



Acute viral myositis and rhabdomyolysis: A descriptive study

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ABSTRACT

Introduction. Acute viral myositis is an inflammatory condition caused by respiratory viruses, characterized by lower-extremity pain and difficulty walking. It is a benign, self-limiting condition; complications such as rhabdomyolysis or acute kidney injury are rare. The objective of this study is to analyze the clinical course and treatment of patients seen in a pediatric emergency department (PED).

Population and methods. Retrospective observational study with exploratory analysis of associations. Patients diagnosed with acute viral myositis between January 2018 and March 2023 at the PED were analyzed. Demographic, clinical, and laboratory data were collected and analyzed using means, standard deviations, and bivariate analysis (Student's t-test or chi-square test), as well as correlations (Pearson or Spearman).

Results. Forty patients were included, with a mean age of 6.75 years (SD 2.59). Blood tests were performed in 30 of 40 patients (75.0%; 95% CI: 59.8-85.8). Eleven of 40 patients (27.5%; 95% CI: 16.1-42.8) met the criteria for rhabdomyolysis. No cases of renal failure or other complications were observed. Exploratory analysis revealed that creatine phosphokinase (CPK) levels were higher in males than in females and were associated with age, the AST/ALT ratio, lactate dehydrogenase (LDH), and the need for hospitalization and intravenous fluid therapy.

Conclusion. Acute viral myositis in this pediatric series had a favorable clinical course. A proportion of patients presented with markedly elevated CPK levels and criteria for rhabdomyolysis, with no cases of acute renal failure.

Keywords: myositis; influenza; rhabdomyolysis; myalgia; pediatric emergency medicine.

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INTRODUCTION

Acute viral myositis (AVM) is a rare, transient inflammatory condition. It is more common in children than in adults and predominantly affects males.¹ Respiratory viruses primarily cause it and is frequently associated with influenza B virus; therefore, its incidence depends on epidemic periods.¹ The characteristic clinical presentation consists of bilateral calf pain and difficulty walking 3 or 4 days after the onset of cold-like symptoms.¹ The initial infection causes muscle fiber necrosis, resulting in elevated levels of creatine phosphokinase (CPK) in the blood. In most cases, the disease is self-limiting, with an excellent prognosis and no functional sequelae. However, it is important to note that several cases of rhabdomyolysis have been reported in association with this condition.²

Rhabdomyolysis is a condition characterized by rapid and massive breakdown of muscle tissue. This breakdown releases large amounts of muscle substances into the bloodstream, which can lead to complications such as acute kidney injury (AKI).³ Rhabdomyolysis has been studied primarily in adults. However, its etiology and consequences differ significantly in the pediatric population.⁴ Available studies in the pediatric population show a lower prevalence of rhabdomyolysis-associated AKI than in adults. The available literature has not linked AKI to mild conditions such as common infections,⁵ suggesting that, in this age group, renal involvement may be due to the underlying disease rather than to rhabdomyolysis itself.

The primary objective of this study is to describe the demographic, clinical, and laboratory characteristics of pediatric patients diagnosed with AVM who were treated in our pediatric emergency department (PED), to analyze the disease course and its clinical management, and to explore possible associations between clinical and laboratory variables.

POPULATION AND METHODS

This is a retrospective observational study with exploratory analysis of associations, based on a review of electronic medical records, conducted in the PED of a medium-complexity hospital. The Research Ethics Committee of our center approved the study.

We analyzed patients treated at the PED from January 2018 through March 2023 with a diagnosis of AVM. The inclusion criteria were patients aged 0-16 years with a diagnosis of

AVM, defined as myalgia in the lower extremities that caused difficulty walking and was associated with symptoms consistent with a viral infection (respiratory symptoms or fever). Patients with diffuse muscle pain or muscle pain without respiratory symptoms, fever, or difficulty walking were excluded. As this was a retrospective study with no direct intervention on the participants and involving pooled data analysis, informed consent was not required.

The collected variables were grouped into demographic, clinical, laboratory, and clinical course variables. Demographic variables included age and sex. Clinical variables included relevant personal history, number of days with fever, highest recorded temperature, number of days with myalgia, location and nature of the myalgia, and changes in gait. Among the laboratory variables, available parameters were recorded, along with the performance and results of microbiological and urinalysis tests. Rhabdomyolysis was defined as a CPK elevation greater than 5 times the upper limit of normal (>5000 U/L). Acute kidney injury was defined as an increase in creatinine ≥ 0.3 mg/dL or ≥ 1.5 times the baseline value. Finally, among the clinical course variables, the following were included: the need for hospitalization and length of stay, treatment received, laboratory values during hospitalization, the presence of complications, and the need for follow-up visits.

