

Original Article

Control of a Measles Outbreak by Prohibiting Non-Vaccinated Susceptible Students from Attending School in Akita Prefecture, Japan

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SUMMARY: In 2007–2008, a measles outbreak occurred among children above the age of 10 years in Akita Prefecture, northeastern Japan (population, approximately 1,120,000 at the time). Our group controlled the outbreak by (i) implementing a publically financed urgent vaccination program and (ii) prohibiting non-vaccinated and non-infected students from attending school as per regulations of the school public health law. We encouraged high-risk students to undergo a vaccination program, which resulted in the successful containment of the outbreak without the development of any severe cases. After the outbreak, the Akita Prefectural Government began an annual “Akita measles elimination month” every April, and no measles case found in Akita Prefecture during 2009–2010 subsequently. Our outbreak response initiative can be applied nationally for the complete elimination of measles throughout Japan.

INTRODUCTION

Measles vaccination started as a routine immunization in 1978 in Japan. In 2006, the measles-rubella vaccine was introduced as a 2-dose vaccination with the first vaccination being given at the age of 1 year, and the second dose given in the year before the children started attending elementary school (age, 5–6 years) (1). Despite the implementation of this immunization schedule, measles outbreaks were reported in many parts of Japan during 2006–2007.

Akita Prefecture (population, approximately 1,120,000), which is located in the northeast of Japan, experienced a devastating measles epidemic during 1987–1988. Over 4,000 cases were reported during this period; the epidemic resulted in 10 deaths. After the outbreak, the measles vaccination rate increased to more than 90%.

A second measles outbreak occurred in Akita Prefecture at the end of 2007 and lasted until the beginning of 2008. Susceptible students, in particular non-vaccinated students, were prohibited from attending school as per regulations of the school public health law, and an effort was made to vaccinate them. We reviewed reports on the number of patients and of vaccinations during the local measles outbreak and evaluated the measures to control the epidemic. Here, we report the results of this study.

OUTBREAK AND RESPONSES

Publically financed urgent vaccination program: At the end of December 2007, an outbreak of measles occurred in Odate City in northern Akita Prefecture (population, approximately 80,000 at the time). On January 10, 2008, Odate City implemented a program to raise financial aid for urgent measles vaccination all school-aged children (age, 6–18 years) who were susceptible and unimmunized. On January 15, 2008, Odate City started paying a subsidy of 3,480 yen/dose to cover a third of the cost for each vaccination, as proposed at the Odate City vaccination meeting. All students who had not been vaccinated or infected prior to this meeting were vaccinated by February 6. On the basis of this action, and with financial aid, all the other municipalities in Akita Prefecture began vaccination program to specifically target non-vaccinated students.

Exclusion of non-vaccinated and non-infected students: Despite the aforementioned action, 220 of the 6,276 elementary and junior high school students in Odate City had not been vaccinated or infected as of January 21, 2008. On January 22, 2008, the Odate City Board of Education decided to request the principals of every elementary and junior high school in Odate City to prohibit students who had not been vaccinated or infected by January 28 from attending school. This ruling was based on the Japanese school public health law Article 12 (current school public health security law Article 19, revised April 1, 2009). Once these students received measles vaccination, they could attend school again. The Odate City Board of Education also requested that all principals give the guardians of such students detailed information concerning the aims of the prohibition.

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On January 23, the Akita Prefectural Board of Education requested a similar exclusion in all 22 public schools, mostly 18 prefectural high schools located in northern Akita (including Odate, Noshiro, and Kitakita Public Health Center [PHC] regions).

RESULTS

Figure 1 shows the number of patients with confirmed measles between December 19, 2007 and March 14, 2008 in Akita Prefecture. Measles patients were reported in all PHC regions except Yuzawa, with the majority of cases being reported in the Odate PHC region.

Figure 2A shows the epidemic curve of measles patients identified in Akita Prefecture during the outbreak. Five distinct infection clusters of measles patients can be seen. Of the 158 cases, 128 were reported in the Odate PHC region. Of these 128 cases, 104 were reported in Odate City, indicating that this city was the major site of the outbreak. Of the 104 cases, 75 (72.1%) were school students. The median age of the patients was 16 years (range, 0–55 years). Males accounted for 66.5% (105/158) of the patients.

