



Differences in Clinical Manifestations of Measles in Children with Complete and Incomplete Immunization History: Literature Review

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Abstract

Measles is a highly contagious acute infectious disease. The six clinical manifestations assessed in this review are fever, cough, coryza, conjunctivitis, shortness of breath, and diarrhea. This literature review aims to analyze differences in these six manifestations in children based on their history or level of measles immunization completion. A search was conducted through PubMed, Google Scholar, and ScienceDirect, prioritizing original studies from 2020–2026. Articles in Indonesian, English, or other languages that were available in full text and could be adequately extracted were included. A total of five pediatric studies were included in the narrative and comparative synthesis. The results showed that fever was the most common symptom across all groups, thus limiting the ability to clinically differentiate immunization status. Cough, coryza, and diarrhea tended to be lower in vaccinated children in some studies, while findings regarding conjunctivitis were inconsistent. Direct evidence regarding shortness of breath is limited because most studies reported indirect respiratory indicators. In conclusion, a history of measles immunization tends to be associated with milder manifestations in some outcomes, but does not exclude the possibility of measles. Diagnosis still requires clinical assessment, epidemiological history, and laboratory confirmation.

Introduction

Measles is an acute infectious disease caused by the measles virus, a member of the genus *Morbivirus* in the family *Paramyxoviridae*. Transmission occurs primarily through the air and respiratory droplets expelled when an infected person breathes, coughs, or sneezes. Its highly contagious nature makes measles prone to outbreaks in populations with inadequate immunity. The prodromal phase is generally characterized by fever and the three classic respiratory symptoms (or 3Cs): cough, coryza, and conjunctivitis (Derakhshan-Nezhad, 2025). Lower respiratory tract involvement can cause shortness of breath, while gastrointestinal involvement can cause loose stools or diarrhea (World Health Organization, 2025; Hübschen et al., 2022; Galanopoulos et al., 2020; Han et al., 2020; Minodier et al., 2017; Jagirdhar et al., 2023).

Measles remains a public health problem despite the availability of an effective vaccine. The World Health Organization estimates that there will be approximately 95,000 measles deaths

globally by 2024, the majority of which will occur in children under five who are unvaccinated or incompletely immunized. Global coverage of the first dose of measles vaccine that year reached 84%, while coverage of two doses was 76%, leaving approximately 30 million infants without adequate protection (World Health Organization, 2025; Minta, 2023; Plans-Rubió, 2025; Wang et al., 2022).

The burden of measles also persists in Indonesia. In 2022, 4,845 laboratory-confirmed measles cases and six deaths were reported from 32 provinces. Ninety-three percent of cases with age information occurred in the 1–14 age group. Based on immunization status, 67% of cases had never received a measles antigen-containing vaccine, 6% had received one dose, and 7% had received two doses. Between January 1–April 3, 2023, 2,161 suspected or clinically compatible measles cases were reported from 18 provinces; most of the confirmed cases with age information were also found in children aged 1–14, and 75% had never received the measles vaccine (World Health Organization, 2023; Hailu et al., 2022; Tesfa et al., 2022; Memon et al., 2025).

The clinical presentation of measles can vary among individuals in terms of the incidence, intensity, and duration of symptoms (Nwalozie et al., 2023; Bîrluțiu et al., 2023). The duration of fever and the incidence of cough, coryza, conjunctivitis, shortness of breath, and diarrhea do not always show a uniform pattern. These variations can be influenced by age, nutritional status, immunological condition, timing of examination, complications, diagnostic method, and immunization history. Measles in vaccinated individuals may exhibit milder manifestations or may not exhibit the entire combination of classic symptoms (Hübschen et al., 2022; Leung et al., 2025; Bonneton et al., 2020).

Measles vaccination stimulates the formation of protective antibodies and immune memory, which play a role in limiting viral replication and spread (Rabaan et al., 2022; Au et al., 2026; Merabti et al., 2026). However, infection can still occur in vaccinated individuals, known as breakthrough measles. Some cases may present as modified measles, which is measles with less intense symptoms, a shorter duration, or an incomplete presentation. Research shows that vaccination is associated with a reduction in disease severity, although it does not provide absolute protection in all individuals (Leung et al., 2025; Bonneton et al., 2020).

