e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(8); 382-386

Original Research Article

Resurgence of Measles in Rural India: An Epidemiological Study from Madhya Pradesh

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Received: 01-05-2026 / Revised: 15-06-2026 / Accepted: 21-07-2026
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Conflict of interest: Nil

Abstract

Background: Measles remains one of the most contagious vaccine-preventable diseases and continues to cause outbreaks in areas with suboptimal immunization coverage. Despite intensified immunization strategies in India, localized outbreaks still occur in vulnerable rural communities. This study investigated a measles outbreak in Kanjia village, Sagar district, Madhya Pradesh, to assess epidemiological characteristics, clinical profile, and immunization gaps.

Methods: A community-based cross-sectional outbreak investigation was conducted in November 2024 using a house-to-house survey in Kanjia village. A total of 1,678 residents from 556 households were surveyed by a multidisciplinary team. Data were collected using a pretested structured questionnaire covering demographic characteristics, symptoms, vaccination status, treatment-seeking behavior, and complications. Cases were identified according to standard measles case definitions. Descriptive epidemiological analysis was performed.

Results: A total of 204 measles cases were identified, yielding an overall attack rate of 12.2%. Children aged 1–6 years accounted for 75.5% of all cases, followed by infants aged <1 year (18.6%). Males constituted 59.3% of cases. Common symptoms included rash (98%), fever (93%), and cough (41%). Pneumonia was reported in 22.5% of patients, and one death occurred (0.4%). Among children aged 0–6 years, only 32% had received two doses of measles vaccine, while 16% were unvaccinated and 49% had unknown vaccination status.

Conclusion: The outbreak highlights persistent immunity gaps in rural populations despite national measles elimination efforts. Strengthening routine immunization, improving documentation, enhancing community awareness, and timely outbreak surveillance are essential to prevent recurrence.

Keywords: measles outbreak, immunization coverage, vaccination gap, rural health, outbreak investigation, India.

DOI: 10.25258/ijcpr.18.8.59

Introduction

Measles is a highly contagious vaccine-preventable viral disease caused by the measles virus and transmitted through respiratory droplets and airborne spread. Because of its high infectivity, even small declines in vaccination coverage can lead to rapid outbreaks in susceptible populations [1,2]. Despite the availability of an effective vaccine, measles remains an important cause of childhood morbidity and mortality, particularly in low- and middle-income countries [3].

The disease can cause serious complications such as pneumonia, diarrhea, encephalitis, blindness, malnutrition, and death, especially among children under five years of age and immunocompromised individuals [3,4]. WHO and UNICEF have reported that millions of deaths have been prevented through vaccination programs; however, recent years have seen resurgence of measles due to vaccine hesitancy, missed immunization, migration, and disruption of health services during the COVID-19 pandemic [5,6].

India has made substantial progress toward measles elimination through the Universal Immunization Programme, Mission Indradhanush, and Measles-

Rubella vaccination campaigns. However, outbreaks continue to occur in areas with low routine immunization coverage, poor awareness, and weak surveillance systems [7,8]. Recent outbreaks from Uttar Pradesh, Rajasthan, and other Indian states have highlighted persistent immunity gaps in rural communities [9,10]. Madhya Pradesh, with its large rural population and healthcare access challenges, remains vulnerable to vaccine-preventable disease outbreaks. In November 2024, a cluster of suspected measles cases was reported from Kanjia village in Sagar district. Therefore, this study was conducted to investigate the outbreak and assess its epidemiological profile, clinical characteristics, and immunization gaps to guide public health action.

Materials and Methods

Study Design and Setting: A community-based cross-sectional outbreak investigation was conducted in Kanjia village, Sagar district, Madhya Pradesh, India, during November 2024.

Study Population: All households in the village were included. A total of 556 households comprising 1,678 residents were surveyed.

Investigation Team: The survey was conducted by three field teams comprising specialists from Community Medicine, Pediatrics, and Microbiology from Bundelkhand Medical College, Sagar.

Case Definition: A suspected measles case was defined as any person with fever and maculopapular rash with cough, coryza, or conjunctivitis during the outbreak period. Epidemiologically linked cases were also included.

Data Collection: House-to-house visits were performed using a pretested structured questionnaire. Information collected included: age and sex, date of onset of symptoms, clinical manifestations complications, vaccination history, treatment-seeking behavior, hospitalization status

Statistical Analysis: Data were entered in Microsoft Excel and analyzed using descriptive statistics. Frequencies, percentages, and attack rate were calculated.

Ethical Approval: The study was approved by the Institutional Ethics Committee of Bundelkhand Medical College, Sagar. Verbal informed consent was obtained from participants or guardians.

