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Brief Report

Mumps outbreak with high complication rates among residents in a university teaching hospital

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According to the US Advisory Committee on Immunization Practices recommendations, only health care personnel (HCP) with adequate evidence of immunity should be exposed to patients with a suspected diagnosis of mumps. Here we report a hospital-outbreak scenario among medical residents with no previous vaccination record against mumps who had a high rate of complications. We also describe the importance and impact of full and proper vaccination, as well as isolation, of HCP in stopping the outbreak and, finally, review opportunities for improving the safety of HCP.

Although severe complications due to mumps are rare, permanent sequelae and spontaneous abortion have been reported.[1] The US Advisory Committee on Immunization Practices recommends that only health care personnel (HCP) with adequate evidence of immunity should be exposed to patients with a suspected diagnosis of mumps.[2] In 2012, the Centers for Disease Control and Prevention issued guidance on the use of a third dose of measles, mumps, and rubella (MMR) vaccine in their *Manual for the Surveillance of Vaccine-Preventable Diseases*, and in October 2017, the US Advisory Committee on Immunization Practices reviewed and accepted the available evidence to supplement this recommendation.[3]

Given that the MMR vaccine was introduced only 20 years ago, HCP born before 1997 are at risk not only for infection but also for facilitating nosocomial transmission.[4] The mumps vaccination has been available in Mexico since 1998, and the latest government-issued report indicates 87% MMR vaccination coverage among children aged 15-23 months. Unfortunately, however, children who receive a second dose of the vaccine at age 6 years account for only 44.6% of the population.[5] In April 2018, the Mexican National Epidemiological Vigilance System released a statement acknowledging the increase in mumps reports. As of May 2018, 150% more cases had been reported compared with data from 2017.[6]

Here we describe the investigation of this outbreak and report the results of serologic testing and a vaccination campaign in a previously unvaccinated HCP population. World Health Organization definitions were used.[1] A clinical case was defined as an acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland lasting ≥ 2 days and without another apparent cause. A laboratory-confirmed case was a clinical case with a positive serologic test for mumps-specific IgM antibodies in the absence of mumps immunization in the preceding 6 weeks. An epidemiologically confirmed case met the clinical case definition and was epidemiologically linked to a laboratory-confirmed case.

Clinical data, patient sex, hospital department, vaccinations in the previous 6 weeks, and exposure to another patient or resident with a clinical presentation suggestive of mumps were collected. Verbal consent was obtained, and blood samples were drawn. IgM and IgG enzyme immunoassays were performed. After identification of the first case, residents and other HCP were instructed to report to the Department of Epidemiology if they experienced any pain or tumefaction in the preauricular and/or maxillary regions or fever. On identification of a suspicious or confirmed case, HCP were put immediately on droplet precautions, underwent evaluation by the Infectious Disease Service, were placed on hospital leave of absence, and were continued in isolation at home for 5-10 days and reinstated only when asymptomatic. Random serologic testing was performed

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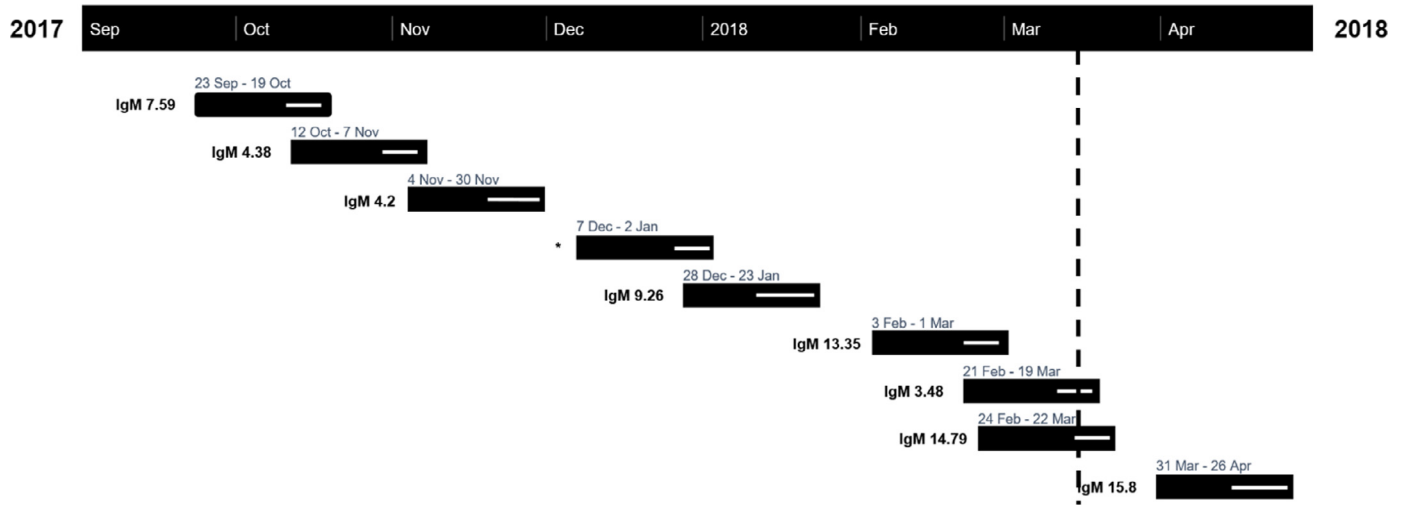