The level of protection is influenced by the number of doses, age at vaccination, initial serological response, and antibody persistence. Administration of two vaccine doses generally results in more consistent immunogenicity and protection than a single dose. Variations in the immune response between individuals can still lead to differences in the level of protection and clinical characteristics if infection occurs (Carazo et al., 2020; Schenk et al., 2021; van Dorst et al., 2024; Quiros-Roldan et al., 2024).

Immunization status is an important aspect in interpreting variations in measles clinical manifestations because the level of protection can vary depending on the number of doses received (Stein-Zamir et al., 2023; Hussain et al., 2026). Classification of immunization status across studies is not consistent; some studies compare vaccinated and unvaccinated groups, while others distinguish between zero doses, one dose, at least two doses, or complete immunization for age. Not all studies report the six manifestations separately by immunization status. This discrepancy results in varying comprehensiveness and strength of evidence for each manifestation (Leung et al., 2025; Miao et al., 2023; Mawlood et al., 2025; Alsulaiman et al., 2025; Akçay et al., 2026; Belcadi Abassi et al., 2026).

This study aims to analyze the differences in clinical manifestations of measles in children with a history of complete and incomplete immunization based on a synthesis of scientific literature. Specifically, this study compares the incidence and/or duration of fever; the incidence and/or duration of cough; the incidence of coryza; the incidence of conjunctivitis; the incidence of shortness of breath or respiratory distress; and diarrhea. This study also identifies heterogeneity

and limitations in the evidence that influence the interpretation of differences in these six manifestations.

Methods

This study employed a structured literature review with narrative and comparative synthesis to examine differences in the clinical manifestations of measles among children according to their immunization status. Narrative synthesis was selected because the eligible studies showed substantial heterogeneity in study design, clinical setting, population characteristics, measles diagnostic criteria, immunization-status classification, and outcome measurement; therefore, a meta-analysis was not considered appropriate.

The literature search was conducted in PubMed, Google Scholar, and ScienceDirect for studies published between January 2020 and August 2026. The search strategy combined terms related to measles, pediatric populations, immunization status, and clinical manifestations: (“measles” OR “rubeola”) AND (“child” OR “children” OR “pediatric”) AND (“vaccination status” OR “immunization status” OR “fully vaccinated” OR “partially vaccinated” OR “unvaccinated”) AND (“fever” OR “cough” OR “coryza” OR “conjunctivitis” OR “dyspnea” OR “shortness of breath” OR “respiratory distress” OR “diarrhea”). The reference lists of relevant articles were also screened to identify additional eligible studies.

Studies were included if they: (1) were original studies involving participants younger than 18 years or reported pediatric findings separately; (2) diagnosed measles using clinical, epidemiological, and/or laboratory criteria; (3) reported measles immunization status or the number of vaccine doses received; (4) presented at least one of the six outcomes of interest—fever, cough, coryza, conjunctivitis, shortness of breath or respiratory involvement, and diarrhea; and (5) were available in full text with adequately extractable data. Studies were excluded if they involved only adults, combined adult and pediatric populations without separately reported pediatric findings, did not report immunization status, did not present any of the six specified outcomes, or consisted of reviews, editorials, commentaries, letters, case reports, duplicate publications, or studies without primary data.

Study selection was conducted through title and abstract screening, followed by full-text assessment. Five pediatric studies met the eligibility criteria and were included in the primary synthesis. Three additional Indonesian studies were used only to provide national epidemiological and clinical context because they did not comprehensively report the six outcomes or did not present clinical manifestations separately according to immunization status. Consequently, these supporting studies were not included in the comparative synthesis table.

The extracted data included the author and publication year, country, study design, clinical setting, sample size, population characteristics, measles diagnostic criteria, immunization-status classification, frequency of each clinical manifestation, indicators of respiratory involvement, and reported *p*-values. Immunization categories were retained according to the definitions used in each original study because the classifications varied considerably and could not be reliably standardized into complete and incomplete immunization groups. Findings reported only for the total study population were presented as aggregate data and were not interpreted as evidence of differences between immunization groups.

The six prespecified outcomes were fever, cough, coryza, conjunctivitis, diarrhea, and shortness of breath or respiratory involvement. Shortness of breath and respiratory distress were considered direct respiratory outcomes, whereas respiratory failure, hypoxemia, oxygen requirement, pneumonia, respiratory complications, and intensive-care admission were treated as indirect indicators of respiratory involvement. The findings were synthesized narratively by comparing the direction, magnitude, and statistical significance of differences between

immunization groups. No pooled effect estimate was calculated because of the methodological and clinical heterogeneity among the included studies.

