

CHARACTERISTICS OF MEASLES SPREAD AMONG CHILDREN UNDER ONE YEAR OF AGE

Masharipova Shakhista Sabirovna

Urganch State Medical Institute, Urgench, Uzbekistan

Abstract. Measles is a highly contagious viral disease that is particularly dangerous in children under one year of age due to its severe course and risk of complications. This study analyzed the characteristics of measles spread, risk factors, and clinical course among children under one year of age during 2024–2025. Medical records of 42 patients were retrospectively analyzed. The results showed that most cases occurred in unvaccinated children and were associated with household contact. Clinically, moderately severe forms predominated, while complications were observed in some cases. The findings confirm the importance of early prevention and vaccination.

Keywords: measles, children, epidemiology, vaccination, risk factors, clinical course, complications

Introduction. Measles is a highly contagious viral infection caused by the *Measles virus*, transmitted via respiratory droplets, and characterized by its high epidemic potential. This disease is particularly significant among the pediatric population, especially infants under one year of age, whose immune systems are not yet fully developed. While newborns possess passive immunity acquired from the mother, this protection diminishes within 3–6 months, leaving infants vulnerable to the infection.

In recent years, there has been a global resurgence in measles cases. This trend is primarily attributed to declining vaccination coverage, intensified migration processes, growing vaccine hesitancy among certain population segments, and insufficient epidemiological surveillance. Consequently, measles has once again emerged as a critical public health challenge. The high infectivity of measles is explained by its exceptionally high basic reproduction number (R_0). A single infected individual can

transmit the virus to 12–18 susceptible persons, leading to rapid spread and the potential for large-scale outbreaks.

In infants under one year of age, the disease often follows a severe clinical course. In this age group, high fever, intoxication, catarrhal symptoms, and typical rashes are frequently accompanied by complications. The most common complications include secondary bacterial pneumonia, otitis media, laryngotracheitis, and central nervous system involvement. In some instances, the disease can be fatal.

Vaccination remains the primary method for specific prevention against measles. According to the national immunization schedule, the measles vaccine is typically administered at 12 months of age. However, since infants under one year are not yet eligible for vaccination, they constitute a high-risk group. Therefore, "herd immunity" (community immunity) plays a vital role in their protection. High vaccination coverage within a population limits viral circulation, thereby indirectly protecting unvaccinated infants. From this perspective, studying the transmission characteristics, risk factors, and clinical manifestations of measles among infants under one year of age is of significant scientific and practical importance. Such research contributes to the refinement of preventive measures, the re-evaluation of vaccination strategies, and the strengthening of epidemiological surveillance.

Objective. To analyze the transmission characteristics, risk factors, and clinical course of measles among infants under one year of age during the period of 2024–2025.

Materials and Methods. The study was conducted using a retrospective-analytical design and covered measles cases recorded among infants under one year of age who received inpatient treatment during 2024–2025. A total of 42 patients (both boys and girls) were included in the study. Data were collected and analyzed based on medical records, including case histories, laboratory test results, and epidemiological questionnaires.

Inclusion Criteria:

- Age: 0 to 12 months;
- Clinically and/or laboratory-confirmed measles;
- Treatment received in an inpatient setting;
- Completeness of medical documentation.

Exclusion Criteria:

- Cases with incomplete clinical data;
- Co-infections with other infectious diseases (where a clear differential diagnosis was not established);
- Patients with late hospital admission where comprehensive data collection was not possible.

Study Variables:

The following epidemiological and clinical parameters were analyzed:

- Age groups: (0–3, 4–6, and 7–12 months);
- Gender;
- Vaccination status: (unvaccinated, not age-eligible for vaccination, or partially vaccinated);
- Source of infection: (household contact, community contact, or unknown);
- Clinical form: (mild, moderate, or severe);
- Key symptoms: (fever, catarrhal signs, Koplik spots, and exanthema);
- Complications: (pneumonia, otitis, laryngitis, and encephalitis);
- Duration of hospitalization (in days).

Clinical diagnoses were established based on the classic symptom complex, including fever, the catarrhal period, Koplik spots, and maculopapular rash. Serological methods (detection of specific IgM antibodies) were employed for laboratory confirmation in selected cases.

Statistical Analysis

Statistical methods were used for data processing and analysis. Relative frequencies (%) were calculated, and results were presented in the form of tables and charts. Where necessary, the χ^2 (chi-square) test was applied to evaluate differences between groups. All procedures were conducted in accordance with medical ethics standards, ensuring the confidentiality of patients' personal data.

