

An outbreak of measles associated with an international dog show in Slovenia, November 2014

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In Slovenia, where measles virus had not been circulating for many years, an outbreak of measles among visitors of an international dog show occurred in November 2014. We identified 23 measles cases plus 21 presumable secondary and tertiary cases. Thirty-nine cases were adults, 27 to 56 years-old, 12 of them vaccinated with two doses. Five were unvaccinated children. Thanks to high vaccination coverage (95.3% in birth cohort 2011) wider transmission is not expected in Slovenia.

On 24 November 2014, the regional epidemiologist from Nova Gorica region notified the Communicable Diseases Centre of the National Institute of Public Health (NIJZ) about two suspected measles cases. Both had visited the international dog show in Vrtojba/Šempeter, close to the Italian border, which took place on 8 and 9 November 2014. Dog owners from 27 (mostly European) countries participated. Around 1,100 persons were present at the exhibition (700 dog owners and ca 400 visitors). As this was the only link between the two cases, we assumed that they were infected there. In both cases, measles infection was laboratory-confirmed on the following two days by positive IgM and positive PCR.

Outbreak description

On 26 November, NIJZ alerted all primary physicians in the country about the event, to rapidly identify further cases. On the same afternoon, four more suspected cases were reported, and in the next two days, another nine that had all visited the exhibition. The measles case definition used in Slovenia is based on the case definitions of the European Union (EU) [1]. All suspected cases were laboratory-tested and measles was confirmed either by detecting measles-specific IgM antibodies in serum samples by ELISA (Serion Immundiagnostica, Würzburg, Germany) and/or by detecting measles antigen in a throat swab or urine with real-time RT-PCR [2].

In total, 28 suspected measles cases that visited the exhibition were tested for measles antigen and/or measles-specific IgM antibodies. In 18 cases, measles were confirmed according to laboratory criteria, and in five suspected cases measles was excluded. In the remaining five cases (three vaccinated with two doses and two with unknown vaccination status) with clinical presentation of measles, only extremely high IgG of >5,000 mIU/ml was detected (cut-off for positivity: 200 mIU/ml). Although these five cases had negative IgM and negative PCR results, we considered that they, too, fulfilled the case definition and defined them as confirmed cases, which gives a total of 23 confirmed measles cases.

In addition to the 23 measles cases infected at the dog show, we confirmed another 21 measles cases (as of 31 December), which were presumably secondary and tertiary cases. However, we were able to establish an epidemiological link to the primary or secondary cases for only 18 of them.

Genotyping

As of December 2014, the 450 nt C-terminal end of the nucleoprotein gene of measles virus from seven cases has been sequenced and genotype D8 has been identified in all seven. All sequences are available in the World Health Organization (WHO) measles sequence database MeaNS (MeaNS sequence ID numbers: 61781–61787) [3]. In 2014, exact matching sequences of D8 genotype measles virus were found also in Austria, Bosnia and Herzegovina, Greece, the Russian Federation, and the United Kingdom [3]. Sequencing of measles viruses from further cases is still in progress at the time of publication.

Epidemiological analysis

As of 31 December, a total of 44 measles cases linked to the dog show have been reported from two of the nine Slovenian regions (Figure 1). For the first generation of

measles cases (the ones that visited the exhibition), the onset of rash started from 21 November, for the second generation from 29 November, and for the third generation from 25 December (Figure 1). Among the 23 cases infected at the exhibition, the majority (n = 16) was from Nova Gorica region and the others (n = 7) were from Ljubljana region. Among the 16 secondary cases, only three were identified in Nova Gorica region, the other 13 were from Ljubljana region, and all five tertiary cases were from Ljubljana region.

Of the 44 measles cases, 19 were male. Five were children between six months and 11 years-old and 39 were adults aged 27 to 56 years, of whom 36 were between 34 and 51 years-old (Figure 2). Among the adults, 12 had been fully vaccinated (with two doses of measles-containing vaccine), nine had received only one dose and 18 were not vaccinated or information was not available (vaccination status unknown or no written proof of vaccination). None of the five children were vaccinated (Figure 2). Only two adult cases required hospitalisation, no fatal outcomes were recorded.

According to our knowledge, only one measles case infected at the exhibition was notified in another country (Belgium). This case is not included in the 44 analysed here.

In addition, six further measles cases were reported in Slovenia in the same period (November to December 2014) which were not linked to the exhibition; five were imported from Bosnia and Herzegovina and one was a secondary case related to one of these imported cases. Also from one of these cases genotype D8 has been identified.