The data were entered into a database hosted in the center's internal repository and protected by a password.

Categorical variables were described using percentages, while continuous variables were expressed as mean and standard deviation (SD) if they followed a normal distribution (assessed using the Kolmogorov-Smirnov and/or Shapiro-Wilk tests), or as median and interquartile range (IQR) otherwise.

For the bivariate analysis of categorical variables, the chi-square test or Fisher's exact test was used; for continuous variables, Student's t-test or the Mann-Whitney U test was used for nonparametric cases. To explore associations between variables, Pearson's or Spearman's correlation coefficients were used, depending on the variables' characteristics. SPSS™ version 23 was used for data analysis, with a p -value < 0.05 considered statistically significant. Given the sample size, the inferential analyses were considered exploratory.

RESULTS

During the study period, 40 patients were diagnosed with AVM. The mean age was 6.75 years (SD 2.59); 26 out of 40 were male (65.0%; 95% CI: 49.5-77.9). None had a personal history of kidney and/or muscle disease, nor were they taking medication that affected these organs.

The season with the highest number of cases (16/40) was 2022-2023, followed by 2019-2020 (12/40), as shown in *Figure 1*—most patients presented during the winter.

The baseline clinical characteristics are summarized in *Table 1*. At the time of the visit, 37 out of 40 patients had a fever (92.5%; 95% CI: 79.6-97.3). The mean duration of fever was 3.22 days (SD 1.27), and the mean maximum temperature was 38.9 °C (SD 0.79). The mean duration of muscle pain was 1.1 days (SD 0.5). Muscle pain was localized in the calves in 34/40 patients (85.0%; 95% CI: 70.2-93.2) or in the quadriceps in 6/40; it was bilateral in 34/40 (85.0%; 95% CI: 70.2-93.2). A flu test was performed on 25/40 patients; 13 of those tested positive, all for influenza B. A COVID-19 test was performed on 9 out of 40 patients, with 2 positive results.

Blood tests were obtained from 30 of 40 patients (75.0%; 95% CI: 59.8-85.8), rapid urine

strips from 6 of 40, and urine sediment tests from 11 of 40. Of the 11 urine sediment tests performed, 3 showed hematuria.

Regarding muscle damage, 11 of 40 patients met the criteria for rhabdomyolysis (27.5%; 95% CI: 16.1-42.8), and the mean CPK level was 2929 U/L (SD 1977). The laboratory data are shown in *Tables 2* and *3*.

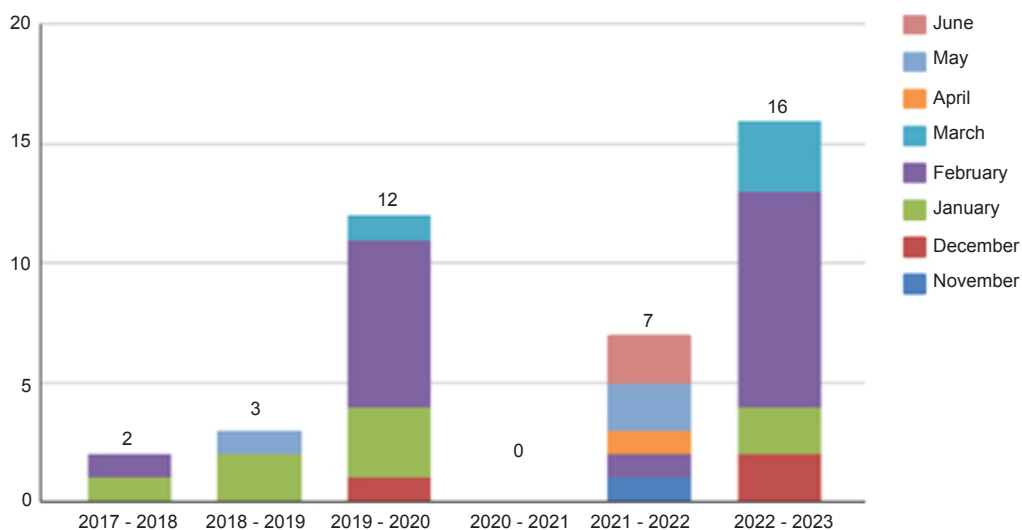
In an exploratory analysis, it was observed that CPK levels were higher in men than in women and were associated with age, the AST/ALT ratio, lactate dehydrogenase (LDH), the need for hospitalization, length of hospital stay, and the need for IV fluid therapy. The remaining associations analyzed showed no statistically significant relationships (*Tables 4* and *5*).