Results. A total of 42 infants under one year of age were included in the study. Analysis by age group revealed that the majority of patients were aged 7–12 months, accounting for 26 cases (61.9%). Infants aged 4–6 months comprised 10 cases (23.8%), while those aged 0–3 months accounted for 6 cases (14.3%). These findings suggest a significant decline in maternally-derived passive immunity after 6 months of age. Regarding gender distribution, 24 patients (57.1%) were male and 18 (42.9%) were female. The analysis of vaccination status showed that the vast majority of patients—33 infants (78.6%)—were unvaccinated. the remaining 9 infants (21.4%) belonged to the group that was not yet age-eligible for vaccination. No fully vaccinated children were recorded in this study.

Regarding the sources of infection:

- Household contact: 30 cases (71.4%)
- Community contact: 8 cases (19.0%)
- Unknown source: 4 cases (9.6%)

These results highlight the critical epidemiological role of family members in the transmission of the infection to infants.

The clinical severity was categorized as follows:

- Moderate form: 27 cases (64.3%)
- Mild form: 9 cases (21.4%)
- Severe form: 6 cases (14.3%)

Fever and catarrhal symptoms (cough, rhinitis, and conjunctivitis) were observed in all patients. Koplik spots were identified in 32 patients (76.2%), while a typical maculopapular rash was recorded in all cases.

Complications occurred in 8 cases (19.0%), including:

- Pneumonia: 5 cases (11.9%)
- Acute otitis media: 2 cases (4.8%)
- Laryngotracheitis: 1 case (2.3%)

Severe forms and a higher frequency of complications were predominantly observed in infants under 6 months of age.

The average duration of hospitalization was $\$8.2 \pm 1.6$ days. In severe cases, this period extended to 10–12 days.

In summary, the results indicate that measles among infants under one year of age primarily occurs in unvaccinated children with a history of household contact, frequently presenting with a moderate clinical course.

Discussion. The results of this study elucidate the specific characteristics of measles transmission among infants under one year of age. Our findings indicate that the disease is most prevalent in infants aged 7–12 months. This phenomenon is explained by the presence of maternally-derived passive immunity during the first months of life, which subsequently wanes. After six months, infants become highly susceptible to infection, significantly increasing the risk of morbidity.

The analysis of vaccination status revealed that the vast majority of patients were unvaccinated. This underscores that insufficient vaccination coverage remains a primary driver of measles transmission. According to the national immunization schedule, the first dose is administered at 12 months; therefore, infants under one year old constitute a high-risk group. In this context, the role of herd immunity is paramount for protecting this vulnerable population. Regarding the source of infection, the predominance of

household contacts suggests that infections among adults and older children significantly increase the probability of transmission to infants. Consequently, it is crucial to strengthen vaccination and revaccination efforts not only for children but also for the adult population. Clinically, while moderate forms were most common, severe forms and complications accounted for a notable proportion of cases. Severe clinical courses and higher complication rates were particularly observed in infants under six months of age, likely due to the immaturity of the immune system. The documentation of complications such as pneumonia, otitis, and laryngotracheitis reaffirms the high clinical significance of measles. Our results align with findings from other researchers, confirming that measles primarily spreads among unvaccinated children and that household contacts serve as a major infection reservoir. However, this study has certain limitations. The sample size was relatively small ($n=42$), and the study was confined to hospitalized patients, which may limit the generalizability of the results to the broader population. Nevertheless, these findings highlight the urgent need to increase vaccination coverage, raise public awareness, and strengthen epidemiological surveillance. Future research involving larger populations is essential to refine strategies for protecting high-risk groups.

Conclusion. The results of this study highlight several critical epidemiological and clinical patterns regarding the spread of measles among infants under one year of age. It was found that the disease primarily occurs in children who are unvaccinated or not yet age-eligible for vaccination. This underscores the high-risk status of this age group and the vital importance of herd immunity in their protection.

The dominance of household contacts in the source analysis confirms that infections among adults and older children are the primary risk factor for infants. Therefore, increasing vaccination coverage across all age groups, not just among children, is of significant preventive importance.

Clinically, while measles often followed a moderate course, a notable proportion of severe cases and complications were observed. The higher frequency of severe illness and complications in infants under six months of age indicates that this subgroup requires specialized monitoring and protection.

Based on the study results, the following conclusions were drawn:

- Vaccination remains the most effective method for preventing measles.
- It is essential to increase vaccination coverage and strengthen revaccination efforts among the population.
- Epidemiological surveillance and early detection measures must be enhanced to protect infants under one year of age.
- Timely isolation of infection sources and implementing preventive measures in family clusters are of critical importance.

In conclusion, a comprehensive approach—combining vaccination, epidemiological surveillance, and public health awareness—is necessary to effectively limit the spread of measles.

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