



Case Series

Clinical Spectrum of Febrile Rash Illnesses in Children: A Hospital-Based Case Series Highlighting Diagnostic Challenges in Measles and Mimicking Conditions

Dr Megha Gaur^{1*}, Dr Apoorva Saini², Dr Anurag Harle³

¹Senior Resident, Department of Paediatric, ESIC medical College and Hospital Jaipur

²Senior Resident, Department of Paediatric, ESIC medical College and Hospital Jaipur

³HOD and Specialist, Department of Paediatric, ESIC medical College and Hospital Jaipur

 OPEN ACCESS

Corresponding Author:

Dr Megha Gaur

Senior Resident, Department of
Paediatric, ESIC Medical College
and Hospital Jaipur

Email: meghusj@gmail.com

Received: 17-05-2026

Accepted: 08-06-2026

Available online: 20-06-2026

Copyright © International Journal of
Medical and Pharmaceutical Research

ABSTRACT

Background: Measles remains one of the most contagious viral diseases despite the availability of highly effective vaccines. Although two-dose measles vaccination provides protection exceeding 95%, sporadic breakthrough infections continue to be reported, particularly in settings approaching measles elimination. Such cases pose important diagnostic and public health challenges because clinicians may have a lower index of suspicion in vaccinated individuals. We describe a cluster of pediatric febrile rash illnesses that included laboratory-confirmed measles in both a fully immunized adolescent and an unimmunized child.

Case Series: Four pediatric patients presented within a short temporal window with fever, respiratory symptoms, and generalized rash. Two cases demonstrated positive measles IgM serology. The first was a 14-year-old fully immunized male who developed fever, cough, pharyngitis, and rash with positive measles IgM and mild transaminitis. The second was an unimmunized 7-year-old female presenting with the classic measles prodrome of cough, coryza, conjunctivitis, and rash, also with positive measles IgM. Two additional fully immunized children developed clinically compatible febrile exanthematous illnesses but tested negative for measles IgM. Alternative etiologies including dengue and malaria were excluded.

Conclusion: This cluster illustrates three important contemporary challenges: (i) occurrence of laboratory-confirmed measles despite complete immunization, (ii) persistence of susceptible individuals due to immunization gaps, and (iii) diagnostic uncertainty associated with serologically negative but epidemiologically linked cases. The findings underscore the need for continued vigilance, robust surveillance systems, and recognition of breakthrough measles during the measles elimination era.

Keywords: Measles, Breakthrough infection, Vaccine failure, Modified measles, Outbreak investigation, Measles elimination, Pediatric infectious diseases.

INTRODUCTION

Measles is an acute viral illness caused by the measles virus, a member of the genus *Morbillivirus* within the family *Paramyxoviridae*. Despite remarkable reductions in global disease burden following widespread vaccination, measles remains a significant public health concern because of its extraordinary transmissibility, with a basic reproductive number (R_0) ranging from 12 to 18, among the highest of all infectious diseases.¹

The introduction of two-dose measles-containing vaccines (MCVs) has substantially reduced measles-related morbidity and mortality worldwide. Nevertheless, outbreaks continue to occur even in regions reporting high vaccination coverage.² This paradox has generated increasing interest in breakthrough measles, defined as laboratory-confirmed measles occurring in previously vaccinated individuals.³

Several mechanisms have been proposed for breakthrough infection, including primary vaccine failure, secondary vaccine failure due to waning immunity, inadequate immune response, host-related immunological factors, and intense exposure during outbreaks.⁴ Although vaccinated individuals generally experience milder disease and reduced transmission potential, breakthrough infections may complicate surveillance efforts because of atypical clinical presentations and delayed diagnosis.⁵

India has made substantial progress toward measles and rubella elimination through intensified immunization campaigns and surveillance programs. However, identification of breakthrough infections remains critical because these cases may represent hidden transmission chains and threaten elimination goals.⁶

Here, we report a pediatric cluster consisting of two laboratory-confirmed measles cases—including one fully immunized adolescent—and two epidemiologically linked febrile rash illnesses with negative measles serology. This cluster highlights important challenges in outbreak recognition, interpretation of serological results, and measles surveillance in highly vaccinated populations.

CASE SERIES

Case 1: Breakthrough Measles in a Fully Immunized Adolescent

A 14-year-old male with documented complete childhood immunization presented with cough and throat pain for six days, fever for three days, and generalized maculopapular rash for two days.