Control measures

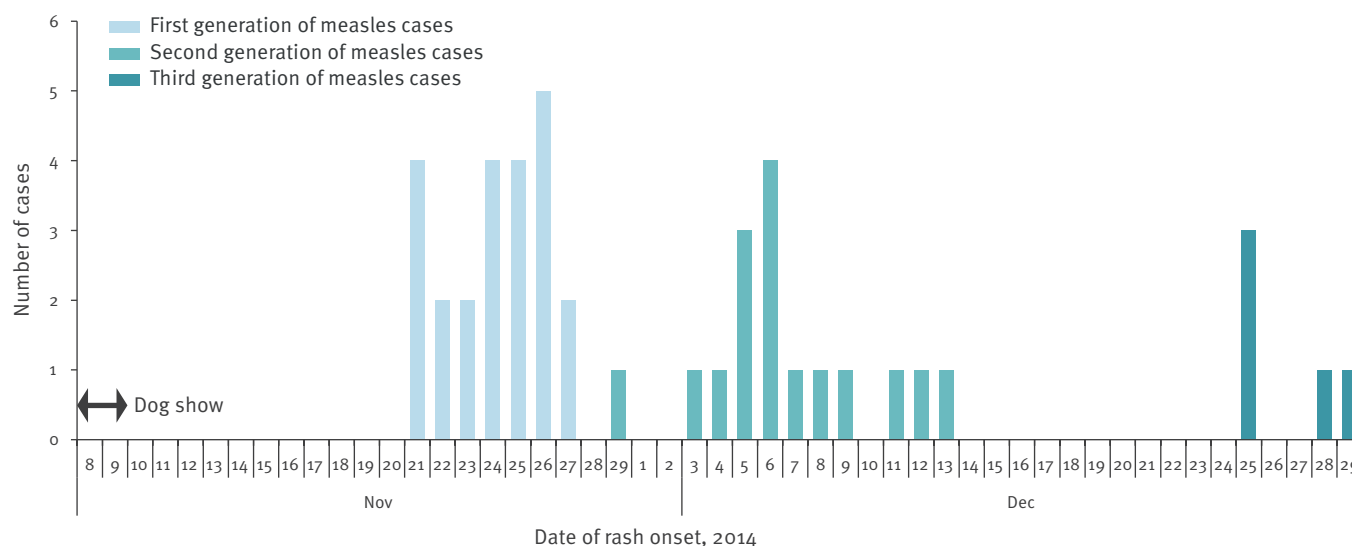
Immediately after confirmation of the first cases, NIJZ alerted all primary physicians about the event. As the contact information for the participants at the dog show was not available, we informed the general public through mass media (radio and television) and regular updates on the NIJZ website. We conducted extensive contact tracing in order to perform prophylactic vaccination where appropriate. As recommended in national guidelines, post-exposure prophylaxis with normal intravenous immunoglobulin (IVIG) was offered to the individuals at high risk of severe disease, including infants younger than six months, pregnant women and immunocompromised persons [4]. We do not have information on how many of those individuals actually received this post-exposure prophylaxis. We also alerted people who intended to travel to Bosnia and Herzegovina or to other countries with ongoing measles outbreaks during the holidays, to update their vaccination status.

Discussion

Thanks to early introduction of measles vaccination into the Slovenian vaccination programme in 1968 (live measles vaccine prepared from a further-attenuated Edmonston-Zagreb strain was used, replaced by a combined vaccine against measles and mumps in 1979, and from 1990 by trivalent vaccine against measles, mumps and rubella) and to high vaccination coverage in past decades (from 93.9% to 96.1% for birth cohorts 2003 to 2012), Slovenia has been measles-free for many years [5]. No cases were reported from 2000 to 2009. In 2010, a cluster of measles was described in a hospital setting [5]. In 2011, 22 cases of measles were reported, six of whom were imported (from France, Germany, Italy and Romania) with a few single secondary cases, except in one situation that led to nine secondary cases [6]. In 2012, two imported cases (from

FIGURE 1

Number of measles cases in an outbreak linked to a dog show, by date of rash onset, Slovenia, notified by 31 December 2014 (n=44)



Cuba and Germany) were reported, whereas in 2013 only one imported case (from London) was reported, with no secondary cases. Before November 2014, two cases imported from Bosnia and Herzegovina were reported in April and July.

This measles outbreak originating in a mass gathering event was the largest in Slovenia after the major outbreak that started in 1994 and peaked in 1995, with a total of 405 cases notified [5]. In contrast to most outbreaks in other European countries, where the majority of cases are seen in unvaccinated children, most cases in the reported outbreak were adults 34 to 51 years of age (birth cohorts 1963 to 1979). These birth cohorts were also the most affected among the cases reported in Slovenia in 2011 (among 22 notified cases, 18 were 31 to 48 years-old, i.e. in birth cohorts 1963 to 1980) [6]. In addition, the serosurveys conducted in Slovenia in the years 1998 and 2000 showed that the same birth cohorts had the highest proportion of measles-seronegative individuals [7].

Nearly half of the cases (n = 21) had been vaccinated with one (n = 9) or two (n = 12) doses of measles-containing vaccine, most of them more than 30 years ago. In an outbreak situation, a substantial proportion of vaccinated cases can usually be expected in a population with very high vaccine coverage [8].

