

MUMPS OUTBREAK IN JERUSALEM AFFECTING MAINLY MALE ADOLESCENTS

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From mid-September 2009 to 7 December 2009, 173 cases of mumps have been reported in the Jerusalem District. Most cases (82.1%) were male adolescents (median age 14.5 years) who are students in religious boarding schools. The majority of them (74%) are appropriately vaccinated for their age; 67% had received two doses of mumps-containing vaccine. An epidemiologic connection has been reported with visitors from New York, some of whom had recently had mumps.

Mumps is a notifiable disease in Israel by law. From mid-September 2009 to 7 December 2009, 173 cases of mumps have been reported to the Jerusalem District Health Office. The patients were mainly (147/173; 85%) students in yeshivas (religious academies operated as boarding schools) in several Jerusalem neighbourhoods and two neighbouring cities, and 142 of 173 (82%) were males. The epidemic curve is presented in Figure 1 and shows a pattern compatible with person-to-person transmission. The median age of the patients was 14.5 years and the mean was 14.8±7.3 years. Their age and sex distribution are presented in Figure 2. Altogether, 60 schools have been affected (see Table). The outbreak spread to other regions of the country, and up to 7 December over 250 cases have been reported with similar demographic and epidemiologic characteristics.

The clinical picture included unilateral and bilateral parotitis. One patient (a 19 year-old) was hospitalised in a urology department with orchitis and another three were admitted to ear, nose and throat departments. A further six patients were observed for varying periods in hospital emergency departments and discharged.

Case ascertainment included: positive mumps IgM antibody (in 20 patients) and positive real-time RT-PCR in urine (in four patients). The virus was classified by the central virology laboratory of the Israel ministry of health as genotype G5. The remaining 149 cases were diagnosed on the basis of clinical features together with an epidemiologic association.

Of the 173 patients, 116 (67%) had received two doses of measles-mumps-rubella (MMR) vaccine (Priorix GlaxoSmithKline Biologicals – Jeryl Lynn strain), 29 (16.8%) had received one dose (age-appropriate in 12 of them), 20 (11.6%) were not immunised, and in another eight patients (4.6%) the immunisation status was unknown (see Figure.3).

A number of patients reported contact with yeshiva students from the United States (New York-) who visited Israel during the

High Holidays in mid-September 2009 and some of whom were reported to have recently had mumps.

Outbreak control measures included investigations in the relevant schools to determine the students' vaccination status and referral for completion of MMR vaccination where necessary. Information on the outbreak was circulated to all health maintenance organisations in the District and to the public via the mass media.

Discussion

Mumps is an acute viral infection; a third of infections are subclinical, another 30-40% are expressed clinically as unilateral or bilateral parotitis. Complications occur more frequently in adults than in children; 10-15% of mumps patients develop meningo-encephalitis. Orchitis occurs in 20-50% of post-pubertal men, but sterility is rare. Other complications include pancreatitis, oophoritis, deafness, arthritis, thyroiditis, and myocarditis. Transmission is through droplet infection. Confirmation of mumps infection includes serological testing (for IgM antibodies by various methods), identification of mumps RNA by RT-PCR and viral isolation in cell culture [1].

Mumps vaccination was included in the routine childhood immunisation schedule in Israel in 1984, and since 1994 has been administered in a two-dose schedule at ages 12 months and six years (first grade in school) in the form of the MMR vaccine, and since 2008 as measles-mumps-rubella-varicella (MMRV) vaccine. The average overall immunisation coverage for the first dose of mumps vaccine (MMR/MMRV) in the Jerusalem District has been maintained between 93 and 96.7% over the past decade [Jerusalem District Health Office, unpublished data]. It is to be noted that in 1992, the coverage for the first dose of MMR among the Jewish population of Jerusalem was a mere 82.3%.

Mumps control in Israel improved significantly during the 1990's [2], although periodic outbreaks still occurred due to under-vaccination, primary vaccine failure and waning immunity. In 1998 and 2005, two outbreaks (each of the order of 100 cases) occurred in Israel. In 2006, 12 cases were reported; six were reported in 2007 and 13 in 2008. Serological studies performed in the late 1990s revealed relatively low mumps antibody levels among adolescents and army recruits in Israel, ranging from 59 to 83.3% positivity; such levels do not guarantee adequate herd immunity [3,4].

