

## Mumps Epidemic in Navi Mumbai in 2023-24: Lessons for the Health Management System

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### ABSTRACT

**Objective:** To investigate the morbidity due to the mumps epidemic in Navi Mumbai region of Maharashtra during 2023-24 and identify the preventive strategies.

**Methods:** An outbreak investigation was carried by pediatricians in Navi Mumbai, Maharashtra, India, between December 2023 and February 2024. A clinical case of mumps was defined as any person with acute onset of unilateral or bilateral, tender, swelling of the parotid or other salivary gland(s), lasting at least two days.

**Results:** 217 documented cases of mumps were investigated. Among them 197 (90.78%) had never received mumps vaccine, and 20 had received Measles-Mumps-Rubella vaccine (MMR) in the private sector. 185 children had been immunized with Measles-Rubella Vaccine (MR) in the National Immunization programme. The opportunity to vaccinate with the additional component of mumps had been missed during immunization with MR vaccine.

**Conclusion:** This outbreak investigation highlights the need to establish a Public Health Division in the Government for monitoring all contagious diseases in the community and the timely detection and control of all outbreaks.

**Keywords:** Meningoencephalitis, MR vaccine, MMR vaccine, National immunization schedule, Orchitis, Parotitis

*Published online:* Sep 24, 2024; *PII:*S097475591600700

### INTRODUCTION

Mumps is contagious and spreads by respiratory route. New hosts contract infection by inhalation of virus inoculum in droplets/aerosol during social contacts. It is characterized by unilateral or bilateral parotitis, lasting for about one week to ten days. Uncommonly mumps virus may target the central nervous system, inner ear, endocrine organs (pancreas, thyroid) or testes and ovaries, and present with serious complications like meningitis, encephalitis, deafness, pancreatitis, and in post-pubertal age with orchitis and oophoritis [1].

Due to the false perception that mumps is always

benign and that it is not a major public health burden, India's Universal Immunisation Programme (UIP) does not include mumps vaccine. During the second half of 2023, there was a pan-India epidemic of mumps which continued into the first quarter of 2024 [2]. The objective of this study is to investigate the morbidity due to the mumps epidemic in Navi Mumbai and identify the preventive strategies.

### METHODS

A mumps outbreak surveillance was carried out in the pediatric clinics or hospitals in Navi Mumbai, Maharashtra, between December 2023 and February 2024. A clinical case of mumps was defined as any person with acute onset of unilateral or bilateral, tender, swelling of the parotid or other salivary gland(s), lasting at least two days [1]. Pediatricians working in different areas in the city of Navi Mumbai filled an electronic form when they

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Received: Jun 19, 2024; Initial review: Jul 04, 2024;

Accepted: Sep 12, 2024

diagnosed a clinical case of mumps. Additionally, they could also report the cases that occurred in 2023, from the clinical records maintained in their clinics/institutions and/or where the information could be retrieved electronically. Only pediatric cases with age upto 18 years were recorded. The details of cases included demographic information, immunization status, clinical features, laboratory investigations, complications and need for hospitalization.

## RESULTS

A total of 217 children were diagnosed and reported as mumps through the online surveillance. The number of cases reported prospectively after the research commenced in December 2023 was 143, while details of 74 cases were retrieved retrospectively from electronic records of two tertiary hospitals. The latter information helped to date the beginning of outbreak to July 2023. 122 boys and 95 girls were included. Their age ranged from 7 months to 15 years and the median age was 6.2 years.

Parotid gland swelling was the commonest presentation and present in all children. Fever was present only in 35.4% ( $n = 77$ ). Unilateral parotid swelling was the commonest presentation and seen in 114 children (52.5%); bilateral parotid swelling was seen in the remaining 103 children (47.5%). There was involvement of both parotid and submandibular glands in 20 children (9.2%). One child aged 2.5 years developed mumps after two weeks of mumps in the father, indicating that the disease burden extends beyond pediatric age and that adults also play a role in disease transmission.

Immunization records revealed that, 185 children (85.25%) had received the MR vaccine from National Immunization Programme, 12 had received neither MMR nor MR (5.52%) vaccine of which one was 7 months old and therefore was ineligible for either vaccine. Out of 20 children (9.22%) who had received MMR vaccine and

(still developed mumps), 8 children (aged 2.5 to 7.9 years) had received 1 dose, 11 children had 2 doses (3.1 to 14 years) and 1 child (7.7 years) had 3 doses.

