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**Research Article**

# An Epidemiological Investigation Report of a Cluster of Chickenpox Cases in a Ward of a Tertiary Healthcare Hospital in Delhi

Sunanda Gupta[1], Monu[2], Shweta Jain[3], Pratap Singh[4], Jugal Kishore[5]

[1]Senior Resident, [2]Postgraduate Student, [5]Director Professor, Department of Community Medicine, VMMC and Safdarjung Hospital, New Delhi, India.
[3]Professor, Department of Physical Medicine and Rehabilitation, VMMC and Safdarjung Hospital, New Delhi, India.
[4]Professor, Department of Medicine, VMMC and Safdarjung Hospital, New Delhi, India.
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## I N F O

**Corresponding Author:**
Jugal Kishore, Director Professor, Department of Community Medicine, VMMC and Safdarjung Hospital, New Delhi, India.
**E-mail Id:**
drjugalkishore@gmail.com
**Orcid Id:**
https://orcid.org/0000-0001-6246-5880
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## A B S T R A C T

*Introduction:* Infectious diseases are common in healthcare settings. When they appear as a cluster, they should be investigated properly and documented. A cluster refers to an aggregation of cases grouped in place and time suspected to be greater than the expected number.

*Method:* A cluster of chickenpox cases was reported from the Physical Medicine and Rehabilitation (PMR) Ward of a tertiary healthcare hospital in January 2023. The case history was noted with the help of a case investigation sheet. Contact tracing was conducted.

Results: This study reports the investigation and control strategy adopted during the outbreak. Vesicular fluid, nasopharyngeal swabs, and blood of the patients were sent in suitable culture media for a Polymerase Chain Reaction test (PCR) for varicella DNA, for microbiological confirmation of the diagnosis. All cases were found positive. Primary and secondary cases were identified. An epidemic curve was prepared.

*Conclusion:* The varicella cases investigation enabled us to find the primary case, who brought the infection to the ward. Prompt preventive measures could limit the spread of infection in the hospital.

**Keywords:** Cluster, Chicken Pox, Varicella, Outbreak Investigation

## Introduction

Cluster refers to an aggregation of cases grouped in place and time suspected to be greater than the expected number, even though the expected number may be unknown. It can be called an epidemic when the distribution of cases occurs in a specific large area, and an outbreak when the geographical area is limited.[1] Unusual frequency of cases in a particular area calls for investigating and implementing appropriate control measures.

Chickenpox is a contagious disease caused by the varicella-zoster virus (VZV). Chickenpox can prove to be serious in all age groups, but more so during pregnancy, and in adults and immune-compromised people. The classic symptom of chickenpox is rashes, which can be itchy, fluid-filled blisters that turn into scabs. The rash usually starts on the chest, back, and face, and then spreads fast over the entire body,

including the buccal mucosa and genital areas. It usually takes about seven days for all of the blisters to become scabs. The incubation period ranges from 10 to 21 days, with an average of 14–16 days. A prodromal phase of fever and malaise typically precedes the onset of the rash by 1 to 2 days, more commonly in adults. In children, the rash is often the first sign of the disease.[2] In some cases, complications may occur which are life-threatening, e.g., varicella pneumonia, septicaemia, encephalitis/ meningitis, Acute Respiratory Distress Syndrome (ARDS), acute renal failure, and acute hepatic failure.

The virus spreads from person to person by direct contact, inhalation of aerosols from the vesicular fluid of skin lesions, and through infected respiratory secretions. A person with varicella is considered infective from one to two days before rash onset until all the lesions have crusted, or if no new lesions have appeared for 24 hours.[2]

## Materials and Method

A cluster of chickenpox cases was reported from the Physical Medicine and Rehabilitation Ward (PMR) of a tertiary healthcare hospital in Delhi in January 2023. This study reports the investigation and control strategy adopted during the outbreak.

On January 2, 2023, four cases (among fifteen admitted patients) of fever with rashes were reported from the PMR ward of the hospital. An epidemiological investigation team was formed, and an investigation was initiated immediately. A case investigation sheet was suitably developed, and a case definition was designed. The presumptive case was defined as 'any case of fever followed by the appearance of rashes within three days of fever'. A confirmed case was defined as 'any presumptive case with laboratory confirmation of aetiological agent (varicella)'. A contact was defined as 'face-to-face contact of ≥ 5 min, without the mask of either person/ anyone touching any body fluid/ present during any aerosol-generating procedure around the index case, from 2 days before the onset of rashes till date'. The case investigation sheets were filled for all four cases after obtaining consent from the patients. A provisional diagnosis of the cases was made. Recommendations for control were shared with the concerned authority. Contact tracing (from 3 weeks before the onset of rashes till the day of investigation) was done. Contact history was noted for each case. Active and passive surveillance for cases was continued till 42 days (twice the longest incubation period) after the onset of rash in the last case. All newly developed cases were investigated with the help of a case investigation form.

