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Mumps outbreak investigation in Jaisalmer, Rajasthan, India, June-September 2016

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Abstract

Mumps, a vaccine-preventable disease, cause inflammation of salivary glands and may cause severe complications, such as encephalitis, meningitis, deafness, and orchitis/oophoritis. In India, mumps vaccine is not included in the universal immunization program and during 2009 to 2014, 72 outbreaks with greater than 1500 cases were reported. In August 2016, a suspected mumps outbreak was reported in Jaisalmer block, Rajasthan. We investigated to confirm the etiology, describe the epidemiology, and recommend prevention and control measures. We defined a case as swelling in the parotid region in a Jaisalmer block resident between 23 June 2016 and 10 September 2016. We searched for cases in health facilities and house-to-house in affected villages and hamlets. We tested blood samples of cases for mumps immunoglobulin M (IgM) enzyme-linked immunosorbent assay (ELISA). We found 162 cases (60% males) with a median age of 9.4 years (range: 7 month-38 years) and 65 (40%) were females. Symptoms included fever (70%) and bilateral swelling in neck (65%). None of them were vaccinated against mumps. Most (84%) cases were school-going children (3–16 years old). The overall attack rate was 2%. Village A, with two hamlets, had the highest attack rate (hamlet 1 = 13% and hamlet 2 = 12%). School A of village A, hamlet 1, which accommodated 200 children in two classrooms, had an attack rate of 55%. Of 18 blood samples from cases, 11 tested positive for mumps IgM ELISA. This was a confirmed mumps outbreak in Jaisalmer block that disproportionately affected school-going children. We recommended continued surveillance, 5-day absence from school, and vaccination.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

Keywords

mumps; outbreak; surveillance; vaccination

1 | INTRODUCTION

Mumps, a vaccine-preventable childhood disease, is highly infectious with secondary attack rates as high as 86%.¹ There is a high burden (100–1000 cases/100 000 population) of mumps in countries that do not offer mumps vaccination with epidemic peaks every 2 to 5 years.² Burden is perhaps higher, as 30% to 40% of cases may be asymptomatic.² Mumps is characterized by fever, swelling, and tenderness of one or more salivary glands, usually parotid and sometimes sublingual or submaxillary glands.^{1,3,4} The incubation period ranges from 12 to 25 days but parotitis typically develops 16 to 18 days after exposure to the mumps virus, 5 days after parotitis patient is infected.^{1,4} Encephalitis, meningitis, deafness orchitis (among postpubertal men), and oophoritis (among postpubertal females) are common complications.⁴ In an unvaccinated population, 1%–30% cases are known to develop complications.^{1,4}

In India, although mumps is not a disease under surveillance in the Integrated Disease Surveillance Program (IDSP), health facilities can report suspected, probable, or laboratory-confirmed mumps cases or deaths to IDSP under “other diseases” category. During 2009 to 2014, IDSP reported 72 mumps outbreaks comprising 1564 cases.⁵ On 24 August 2016, IDSP reported a cluster of suspected mumps cases in Chandan village, Jaisalmer block, Jaisalmer district, Rajasthan. Jaisalmer is a tribal block in the Thar desert of Rajasthan with a population of 0.26 million and approximately 100 000 people in 0 to 20 years age group. We investigated to confirm the epidemiology, describe the outbreak, and to provide recommendations for control and prevention.

2 | METHODS

2.1 | Mumps reporting by IDSP

We analyzed “other diseases” category of IDSP data for 5 years (1 January 2011–July 2016) of district Jaisalmer from the IDSP portal to describe reporting of mumps cases. Other diseases is an open comment field that the health facilities can use to report probable or laboratory-confirmed diseases.⁵

2.2 | Case search

We defined a suspected case as a resident of block Jaisalmer with swelling in the parotid region (unilateral or bilateral) between 23 June 2016 and 10 September 2016 and a confirmed case as a suspected case positive for mumps immunoglobulin M (IgM) by enzyme-linked immunosorbent assay (ELISA) in a serum sample. We searched outpatient and inpatient medical records of health facilities of Jaisalmer block for patients who were diagnosed with mumps. Field teams searched house-to-house for the suspected cases in all villages of block Jaisalmer. In affected villages, we conducted a second round of house-to-house search to collect detailed information regarding age, sex, symptoms, date of illness

onset, immunization history, residence, school attended, and interviewed cases using a semi-structured questionnaire to describe the epidemiology (time, place, and person) of the outbreak. We collected information from schools regarding the number of affected students and the number of students in each school to calculate attack rates. We also collected information on case management, control, and prevention activities from the medical officer and school staff.