Five cases were reported in the study with complications of the central nervous system (CNS); two cases had aseptic meningitis and three presented with meningoencephalitis. Of these five cases, two had mumps virus detected in cerebrospinal fluid (CSF) by polymerase chain reaction testing while the rest were diagnosed based on clinical criteria. The details of clinical and laboratory profile of these patients are given in the **Table I**. Another case mentioned is a fifteen-year-old girl diagnosed as meningitis during the study period, whose CSF analysis revealed mumps virus by polymerase chain reaction (PCR) testing but was excluded from the study as there was no clinical signs of mumps.

Four children required inpatient care for lower respiratory tract infections. Four children were admitted with dehydration due to poor intake. One twelve-year-old boy developed orchitis two weeks after parotitis.

## DISCUSSION

Mumps outbreaks are known to occur periodically, with intervals of 5-10 years. Although the study represented 217 cases, the actual burden of this disease could be estimated to be several times higher in the community as the study cases were reported by less than eight percent of pediatricians of Navi Mumbai.

The median age of children was 6.2 years in our study, compared to an age of 8 to 9 years which was reported previously [3-6]. One child developed mumps two weeks after his parent developed mumps suggesting that mumps in adults can be transmitted to household contacts. Investigating the spread in the household would have increased the study sample size, and helped to estimate the secondary attack rate in the households.

**Table I Clinical and Laboratory Profile and Immunization Status of Cases With Mumps Meningoencephalitis/Meningitis.**

Age (years), Sex	Salivary gland swelling	Other clinical features	CSF					Vaccination status
			Cell count (cells/mm <sup>3</sup> )	Lymphocyte (%)	Proteins (g/dL)	Sugars (mg/dL)	PCR for mumps virus	
12, male	Present	Fever, headache, convulsion	83	95	10.8	45	Positive	MR
15, female	Present	Fever, headache, vomiting	270	100	91.3	52	Positive	MMR (1 dose)
9, male	Present	Fever, vomiting, convulsion	277	100	56	57	Negative	MR
3.5, male	Present	Fever, vomiting, irritability	262	100	160	52	Negative	MR
6, male	Present	Fever, convulsion, altered sensorium	744	100	284	42	Negative	Unimmunized
15, female <sup>a</sup>	Absent	Fever, headache, vomiting	520	100	87	52.4	Positive	MR

CSF Cerebrospinal fluid, MMR Mumps, Measles, Rubella vaccine, MR Measle Rubella vaccine, PCR Polymerase chain reaction

<sup>a</sup> Excluded as she did not manifest with clinical features of mumps

Fever was present in a minority of the cases which was unusual as many other research studies reported fever to be present in 70 to 100% patients. [3-6]. Although bilateral parotid swelling is more commonly reported than unilateral swelling in most studies [3-6], this study revealed that unilateral parotitis was marginally more than bilateral involvement (52.5% versus 48%, respectively).

Meningoencephalitis was a common complication reported in our study. One girl with meningitis did not have clinical manifestations of mumps, hence did not meet the criteria to be included in the study, but etiology of mumps virus was confirmed by CSF PCR test. The sensitivity of CSF PCR to detect mumps virus is about 70% with specificity of 100% [7]. Therefore, the number of cases of viral meningitis by mumps could be underestimated due to absence of preceding parotitis, lower sensitivity of the PCR test in CSF and unavailability of testing facility in resource limited settings.

In countries which have yet to introduce mumps vaccine in their national immunization schedule, sensorineural hearing loss caused by mumps can account for upto 25% of pediatric single-sided acquired deafness [1]. Sensorineural hearing loss can also be bilateral and irreversible. There were no reports of sensorineural deafness in our study since this was exclusively for acute disease. However, this complication could have been missed due to difficulty in identifying hearing loss, especially one sided, in young children who might not be able to communicate hearing difficulties. Long term follow-up is required to estimate the real incidence of mumps causing deafness.

