Measles Outbreak in an Orphanage, Bangkok, Thailand, September-October 2000

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Abstract

In Thailand, the morbidity rate of measles has declined since measles vaccination was included in the National Immunization Programme. A measles outbreak affected 41 infants in an orphanage in Bangkok during September-October 2000 prompted an investigation to study the epidemiological distribution, assess vaccine coverage and vaccine effectiveness. The attack rate was 66 per cent, among infants aged 6-12 months in two separate rooms. Sixty-three per cent of the 41 cases were less than 9 months old. Measles vaccine coverage among infants over 9 months was 45 per cent due to delay in immunization caused by mild illnesses of the infants and the vaccine effectiveness was 91 per cent (95%CI 42%-99%). Inefficiency of the surveillance system to early detect and respond to the outbreak was observed. A catch-up immunization program, close supervision for surveillance and immunization systems and an increase of measles vaccine coverage to more than 95 per cent in this and other orphanages in Thailand were recommended.

Key word : Immunization, Measles, Outbreak

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In Thailand, from 1973 to 1984, measles was a leading cause of morbidity among children and the highest morbidity rate was 94 per 100,000 population in 1984[1]. The Ministry of Public Health has recommended measles vaccination in 9-12 month old infants since 1984[2,3]. After that the trend of morbidity rate declined. However, between 1984 and 1993, measles outbreaks occurred every two years despite an increase of measles vaccine coverage from 6 per cent to 86 per cent[1,4]. It indicated an

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inadequate protection of the single-dose measles vaccination, due to either primary or secondary vaccine failure. In 1992, the extended programme on immunization (EPI) recommended the first dose of measles-mumps-rubella (MMR) or measles vaccine in nine-month old infants and the second dose of MMR at 12-16 years of age(2). At present, the schedule for the second dose is recommended at the age of four to six years or the first grade of elementary school (2) and the measles vaccine coverage increased to 94 per cent in 1999(4).

On October 11,2000, a pediatrician from Ramathibodi Hospital reported a measles outbreak in a government orphanage, Bangkok to the Division of Epidemiology. Beginning October 11, 2000, the Division of Epidemiology and the Bangkok Metropolitan Administration (BMA) conducted an investigation to identify the epidemiological distribution of cases and to assess vaccine coverage and vaccine effectiveness.

This orphanage is under the Department of Public Welfare, Ministry of Labour and Social Welfare. It is a residential care service for orphans or children in impoverished families or abandoned children under five years of age. Services provided to the children are basic necessities, education, recreation activities and immunization. It has 10 children's rooms and one primary health care unit. Normally, ill children get treatment from a volunteer doctor or are sent to a hospital. During the investigation, there were 382 children; 214 were boys and 168 were girls, 52 baby-sitters, 5 nurses and 28 officers in this orphanage.

MATERIAL AND METHOD

In order to verify the diagnosis and identify additional cases, the authors reviewed the orphanage's medical records and daily records of baby-sitters. A case was defined as a child or an officer of the orphanage who had fever, generalized maculopapular rash and one of the following symptoms: cough, coryza and conjunctivitis(5) from September to October 2000. Histories of illness were gathered by using standardized questionnaires to interview baby-sitters and nurses who took care of ill the children. Vaccination histories were obtained from individual vaccination records. Measles vaccine coverage among the children aged more than nine months and vaccination practice of responsible nurses were appraised.

A retrospective cohort study was conducted to calculate the measles vaccine effectiveness by using formula; 1-RR (RR = attack rate among vaccinated infants/attack rate among unvaccinated infants) (6). Inclusion criterion was all infants aged over 9 months in rooms where a measles case had occurred. Infants who contracted measles before September 2000 were excluded from this study.

Serological confirmation by ELISA method was used to examine measles-specific IgM antibody among the sera of seven infants with measles who had fever and generalized maculopapular rash at the time of investigation.

RESULTS

From 17 September to 15 October 2000, there were 41 measles cases among 62 infants in only two affected rooms out of 3 separate rooms in the same building. Of the 41 cases, 26 were boys (63.4%) and 15 were girls (36.6%), the ratio of boy to girl was 1.7 to 1. The median age was eight months. The age ranged from six months to one year. Twenty-six cases were less than nine months old (63%). Overall attack rate among all infants was 66 per cent. Age-specific attack rates of measles among unvaccinated infants aged 9-11 months were 64 per cent-100 per cent but among all infants were 20 per cent-54 per cent. Because some infants had been vaccinated against measles. For unvaccinated infants aged 7-9 months, age-specific attack rates of measles were 64 per cent-94 per cent (Table 1).