Laboratory evaluation demonstrated:

- Total leukocyte count: 13,000/ μ L
- Hemoglobin: 10.2 g/dL
- Platelet count: 226 $\times 10^3$ / μ L
- hsCRP: 12.6 mg/L
- AST/ALT: 60.3/59.7 U/L
- Dengue: Negative
- Malaria: Negative
- Measles IgM: Positive

The combination of fever, respiratory symptoms, rash, and positive measles IgM established the diagnosis of measles despite complete immunization status. Mild hepatic involvement was noted.

Case 2: Febrile Exanthematous Illness with Negative Measles Serology

A 3-year-old fully immunized female presented with fever and cough for five days followed by rash for two days.

Investigations showed:

- TLC: 4,060/ μ L
- Hemoglobin: 10.5 g/dL
- hsCRP: 12.36 mg/L
- AST/ALT: 49.7/11.8 U/L
- Measles IgM: Negative

The clinical presentation was compatible with measles; however, serology was negative. The possibility of early testing, modified measles, or another viral exanthem was considered.

Case 3: Febrile Rash Illness in a Child with Asthma

A 7-year-old male with known bronchial asthma presented with fever for seven days, upper respiratory symptoms for five days, and rash for three days.

Investigations revealed:

- TLC: 9,670/ μ L
- Platelets: 483 $\times 10^3$ / μ L
- hsCRP: 0.94 mg/L
- Measles IgM: Negative
- Dengue: Negative
- Malaria: Negative

The absence of serological evidence of measles and normal inflammatory markers suggested an alternative viral etiology.

Case 4: Classical Measles in an Unimmunized Child

A 7-year-old female with no prior measles vaccination presented with fever, cough, coryza, conjunctivitis, and rash.

Investigations showed:

- TLC: 6,000/ μ L
- Platelets: 203 $\times 10^3$ / μ L
- hsCRP: 10.6 mg/L

- AST: 75 U/L
- Measles IgM: Positive

The patient fulfilled the classical clinical and laboratory criteria for measles. Abdominal ultrasonography incidentally revealed a left ectopic kidney.



Figure 1: 7years old unimmunized female child with rashes over face



Figure 2 : 14 years old immunized male with rashes over chest and abdomen

DISCUSSION

The present case series is noteworthy because it captures several important contemporary phenomena in measles epidemiology: breakthrough measles in a vaccinated adolescent, ongoing transmission associated with an unimmunized child, and the occurrence of clinically compatible but serologically discordant cases during a suspected outbreak.

Breakthrough Measles in the Era of High Vaccine Coverage

The most significant observation is the occurrence of laboratory-confirmed measles in a fully immunized 14-year-old adolescent. Although two doses of measles-containing vaccine provide approximately 97% protection, vaccine effectiveness is not absolute.⁷

Breakthrough measles has become increasingly recognized in countries with high vaccine coverage and successful elimination programs.⁸ In such settings, the epidemiology of measles shifts from predominantly unvaccinated populations to occasional infections among vaccinated individuals. Several studies have suggested that waning humoral immunity may contribute to susceptibility in adolescents and young adults many years after primary immunization.⁹

The adolescent age of the patient is particularly important. Most published reports from developing countries continue to focus on younger children. Demonstration of laboratory-confirmed disease in an older vaccinated child raises concerns regarding the durability of vaccine-induced immunity and the possibility of secondary vaccine failure.

Modified Measles and Diagnostic Challenges

Vaccinated individuals who develop measles often present with modified disease characterized by less severe symptoms, lower viral loads, shorter duration of illness, and atypical manifestations.¹⁰

Consequently, clinicians may not initially suspect measles, leading to delayed diagnosis and potential opportunities for transmission. The first case in our series lacked conjunctivitis and presented primarily with respiratory symptoms and rash, emphasizing that classical textbook descriptions may not always be present in vaccinated hosts.

This observation carries particular significance for countries pursuing measles elimination because failure to recognize breakthrough infections may result in underreporting and delayed outbreak detection.

Significance of Serologically Negative Cases During Outbreak Investigations

Two children demonstrated clinically compatible illness but negative measles IgM results. This finding highlights an important limitation of measles serology.

Measles-specific IgM antibodies may be absent during the earliest days following rash onset, resulting in false-negative results. The sensitivity of IgM testing increases substantially after the third day of rash.¹¹ Consequently, a single negative IgM result should not be used to exclude measles in epidemiologically linked patients.

The phenomenon has important public health implications. During outbreaks, reliance solely on laboratory confirmation may underestimate disease burden. Integration of clinical findings, epidemiological linkage, and repeat testing remains essential.