A few children had mumps in spite of vaccination, even with three doses. This study reported that the risk of mumps, and morbidities/ complications was remarkably lower in the vaccinated group compared to unvaccinated group. However, mumps vaccine failure is also well known. Most countries using MMR vaccine in their National Immunization Programme, give two doses, with the first dose at or preferably after 12 months of age. Currently mumps vaccine is available only in the private sector. Indian Academy of Pediatrics (IAP) recommends MMR vaccine between 9 months and 15 months' age and another third dose at 4-6years [8]. MR vaccine is widely used in the country in a two-dose schedule for measles elimination. Inclusion of mumps vaccine will result in a two-dose schedule of MMR vaccine.

The vaccine effectiveness for Jeryl Lynn containing mumps vaccine after one and two doses were found to be 72% and 86% respectively [9]. Also, the secondary attack rate was found to be prevented by 74%. Mumps vaccine containing other strains especially Leningrad-Zagreb have

been associated in few studies with a risk for aseptic meningitis, in 1 in 1000 doses administered [10].

An outbreak of mumps virus meningoencephalitis was reported in 2005-2006 from Sangli district in Maharashtra in which out of the reported 10 cases, 9 children had received vaccination as per National Immunization Programme at 9 months and then one dose of MMR at 15 months [11].

Seronegativity for mumps in a cross-sectional study of young adults (mean age 20 years) in India was found to be 11.4% [12]. Another cross-sectional study showed seronegativity in children below 9 months' age to be 46.7% and those aged below 24 months as 60% [13]. Countries which have successfully achieved adequate two dose mumps vaccine coverage before 24 months have reported mumps with complications more commonly in teenagers and adults due to longer interval from the last dose and waning immunity [14]. The effectiveness of two-doses of mumps vaccine offered at 9 and 15 months, or administered at 15 months and two years, needs to be studied further.

The World Health Organization in its recent position paper discussed the paucity of data on disease burden available from low-and middle-income countries [1]. It stated that mumps vaccine should be introduced in National Immunization Schedule only if there is high sustained coverage of over 80% with MR vaccination. There is data from the developed countries on the cost effectiveness of including mumps in National Immunization Schedule. Unfortunately, the data from low-income countries about the burden as well as cost effectiveness is sparse [1]. However, considering the successful implementation of MR vaccination programme, India has shown that its immunization system is mature enough to target mumps for elimination. Mumps vaccine policy of 2 doses with a booster at an older age would therefore help reduce the burden of disease in the community by reducing secondary attack rate as well as reducing the severe complications in adolescents. A novel and safe mumps vaccine with persistent attenuation and immunogenicity might be a potential solution to avoid a third dose in children [15].

Only a small group of pediatricians in the private sector were part of this investigation and therefore the burden evidenced from this study seems under reported. The actual burden of the disease and its complications can only be known by the active surveillance of the disease in the community. Integrated Disease Surveillance Programme (IDSP) under National Centre for Disease Control (NCDC) regularly collects outbreak information from the states. The reporting for IDSP is voluntary and

### WHAT THIS STUDY ADDS?

- The research results support the need for inclusion of mumps vaccine in the National Immunization Schedule.
- It alludes to the key challenges of vulnerability of younger and adolescent age-groups that need to be addressed while formulating the dosing regimen in a national policy for inclusion of mumps vaccine.
- There is a need to establish a public health division for countrywide regular surveillance of contagious diseases.

therefore unreported outbreaks can be missed. The study therefore also highlights the need for a Public Health Division in Central and State Governments for early detection and rapid control of all outbreaks. Case-based surveillance ought to be made mandatory for all healthcare providers. Establishment of such a system is most needed to monitor not only endemic diseases but also to recognize new and resurgent diseases.

An important lacuna identified from this study is the need for linking of institutions for systematic data collection, as expanded sentinel surveillance, so that diseases of public health importance can be monitored and investigated. The study also reaffirms that immunization should target not only the diseases with high case-fatality, but also those with high frequency and complications.

*Contributors:* DD: Conceptualization, design, data collection, review and writing; JG: Data collection, review and writing; AP, SS, SE, YY, PM VY: Data collection and review; TJJ: Design, review and writing. All authors approved the final version.

*Ethics:* Exempted from ethics review by Institutional Review Board, MGM Institute of Health Sciences, Navi Mumbai, Maharashtra, India.

*Funding:* None; *Competing interest:* None stated.

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