All cases had acute fever and generalized maculopapular rashes. Seventeen cases (41.5%) were admitted to hospitals. Seven cases were malnourished; six cases had first-degree malnutrition and one case had second-degree malnutrition. Twelve cases (29%) had pneumonia complication; two cases had first-degree malnutrition. Complication rate among well-nourished cases was 29 per cent indifferent from the malnourished cases. No deaths occurred. All sera collected from seven cases with fever and generalized maculopapular rashes at the time of investigation were positive for measles-specific IgM antibody.

The epidemic curve (Fig. 1) shows the number of measles cases by date of symptom onset and the affected room. The first case had symptom onset on September 17, 2000 and the highest number of cases was on October 1,2000. Generally, measles transmission is person-to-person but from this curve,

Table 1. Age-specific attack rates of measles among unvaccinated and all infants.

Age	All infants*			Unvaccinated infants		
	Total No.	No. of cases	Attack rate (%)	Total No.	No. of cases	Attack rate (%)
6 months	5	5	100	5	5	100
7 months	7	6	86	7	6	86
8 months	17	15	88	16	15	94
9 months	13	7	54	11	7	64
10 months	14	7	50	7	7	100
11 months	5	1	20	0	0	0
1+ year	1	0	0	0	0	0

* Included both vaccinated and unvaccinated infants in two affected rooms.

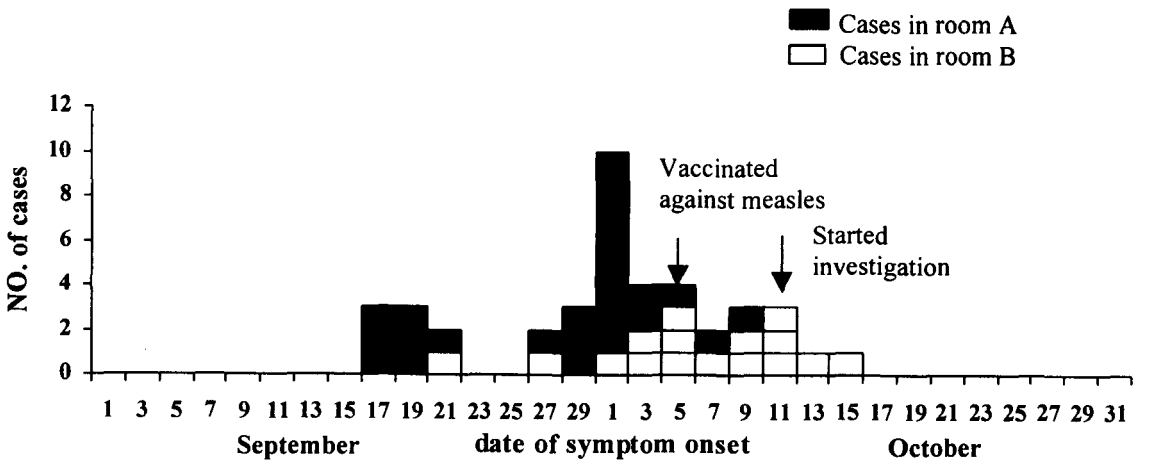

Fig. 1. Number of measles cases by date of symptom onset and the affected room from September to October 2000.

the first group of cases who had symptom onsets between 17 and 21 September was likely to have a common-source exposure. Because their symptom onsets were within the same incubation period of measles that was 7-18 days[7]. On October 5, 2000, the nurses of the orphanage gave measles vaccines to all infants to control the disease. The last case had symptom onset on October 15, 2000.

Attack rates of measles among unvaccinated infants by two affected rooms were 92 per cent and 80 per cent, respectively. The infants in another room of the same building had no measles because they were under six months old and were strictly isolated from visitors.

From interviewing the nurses and baby-sitters, the authors found that during two months before the outbreak, no new children or measles cases were admitted to the orphanage and none of the cases went outside their rooms or the orphanage. However, many people, including children visited them and it was not known whether they were ill or might be an index case. The authors could not identify a definite transmission route. All cases were not separated from other healthy infants and were not reported to the local authority because of limited area and lack of disease surveillance in this orphanage. Some nurses, who were responsible for the immunization, lacked knowledge about the adminis-

tration of vaccines. For instance, they delayed the vaccination due to mild illness of infants such as common cold, diarrhea, etc. Sometimes the delay was caused by lack of vaccines.

For the immunization issue, 16 of 62 infants had measles vaccination records. Of these, only one fitted the case definition without serological confirmation test. The vaccine coverage of the infants aged more than nine months was 45 per cent. The vaccinated infants aged over 9 months were 0.09 times less likely to have measles than the unvaccinated infants in the same age group (risk ratio 0.09, 95% confidence interval 0.01-0.58). On the other hand, measles vaccination was a protective factor for measles. Measles vaccine effectiveness was 91 per cent (95% confidence interval 42%-99%).

