

## Short Communication

# Report on the Measles Outbreak Case in a Medical Institution in South Korea, 2024

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**ABSTRACT:** This report analyzes a measles outbreak that occurred at a medical institution (Hospital A) in Gyeonggi-do in April 2024, aiming to examine its epidemiological characteristics and derive implications for disease control policies. A cross-sectional study was conducted on 469 confirmed cases and contacts associated with Hospital A during the outbreak period using telephone interviews and on-site epidemiological investigations. A frequency analysis of epidemiological data was performed using statistical software. The attack rate related to the outbreak at Hospital A was 0.64%, with a secondary attack rate of 25.0%. The outbreak involved three confirmed measles cases, including one patient (index case) and two healthcare workers (secondary cases), all carrying the B3 genotype. In total, 469 individuals were exposed during the outbreak at Hospital A, including the three confirmed cases. The outbreak likely originated from a hospital visitor as the source of infection, with no additional transmission beyond hospital staff. To prevent transmission, prompt contact management, periodic antibody testing, and additional vaccinations for staff are recommended.

Measles is a vaccine-preventable infectious disease, and many countries, including South Korea (hereafter simply referred to as “Korea”), have incorporated it into their National Immunization Program (1). Due to national efforts, the incidence rate per 100,000 population decreased to below 1, leading to Korea's verification as a measles-eliminated country by the World Health Organization in March 2014 (2). However, measles cases are rising globally, and sporadic outbreaks continue to occur even in countries verified as measles-eliminated (3–5). Medical institutions are

a primary transmission site for such outbreaks. For instance, in Korea in 2019, an imported measles case resulted in 194 patients nationwide, predominantly affecting infants and individuals in medical institutions (6).

The investigation into the current outbreak began with the epidemiological inquiry of the first confirmed measles case on March 20, 2024. Upon confirming that the individual used Hospital A during the infectious period (March 11–19), the monitoring of 154 contacts at the same hospital led to the identification of two additional cases with symptoms, and the outbreak was officially recognized on April 1. On-site investigations examined the hospital's structure, work processes, and risk factors, and measures for contact management were discussed with the hospital's infection control team. A joint response team conducted a cross-sectional survey to assess the general characteristics, contact history, risk factors, and vaccination status of the three confirmed cases and 466 contacts.

Through the outbreak at Hospital A, three measles cases were confirmed: one patient (index case) and two healthcare workers (secondary cases). According to the report from the Bacterial Analysis Division of

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Table 1. Demographic and epidemic characteristics of confirmed cases

Case	#1	#2	#3
Age/Sex	40s/Female	20s/Female	20s/Female
Symptoms (onset)	Fever (3.13.), rash (3.15.)	Fever (3.29.), rash (3.29)	Rash (3.31.)
Vaccination/Antibody	None	1st dose ('08)/ Negative	1st dose ('03)/ Negative
Source	From abroad	#1	#1
Laboratory Test	IgM positive PCR positive	PCR positive	PCR positive
Contacts tracing	Total 187 (Family) 2 (Airplane) 31 (Hospital) A 120, B 34	Total 261 (Family) 3 (A hospital) 230 (Community <sup>2</sup> ) 28	Total 20 (A hospital) 10 <sup>1</sup> (Community) 10

<sup>1</sup>): Excluding duplicate contacts with #2.

<sup>2</sup>): Public places like restaurants, gym, café, etc.

the Korea Disease Control and Prevention Agency, all three confirmed cases shared the same genotype, “B3.” Excluding the three confirmed cases, 466 individuals were exposed during the Hospital A outbreak. Among them, 16 exhibited symptoms but tested negative by PCR. Consequently, the attack rate for this outbreak was 0.64% (3/469), while the secondary attack rate among Hospital A staff who had direct or indirect exposure to the index case was 25.0% (2/8). Additional cases related to the index case occurred only among susceptible staff at Hospital A. Calculating the attack rate among all susceptible contacts was limited due to the inability to verify the susceptibility status of 107 contacts, including foreigners. The epidemiological investigation findings for each confirmed case and contact are summarized in Table 1 and Table 2.

The index patient (#1) was a foreign resident living near Hospital A, a woman in her 40s, with no history of measles vaccination. Based on the known incubation period (7–21 days), it is estimated that she was exposed to the virus between February 23 and March 10 while abroad in her home country with two family members. She developed a fever of 39.2°C on March 13, followed by a cough and oral lesions (Koplik's spots). By March 15, she had a non-vesicular rash that began on her face and neck, then spread to her trunk and body by March 16. The patient visited Hospital A between March 17 and March 19. An IgM-positive result was confirmed through a blood culture test conducted at Hospital A on March 18, with additional nasopharyngeal and oropharyngeal swab PCR tests confirming positivity on March 20.

The total number of contacts was 187, including two cohabiting family members, 31 in-flight contacts, and 154 contacts at the medical institution. Given that the index patient traveled internationally during the infectious period, an investigation of in-flight contacts was conducted according to related guidelines (7). This investigation targeted 30 passengers seated within two rows in front of and behind the confirmed patient's seat on the flight arriving on March 13, as well as one foreign flight attendant. Additionally, coordination with the International Health Regulations (IHR) was undertaken, and the Korea Disease Control and Prevention Agency (KDCA) provided notification that

Table 2. Demographic and epidemic characteristics of contacts

	Cases (N = 466)
Sex	
Male	181 (38.8%)
Female	285 (61.2%)
Age <sup>1</sup> )	
0–19	33 (7.1%)
20–29	65 (14.0%)
30–39	52 (11.2%)
40–49	55 (11.9%)
50–59	83 (17.9%)
Over 60	175 (37.8%)
Source	
#1 patient	185 (39.7%)
#2 patient	261 (56.0%)
#3 patient	20 (4.3%)
Symptoms	
Yes	13 (2.8%)
No	453 (97.2%)
Vaccination <sup>2</sup> )	
None-vaccinated	139 (76.8%)
Partly-vaccinated <sup>3</sup> )	27 (14.9%)
Total-vaccinated	15 (8.3%)
Contact place	
Family member	5 (1.1%)
Airplane	31 (6.7%)
Hospital	392 (84.1%)
- Visitors	347 (88.5%)
- Medical staff	45 (11.5%)
Community	15 (3.2%)

<sup>1</sup>): Excluding 3 cases of unknown.