Five out of 40 patients received intravenous (IV) analgesia, and 10 out of 40 received IV fluid therapy. A total of 7 out of 40 patients (17.5%; 95% CI 8.7–31.9) were admitted, of whom 5 were admitted due to elevated CPK levels and the rest due to poor pain control and functional impairment. The mean length of stay was 2.0 days (SD 1.15).

No patient developed associated renal failure or other relevant complications.

No new visits to the PED were recorded during follow-up.

FIGURE 1. Cases by flu season



The flu season is defined as the period from November of one year to March of the following year. Since the season may vary with the virus's annual seasonality, the months that make up the season may vary from year to year.

TABLE 1. Characteristics, symptoms, and signs of patients with acute viral myositis

Variables	n = 40	95% CI
Fever	37 (92.5)	79.6-97.3
Days with myalgia	1.10 (0.5)*	0.95-1.27
Bilateral myalgia	34 (85)	70.2-93.2
Gait abnormalities		
Limp	9 (31)	15.3-50.8
Equinus gait	8 (27.6)	12.8-47.2
Increased base support	3 (10.3)	2.2-27.4
March rejected	9 (31)	15.3-50.8
Blood test	30 (75)	59.8-85.8
Urine test strip	6 (15)	5.7-29.8
Urine sediment	11 (27.5)	16.1-42.8
Flu test	25 (62.50)	46.7-76.2
Flu A	0	
Flu B	13/25 (52)	31.3-72.2

Data are expressed as absolute values and percentages (%) for categorical variables or as means (SD)* for continuous variables. 95% CI: 95% confidence interval

TABLE 2. Laboratory results in the pediatric emergency department

Laboratory values	n = 40
White blood cells ($\times 10^3/\mu\text{L}$)	4.43 (17.42)*
Neutrophils ($\times 10^3/\mu\text{L}$)	1.8 (1.80)*
Platelets ($\times 10^3/\mu\text{L}$)	216.4 (82.85)
Hemoglobin (g/dL)	13.5 (10.70)*
CRP (mg/L)	2.9 (48.90)*
Creatinine (mg/dL)	0.40 (0.13)
Urea (mg/dL)	26.47 (6.94)
CPK (U/L)	2920 (5454)*
AST/ALT	2.84 (1.08)
LDH (U/L)	329 (703)*

Data are expressed as mean (SD) or median (IQR)*.

CRP: C-reactive protein; CPK: creatine phosphokinase; AST/ALT: aspartate aminotransferase/alanine aminotransferase; LDH: lactate dehydrogenase.

TABLE 3. Laboratory results during hospitalization

Laboratory values	n = 7
Days of hospitalization until peak CPK level	1.14 (0.37)
CPK (maximum value) U/L	12 531 (10 769)*
CPK (value at discharge) U/L	1432 (3273)*
Days of hospitalization until peak creatinine level	1.28 (0.48)
Creatinine (peak value) mg/dL	0.41 (0.067)

Data are presented as mean (SD) or median (IQR)*; CPK: creatine phosphokinase.

DISCUSSION

In this retrospective series of pediatric patients diagnosed with acute viral myositis, no significant complications were observed, suggesting a favorable clinical course in our sample and consistent with the disease course described in the literature. The mean age of the patients analyzed was 6.7 years, consistent with the results reported by Attaianese et al.⁶ However,

other authors report a slightly higher mean age.⁷ As in other studies,⁶⁻⁹ the proportion of AVM in males was higher than in females. However, upon reviewing the census data, we found no differences compared to the reference population.