Results

A total population of 1,678 individuals residing in 556 households was surveyed during the outbreak investigation. Of the surveyed population, 877 (51.4%) were males and 801 (48.6%) were females, indicating a near-equal sex distribution. The overall literacy rate in the village was 58.1% (975 individuals), while female literacy was substantially lower at 24.0%. The working population constituted 795 (47.4%) individuals. Children aged 0–6 years accounted for 372 of the surveyed population, of whom 180 (48.4%) were girls. Additionally, 477 individuals belonged to the 7–17 years age group, while 729 were adults aged 18–59 years (Table 1).

Table 1: Demography of population during survey

Population Surveyed	Frequency (N) & %
Total Population	1678
Total No of Houses	556
Female Population %	801 (48.6 %)
Male Population %	877 (51.4%)
Total Literacy rate %	975 (58.1 %)
Female Literacy rate %	234 (24.0 %)
Working Population %	795 (47.4 %)
Child (0-6) Population	372
Girl Child (0-6) Population	180 (48.4 %)
Child (7-17) population	477
Adult 18-59 year	729

A total of 204 measles cases were identified during the survey, yielding an overall attack rate of 12.2% in the village population. The majority of cases occurred among children aged 1–6 years, comprising 154 (75.5%) of all reported cases. Infants aged below 1 year accounted for 38 (18.6%) cases, while only 10 (4.9%) cases were reported among children aged 7–17 years. Adults aged 18–59 years were minimally affected, with only 2 (0.98%) cases. Male cases were higher than female cases, with 121 (59.3%) males and 83 (40.7%) females affected (Table 2).

Table 2: shows socio-demographic profile of cases

Age	**Frequency**	**Percentage**
< 1 year	38	18.62
1-6 year	154	75.49
7-17 year	10	4.90
18-59 year	2	0.98
Total Cases	204	
Sex		
Male	121	59.31%
Female	83	40.69%

Regarding clinical presentation, maculopapular rash was the most common symptom, observed in 200 (98%) cases, followed by fever in 190 (93%) cases.

Cough was present in 84 (41%) individuals. Complications included pneumonia in 46 (22.5%) cases and conjunctivitis in 12 (5.8%) cases. One measles-related death was reported during the outbreak (0.4%) (Table 3, Chart 1). With respect to healthcare-seeking behaviour, the majority of affected individuals, 137 (67%), sought treatment from Subcentre/PHC/CHC facilities, while 60 (29.4%) consulted private clinics.

Six patients (2.9%) required hospitalization, indicating the occurrence of moderate to severe disease in a subset of cases (Table 3).

Table 3: shows clinical Signs & treatment

Clinical Signs	**No of cases**	**Percentage of cases**
Fever	190	93%
Maculopapular rash	200	98%
Cough	84	41%
Conjunctivitis	12	5.8%
Pneumonia	46	22.5%
Place of treatment		
Subcentre/ PHC/ CHC	137	67%
Private Clinic	60	29.4%
Hospitalisation	6	2.9%
Death due to measles	1	0.4%

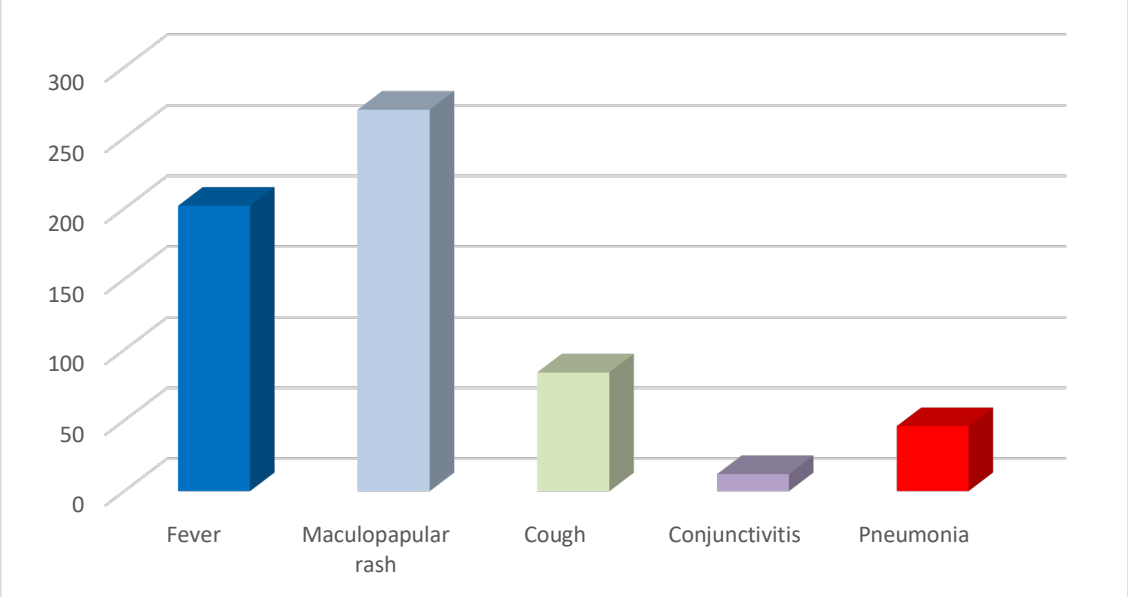

Figure 1:

Assessment of vaccination status among children aged 0–6 years revealed important immunization gaps. Only 121 (32%) children had received the recommended two doses of measles vaccine, while 4 (1%) had received a single dose. A total of 63 (16%) children were completely unvaccinated. Vaccination status was unknown in 184 (49%) children, reflecting inadequate documentation or poor recall by caregivers (Table 4).

Table 4: shows vaccination status in children [0-6 yrs]

Vaccination	No	%
Unvaccinated [0 Measles dose]	63	16%
1 Measles dose	4	1%
2 Measles dose	121	32%
Unknown	184	49%

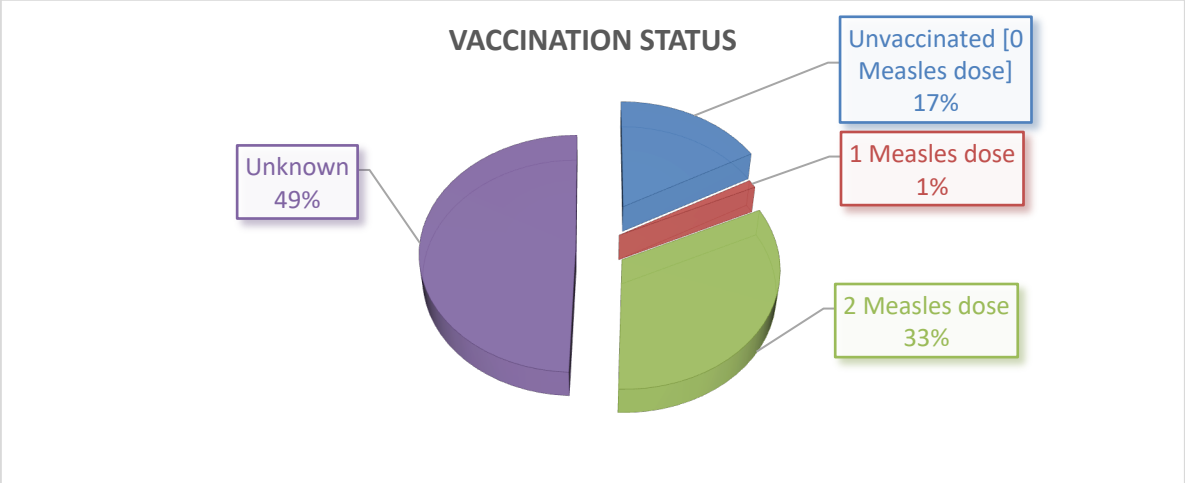

Figure 2: Vaccination Status

Discussion

The present outbreak investigation documented a considerable measles burden with an overall attack rate of 12.2%, indicating active community transmission in Kanjia village. Similar findings have been reported in other resource-limited settings where immunity gaps persist. Tefera et al. (2024) from Ethiopia highlighted low vaccination coverage as the strongest predictor of outbreak clustering, while Agiwal et al. (2024) reported that measles outbreaks in India continue despite declining national incidence due to district-level disparities in vaccine uptake [11,12].

Children were the most affected group in the present study, with 75.5% of cases occurring among those aged 1–6 years, followed by 18.6% among infants aged <1 year. This is consistent with Adebayo et al. (2022), who reported that 72% of cases in Nigeria occurred among children below five years [13]. Sharma et al. (2023) also observed that most outbreak cases in Rajasthan were among children under six years [14]. The involvement of infants may reflect waning maternal antibodies and delayed routine immunization.

Male predominance was noted, with 59.3% males affected. Comparable findings were reported by Musa et al. (2021), who documented 57% male cases [15]. However, sex differences in measles outbreaks often vary by setting and may be influenced more by care-seeking behavior and exposure patterns than biological susceptibility. The clinical presentation was classical, with rash (98%) and fever (93%) as the predominant symptoms. Getahun et al. (2021) similarly reported rash in over 95% and fever in around 90% of measles patients [16]. Pneumonia was the most common complication in our study (22.5%), which is comparable to the 26.3% reported by Khan et al. (2022) in hospitalized children from Pakistan [17]. One death (0.4%) was recorded, reinforcing that measles remains potentially fatal despite vaccine availability.

Healthcare-seeking behavior was encouraging, with 67% of patients utilizing government health facilities. Tiwari et al. (2023) reported similar findings in Madhya Pradesh, where around 62% of outbreak patients preferred public facilities [18]. This indicates that primary healthcare systems can play a key role in early case detection, treatment, and outbreak response.