Vesicular fluid, nasopharyngeal swab, and blood of the patients were sent in suitable culture media for a Polymerase Chain Reaction test (PCR) for varicella DNA, for microbiological confirmation of the diagnosis, on January 3, 2023. On January 4, 2023, the reports came back reactive for varicella for all four cases.

The data from the outbreak investigation were used retrospectively for this study. The Institutional Ethics Committee approval was waived. An Excel sheet was used to create the graph used in the study.

## Results

Outbreak control measures were instituted as soon as the case was reported to the Department of Community Medicine and included:

- Isolation of the cases was recommended till 7 days after the appearance of the rash.
- The attendant, nursing staff, and doctor were advised to wear properly fitted masks, gloves, and waterproof aprons.
- Attendants were advised to wash their hands properly after contact with the patient.
- A dermatologist's opinion was sought and followed.
- Vaccination (0.5 mL of varicella vaccine, subcutaneously in the anterolateral thigh or upper arm, within 72 hours of exposure) of contact persons who did not have a history of varicella infection.
- Active and passive contact tracing was continued till 42 days after the onset of the rash in the last case.
- Immediate reporting and isolation of any other suspected case (epidemiologically linked contact with symptom) were recommended.

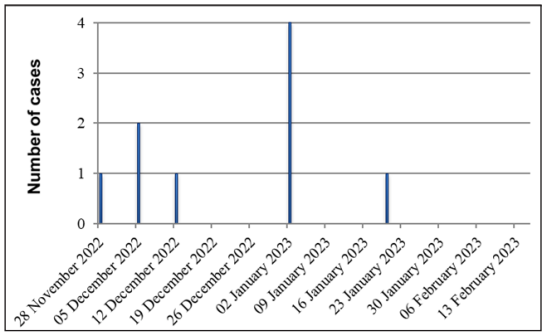


**Figure 1.Epidemic Curve for Chickenpox Cases in PMR Ward**

**Figure 2.Rashes on A Patient on Day 4 of Onset of Rash**

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We tried to identify the primary case in the ward by contact tracing. We noted that in December 2022, one housekeeper working in the ward had been infected with varicella. Another patient, a five-year-old child, was admitted to the ward and had a history of infection in November 2022. This child was probably the primary case in the ward. This child had a history of contact with a visitor from home who was infected with varicella in October 2022. Two students (Bachelors in Prosthetics and Orthotics) had been affected with similar illnesses in November and December 2022. On January 20, 2023, one nursing officer was diagnosed with varicella infection. This was the last epidemiologically linked case reported. Active and passive surveillance did not yield any additional cases.

## Characteristics of the Cases (Epidemiological Observations)

- All the cases were admitted for at least one month or were working in the PMR ward.
- Prior to the cluster of cases, isolated cases had occurred.
- The vaccination status of the cases was unknown or unvaccinated.
- The affected nursing officer had previously been infected with varicella; the other cases had never been affected before.
- All patients except one were adults.
- No patient required intensive care treatment for varicella infection.

The appearance of the cases was demonstrated by an epidemic curve as shown in Figure 1. Figure 2 shows a photograph of a case with a rash on day 4 from onset.

## Discussion

In India, similar outbreaks of varicella in healthcare have been reported in a few studies.[3,4] Similar strategies of vaccination and isolation have been utilised in those events. Recovery from primary varicella infection usually provides lifetime immunity. The second occurrence of varicella is more likely in people who are immunocompromised. As with other viral infections, re-exposure to natural varicella leads to re-infection that boosts antibody titres without usually causing illness.[5] However, in our hospital, the nursing staff who developed chickenpox was previously infected and otherwise healthy (without immune-compromising comorbidities). This leads to the idea of vaccination in healthcare professionals, irrespective of previous exposure. However, this requires rigorous cost-benefit analysis.

The attack rate of varicella infection is high (> 85%). However, the number of cases remained restricted in the affected ward because of the implementation of appropriate control measures immediately. Limiting visitors in the ward could have prevented the cluster of cases in the wards. Also, personal hygiene practices, like masking, hand-washing, and maintaining physical distancing from admitted patients, should be promoted. Immediate reporting of the clustering of cases should be encouraged.

The Indian Medical Association (IMA) recommends two doses of the varicella vaccine at 4–8 weeks intervals for healthcare workers.[6] Though breakthrough infection (infection with wild-type VZV that occurs in a varicella-vaccinated person more than 42 days after vaccination) can occur in a few, the severity is usually reported to be low.[5]

Outbreaks in community and healthcare settings, in India and abroad, have time and again underlined the importance of a robust surveillance system for immediate action and implementation of control measures.[7–10]

## Conclusion

The varicella cases investigation was able to find the primary case, who brought the infection to the ward. Prompt preventive measures were able to limit the spread of infection in the hospital. A vaccination policy for healthcare workers for infectious diseases like chickenpox is essential, as they can acquire as well as transmit the disease in healthcare settings.

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