Figure 2B shows the time course of the vaccination program in Odate City. With the financial subsidy, 91 out of 503 students (18.1%) in elementary and junior high schools were vaccinated between January 15 and January 20. Of the remaining 412 non-vaccinated students, 58 were infected with measles; out of the remaining 354 students, 173 (48.9%) were vaccinated between January 22 and January 28, as requested by the Odate City Board of Education. The publically financed vaccination program started on January 15, and the vaccina-

tion of elementary and junior high school students was completed by February 6. During the course of the vaccination program, the non-vaccinated and non-infected students were prohibited from attending school from January 22. One elementary school student and 20 high

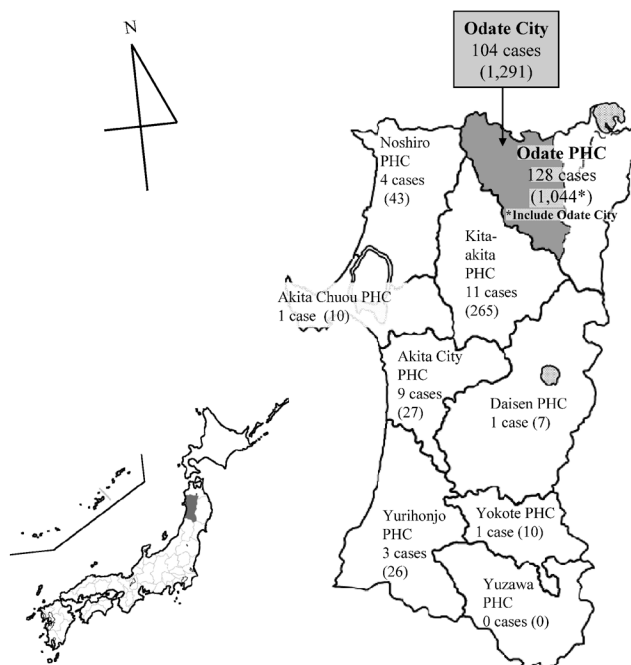


Fig. 1. Number of reported measles cases in each Public Health Center (PHC) and Odate City in Akita Prefecture, December 19, 2007–March 14, 2008. The values in the parentheses indicate measles incidence per 100,000 population as of January 2008.