DISCUSSION

The clustering of cases with clinical findings typical of measles and the positive result of measles-specific IgM antibody in 7 cases confirmed a measles outbreak in the orphanage. The high overall attack rate facilitated the evaluation of vaccine effectiveness. The children of the orphanage were at high risk of developing complications because of their young age, staying in crowded rooms and malnutrition[7,8]. The present study and previous studies[9,10] in hospitals in Thailand found that 30 per cent-52 per cent of all cases developed pneumonia which is common in Thailand. But it was different from the studies in America[8] and Netherlands[11] in which 5 per cent-9 per cent of cases developed Otitis media and 1 per cent-6 per cent developed pneumonia.

The results indicated that an enhancing factor of the outbreak was low measles vaccine coverage despite high vaccine effectiveness. This reflected the problem of the immunization system in the orphanage caused by lack of supporting knowledge, vaccines, supervision, good coordination with the local authority and lack of awareness of the consequence of low vaccine coverage. Moreover, having no disease surveillance system, late disease prevention and control resulted in widespread disease in the affected rooms.

Measles vaccination and remaining maternal immunity protect infants from measles. However, the maternal immunity interferes with the antibody response of the vaccinated infants. Infants are usually immune to measles for at least the first 6 months of life. Immunity gradually wanes thereafter, and by 15 months 100 per cent of infants are susceptible[8]. But the results of this investigation showed that most infants aged less than nine months were susceptible to measles. So further study in aspects of an eligible age to start the first dose of measles vaccine and a suitable type of measles vaccine for infants aged 6 months-1 year should be done.

Limitation of the investigation was inadequate information about symptoms, signs and other complications because of incomplete records of the baby-sitters.

After the investigation, a catch-up program for measles and other vaccines was done. A surveillance system was set up in the orphanage. Long-term supervision of the immunization system was established and taken care of by immunization officers of the Bangkok Metropolitan Administration. The authors recommended the orphanage to report the first case to officers of a nearby health center within 24 hours after the diagnosis and separate cases from other children from the date of onset to 4 days after rash appearance. Visitors aged less than 12 years should be prohibited. Newly admitted children should be vaccinated and quarantined for two weeks (during the incubation period of measles). In response to an outbreak, the orphanage should administer measles vaccine (or MMR) to all susceptible children aged over 6 months within 72 hours of exposure or administer immunoglobulin as soon as possible to all susceptible children younger than 1 year of age or immunocompromised children within 6 days of exposure[3,7,8]. The Ministry of Public Health required all Provincial Health Offices to examine vaccination practice and increase vaccine coverage to more than 95 per cent in all orphanages under their jurisdiction.

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ในประเทศไทย อัตราป่วยของโรคหัดเริ่มลดลง ตั้งแต่การให้วัคซีนหัดถูกรวมอยู่ในโปรแกรมการสร้างเสริมภูมิคุ้มกันโรคแห่งชาติ การระบาดของโรคหัด ในสถานสงเคราะห์เด็กอ่อนแห่งหนึ่ง ในกรุงเทพมหานคร ช่วงเดือนกันยายน ถึงเดือนตุลาคม 2543 ซึ่งมีเด็กป่วยทั้งหมด 41 ราย ทำให้มีการสอบสวนโรค เพื่อที่จะศึกษาการกระจายของโรค ความครอบคลุมของการได้รับวัคซีน และประสิทธิผลของวัคซีน อัตราป่วยในกลุ่มทารกอายุระหว่าง 6-12 เดือนในสองห้องที่แยกจากกัน คิดเป็น ร้อยละ 66. ร้อยละ 63 ของผู้ป่วย 41 คน มีอายุน้อยกว่า 9 เดือน ความครอบคลุมของการได้รับวัคซีนหัด ในเด็กอายุมากกว่า 9 เดือน เท่ากับ 45% ซึ่งเกิดจากการได้รับวัคซีนล่าช้า เนื่องจากการเจ็บป่วยของเด็ก ทำให้ต้องเลื่อนการให้วัคซีน และประสิทธิผลของวัคซีนหัด เท่ากับ 91% (95%CI 42%-99%) การไม่มีระบบเฝ้าระวังโรคที่จะตรวจจับและตอบสนองต่อการระบาดถูกพบ การให้วัคซีนหัดและวัคซีนชนิดอื่นให้ทันและครบตามเกณฑ์อายุที่กำหนดให้รับวัคซีน การได้รับการควบคุมดูแลอย่างใกล้ชิดในเรื่องระบบเฝ้าระวังโรค และระบบสร้างเสริมภูมิคุ้มกันโรค และได้แนะนำให้มีการเพิ่มความครอบคลุมของการได้รับวัคซีนหัดให้มากกว่าร้อยละ 95 ในสถานสงเคราะห์แห่งนี้ และสถานสงเคราะห์อื่นทั่วประเทศไทย

คำสำคัญ : การสร้างเสริมภูมิคุ้มกันโรค, โรคหัด, การระบาด

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