<sup>2</sup>): Excluding 285 cases of unknown.

<sup>3</sup>): Only checked 1<sup>st</sup> dose of vaccination.

the case was confirmed.

Regarding medical institutions, two facilities visited by the confirmed patient were investigated. The first, Clinic B, was visited on March 16, prior to the patient's visit to Hospital A. A total of 34 contacts were identified

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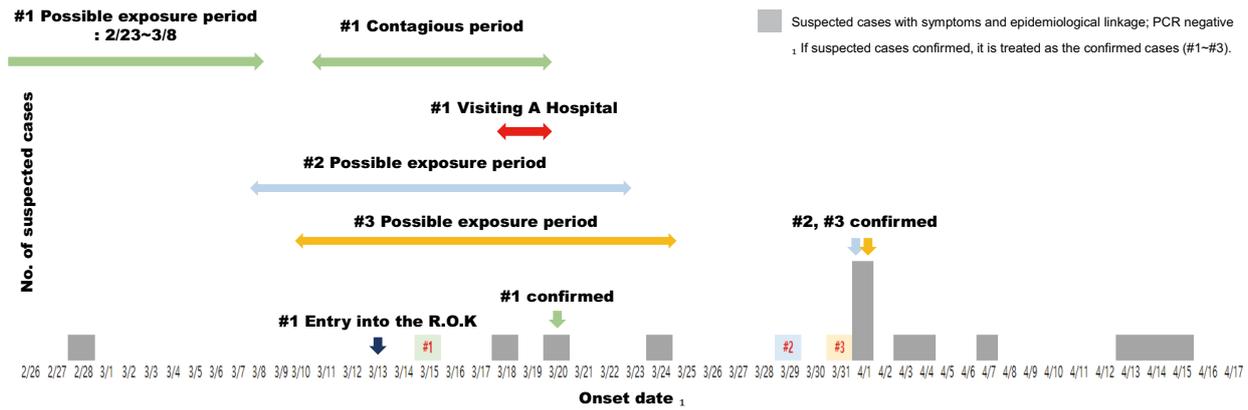


Fig. 1. (Color online) Epidemic curve

at Clinic B, including 4 staff members, 29 patients and guardians, and 1 pharmacist at an external pharmacy. None of the contacts at Clinic B exhibited symptoms or tested positive for measles. At Hospital A, where the measles diagnosis was made, the patient visited the emergency room on March 17 and the outpatient clinic and injection room on March 18 and 19. A total of 120 contacts were investigated in these areas, comprising 28 staff members and 92 patients and guardians. Among the patients and guardians, 7 were identified as having stayed in the same second-floor injection room as the patient. Among the contacts of the index patient at Hospital A, 4 individuals exhibited symptoms, including 2 staff members who were subsequently confirmed as secondary cases. A detailed genetic analysis of close relationships with the index patient was not possible due to insufficient virus detection in the samples of the additional confirmed cases. Among the contacts of the two additional confirmed cases, 10 individuals exhibited symptoms, including 8 from Hospital A and 2 from public facilities. However, all tested negative by PCR, resulting in no further confirmed cases (Figure 1).

The transmission route in this case is presumed to have originated from the index patient, the first confirmed case exhibiting the earliest symptoms, to healthcare workers during the infectious period. Notably, the two additional confirmed cases were not directly involved in the index patient's injection procedures, suggesting the possibility of airborne transmission due to co-occupancy in the same space. Since the additional confirmed cases were limited to the injection room, structural vulnerabilities, ventilation, and contact intensity within the location should be considered, as indicated by the on-site epidemiological investigation. Second, differences in vaccination history may have influenced the outbreak. Healthcare facilities should verify the vaccination history of their staff before employment and conduct antibody tests, administering additional vaccinations as necessary (7). Research indicates that antibody levels decline with age after vaccination (8–11), and both the absence of antibodies and the absence of vaccination have been identified as risk factors for measles outbreaks in Korean healthcare facilities (8). Third, the level of personal protective equipment (PPE) use may have affected disease transmission. Following the COVID-19 pandemic, awareness and compliance with personal

preventive measures in healthcare facilities have improved, reducing the risk of respiratory infectious diseases (12). While the confirmed cases were reported to have worn masks, the specific type of mask and the adherence to proper wearing methods could not be verified. Interestingly, a close contact worker at Hospital A, responsible for interpreting for the index patient, had no history of vaccination and tested antibody-negative (IgG negative) but did not develop symptoms or test positive for measles. This suggests the potential protective effect of proper PPE use, such as recommended masks (e.g., N95 or KF94). As of May 2024, with the downgrade of the COVID-19 crisis level, mask-wearing in medical institutions has shifted from mandatory to recommended (13). However, considering the risk of respiratory transmission, mask-wearing by staff and visitors should continue to be encouraged. In conclusion, to prevent transmission during measles outbreaks in medical institutions, rapid contact management, periodic antibody testing, and additional vaccinations for healthcare workers remain essential.

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**Conflicts of interest** None to declare.

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