Mumps outbreaks, mainly involving adolescents and young adults, have emerged recently in several countries. A nationwide

mumps outbreak occurred in the United Kingdom in 2004-2005, with 56,390 reported cases. The majority (79%) were aged 15-24 years; two thirds were unvaccinated. Non-availability of MMR vaccine probably contributed to susceptibility of the birth cohorts 1983-1986 [5].

FIGURE 1

Mumps outbreak in Jerusalem September-December 2009, epidemic curve (n=173)

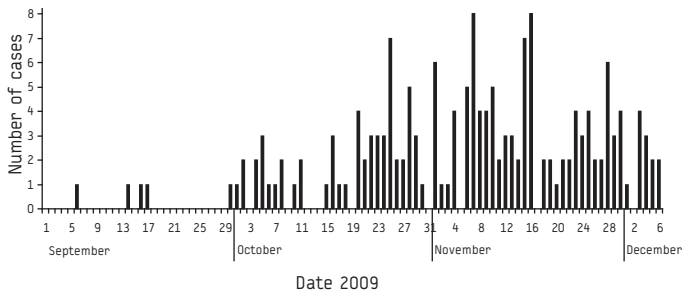
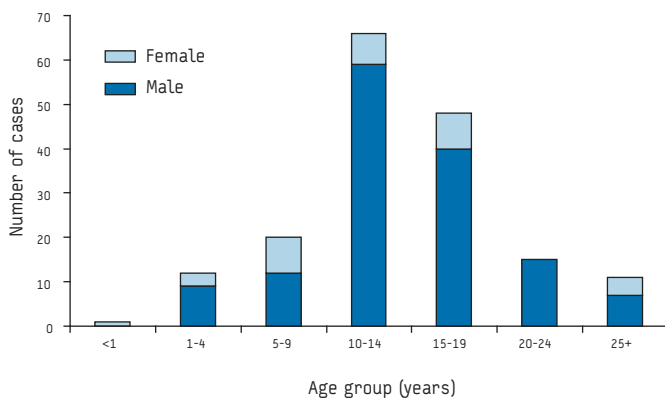


FIGURE 2

Mumps outbreak in Jerusalem September-December 2009, cases by age and sex (n=173)



TABLE

Mumps outbreak in Jerusalem, September-December 2009, distribution of cases in the affected schools (n=147)

Number of Mumps cases per school	Total number of cases	Number of schools
1	37	37
2	18	9
3	9	3
4	12	3
5	10	2
6	6	1
9	9	1
10	10	1
11	22	2
14	14	1
Total	147	60

In the United States, the largest outbreak in 20 years occurred in 2006-2007, encompassing more than 6,000 cases centred in college campuses. Of the students aged 18-24 years, 84% had been vaccinated with two doses of mumps vaccine [6]. The epidemic occurred despite high vaccination rates and low mumps activity in the community [7].

England and Wales are currently in the throes of an outbreak of mumps centred in college campuses, with 998 cases reported in January-February 2009, and further cases still being reported, mainly among college students. The circulating genotype is G5 [8].

Other European outbreaks have been reported in recent years. In an Austrian outbreak involving over 200 cases [9], 49% of the patients were unvaccinated – a very different situation from the outbreak we report. In the Republic of Moldova, an extremely large outbreak of nearly 20,000 cases was reported in 2007-2008 [10]. Most of the patients (96%) had received only one dose of MMR. A two-dose schedule was introduced in that country in 2002, for birth cohorts from 1995 onwards.

In an ongoing mumps outbreak in the United States (New York, New Jersey), and Canada (Quebec), 179 and 15 cases, respectively, were reported in August-October 2009. The affected individuals are mainly members of a Jewish religious community (83% males; median age 14 years). Of those for whom vaccination status is known 72% were vaccinated with two doses. The virus was of genotype G [11].

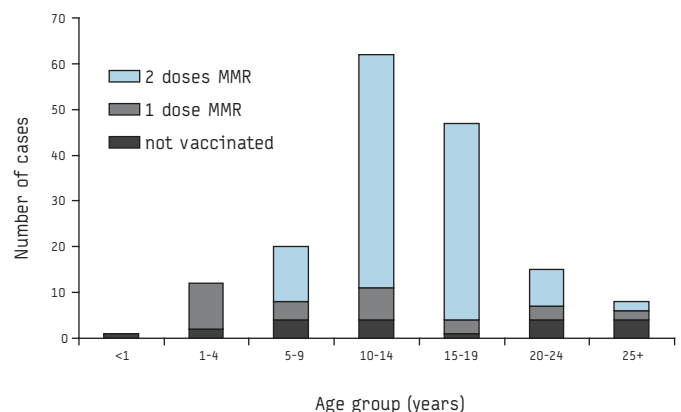
Conclusions

The two main characteristics of the current outbreak in Jerusalem are the predominance of male adolescents in religious boarding schools and the fact that most cases (74%) are appropriately vaccinated for their age. The male predominance is striking, and requires further study.

