



The Re-emergence of Measles in Children in Bangladesh: A Review of Outbreak Patterns and Updated Management

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Abstract

Measles remains a major vaccine-preventable public health threat globally and in Bangladesh, particularly among children, despite substantial progress in immunization. Recent post-pandemic resurgence, persistent immunity gaps, and delayed or incomplete vaccination have contributed to renewed outbreaks, especially among under-immunized infants and young children. This review assessed the re-emergence of measles in children in Bangladesh, focusing on outbreak patterns, determinants of susceptibility, and updated approaches to management and prevention. This narrative review summarized published evidence on the re-emergence of measles in children in Bangladesh. A structured search of PubMed, Google Scholar, Scopus, BanglaJOL, and open-access reports from WHO, UNICEF, and the Government of Bangladesh was conducted for literature published from January 2010 to March 2026. Screened studies and reports were synthesized descriptively under themes of outbreak patterns, risk factors, clinical features, management, and prevention. The review identified that the re-emergence of measles among Bangladeshi children is primarily linked to immunity gaps, delayed or incomplete vaccination, and concentrated susceptibility among infants, under-immunized children, and populations that are hard to reach or displaced. Recent outbreaks have predominantly affected children under one year of age, with pneumonia and diarrhea being the most common complications. Although national immunization coverage has increased, persistent subnational inequities, missed children, and surveillance deficiencies continue to facilitate outbreaks. These findings underscore the importance of timely vaccination, early case detection, and updated supportive management strategies. Measles continues to pose a significant public health threat to children in Bangladesh, primarily due to immunity gaps, delayed or incomplete vaccination, and increased vulnerability among infants and underserved populations. Enhancing timely administration of the two-dose vaccine, strengthening surveillance systems, improving outbreak response, and updating case management protocols are critical for effective measles control.

Keywords: Measles; Children; Bangladesh; Outbreak patterns; Vaccination coverage

Introduction

Measles remains a major global public health concern despite the availability of a safe and highly effective vaccine. As one of the most contagious human infections, even minor declines in population immunity can quickly lead to new outbreaks, especially in children. From 2000 to 2023, measles vaccination prevented an estimated 60.3 million deaths, yet progress has stalled. In 2023, first-dose vaccine coverage stayed at 83%, cases rose by about 20% compared to 2022, and the number of countries with major outbreaks increased from 36 to 57 [1]. Together, these trends highlight measles as an indicator of weaknesses in immunization systems and an ongoing risk to child

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survival, particularly where two-dose coverage is inadequate [1,2].

The burden of measles is concentrated in low- and middle-income countries, where under-vaccination, crowding, malnutrition, and delayed access to care often coexist. A recent systematic review of the early impact of COVID-19 in these countries found that first-dose measles vaccine coverage fell by a median of 23.3%. Second-dose coverage dropped by 48.2% during disruption periods [2]. The review highlighted that most unvaccinated children live in lower-resource settings. This helps explain the pronounced measles resurgence [2]. Children under five, especially those too young for the first scheduled dose, are most vulnerable. This is due to severe outcomes in this group and to amplified risk from undernutrition, vitamin A deficiency, poor access to health services, and low immunization coverage [3]. In a Bangladeshi study of under-five measles cases, the majority were younger than 9 months. Pneumonia and diarrhea were common complications, underscoring the combined effect of biological susceptibility and delayed vaccine protection [4].

Bangladesh has made notable progress in measles control through the Expanded Programme on Immunization and supplementary immunization activities, but recent evidence shows this progress is fragile. In 2016, a national report documented 21 outbreaks and 972 confirmed measles cases, demonstrating persistent transmission in susceptible pockets [5]. More recent Demographic and Health Survey data indicate that full basic vaccination coverage improved to 88%–89%, but maternal education, media exposure, geography, and household conditions remained key determinants [6,7]. However, national averages may hide local immunity gaps. Hospital studies from Chattogram underscore this: during the 2019–2020 upsurge, 67.6% of affected children were under one year old and 80% were unvaccinated; another facility-based study found 69% had incomplete or no vaccination and just 31% completed two doses [8,9]. These findings indicate that measles re-emergence in Bangladesh results more from delayed vaccination, missed children, and clusters of under-immunized infants and young children than vaccine failure.

A review is needed now because the post-pandemic global resurgence of measles coincides with renewed evidence of pediatric susceptibility in Bangladesh, while the available literature remains scattered across surveillance reports, national vaccination analyses, and single-centre hospital studies [1,2,5–9]. There is also a practical need to bring epidemiologic patterns together with updated clinical and public health priorities, as measles in Bangladeshi children carries not only risks of preventable complications and deaths but also substantial family and health-system costs [3,10]. A contemporary narrative synthesis can therefore help clarify who is most at risk, where immunity gaps remain, and how outbreak response and case management should be updated in

the current context. This review examines the re-emergence of measles among children in Bangladesh, with particular emphasis on outbreak patterns, determinants of susceptibility, and updated approaches to management and prevention.