2.3 | Laboratory investigation

Blood samples were collected from students with swelling in neck present on the day of the visit to two schools in village A, that reported the maximum number of cases. Serum was separated and sent to the Sawai Man Singh Medical College, Jaipur, for serological testing for mumps virus infection. A commercially available Mumps IgM ELISA (Calbiotech Inc.) was used for the detection and qualitative determination of the presence of IgM antibodies to mumps virus in serum specimens. As reported by the manufacturer, the relative sensitivity of this test is 90% and the relative specificity is 97%. Serum samples testing either negative or indeterminate were considered negative. For quality assurance, a 10% random sample repeat of the entire specimen collection set was performed.

3 | RESULTS

3.1 | Mumps reporting by IDSP

There were no probable (unilateral or bilateral swelling in the parotid region) or laboratory-confirmed mumps cases reported in the previous 5 years (1 January 2011-July 2016) in district Jaisalmer, Rajasthan.

3.2 | Descriptive epidemiology

We found 162 mumps cases (suspected = 151; confirmed = 11) in block Jaisalmer, Rajasthan. The median age was 9.4 years (range: 7 months – 38 years) and 97 (60%) were males. Fever was present among 113 (70%) cases, bilateral swelling of the neck in 105 (65%), and unilateral swelling among 57 (35%) (Table 1). Of four postpubertal males, one suffered from orchitis (Table 1). There were no cases of oophoritis in postpubertal females, no hospitalizations, and no deaths. None of the cases had received mumps vaccination. Among 162 cases, 140 (86%) received symptomatic treatment for fever and pain: 99 (61%) from government health providers and 41 (29%) from private health providers.

The age distribution of cases revealed that 136 (84%) cases were school-going children in the age group of 3 to 16 years (Table 2). Of 136 children, 16 (12%) did not attend school and other 120 (88%) attended one of the 12 schools in 5 villages and two hamlets of this area. The overall attack rate of the outbreak was 2% (Table 3). Both hamlets of village A had attack rates (13% and 12%) 4 to 13 times higher than the attack rates of any of the other four villages (Table 3). School A of village A, hamlet 1 had the highest attack rate (55%) followed by school B of village B (Table 3). Some children of village A attended schools in village B that had 5 of 12 schools of the area. Both schools A and B were small government schools with only two classrooms to accommodate up to 200 children. The index case was a 3-year-old male from village D who reported onset of swelling after visiting a funeral

ceremony of a family member in a distant (15 kilometers away) village on June 2016. Although the index case resided in village D, he attended school A in village A, hamlet 1. The outbreak started on 5 July 2016, peaked 46 days later on 20 August 2016, and then declined with the last case reported 20 days later on 9 September 2016 (Figure 1).

When school principals noticed symptoms in children, they immediately contacted the medical officer at the nearby health facility. School principals also advised children to not attend the school until symptoms subsided or only after two weeks. Children were also encouraged to report illness in family members to school staff or medical officers.

3.3 | Laboratory results

Among blood samples collected from 18 students attending schools A and B of village A, 11 (61%) tested positive (school A = 4/8, 50%; school B = 7/10, 70%) for mumps IgM antibodies.

4 | CONCLUSIONS AND DISCUSSION

This was a laboratory-confirmed mumps outbreak in an unvaccinated population of Jaisalmer, Rajasthan. School-aged children of one village were predominantly affected. Close contact in classrooms and on the playground facilitated virus transmission among students within the schools and likely contributed to transmission to other villages. Congregation of unvaccinated children in a closed setting like schools is known to play a role in the spread of mumps as documented in a retrospective school cohort in the Netherlands.⁶

As per IDSP, this outbreak was the only mumps outbreak detected and reported in the state of Rajasthan since 2005. Though mumps is not a notifiable disease as per IDSP, sensitive and flexible event-based surveillance of IDSP facilitated prompt outbreak detection and response. Despite limited laboratory capacity in the district, the rapid response team successfully collected samples and transported them to a referral laboratory in the state capital to confirm the outbreak.