It had been observed that the mumps component of the MMR vaccine provides inferior protection compared to the measles and rubella components. Unlike the levels of 95% and 98% provided by the latter two, the mumps protection levels are approximately 62.85% and 85.88% for the first and second doses, respectively. Recently, the effectiveness in the United Kingdom was determined as 88% and 95%, respectively. However, the effectiveness of one

FIGURE 3

Mumps outbreak in Jerusalem September-December 2009, cases by age and vaccination status (n=165)



dose waned from 96% in two year-olds to 66% in 11-12 year-olds, and the effectiveness of two doses from 99% in 5-6 year-olds to 86% in 11-12 year-olds [12].

The reasons for the particular characteristics of these mumps outbreaks are unclear. Possible explanations include a combination of primary and secondary vaccine failure, waning immunity, inadequate vaccine effectiveness and previous low immunisation coverage. Contributory factors include living conditions in specific population groups such as college freshmen, army recruits and adolescent students in boarding schools.

References

1. Atkinson W, Wolfe S, Hamborsky J, McIntyre L, editors. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. 11th ed. Centers for Disease Control and Prevention (CDC). Chapter 13: Mumps. Washington, D.C.: Public Health Foundation; 2009. p.189-91. Available from: <http://www.cdc.gov/vaccines/pubs/pinkbook/default.htm>
2. Slater PE, Anis E, Leventhal A. The control of mumps in Israel. *Eur J Epidemiol*. 1999;15(8):765-7.
3. Muhsen K, Aboudy Y, Mendelson E, Green MS, Cohen D. Prevalence of mumps antibodies in the Israeli population in relation to mumps vaccination policy and incidence of disease. *Epidemiol Infect*. 2008;136(5):688-93.
4. Huerta M, Davidovitch N, Aboudy Y, Ankol OE, Balicer RD, Zarka S, et al. Declining population immunity to mumps among Israeli military recruits. *Vaccine*. 2006;24(37-39):6300-3.
5. Centers for Disease Control and Prevention (CDC). Mumps epidemic – United Kingdom, 2004-2005. *MMWR Morb Mortal Wkly Rep*. 2006;55(7):173-5.
6. Dayan GH, Quinlisk MP, Parker AA, Barskey AE, Harris ML, Schwartz JM, et al. Recent resurgence of mumps in the United States. *N Engl J Med*. 2008;358(15):1580-9.
7. Barskey AE, Glasser JW, LeBaron CW. Mumps resurgences in the United States: A historical perspective on unexpected elements. *Vaccine*. 2009;27(44):6186-95.
8. Health Protection Agency. Continued increase in mumps in universities 2008-2009. *Health Protection Report*. 2009;3(14), 9 April 2009, United Kingdom. Available from: <http://www.hpa.org.uk/hpr/archives/2009/news1409.htm>
9. Schmid D, Holzmann H, Alfery C, Wallenko H, Popow-Kraupp TH, Allerberger F. Mumps outbreak in young adults following a festival in Austria, 2006. *Euro Surveill*. 2008;13(7):pii=8042. Available from: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=8042>
10. Mossong J, Bonert C, Weicherding P, Opp M, Reichert P, Even J, et al. Mumps outbreak among the military in Luxembourg in 2008: epidemiology and evaluation of control measures. *Euro Surveill*. 2009;14(7):pii=19121. Available from: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19121>
11. Centers for Disease Control and Prevention (CDC). Mumps outbreak – New York, New Jersey, Quebec, 2009. *MMWR Morb Mortal Wkly Rep*. 2009;58(45):1270-4.
12. Cohen C, White JM, Savage EJ, Glynn JR, Choi Y, Andrews N, et al. Vaccine effectiveness estimates, 2004-2005 mumps outbreak, England. *Emerg Infect Dis*. 2007;13(1):12-7.