Result and Discussion

Five pediatric studies were included in the synthesis, comprising retrospective studies, prospective cohort studies, and multicenter studies of hospitalized and PICU patients. The number of subjects ranged from 53 to 726 children. Classification of immunization status varied across studies, including vaccinated and unvaccinated; zero doses and one dose; zero, one, and at least two doses; and complete, partial, and no immunization according to age. The results of each study were maintained based on the original classification and were not simplified into vaccinated and unvaccinated groups.

In addition to the five primary studies used in the comparative synthesis, three national articles were cited as supporting sources to provide epidemiological and clinical context for measles in children in Indonesia. These three articles demonstrated that immunization status is an important factor associated with the incidence and characteristics of measles in the pediatric population. However, these articles were not included in the main synthesis tables because they did not present the six clinical outcomes studied in full and/or did not report clinical manifestations separately by immunization status group.

Table 1 presents the six clinical manifestations assessed in each primary study. The term “total data” is used when articles present overall figures without figures per immunization group. Shortness of breath and respiratory distress are treated as direct outcomes, while pneumonia, bronchopneumonia, respiratory failure, hypoxemia, oxygen requirement, and intensive care admission are listed as indirect indicators of respiratory involvement.

Table 1. Synthesis of clinical manifestations of measles based on the classification of immunization status in each study

Author	Design and population	Immunization group	Fever	Cough	Coryza	Conjunctivitis	Shortness of breath or indicators of respiratory involvement	Diarrhea
Miao et al. (2023) ⁸	Retrospective; 726 children, China	Unvaccinated n=622; vaccinated n=104	High fever: unvaccinated 66.9% compared to vaccinated 75.0%; p=0.100.	Unvaccinated 77.2% compared to vaccinated 63.5%; p=0.003.	Unvaccinated 28.0% compared to vaccinated 22.1%; p=0.214.	Conjunctival congestion: unvaccinated 45.0% compared to vaccinated 24.0%; p<0.001.	Shortness of breath was not reported directly. Respiratory failure: unvaccinated 8.2% compared to vaccinated 4.8%; p=0.230.	Unvaccinated 29.3% compared to vaccinated 18.3%; p=0.020.
Mawlood et al. (2025) ⁹	Prospective cohort; 289 children, Iraq	Not vaccinated n=187; vaccinated n=102	Fever was reported to be common in both groups; it was not used as a basis for quantitative comparison.	Unvaccinated 97.3% compared to vaccinated 93.1%; p=0.088.	Unvaccinated 78.1% compared to vaccinated 60.8%; p=0.002.	Unvaccinated 90.9% compared to vaccinated 96.1%; p=0.106.	Shortness of breath was not directly reported. RCU care: unvaccinated 2.1% vs. vaccinated 1.0%; p=0.470.	Unvaccinated 37.4% compared to vaccinated 22.5%; p=0.010.

Alsulaiman et al. (2025) ¹⁰	Retrospective; 63 children confirmed IgM, Jordan	No immunization n=40; one dose n=8; two/three doses n=15	Total data: 60/63 (95.2%).	Total data: 43/63 (68.2%).	Total data: 34/63 (53.9%).	Total data: 24/63 (38.1%).	Severe distress in 1 NICU patient and 3 PICU patients; 4 patients required oxygen. Data are presented as total outcomes..	Total data: 18/63 (28.5%).
Akçay et al. (2026) ¹¹	Multicenter retrospective; 53 PICU children, Turkey	Vaccinated n=10; unimmunized in analysis n=43	Without immunization 97.7% compared to vaccinated 100%; p=0.581.	Without immunization 81.4% compared to vaccinated 80.0%; p=0.612.	Without immunization 69.8% compared to vaccinated 20.0%; p=0.009.	Without immunization 32.6% compared to vaccinated 40.0%; p=0.719.	Respiratory distress: 83.7% without immunization compared to 90.0% with vaccination; p=0.527. SpO2 was lower in the unimmunized group; p=0.015.	Without immunization 11.6% compared to vaccinated 30.0%; p=0.163.
Belcadi Abassi et al. (2026) ¹²	Retrospective; 587 hospitalized children, Morocco	Complete 23%; partial 16%; without immunization 61%	Total data: 587/587 (100%).	Total data: 73%.	Total data: 36%.	Total data: 91%.	Distress was cited as the reason for admission; respiratory complications 54%. Data are presented as total outcomes.	Digestive complications 32%; diarrhea not quantified separately.