Methods

This article was prepared as a narrative review to summarize evidence on the re-emergence of measles in children in Bangladesh. It focuses on outbreak patterns, contributing factors, and updated management. A narrative approach was chosen because the literature includes diverse sources, including surveillance reports, outbreak investigations, hospital-based studies, analyses of vaccination coverage, and guideline documents.

A structured literature search was conducted in PubMed, Google Scholar, Scopus, and BanglaJOL. We also included open-access reports from the World Health Organization, UNICEF, and Government of Bangladesh. The search covered publications from January 2010 to March 2026. Search terms included measles, children, pediatric, Bangladesh, outbreak, vaccination, immunization coverage, complications, management, vitamin A, and surveillance. Reference lists of selected articles were also manually screened.

Eligible sources included open-access, English-language, peer-reviewed original articles, outbreak investigations, epidemiological studies, hospital-based pediatric studies, vaccination coverage analyses, and relevant guideline-based reports related to measles in children. Bangladesh-specific studies were prioritized. Selected regional and global references were included where necessary for context and updated management. Articles focusing only on adults, unrelated diseases, duplicate reports, editorials, conference abstracts without full text, and studies lacking sufficient relevance were excluded.

Data from the included literature were reviewed and organized under major thematic domains: global importance of measles, burden in low- and middle-income countries, vulnerability of children, measles epidemiology in Bangladesh, outbreak patterns, contributory risk factors, clinical manifestations and complications, diagnosis, updated management, and prevention strategies. Information was synthesized descriptively rather than statistically. Special emphasis was placed on the consistency of findings across studies, public health relevance, and applicability to the Bangladeshi pediatric context. As this was a review of previously published literature, the authors did not undertake direct patient enrollment, and ethical approval was therefore not required.

Results

The selected studies indicate that Bangladesh's measles problem is no longer simply one of low national coverage,

but of clustered susceptibility, especially among infants, delayed or incomplete vaccine recipients, and displaced populations (Table 1).

Table 1: Summary of selected studies on measles outbreaks in Bangladesh.

Author	Year	Study type	Study area	Population	Key findings
Khanal et al. [5]	2017	National surveillance and program review	Bangladesh	National child population covered by routine immunization and supplementary immunization activities	MCV1 coverage increased from 74% in 2000 to 94% in 2016, MCV2 rose to 93% by 2016, and confirmed measles incidence declined substantially; however, surveillance and district-level elimination targets were not uniformly achieved.
Feldstein et al. [11]	2020	Cross-sectional vaccination coverage survey and seroprevalence study	Cox's Bazar, Bangladesh	Forcibly displaced Rohingya children, 1 to 14 years	Post-campaign seroprotection against measles was high among surveyed Rohingya children, showing the effectiveness of emergency vaccination, though the setting remained vulnerable because of prior immunity gaps and population movement.
Chin et al. [12]	2020	Modeling study	Rohingya refugee camps, Cox's Bazar	Camp population, especially children targeted during outbreak response	After the 2017 outbreak, reactive MR vaccination campaigns were estimated to have averted about 77,000 measles cases, emphasizing the explosive transmission potential in low-immunity settings.
Ferdousi et al. [8]	2023	Hospital-based descriptive study	Chattogram	65 children with measles during the 2019 to 2020 upsurge	Most cases were below 1 year of age and most were unvaccinated; common complications included bronchopneumonia and purulent conjunctivitis.
Tauhid et al. [13]	2024	Descriptive study of confirmed cases	Bangladesh, hospital-based under-five setting	74 under-five children with confirmed measles	Children below 9 months were the most vulnerable group, and pneumonia and diarrhea were the most frequent complications.
Sabia et al. [9]	2025	Descriptive cross-sectional study	Chattogram	100 children aged 5 years and below	A large proportion had incomplete or no vaccination, supporting the role of delayed or incomplete immunization in continued pediatric transmission.

Bangladesh studies on vaccination coverage and outbreak epidemiology point repeatedly to educational inequity, wealth-related disadvantage, geographic disparity, delayed completion of measles vaccination, and vulnerability in displaced populations as the main conditions allowing re-emergence (Table 2).

Table 2: Risk factors associated with measles re-emergence in children in Bangladesh.