The symptoms and physical findings were similar to those reported in other studies.^{1,5-9} Regarding diagnostic tests, the discrepancy in test ordering is striking, even though the patients'

TABLE 4. Bivariate analysis of baseline creatine phosphokinase and categorical variables

Variable	CPK, median (IQR)	p-value
Gender		
Male	5021.00 (8181.50)	0.031
Female	477.00 (2529.00)	
Fever		
Yes	4114.00 (6158.00)	0.734
No	3782.50 (NC; n = 2)	
Bilateral myalgia		
Yes	4312.00 (7570.50)	0.230
No	525.00 (NC; n = 3)	
Gait abnormalities		
Yes	4114.00 (5996.50)	0.532
No	826.00 (4014.00)	
Flu		
Yes	4446.50 (7501.30)	0.168
No	7438.00 (NC; n = 2)	
IV serum therapy		
Yes	7227.50 (NC; n = 2)	0.043
No	4446.50 (7396.00)	
Admission		
Yes	(NC; n = 1)	0.030
No	4390.00 (5794.00)	

Comparison using the Mann-Whitney U test (nonparametric variables). The 95% confidence interval (CI) for the difference in means is not reported because this is a nonparametric test.

*NC: not calculable, CPK: creatine phosphokinase.

TABLE 5. Correlation between baseline creatine phosphokinase and continuous variables

Variable	Correlation coefficient (r_s)	95% CI	p-value
Age	0.430	0.022-0.722	0.014
AST/ALT ratio	0.725	0.440-0.901	0.000
Creatinine	0.120	-0.272-0.419	0.526
Urea	-0.370	-0.634-0.111	0.119
LDH	0.814	0.412-0.955	0.000
Days of hospitalization	0.765	0.331-1.000	0.045

CPK: creatine phosphokinase; AST: aspartate aminotransferase; ALT: alanine aminotransferase; LDH: lactate dehydrogenase. Correlation level calculated using Spearman's correlation coefficient; 95% CI: 95% confidence interval.

clinical characteristics were similar. Although this is a predominantly benign condition, blood tests were ordered in most cases and, to a lesser extent, urinalysis was ordered. This highly heterogeneous approach may be due to the lack of standardized protocols for this condition.¹⁰

In our study, despite the classic association between AVM and influenza, microbiological testing was performed on only half of the patients, and 52% of those tests were positive. This figure is higher than that reported by other studies (19-22%).^{5,6} Given that not all patients in the sample were tested for the virus, this higher prevalence of influenza compared with other studies could be due to an initial selection of patients more likely to present with flu-like symptoms. All patients tested positive for influenza B, consistent with the literature reviewed.^{3,5,8} Regarding the SARS-CoV-2 virus, 22.2% of the tests performed were

positive, a figure similar to that reported by another study which found a prevalence of 16.9%.⁹ No association was observed between CPK levels and COVID-19 infection, unlike what was described by Chen HW et al.,⁹ who reported more pronounced laboratory abnormalities in patients with AVM and COVID-19, as well as a higher rate of hospitalization. However, the absence of an association in our series should be interpreted with caution given the small number of patients with confirmed SARS-CoV-2 infection.

The main laboratory findings were those related to muscle damage: elevated CPK, an increased AST/ALT ratio, and elevated LDH, as previously described in other studies.^{2,3,6,7} Mean CPK values were 2920 U/L, similar to those in other studies.⁵ CPK levels were associated with age and sex—they were higher in males—findings that have not been previously described

in the literature. We also found associations between CPK levels and hospital admission and the initiation of IV fluid therapy; these interventions were more likely to be performed as CPK levels increased. This could reflect a tendency toward a more interventionist approach in patients with elevated CPK levels, possibly due to concern about the development of secondary complications. Finally, we found an association between initial CPK levels and the total length of hospital stay: the stay was longer when CPK levels were elevated, suggesting that discharge may be contingent on improvement in elevated blood CPK levels rather than on the resolution or improvement of clinical symptoms.

The prevalence of rhabdomyolysis in our study—defined as CPK levels 5 times the upper limit of normal—was 27.5% (11/40), much higher than that reported in other studies, which range from 3% to 6.7%.^{7,11} This difference could be explained either by the fact that not all patients in our study underwent laboratory testing, by a discrepancy in the criteria used to define rhabdomyolysis—which are not specified in the aforementioned studies,^{7,11} or by the small sample size.

There is little published evidence on rhabdomyolysis in childhood, and recommendations are extrapolated from findings in the adult population. While previous studies report an overall incidence of acute kidney injury (AKI) ranging from 35% to 50%,⁵ in the review by Mannix et al.,⁴—the largest pediatric series to date—it is shown that the proportion of AKI attributed exclusively to rhabdomyolysis is, in fact, only 1.6% (95% CI: 0-3.3), and that, in general, it is more closely associated with the presence of other factors such as dehydration or multiple organ failure. No case of AKI secondary to rhabdomyolysis,⁴ was attributed to AVM.