Note: Immunization status classification was maintained according to the definitions of each study. Total data represent the overall figures presented in the article and are not used to infer intergroup differences. PICU = pediatric intensive care unit; NICU = neonatal intensive care unit; RCU = respiratory care unit; SpO2 = peripheral oxygen saturation; p = probability value.

Fever

Fever is one of the most common clinical manifestations of measles. Miao et al. found no significant difference in the incidence of high fever between unvaccinated and vaccinated children, with rates of 66.9% and 75.0%, respectively (p=0.100) (Miao et al., 2023). Similar findings were reported by Akçay et al. in a PICU patient population, with fever present in almost all patients, both in the unvaccinated and vaccinated groups (97.7% compared to 100%; p=0.581) (Akçay et al., 2026). Alsulaiman et al. and Belcadi Abassi et al. also reported a high overall frequency of fever, with rates of 95.2% and 100%, respectively (Alsulaiman et al., 2025; Belcadi Abassi et al., 2026). These findings indicate that fever can persist in children with measles despite a history of vaccination, and therefore, the absence of fever cannot be used to clinically differentiate immunization status.

Cough

The manifestation of cough has shown variable results across studies. Miao et al. reported a lower proportion of cough in the vaccinated group compared to the unvaccinated group, 63.5% compared to 77.2% (p=0.003) (Miao et al., 2023). Mawlood et al. showed a similar trend, with lower cough in the vaccinated group compared to the unvaccinated group, although the difference was not statistically significant (93.1% compared to 97.3%; p=0.088) (Mawlood et al., 2025). In contrast, Akçay et al. found no significant difference in measles patients requiring

intensive care (80.0% compared to 81.4%; $p=0.612$) (Akçay et al., 2026). In the studies by Alsulaiman et al. and Belcadi Abassi et al., cough was reported as a whole in 68.2% and 73%, respectively, without separate analysis by immunization status (Alsulaiman et al., 2025; Belcadi Abassi et al., 2026).

Coryza

Coryza tends to be lower in vaccinated children in some studies. Mawlood et al. found that the proportion of coryza was higher in the unvaccinated group than in the vaccinated group, at 78.1% compared to 60.8% ($p=0.002$) (Mawlood et al., 2025). Akçay et al. also showed a significant difference, with coryza being more common in the unvaccinated group than in the vaccinated group (69.8% compared to 20.0%; $p=0.009$) (Akçay et al., 2026). Miao et al. reported similar findings, but did not reach statistical significance (28.0% compared to 22.1%; $p=0.214$) (Miao et al., 2023). Meanwhile, Alsulaiman et al. and Belcadi Abassi et al. only reported the overall frequency of coryza, at 53.9% and 36%, respectively (Alsulaiman et al., 2025; Belcadi Abassi et al., 2026).

Conjunctivitis

Results regarding conjunctivitis still showed heterogeneity. Miao et al. reported that conjunctival congestion was significantly lower in the vaccinated group than in the unvaccinated group, at 24.0% compared to 45.0% ($p<0.001$) (Miao et al., 2023). Conversely, Mawlood et al. reported a higher rate in the vaccinated group, although the difference was not statistically significant (96.1% compared to 90.9%; $p=0.106$) (Mawlood et al., 2025). Akçay et al. also found no significant difference in the PICU patient population (40.0% compared to 32.6%; $p=0.719$) (Akçay et al., 2026). In the studies by Alsulaiman et al. and Belcadi Abassi et al., conjunctivitis was only reported as a total, at 38.1% and 91%, respectively (Alsulaiman et al., 2025; Belcadi Abassi et al., 2026). Thus, the available evidence does not yet demonstrate a consistent pattern of association between immunization status and conjunctivitis incidence.