Risk factor	Mechanism	Public health significance
Age below first routine measles dose, especially under 9 months	Infants remain immunologically vulnerable before scheduled vaccination at 9 months	Creates a susceptible pool that can amplify outbreaks and contributes to early severe disease burden
Delayed, missed, or incomplete vaccination	Leaves children partially protected or unprotected; dropout between early infant vaccines and measles dose sustains transmission	A major modifiable driver of resurgence; supports catch-up vaccination and defaulter tracing
Invalid doses and poor schedule completion	Children may be recorded as vaccinated but remain inadequately protected	Distorts program performance and requires better vaccination quality monitoring
Low maternal education	Reduces awareness of schedule completion, complications, and the importance of timely vaccination	Indicates need for caregiver-focused health education
Limited media exposure and poor health information access	Weakens awareness of vaccine schedules and outbreak alerts	Supports targeted communication strategies in low-performing areas
Poverty and low household resources	Increases missed appointments, transport barriers, and competing survival priorities	Reinforces the need for outreach services and equity-focused immunization planning
Geographic inequity	Some divisions and districts perform worse than others in full vaccination coverage	Requires district-level microplanning rather than reliance on national averages

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Displacement, camp settings, and hard-to-reach populations	Overcrowding, mobility, disrupted services, and prior low coverage increase contact rates and vulnerability	Makes outbreak-prone pockets persist even when national coverage appears high
Overcrowding and high-contact environments	Measles spreads efficiently in dense households, camps, and institutional settings	Raises the urgency of rapid case detection and reactive immunization
Surveillance gaps and delayed outbreak response	Late recognition allows chains of transmission to expand before control measures begin	Strong surveillance is essential for elimination and outbreak containment
Malnutrition and vitamin A deficiency	Increase risk of severe disease, prolonged illness, and complications	Adds clinical severity and raises mortality risk, especially in under-fives

Current guidance remains centered on supportive care, early vitamin A, treatment of bacterial complications when present, and strict isolation, while post-exposure prophylaxis is critical for susceptible contacts during outbreak response (Table 3).

Table 3: Updated management of measles in children.

Clinical Issue	Recommended Management	Remarks
Uncomplicated measles	Supportive care, rest, adequate oral fluids, continued feeding, antipyretics, and monitoring for complications	There is no specific antiviral therapy approved for routine measles treatment
Vitamin A supplementation	Give promptly after diagnosis, then repeat the next day	Age-specific doses: 50,000 IU for infants under 6 months, 100,000 IU for 6 to 11 months, and 200,000 IU for 12 months or older
Dehydration or poor oral intake	Oral rehydration solution for mild to moderate dehydration; intravenous fluids if severe or unable to drink	Particularly important when fever, poor intake, vomiting, or diarrhea are present
Pneumonia or suspected secondary bacterial infection	Assess severity and treat with appropriate antibiotics when bacterial superinfection is suspected	Antibiotics are not for measles itself, but for bacterial complications such as pneumonia or otitis media
Diarrhea	ORS, zinc where age-appropriate under local protocols, nutrition support, and monitoring for dehydration	Common complication in Bangladeshi children with measles
Eye involvement, conjunctivitis, or ocular complications	Gentle eye care, vitamin A, and urgent ophthalmic review if corneal involvement or visual risk is suspected	Important where vitamin A deficiency or severe malnutrition coexist
Severe measles, encephalitis, hypoxia, or inability to maintain hydration	Hospital admission, close monitoring, oxygen if required, seizure management when indicated, and treatment of complications	Infants, malnourished children, and immunocompromised children warrant lower admission thresholds
Infection prevention and control	Immediate isolation of suspected or confirmed cases; airborne precautions in health facilities	Reduces nosocomial spread and protects unvaccinated contacts and staff
Exposed susceptible contacts	Post-exposure prophylaxis with MMR within 72 hours of exposure, or immune globulin within an appropriate window for high-risk contacts	This is outbreak control, not treatment of established disease
Nutritional support	Continue breastfeeding, maintain calorie intake, and assess for malnutrition	Nutritional recovery improves resilience and may reduce complication burden

Discussion

The reviewed evidence demonstrates that the re-emergence of measles among Bangladeshi children should be attributed not to a failure of vaccination as a concept, but to the inability to maintain consistently high, timely, and equitable immunity across all subpopulations. Globally, measles control has become increasingly fragile following the COVID-19 period, as first-dose coverage remains below the threshold required to interrupt transmission and the number of countries experiencing large or disruptive outbreaks has risen [2,14]. This global reversal is also evident within the WHO South-East Asia Region, where elimination efforts have achieved significant progress, yet the region remains off track because high national averages continue to obscure

subnational pockets of susceptibility [15]. Bangladesh, therefore, exemplifies a broader regional and global trend: measles resurges wherever immunity gaps accumulate more rapidly than health systems can identify and address them.