A major concern identified was the substantial immunization gap. Only 32% of eligible children had received two documented measles doses, 16% were unvaccinated, and 49% had unknown vaccination status. This suggests poor record-keeping and inadequate caregiver awareness. NFHS-5 reported much higher national measles vaccine coverage, indicating marked local inequity [19]. Similar disparities were noted by Agiwal et al. (2024) in their national review [12].

Globally, measles resurgence has re-emerged as a serious public health challenge. WHO and UNICEF reported increasing outbreaks after the COVID-19 pandemic due to disruptions in routine immunization services [20]. These global trends support our findings that even temporary reductions

in vaccination coverage can rapidly lead to outbreaks. Overall, the present study demonstrates that measles remains a persistent threat in vulnerable rural communities. Strengthening routine immunization, ensuring two-dose vaccine completion, improving documentation, and enhancing surveillance are essential to prevent future outbreaks.

Limitations

This study had certain limitations. Vaccination status was partly based on parental recall in many households due to absent records. Laboratory confirmation was limited, and some epidemiologically linked cases were included clinically. As a cross-sectional outbreak investigation, causal

Conclusions

This outbreak underscores that measles remains a persistent public health threat in vulnerable rural communities. The high concentration of cases among young children, presence of complications, and suboptimal vaccination coverage indicate persistent immunity gaps.

Strengthening routine immunization, ensuring completion of two-dose measles-rubella schedules, maintaining accurate vaccination records, and improving community awareness are essential for measles elimination. Robust surveillance and rapid outbreak response mechanisms must remain public health priorities.

Human Ethics: Approved by Institutional Ethics Committee, Bundelkhand Medical College, Sagar, and Madhya Pradesh, India.

References

1. World Health Organization. Measles fact sheet. Geneva: WHO; 2024. Available from: https://www.who.int/news-room/fact-sheets/detail/measles
2. Moss WJ. Measles. Lancet. 2017;390(10111): 2490-2502.
3. Strebel PM, Orenstein WA. Measles. N Engl J Med. 2019;381(4):349-357.
4. World Health Organization. Measles vaccines: WHO position paper. Wkly Epidemiol Rec. 2023;98(17):173-196.
5. World Health Organization, UNICEF. Progress toward regional measles elimination worldwide, 2000–2023. Wkly Epidemiol Rec. 2024;99(12):101-112.
6. Patel MK, Goodson JL, Alexander JP Jr, et al. Progress toward regional measles elimination — worldwide, 2000–2022. MMWR Morb Mortal Wkly Rep. 2023;72(46):1262-1268.
7. Durrheim DN, Crowcroft NS, Strebel PM. Measles – the epidemiology of elimination. Vaccine. 2014;32(51):6880-6883.
8. World Health Organization. Global measles and rubella update 2024. Geneva: WHO; 2024.
9. Ministry of Health and Family Welfare, Government of India. National Operational Guidelines for Measles-Rubella Elimination. New Delhi: MoHFW; 2023.
10. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), India, 2019–21. Mumbai: IIPS; 2021.
11. Tefera Y, Bekele A, Tadesse M, et al. Measles outbreak investigation in under-immunized communities of southwestern Ethiopia. Front Public Health. 2024;12:1331798.
12. Agiwal V, Sharma R, Gupta P, et al. Decadal epidemiological trends of measles outbreaks in India: persistent immunity gaps and district disparities. Infect Dis Poverty. 2024;13:25.
13. Adebayo BE, Oladokun RE, Esan DT. Measles outbreak among children in Nigeria: a retrospective study. Pan Afr Med J. 2022;41:89.
14. Sharma P, Kumar D, Singh S. Epidemiological investigation of measles outbreak in Rajasthan. Int J Community Med Public Health. 2023;10(3):1120-1125.
15. Musa EO, Adeyemi AO. Gender differences in measles infection and care-seeking behavior. Afr Health Sci. 2021;21(2):789-795.
16. Getahun M, Worku A, Yitayew G. Clinical profile of measles cases in outbreak settings. Trop Med Health. 2021;49:67.
17. Khan A, Shah S, Qureshi H. Complications of measles in hospitalized children in Pakistan. J Pak Med Assoc. 2022;72(5):901-905.
18. Tiwari S, Dwivedi R, Mishra P. Healthcare utilization during measles outbreaks in Madhya Pradesh. Int J Health Sci Res. 2023;13(1):45-50.
19. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey-5 (2019–21): State Fact Sheets. Mumbai: IIPS; 2021.
20. World Health Organization, UNICEF. Impact of COVID-19 pandemic on routine immuniza tion services and measles resurgence. Wkly Epidemiol Rec. 2024;99(20):201-214.