Shortness of breath or indicators of respiratory involvement

Direct evidence regarding shortness of breath by immunization status is limited. Akçay et al. is one of the studies that presents a direct comparison of respiratory distress in measles patients admitted to the PICU. The study found no significant difference between the unimmunized and vaccinated groups (83.7% compared to 90.0%; $p=0.527$), although SpO_2 values were reported to be lower in the unimmunized group ($p=0.015$) (Akçay et al., 2026). Miao et al. reported respiratory failure as an indirect indicator of respiratory involvement, with a proportion of 8.2% in the unvaccinated group and 4.8% in the vaccinated group ($p=0.230$) (Miao et al., 2023). Mawlood et al. reported no significant difference in the need for care in the respiratory care unit between the unvaccinated and vaccinated groups (2.1% compared to 1.0%; $p=0.470$) (Mawlood et al., 2025). Meanwhile, Alsulaiman et al. and Belcadi Abassi et al. reported severe distress, oxygen requirement, or respiratory complications as aggregate data (Alsulaiman et al., 2025; Belcadi Abassi et al., 2026). Therefore, the effect of immunization status on the incidence of shortness of breath cannot be concluded with certainty.

Diarrhea

Diarrhea has been found to be more common in the unvaccinated group in several comparative studies. Miao et al. reported that diarrhea occurred in 29.3% of unvaccinated children and 18.3% of vaccinated children ($p=0.020$) (Miao et al., 2023). Mawlood et al. also found a higher proportion of diarrhea in the unvaccinated group than in the vaccinated group, 37.4% compared to 22.5% ($p=0.010$) (Mawlood et al., 2025). In Akçay et al.'s study, the proportion of diarrhea was numerically higher in the vaccinated group, but the difference was not statistically significant, and the number of vaccinated subjects was relatively small, only 10 children (30.0% compared to 11.6%; $p=0.163$) (Akçay et al., 2026). Alsulaiman et al. reported diarrhea

as a total of 28.5%, while Belcadi Abassi et al. reported digestive complications in 32% without specific quantification of diarrhea (Alsulaiman et al., 2025; Belcadi Abassi et al., 2026).

A synthesis of five major studies showed that fever, cough, coryza, conjunctivitis, respiratory symptoms, and diarrhea were still found in children with measles, both in the vaccinated and unvaccinated groups (Miao et al., 2023; Mawlood et al., 2025; Alsulaiman et al., 2025; Akçay et al., 2026; Belcadi Abassi et al., 2026). Vaccination history appeared to be associated with a trend toward a reduction in several clinical manifestations, particularly cough, coryza, and diarrhea, in some studies. However, this association was not consistent across studies, requiring interpretation of the results to consider differences in study design, population, definition of immunization status, and reporting methods for clinical outcomes (Miao et al., 2023; Mawlood et al., 2025; Akçay et al., 2026).

Fever was the most consistent manifestation across all groups. In studies comparing immunization status, fever was reported in high proportions in both vaccinated and unvaccinated groups (Miao et al., 2023; Akçay et al., 2026). This suggests that fever cannot be used as a single clinical indicator to differentiate measles in fully immunized and incompletely immunized children. Clinically, vaccinated children can still experience breakthrough measles or modified measles. Therefore, the diagnosis of measles must still take into account exposure history, epidemiological situation, rash, prodromal symptoms, and laboratory tests (Leung et al., 2025; Bonneton et al., 2020).

Cough and coryza tend to be lower in some groups of vaccinated children, but results are not entirely consistent across studies (Miao et al., 2023; Mawlood et al., 2025; Akçay et al., 2026). This variation may be influenced by differences in population characteristics, patient age, disease severity, timing of examination, and symptom recording methods. For example, the study by Akçay et al. included only patients requiring intensive care, so this population represents a more severe spectrum of the disease and does not fully reflect the clinical characteristics of measles in the general pediatric population (Akçay et al., 2026).

Conjunctivitis shows greater variation in results than other prodromal manifestations. Miao et al. reported a significant decrease in the vaccinated group, while Mawlood et al. and Akçay et al. showed no significant difference (Miao et al., 2023; Mawlood et al., 2025; Akçay et al., 2026). These differences may be due to variations in clinical definitions, inconsistent use of terms such as conjunctivitis or conjunctival congestion, timing of examination, and quality of documentation in retrospective studies.

Assessment of respiratory involvement requires careful interpretation because not all studies report shortness of breath directly. Respiratory distress is more closely related to the clinical manifestation of shortness of breath, while respiratory failure, hypoxemia, oxygen requirement, ICU or PICU admission, pneumonia, and respiratory complications are indirect indicators that better reflect the severity or degree of lower airway involvement (Miao et al., 2023; Mawlood et al., 2025; Alsulaiman et al., 2025; Akçay et al., 2026; Belcadi Abassi et al., 2026). In this synthesis, direct evidence on shortness of breath is still limited, so conclusions regarding differences in shortness of breath complaints based on immunization completeness cannot be firmly established.

