent with BACM, with a median age of 6 years, and 77% were male. The relatively high number of cases in our cohort within a short timeframe may reflect a regional outbreak, increased awareness and diagnosis of the condition,

Table 1. Prodromal symptoms of BACM cases

Patient no	Fever	Runny nose	Sore throat	Cough	Abdominal pain	Vomiting	Diarrhea
1	-	+	+	-	-	-	-
2	-	-	-	-	-	+	+
3	-	-	-	+	-	-	+
4	-	-	-	-	+	+	-
5	+	-	-	-	-	-	-
6	+	-	-	-	-	+	-
7	+	+	-	+	-	-	-
8	-	+	+	+	-	-	-
9	+	-	-	-	-	-	-
10	-	-	-	-	-	-	-
11	+	+	+	-	-	-	-
12	-	+	+	+	-	-	-
13	-	+	-	+	-	-	-
14	-	-	-	-	+	-	+

BACM: Benign acute childhood myositis

Table 2. Demographic, clinical, and laboratory data of BACM cases

Total number of patients (n)	14
Sex (n, %)	
Male	12, 85.7%
Female	2, 14.3%
Age (mean, median, range)	8.93, 8 (6-17)
Follow-up type (n, %)	
Inpatient	6, 42.9%
Outpatient	8, 57.1%
Presenting symptoms	
Inability to walk (%)	26.6%
Leg pain (%)	85.7%
Laboratory values (mean, median, range)	
Leukocyte count	5608, 4975 (2600-15660)
Neutrophil/lymphocyte ratio	1.69, 0.81 (0.45-11.1)
Platelet count	198.214, 214.500 (109.000-296.000)
Creatinine	0.47, 0.47 (0.24-0.8)
Aspartate aminotransferase	166, 121 (62-531)
Alanine aminotransferase	40, 35 (15-93)
Creatine kinase	3816, 3603 (935, 7122)
Creatine kinase normalization time (mean, median, range)	4.5, 3 (2-12) day
Symptom resolution time (mean, median, range)	2.4, 2 (1-13) day

BACM: Benign acute childhood myositis

or a clustering of cases due to seasonal viral trends. These findings underscore the importance of clinician awareness, especially during peak viral seasons.

In our study, 85.7% of the patients were male, which is significantly higher than the approximately 2:1 male-to-female ratio reported in the literature, with our findings showing a 6:1 ratio. This is consistent with a study by Müjgan Sonmez et al. (6) in Turkey which reported that BACM occurs five times more often in males. Most cases in our study were of school age, which supports previous reports that BACM is more common in this age group.

A review of the literature indicates that the most common symptoms of BACM are calf pain, generalized muscle pain, and difficulty walking (3,7). In our study, 85.7% of the patients presented with muscle pain and tenderness. A study conducted with 38 children diagnosed with BACM showed a similar rate of 81% (7). The diagnosis of BACM can be made even in the absence of the classical symptoms of leg pain and difficulty walking. Particularly in cases following viral infections with a marked elevation of serum CK levels, BACM should be considered even if typical musculoskeletal symptoms such as muscle pain or gait disturbance are absent.

The literature indicates that the clinical spectrum of BACM is broad, and some cases may present without muscle pain or difficulty walking (8,9). Several studies emphasize that BACM

diagnosis should also be considered in children with elevated CK levels during or after viral infections, even when typical musculoskeletal complaints are not evident. Therefore, diagnosing BACM in two patients in your study who presented with viral symptoms but without leg pain or gait difficulty, yet had biochemical evidence of muscle involvement, is consistent with the broader clinical spectrum described in the literature. This approach highlights the need to recognize atypical or subclinical forms of BACM.

Prodromal symptoms indicative of upper respiratory tract infections were frequently observed in our cohort, which is consistent with previous reports in the literature (1,6,7). Because of the unavailability of respiratory PCR testing at our institution during the study period, the etiology in most cases was presumed to be viral based on clinical presentation. However, in three patients who underwent respiratory PCR testing at external centers, influenza virus was identified. Additionally, *Streptococcus* A was isolated from a throat culture in one patient. The specific causative agent remained unidentified in the remaining cases.