Fig 1. Timeline depicting the mumps cases among residents. The black bar depicts the period between incubation and the end of the contagious phase. This is extrapolated by using a mean of 17 days of incubation period from exposure to onset of symptoms (range, 12-25 days) and infectiousness until 9 days after exposure.[7] The white bar indicates the period during which the HCP reported symptoms. The dashed line indicates the start date of the ongoing measles, mumps, and rubella vaccination campaign. *The subject refused serologic testing. **IgM was reported as positive if >1.2 AU, borderline if ≥ 0.80 AU and ≤ 1.20 AU, and negative if <0.8. *AU*, arbitrary units.

in asymptomatic residents paired with cases by age and sex who had not been recently vaccinated for any indication.

In September 23, 2017, a pediatrics resident attended a child with a clinical diagnosis of mumps during a short stay in a hospital in Chile (Fig 1). Approximately 15-20 days later, the resident developed bilateral swelling of the salivary glands and fever while assigned to our hospital's pediatric ward. A second pediatrics resident developed the same symptoms, and an internal medicine resident followed as the third case. A hospital alert was implemented because only 1 case of mumps in residents had been registered in the previous 5 years. Afterward, 5 surgery residents who met the clinical criteria were identified (1 of whom refused serologic testing). Two of the residents developed bilateral orchitis, and a third had keratitis, with a decrease in visual acuity to 20/200 (Table 1).

The pediatrics and surgery residents had a common working area and reported exposure to one another; however, the internal medicine resident had no apparent link with the other residents except for the hospital cafeteria. There was a shortage of vaccine, and only after the eighth case presented was it made available to and strongly recommended for all residents at the hospital. After 2 weeks, coverage of at least 1 new dose was achieved in 75% of internal medicine residents, 51% of surgery residents, and 66% of in pediatrics residents.

Table 1
Clinical presentations and serology results of the residents presenting with mumps infection and their controls

Clinical characteristic	Patients (n = 9)	Controls (n = 8)
Male sex, n (%)	7 (77.9)	6 (75)
Age, y, median (range)	28.1 (26-31)	27.6 (25-30)
Clinical presentation, n (%)		
Bilateral parotitis	9 (100)	—
Fever	6 (66.6)	—
Orchitis	2 (28.5)	—
Meningitis	1 (11.1)	—
Keratitis	1 (11.1)	—
Hospitalization	1 (11.1)	—
Serology, n (%)		
Positive IgM	8 (100)	0 (0)
Positive IgG	8 (100)	3 (37.5)

NOTE. IgM was reported as positive if >1.2 AU, and IgG was reported as positive if >10.9 AU/mL.
AU, arbitrary units.

On March 31, 2018, a radiology resident presented with an infection, and headache and nausea developed 2 days after the diagnosis. A lumbar puncture confirmed central nervous system involvement, but no further complications developed, and the resident fully recovered. Vaccination was extended to the Radiology Department (76% coverage), and no further cases were identified. We compared serologic results pairing the subjects with 8 controls matched by sex and age with asymptomatic residents; only 37.5% of them had positive IgG, but none had positive IgM.

This outbreak had a 44% complication rate (2 cases of orchitis and 1 case each of keratitis and meningitis). No other HCP besides residents met the clinical criteria, and neither did any hospitalized patients during their hospital stay.

These results describe an unvaccinated HCP population in the context of a nosocomial outbreak. Although we acknowledge the seasonality of mumps infection, we postulate that the program of standard droplet precautions, leave of absence, and vaccination helped stop the outbreak. The cases in residents stopped after vaccination was initiated despite an increase in community cases.

In Mexico, there is no mandatory vaccination schedule for HCP, and MMR coverage in adults aged >21 years is null, creating a risky work environment for both doctors and patients. None of the affected residents had any immunodeficiency or comorbidity, posing an interesting question regarding the high complication rate; we speculate that it could be owing to transient immunodeficiency related to working schedules (overnight shifts every 3 days).

Limitations of this outbreak study were the lack of long-term follow-up of potentially exposed patients, the possibility of missed cases given that 20%-40% of the infections are asymptomatic, and the absence of widespread serologic testing. We believe that this hospital outbreak illustrates 2 important points: first, that universities and health care systems must enforce vaccination in their health divisions, and second, health care systems in developing economies and economies in transition must provide sufficient vaccine coverage for vulnerable populations and the HCP who attend them.

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