India does not currently offer mumps vaccination in its national immunization schedule, consequently, most of the population was unimmunized which led to rapid spread of infection within the community. However, the outbreak was limited to five villages; their location in the Thar desert of Jaisalmer with large distances between villages likely played a role in limiting the geographic spread of the outbreak. This outbreak affected a considerable proportion of adults, which is typical in a population that is unimmunized.^{7–12} Low prevalence of complications is similar to what has been reported in other studies and investigations.^{9,10,12}

The overall attack rate (2%) was lower compared with other outbreaks¹² probably due to following prompt actions by school staff: detection of symptoms, arranging consultation by a medical officer, allowing absence from school, and requesting children to report similar illness among family members to school staff or medical officer. These practices in a unvaccinated population limited the spread and associated complications, however, the

epidemic took its natural course and ended. The epidemiology of this outbreak is similar to that of recent outbreaks reported in tribal villages of neighboring Dadra and Nagar Haveli, Maharashtra, and Karnataka.^{7,9–12}

Our investigation had limitations. There was potentially recall bias regarding the date of illness onset. Due to limited laboratory capacity, blood samples were tested only from suspected cases of two schools during the investigation; no sample was collected from suspected cases in other age groups. An additional limitation was the timing of our laboratory testing. Since samples were collected 3 days after the onset of parotitis, some students may have falsely tested IgM negative because their immune response had not yet developed.⁴ Furthermore, parainfluenza viruses 1, 2, and 3, Epstein-Barr virus, adenovirus, and human herpesvirus 6 are known to interfere with mumps serologic assays¹³; as we did not test for any of these infections, it is possible that there are false positives in our investigation.

5 | RECOMMENDATIONS

There is likely an under recognized burden of mumps in India because it is not a notifiable disease. India may want to consider mumps as a notifiable disease and include it in routine surveillance under IDSP to estimate disease burden.³ This recommendation is consistent with the recommendations of other researchers in India.^{10,12} More outbreaks need to be investigated to understand the epidemiology of mumps in India and to guide future vaccination policy. We recommend that in future investigations of mumps outbreaks among unvaccinated populations, serum samples should be collected and tested at least 3 days after the onset of parotitis, if an acute-phase serum sample collected 3 days after parotitis onset is negative for IgM, testing a second sample collected 5 to 7 days after symptom onset is recommended, allowing for the IgM response to develop.⁴ Finally, during a mumps outbreak, school authorities should be advised that a 5-day absence from school is sufficient for students with symptoms, to both limit the transmission of mumps and to reduce school absenteeism.¹⁴

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FIGURE 1.
Mumps cases by date of illness onset, block Jaisalmer, district Jaisalmer, Rajasthan, India,
23 June 2016 to 10 September 2016 (N = 162)

TABLE 1

Presentation of mumps cases, block Jaisalmer, district Jaisalmer, Rajasthan, India, 23 June 2016 to 10 September 2016 (N = 162)

	n	%
Symptoms		
Fever	113	70
Bilateral swelling in neck	105	65
Unilateral swelling in neck	57	35
Jaw pain	53	33
Difficulty swallowing	45	28
Abdominal pain	4	2
Scrotum swelling	1	1
Complications		
Pancreatitis	4	2
Orchitis	1	1
Hospitalization	0	0
Death	0	0

TABLE 2

Age distribution of mumps case, block Jaisalmer, district Jaisalmer, Rajasthan, India, 23 June 2016 to 10 September 2016 (N = 162)

Age group	n	%
<3 y	11	7
3–4	13	8
5–8	54	33
9–12	53	33
13–16	16	10
>17 y	15	9

TABLE 3

Attack rates for mumps by villages and schools, block Jaisalmer, district Jaisalmer, Rajasthan, India, 23 June 2016 to 10 September 2016 (N = 162)

Village	Hamlet	Cases	Population	AR, %
Village A	Hamlet 1	84	650	13
	Hamlet 2	23	200	12
Village B		32	3637	0.8
Village C		8	1719	0.5
Village D		9	1090	1
Village E		6	200	3
Total		162	7496	2
School-going children (n = 120)				
School	Village/Hamlet	Cases	Students	AR, %
School A	A/1	66	118	55
School B	B	19	105	18
School C	B	21	320	6
School D-F	B	8	632	1
School G-K	A/2,C,D *	6	494	1
Total		120	1520	8

* No school in village E.