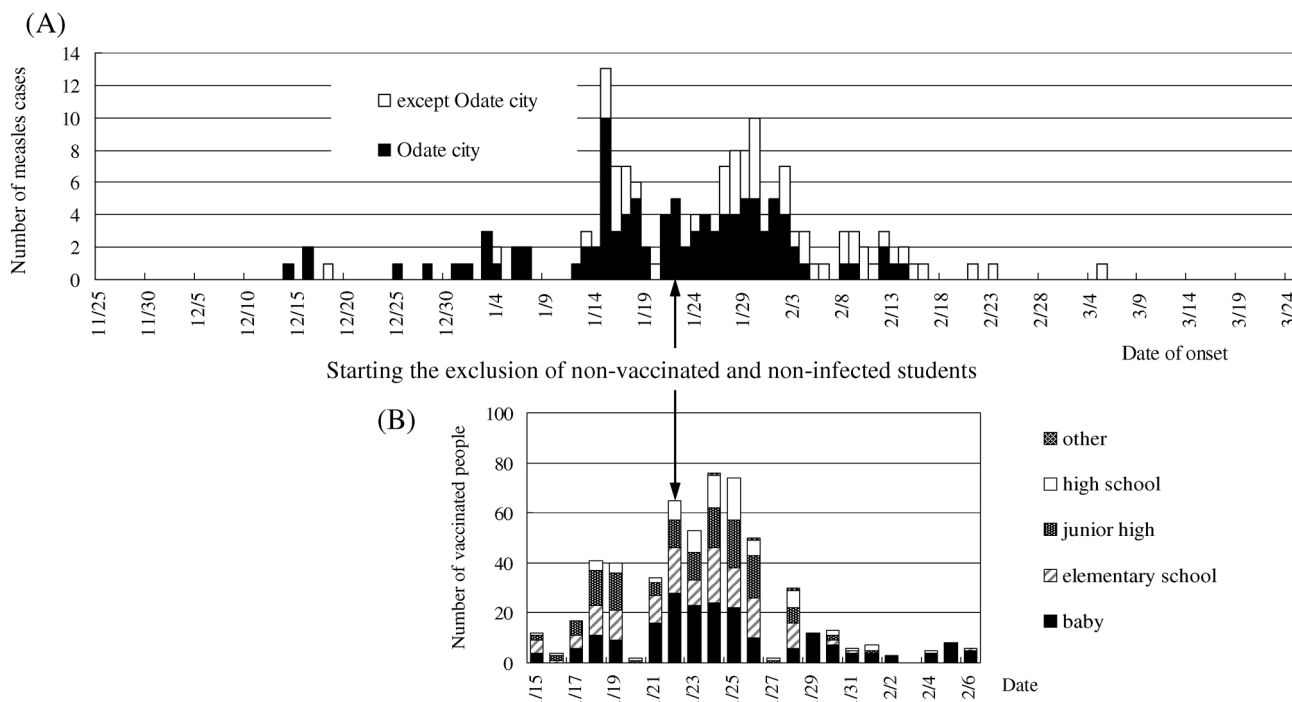


Fig. 2. (A) Reported number of measles cases in Akita Prefecture, November 25, 2007–March 24, 2008 ($n = 158$). ■, Odate City ($n = 104$). □, except Odate City ($n = 54$). (B) Number of vaccinated by age group in Odate City, January 15–February 6, 2008 ($n = 560$). Arrows indicate January 22, the starting the prohibition of non-vaccinated and non-infected elementary and junior high school students from attending school.

school students were prohibited from attending school in Odate City (no junior high school students were prohibited) because they were at risk of exposure to the measles virus.

The last measles case was identified on February 14 in Odate City, and no new cases appeared after this date. The Mayor of Odate City finally declared the end of the measles outbreak on March 14, 2008. Severe cases or deaths were not reported during this outbreak.

DISCUSSION

The prohibition of students from attending school was strictly enforced in Akita Prefecture. The number of reported patients decreased after this prohibition and initiation of the vaccination program. The school public health law Article 12 (current school public health security law Article 19) allows the principal of a school to prohibit students who are infected or suspected of being infected from attending school. This law also allows principals to prohibit students who are susceptible to infectious diseases from attending school. To the best of the authors' knowledge, such prohibition of non-vaccinated students from attending school has not been applied to control disease outbreaks in Japan before; this is in contrast to the situation in other countries such as the United States where non-vaccinated students are strictly prohibited from attending school during outbreaks of measles. In 2007 and 2008, despite the closure of several Japanese schools because of measles outbreaks (2), some students were exposed to the measles virus. The Akita Prefectural Government enforced the prohibition of high-risk students, in conjunction with an urgent vaccination program in order to control the measles outbreak in Odate City. During the course of controlling the outbreak, we noted that the prohibition of infected as well as high-risk students had three advantages over closing classes or even the school, the method that was most frequently used in schools prior to the new regulation. These benefits are as follows: (i) continuity of lessons for those students who had immunity against the measles virus; (ii) minimizing contact between immunized and non-immunized students at school; and (iii) encouraging non-vaccinated students to receive immunization as soon as possible and thus controlling the outbreak. The prohibition from attending school was immediately cancelled after the students were vaccinated, and this served as an incentive for the high-risk students to be vaccinated, thereby resulting in a rapid rise in vaccination of students and causing the end of the outbreak. We believe that these measures were effective to control the measles outbreak in Akita. However, the understanding and cooperation of the guardians of the students who were prohibited were necessary for the successful application of this measure. Therefore, we provided detailed information about the purpose and advantages of prohibiting their children from attending school, and as a result, none of the guardians had complaints or issues regarding the explanation.

Urgent vaccination of students was also performed to control the outbreak, and the vaccination was successfully completed on February 6. Vaccination is the only effective measure to prevent measles infection; there-

fore, this urgent vaccination program was effective to control the outbreak. In fact, the last measles case in Odate City was identified on February 14, indicating that the measles outbreak was successfully controlled by the aforementioned measures.

Several factors had made it possible to apply these measures in Odate City. (i) An adequate amount of measles vaccine was supplied. (ii) The Health and Welfare Department of Akita Prefectural Government frequently announced via a press release that non-vaccinated students were a high-risk group and that they needed to be vaccinated immediately. (iii) Decisions that had to be made to accomplish the measures were always made promptly.

The success of distribution of the vaccine was achieved by the cooperation of the Akita Prefectural Government and the regional medical supply wholesalers. Frequent announcements in the media ensured that citizens realized the severity of the measles outbreak in Odate City, as well as the need for immediate vaccination. On January 22, the Mayor of Odate City declared a state of emergency, which also ensured that Odate citizens realized the severity of the outbreak. Quick decision-making was achieved by the successful cooperation of the proper authorities.

Furthermore, the Akita Prefectural Government began an annual "Akita measles elimination month" awareness campaign every April since 2010 (3). In addition, the health administration section will greatly benefit by the continued cooperation between the Board of Education and the public sector as a public-private partnership during periods of no outbreaks to prevent future measles outbreaks. Afterward, no reports of measles were found in the prefecture during 2009–2010. We hope that these outbreak response activities will contribute to the development of a program for elimination of measles in Japan (2,4).

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Conflict of interest None to declare.

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