Regarding complications secondary to AVM, in our 5-year series, no patient showed evidence of worsening renal function, similar to has been shown in other reviewed studies,^{5,7,11} where the rate of complications is similarly low.

Study limitations

This is a low-incidence condition, so the sample size is small, limiting the study's statistical power. Furthermore, because this is a retrospective study, data recording in the medical records was not performed according to a standardized protocol, nor was patient treatment uniform, which may skew the results. Therefore,

the association analyses should be considered exploratory in nature and do not allow for the establishment of causal relationships.

Implications for clinical practice

AVM is generally a benign condition with a very low rate of complications that can usually be treated on an outpatient basis. However, in clinical practice, invasive procedures are still performed for its diagnosis or to screen for such complications.

According to the data from our study and the available literature, rhabdomyolysis is rare in the context of AVM, and secondary AKI is almost anecdotal.

New protocols are therefore needed to standardize the treatment of this condition. Given that patients with suspected rhabdomyolysis and a negative urine dipstick test have been shown to have an almost negligible risk of developing AKI,^{4,8} a first-line diagnostic approach could involve performing a urine dipstick test without laboratory analysis, reserving laboratory testing only for cases with potential comorbidities or associated complications that could progress to AKI, such as poor oral intake, dehydration, suspected bacterial superinfection, etc. However, this proposal should be interpreted with caution due to the small sample size and requires validation in prospective studies with a larger number of patients. This approach could contribute to less invasive treatment for patients, reduce unnecessary hospitalizations, and lower healthcare costs.

CONCLUSION

Acute viral myositis in our pediatric series had a favorable clinical course, with no cases of acute kidney injury or other significant complications during follow-up. A proportion of patients presented with markedly elevated CPK levels and criteria for rhabdomyolysis; however, in our sample, this was not associated with impaired renal function. The associations observed between CPK and certain clinical and laboratory variables should be considered exploratory. ■

REFERENCES

1. Magee H, Goldman RD. Viral myositis in children. *Can Fam Physician*. 2017;63(5):365-8.
2. Agyeman P, Duppenhaler A, Heininger U, Aebi C. Influenza-associated myositis in children. *Infection*. 2004;32(4):199-203. doi:10.1007/s15010-004-4003-2.
3. Elsayed EF, Reilly RF. Rhabdomyolysis: a review, with emphasis on the pediatric population. *Pediatr Nephrol*. 2010;25(1):7-18. doi:10.1007/s00467-009-1223-9.
4. Martínez López AB, Alcaraz Romero AJ, Hidalgo

- Cebrián R, Fernández Lafever SN, González Pacheco N. Rhabdomyolysis aguda: revisión y evaluación del daño renal. *Acta Pediatr Esp*. 2014;72(7):e235-8.
5. Mannix R, Tan ML, Wright R, Baskin M. Acute pediatric rhabdomyolysis: causes and rates of renal failure. *Pediatrics*. 2006;118(5):2119-25. doi:10.1542/peds.2006-1352.
 6. Attaianese F, Costantino A, Benucci C, Lasagni D, Trapani S. Benign acute children myositis: 5 years experience in a tertiary care pediatric hospital. *Eur J Pediatr*. 2023;182(10):4341-9. doi:10.1007/s00431-02305115-9.
 7. Delavar MA, Ebrahimi HK, 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. *J Family Med Prim Care*. 2022;11(6):2744-9. doi:10.4103/jfmprc.jfmprc_1940_21.
 8. Cavagnaro SMF, Aird GA, Harwardt RI, Marambio QCG. Miositis aguda benigna de la infancia. Serie clínica y revisión de la literatura. *Rev Chil Pediatr*. 2017;88(2):268-74. doi:10.1016/j.rchipe.2016.07.002.
 9. Chen HW, Chang MC, Wang TL, Shia BC, Wang SR. Benign acute childhood myositis in the COVID-19 era: how does it compare to influenza? *Eur J Pediatr*. 2025;184(5):291. doi:10.1007/s00431-025-06116-6.
 10. Turan C, Yurtseven A, Cicek C, Keskin G, Saz EU. Benign acute childhood myositis associated with influenza A/B in the paediatric emergency department and the efficacy of early-onset oseltamivir. *J Paediatr Child Health*. 2022;58(6):1022-7. doi:10.1111/jpc.15894.
 11. 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. *Ital J Pediatr*. 2021;47(1):57. doi:10.1186/s13052-021-01002-x.