Five cases fulfilled the clinical criteria, had epidemiological links to the dog show, and measles IgG antibodies higher than 5,000 mIU/ml, but negative IgM results and a negative PCR. In these patients, the course of disease was mild. In our experience, such high IgG values are never observed more than three years after

vaccination (three of the five cases were vaccinated with two doses more than 30 years ago), so we considered this too high to be attributed to former immunisation. Presumably, IgG antibodies higher than 5,000 mIU/ml indicate a strong secondary immune response, where the presence of IgM antibodies in the serum and the presence of virus in a throat swab or urine are very short and difficult to detect. The ability to detect IgM and viral RNA in vaccinated cases depends on the individual immune response and the timing of the serum sample collection [9].

As pointed out by some authors, with improved measles control over time (high coverage) and in the absence of circulating virus, boosting by exposure to wild type virus becomes rare and the rate of non-classical infection (mild measles) is likely to increase [10,11].

Conclusion

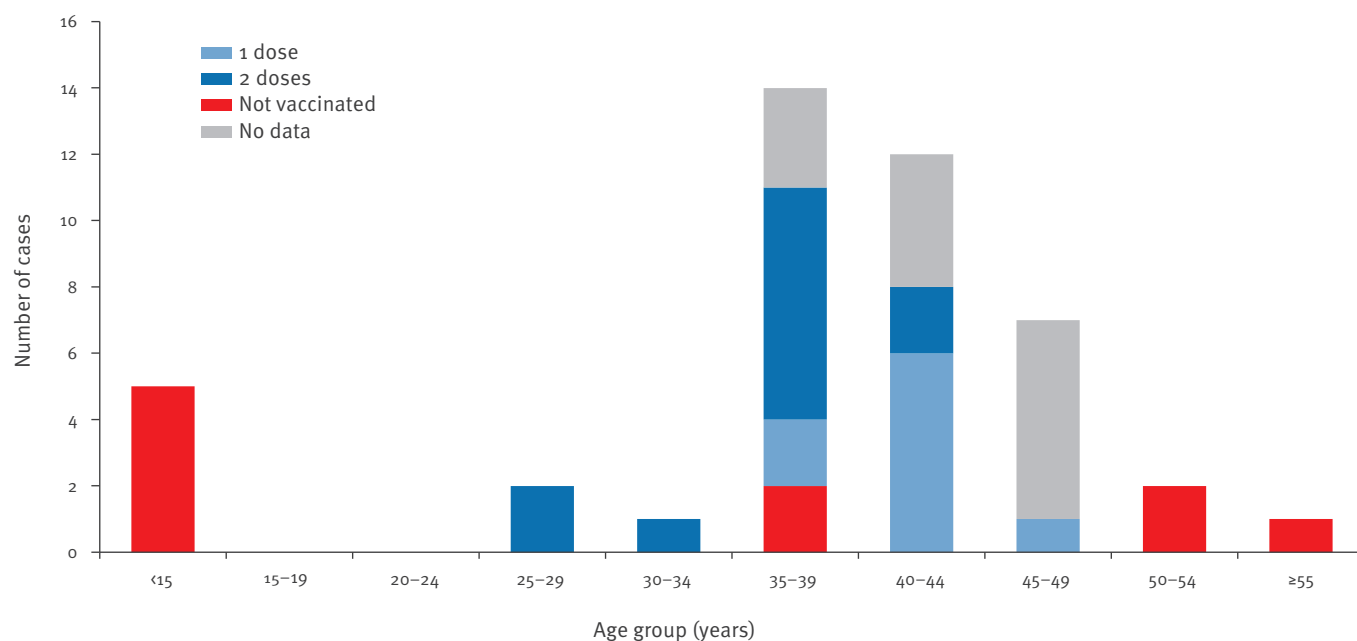
Although two incubation periods have not yet passed since the last case, further widespread transmission is not expected due to high vaccination coverage in Slovenia. As the majority of measles cases occurred in birth cohorts 1963 to 1979, and a third of them were fully vaccinated, it remains necessary to closely follow any measles breakthrough cases and conduct a seroepidemiological study to assess the proportion of susceptibles in these cohorts. This would inform a discussion on the need for an additional (third) dose of measles vaccine in these birth cohorts in Slovenia.

Conflict of interest

None declared.

FIGURE 2

Reported measles cases in an outbreak linked to a dog show, by age group and vaccination status, Slovenia, notified by 31 December 2014 (n=44)



Authors' contributions

Mario Fafangel, Ondina Jordan Markočič and Katarina Prosenc contributed to acquisition of data. Marta Grgič Vitek and Tatjana Frelj analysed and interpreted the data, and also drafted the manuscript. Mario Fafangel, Veronika Učakar, Katarina Prosenc and Alenka Kraigher critically revised the manuscript. All authors approved the final version of the manuscript.

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