Diarrhea is a relatively consistent manifestation, showing a higher proportion in unimmunized children, particularly in the studies by Miao et al. and Mawlood et al. (Miao et al., 2023; Mawlood et al., 2025). However, these results still need to be interpreted considering confounding factors, such as age, nutritional status, gastrointestinal coinfection, antibiotic use, disease severity, and the predominance of hospitalized populations in most studies.

Biologically, measles vaccination can induce neutralizing antibodies and memory cell responses, which play a role in limiting viremia, viral replication, systemic spread, and inflammatory responses (Hübschen et al., 2022; Carazo et al., 2020; Schenk et al., 2021). These

mechanisms may explain why some vaccinated children exhibit milder, fewer, or shorter-lasting clinical manifestations. However, the effectiveness of clinical vaccine protection remains influenced by age at vaccination, number of doses received, inter-dose interval, primary vaccine failure, decline in antibody levels over time, nutritional status, and the individual's immunological condition (Carazo et al., 2020; Schenk et al., 2021).

The findings from national articles strengthen the relevance of this study in the Indonesian context. Puspita showed that suspected measles cases in Madiun Regency were still found in conditions of uneven immunization coverage, with classic clinical symptoms of fever, rash, cough, runny nose, and red eyes (Puspita, 2025). Asy-syifaa et al. reported that most pediatric measles patients in Bireuen had incomplete measles immunization status, with bronchopneumonia as the most common complication (Asy-Syifaa et al., 2024). Fadhila and Selviana also showed that immunization status was a risk factor for measles in children in Pontianak (Fadhila & Selviana, 2024). However, these three national articles cannot be used to directly compare the six clinical manifestations between the fully and incompletely immunized groups because they do not present complete clinical outcomes stratified by immunization status.

The main limitations of this study lie in the heterogeneity in immunization status classification and variations in reporting of clinical manifestations between studies. One dose of vaccine may be categorized as vaccinated in one study, but as partially or incompletely immunized in another (Leung et al., 2025; Miao et al., 2023; Mawlood et al., 2025; Alsulaiman et al., 2025; Akçay et al., 2026; Belcadi Abassi et al., 2026). Furthermore, some primary articles present some manifestations as total data or indicators of complications, rather than as direct comparisons between immunization statuses. Therefore, the results of this study are best interpreted as clinical trends based on the level of immunization protection, rather than as a definitive quantitative estimate of the difference between complete and incomplete immunization.

The clinical implication of this study is that a complete immunization history cannot be used to rule out a diagnosis of measles. Vaccinated children can still experience fever, cough, coryza, conjunctivitis, respiratory symptoms, and diarrhea (Leung et al., 2025; Bonneton et al., 2020; Miao et al., 2023; Mawlood et al., 2025; Alsulaiman et al., 2025; Akçay et al., 2026; Belcadi Abassi et al., 2026). Therefore, establishing a diagnosis still requires consideration of exposure history, outbreak situation, number of vaccine doses, age, nutritional status, clinical presentation, and laboratory confirmation results.

Conclusion

In children with measles, a history of measles vaccination tended to be associated with milder clinical manifestations for several outcomes, but the direction and strength of the association varied for each symptom. Fever remained common across all groups and did not reliably differentiate between immunization statuses. Cough and coryza tended to be lower in vaccinated children in some studies, while findings regarding conjunctivitis were inconsistent. Diarrhea tended to be higher in the unimmunized group in two major comparative studies.

Direct evidence regarding shortness of breath remains limited because most studies report respiratory distress, respiratory failure, hypoxemia, oxygen requirement, intensive care admission, or respiratory complications as indicators of respiratory involvement. These outcomes are not fully equivalent to shortness of breath. Heterogeneity in immunization status classification, the predominance of studies in inpatient or PICU populations, and limited symptom reporting mean that the magnitude of differences in clinical manifestations between fully and incompletely immunized children cannot be definitively determined. Thus, complete immunization status cannot be used to exclude the diagnosis of measles, so clinical assessment

must still take into account fever, cough, coryza, conjunctivitis, respiratory distress, diarrhea, epidemiological history, and laboratory confirmation.

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