Persistence of Susceptible Pockets and Elimination Challenges

The second confirmed case occurred in an unimmunized child. This finding illustrates how immunity gaps continue to facilitate measles transmission despite improvements in overall vaccine coverage.

Mathematical models suggest that measles elimination requires population immunity exceeding 92–95%.¹² Even small clusters of unvaccinated individuals can sustain transmission and initiate outbreaks.

The coexistence of vaccinated and unvaccinated cases within the same cluster reflects the complex epidemiological landscape currently observed in many countries transitioning toward elimination.

Hepatic Involvement in Measles

Both confirmed cases demonstrated elevated AST levels. Although respiratory and dermatological manifestations dominate clinical descriptions of measles, hepatic involvement is increasingly recognized.

Previous studies have reported transient transaminase elevations in 40–80% of hospitalized measles patients.¹³ The mechanism is believed to involve direct viral injury and immune-mediated hepatocellular inflammation. Such abnormalities are generally self-limited but may serve as an additional diagnostic clue.

Public Health Importance

This cluster has implications extending beyond individual patient care.

First, it demonstrates that clinicians should maintain suspicion for measles even among fully vaccinated individuals.

Second, it highlights the limitations of relying exclusively on serological testing during outbreak investigations.

Third, it underscores the continued importance of surveillance systems capable of identifying both classical and modified measles presentations.

Finally, the report contributes to the limited literature describing laboratory-confirmed breakthrough measles in children from regions actively pursuing measles elimination.

Learning Points

1. Measles can occur despite complete childhood immunization.
2. Breakthrough measles should be considered in vaccinated children presenting with fever and rash.
3. Negative measles IgM does not exclude measles during the early phase of illness.
4. Epidemiological linkage remains critical during outbreak investigations.
5. Mild hepatic dysfunction may accompany measles infection.
6. Immunization gaps continue to threaten measles elimination efforts.

CONCLUSION

This pediatric cluster demonstrates the coexistence of classical measles in an unimmunized child and breakthrough measles in a fully immunized adolescent. The occurrence of laboratory-confirmed measles despite complete vaccination, together with clinically compatible but serologically negative cases, highlights the evolving challenges facing measles surveillance programs. Recognition of modified measles, careful interpretation of serological testing, and maintenance of high clinical suspicion remain essential for achieving and sustaining measles elimination goals.

REFERENCES

1. World Health Organization. Measles vaccines: WHO position paper. *Weekly Epidemiological Record*. 2017;92:205–228.
2. World Health Organization. Progress toward regional measles elimination worldwide. *Weekly Epidemiological Record*. 2023.

3. Cherry JD, Zahn M. Clinical characteristics of measles in previously vaccinated and unvaccinated patients. *Journal of Infectious Diseases*. 2018;218(10):1610–1618.
4. Poland GA, Jacobson RM. Failure to reach the goal of measles elimination. Apparent paradox of measles infections in immunized persons. *Archives of Internal Medicine*. 1994;154:1815–1820.
5. Rosen JB, Rota JS, Hickman CJ, et al. Outbreak of measles among persons with prior evidence of immunity. *Clinical Infectious Diseases*. 2014;58(9):1205–1210.
6. World Health Organization. Regional Strategic Plan for Measles and Rubella Elimination.
7. Centers for Disease Control and Prevention. Measles Vaccination: Effectiveness and Protection.
8. Fiebelkorn AP, Redd SB, Kuhar DT. Measles in vaccinated persons. *Current Epidemiology Reports*. 2017;4:134–141.
9. Kontio M, Jokinen S, Paunio M, et al. Waning antibody levels and avidity: implications for MMR vaccine-induced protection. *Vaccine*. 2012;30:2192–2198.
10. Rota PA, Moss WJ, Takeda M, et al. Measles. *Nature Reviews Disease Primers*. 2016;2:16049.
11. Helfand RF, Keyserling HL, Williams I, et al. Comparative detection of measles-specific IgM in serum and oral fluid samples. *Journal of Infectious Diseases*. 1996;173:1470–1474.
12. Fine P, Eames K, Heymann DL. Herd immunity: a rough guide. *Clinical Infectious Diseases*. 2011;52:911–916.
13. Gavish D, Kleinman Y, Morag A, Chajek-Shaul T. Hepatitis and jaundice associated with measles in young adults. *Archives of Internal Medicine*. 1983;143:674–677.