Despite these challenges, Bangladesh has achieved considerable progress over the past two decades. Early national initiatives, such as supplementary immunization activities and the introduction of a second measles-containing dose, significantly reduced incidence and enhanced population-level protection [5]. However, current evidence indicates that this progress has plateaued at a level insufficient to control a virus as highly transmissible as measles. Nationally representative analyses consistently demonstrate that while childhood vaccination coverage has improved over time, it

remains uneven across administrative divisions and social groups. Factors such as maternal education, household wealth, media exposure, antenatal care utilization, family size, place of residence, and possession of vaccination cards all influence completion of the vaccination schedule [6,7,16,17]. Consequently, the primary epidemiologic challenge in Bangladesh is now less about low national coverage and more about incomplete coverage, delayed dosing, dropout, invalid doses, and inequities between communities. For a disease that typically requires at least 95% two-dose coverage in every district, this “near-success” remains epidemiologically unstable [6,7,15].

An important finding from the Bangladeshi literature is that susceptibility to measles is clustered rather than randomly distributed. Recent studies on zero-dose and under-immunized children reveal that vulnerable populations are concentrated in hard-to-reach areas, including haor, coastal, hilly, and char regions, as well as urban slums and communities distant from Expanded Programme on Immunization (EPI) centers [18,19]. The Rohingya context introduces a humanitarian aspect to this pattern. While emergency campaigns in Cox’s Bazar achieved high levels of seroprotection among surveyed children and likely prevented numerous additional cases, the refugee setting underscores that crowding, displacement, disrupted routine services, and rapid population movement can rapidly facilitate explosive measles transmission [11,12]. Thus, the resurgence of measles in Bangladesh is best understood as the result of interactions between routine immunization gaps and high-risk environments where these gaps are intensified.

Clinical evidence aligns closely with epidemiologic findings. Hospital-based studies from Bangladesh indicate that measles cases disproportionately affect children under one year of age, particularly those younger than nine months. These children are either too young to receive the first routine dose or have experienced delayed vaccination after becoming eligible [8,4,9,20]. This pattern highlights a biologically and programmatically vulnerable period during which infants are exposed to intense community transmission before formal protection is established. Reported complications in Bangladeshi children, including pneumonia, diarrhea, and conjunctival involvement, are consistent with broader evidence that young age, malnutrition, crowding, and limited access to timely care increase the risk of severe outcomes and case fatality [3,4,8,9,20]. Therefore, the evidence indicates that outbreak control and case management are interdependent: delayed vaccination increases case numbers, and the same structural vulnerabilities that delay vaccination also exacerbate disease severity.

In comparison with neighboring countries, Bangladesh performs better than some at the national level but continues

to face similar last-mile challenges. Recent registry-based analysis from Pakistan indicates that timely measles vaccination remains a significant issue even when nominal coverage is high, while evidence from India demonstrates that large-scale, campaign-based interventions can substantially reduce mortality [21,22]. These comparisons illustrate that Bangladesh is not unique in the factors driving measles resurgence: delayed vaccination, missed opportunities, social inequity, and subnational heterogeneity are persistent issues across South Asia [15,21,22]. The practical implication is that Bangladesh should not depend solely on national coverage indicators. Instead, emphasis should shift to district- and community-level microplanning, active defaulter tracing, rapid identification of zero-dose children, outreach in urban slums and hard-to-reach areas, enhanced case-based surveillance, and rigorous infection prevention in health facilities, particularly given previous documentation of nosocomial transmission during outbreaks [5,18,19].

Limitations of the Study: As a narrative review, this study is potentially subject to selection bias. The limited availability of Bangladesh-specific evidence, along with the predominance of hospital-based and heterogeneous studies, may limit generalizability and hinder direct comparison.

Conclusion

Measles continues to pose a re-emerging public health threat among children in Bangladesh, despite significant improvements in immunization coverage. Recent evidence indicates that outbreaks are primarily driven by immunity gaps, delayed or incomplete vaccination, and increased vulnerability among infants and underserved populations. Enhancing timely administration of the two-dose vaccine, strengthening surveillance, improving outbreak response, and updating case management protocols are essential measures to reduce complications and advance measles control efforts among Bangladeshi children.

Recommendations

Routine measles immunization coverage should be strengthened with special attention to timely completion of the two-dose schedule. Targeted outreach is needed for zero-dose, under-immunized, hard-to-reach, and displaced children. Surveillance and rapid outbreak response should be improved to detect and contain cases early. Greater caregiver awareness, nutritional support, and availability of standard case management, including vitamin A supplementation, are also recommended. Further Bangladesh-specific studies are needed to monitor changing outbreak patterns and guide policy.

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