Sudden difficulty walking or inability to walk should raise concerns about GBS, one of the most important neurological emergencies for differential diagnosis (8). Muscle pain is a common feature of both diseases. While areflexia or hyporeflexia can rarely be observed in viral myositis, GBS

typically presents with preserved reflexes, which can be misleading for diagnosis. An elevated serum CK level is an important laboratory finding that helps differentiate viral myositis from GBS. In our study, all patients had normal neurological examinations, while some reported cases from Turkey showed hypoactive deep tendon reflexes in BACM patients (10).

In our study, all patients had elevated CK levels, with a mean of 3816 IU/L, and the levels tended to normalize within an average of 4.5 days. These findings are consistent with those reported in the literature. However, in two patients, it took up to 12 days for CK levels to return to normal, while others showed earlier improvement. None of the patients developed serious complications such as rhabdomyolysis or kidney failure, indicating that the disease typically follows a benign course.

Elevations in other muscle enzymes such as AST and ALT were also observed in our study. This reflects systemic biochemical changes secondary to muscle inflammation. A similar study by Daniş et al. (11) reported an average AST level of 128 IU/L, while our study found an average of 166 IU/L.

We also analyzed parameters reflecting both inflammation and viral infection response, such as leukocyte count and the NLR. Leukopenia was present in 35.7% of the patients, and leukocytosis was seen in one patient. These findings can be interpreted as supportive of a viral etiology.

The average NLR in our study was found to be 1.69. NLR is a simple, cost-effective, and easily accessible biomarker used to diagnose and assess the severity of inflammation and infection. In viral infections, lymphocytosis is generally seen, whereas bacterial infections typically show neutrophilia, resulting in low NLR values (12,13,14). The NLR value observed in our study supports a viral etiology and is consistent with the fact that BACM often follows influenza and other viral upper respiratory infections. Although there is limited research specifically on NLR in BACM a low or normal NLR is a typical finding in cases of myositis associated with viral infections. Thus, NLR can be considered a supportive parameter in distinguishing BACM from bacterial infections in addition to clinical evaluation.

Conditions such as trauma, osteomyelitis, rheumatoid arthritis, deep vein thrombosis, dermatomyositis, polymyositis, and intracranial pathologies should be kept in mind for differential diagnosis. Therefore, it is important to gather information about the patient's history, including family history of neuromuscular diseases, recent history of strenuous exercise, trauma, medication use, metabolic disorders, and thyroid diseases. While most cases in the

pediatric population are benign, close monitoring of patients is crucial.

Study Limitations

This study has several limitations. First, the retrospective nature of the study may have led to incomplete data or recall bias, particularly concerning prodromal symptoms and symptom onset. Second, although similar cases have been reported in the literature, and the total number of patients in this study may not be very large, the clustering of 14 BACM cases within a brief, three-month period is noteworthy. This temporal concentration likely reflects a seasonal surge in viral respiratory infections, which are known triggers for BACM. Therefore, despite the relatively modest sample size, the study provides valuable insights into the management and follow-up of BACM during peak viral seasons. Third, viral serology or PCR testing was not routinely performed in all cases, which restricts our ability to definitively identify the viral etiology in each patient. Lastly, long-term follow-up data were not available, which prevents conclusions about possible late sequelae or recurrence.

Conclusion

BACM is a self-limiting condition most commonly affecting school-aged boys following viral upper respiratory infections. It typically presents with sudden lower extremity pain and difficulty walking and can mimic more serious neuromuscular or neurological disorders. Awareness of BACM and its clinical and laboratory features, including elevated CK levels and low NLR, can help clinicians avoid unnecessary diagnostic procedures and hospitalization. Although the disease follows a benign course in most cases, careful evaluation and close monitoring are essential to exclude other serious conditions and to ensure patient safety.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the Ordu University Clinical Research Ethics Committee with the decision number 2023/162, date: 09.06.2023.

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: T.K., Concept: E.İ.A., V.A., Design: E.Y.E., Data Collection or Processing: E.Y.E., T.K., V.A., Analysis or Interpretation: T.K., C.Y.G., Literature Search: E.Y.E., T.K., Writing: E.İ.A., T.K.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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