

Rubella Outbreak in a Boarding School, Malaysia, April 2007

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Introduction

Rubella, also known as German measles, is a vaccine preventable disease. It has an average incubation period of 14 days, with a range of 12 to 23 days¹. The virus is shed in the nasopharynx of symptomatic cases for approximately seven days before and after the rash is visible. The virus is present in the nasopharyngeal secretions, blood, faeces and urine during the clinical illness although patients with subclinical disease are also infectious. Often presenting with mild symptoms, up to 50% of rubella cases may be subclinical or inapparent. Maculopapular rash is usually the first manifestation. In older children and adults, there is often a 1-5 days prodrome with low grade fever, malaise, lymphadenopathy and upper respiratory symptoms preceding the rash. In the earlier stage of the disease, the clinical signs and symptoms are similar to measles. Infection with rubella virus in early gestation can cause congenital defects in newborn babies.

Measles vaccine was introduced into the Expanded Programme for Immunization (EPI) of Malaysia in 1982. Rubella vaccine was added in 1986. Since 2002, a trivalent vaccine, Measles, Mumps and Rubella (MMR) is used. Measles vaccine is given to both boys and girls nowadays. During the earlier phase of the rubella vaccination program, only girls were vaccinated to prevent the occurrence of Congenital Rubella Syndrome (CRS). Rubella vaccine is effective in preventing clinical rubella as it is associated with high antibody titers in vaccinees². However, there was a reported case of CRS delivered by a mother who was vaccinated before conception, and developed low titres of rubella antibody³.

On 9 Apr 2007, the State Health Department of Selangor was informed of an unusual occurrence of febrile illness associated with maculopapular skin rash among 13 students of Sekolah Menengah Sains

(SMS) Kuala Selangor, whom had sought treatment from Kuala Selangor Health Clinic. The provisional diagnosis made by the attending doctor in the health clinic was measles.

SMS Kuala Selangor was a fully residential school situated about 2 km from the town of Kuala Selangor and less than a kilometre from the nearest health clinic i.e., Kuala Selangor Health Clinic. With 874 staff and students, this school had an enrollment of 777 students; 392 females and 385 males. Majority of the students came from various districts in Selangor. There were 46 dormitories and each dorm housed an average of 18-20 students. There was no recent history on outbreaks of febrile illness in this school and neither was there any similar outbreak elsewhere in Kuala Selangor.

Outbreak investigation was initiated by the Kuala Selangor District Health Office (DHO) on the same day. The investigation team consisted of Kuala Selangor DHO team, and was assisted by the epidemiology team and Epidemic Intelligence Program (EIP) team from Selangor Health Department. The investigation aimed to verify the outbreak, confirm the diagnosis, describe the outbreak epidemiologically and recommend preventive measures.

Methods

A cross-sectional study was conducted to describe the outbreak in relation to person time and place. Line-listed data were collected by using Microsoft Office Excel and analysed using SPSS version 15. Descriptive statistics were used to describe the distribution of cases, and Chi-square test was used to detect significance of association between categorical variables. The level of significance was taken at 0.05.

Any student or staff of the school who presented with history of maculopapular rash with or without fever anytime from 19 Mar to 16 Apr 2007 was defined as a suspected case. Confirmed positive cases were suspected cases positive for rubella IgM.

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Upon receiving the notification, active case detection was carried out immediately by the district investigation team on 9 Apr 2007. All students and residential staff of SMS Kuala Selangor who had similar signs and symptoms were interviewed and examined. Retrospective record search was also conducted at the Kuala Selangor Health Center, which was the nearest clinic, to look for similar cases from the same school or surrounding areas.

Information on patient identification such as name, dormitory and classroom; demographic details such as age, gender, ethnicity, travel history; clinical data on signs and symptoms, date of onset; and laboratory findings were gathered. The vaccination status of the students was obtained from the school health records.

About 5 ml blood were taken from each case and sent to the National Public Health Laboratory (NPHL) in Sungai Buloh for rubella and measles IgM testing by ELISA method.

The ventilation status and distance between beds in the dormitories and classrooms were examined. General cleanliness in the dormitories and toilets were also inspected.

Results

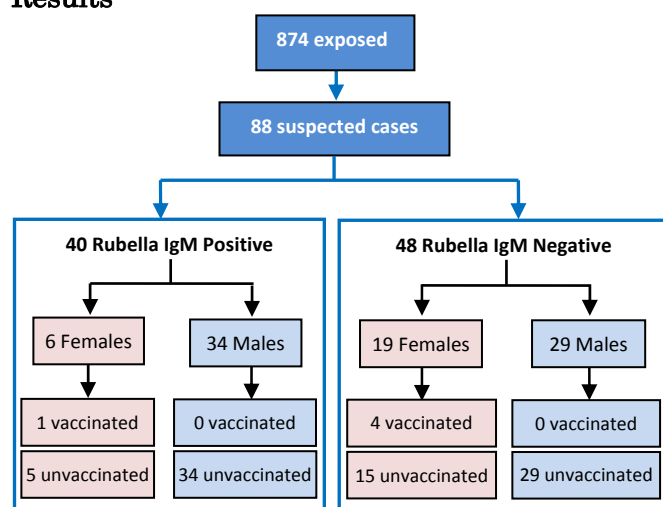


Figure 1. Distribution of suspected and confirmed rubella cases in SMS Kuala Selangor

Of 874 people who studied or worked in the school, 88 (10%) met the case definition; 45% of whom were confirmed IgM positive for rubella. None of the suspected cases was positive for measles. Record search from the school health cards revealed that only 40% of the female students had rubella vaccination recorded while all male students were not vaccinated. Of asymptomatic female students, approximately half had no record of vaccination given.

Forty of the suspected cases (45%) were confirmed positive for IgM rubella with male significantly more than female cases ($p < 0.001$) (figure 1). Of confirmed cases, only one was a female student who was vaccinated in the past year. Both the suspected and confirmed cases were predominantly male students as seen in figure 2. The mean age of the cases was 15 years (range 13 to 17 years).

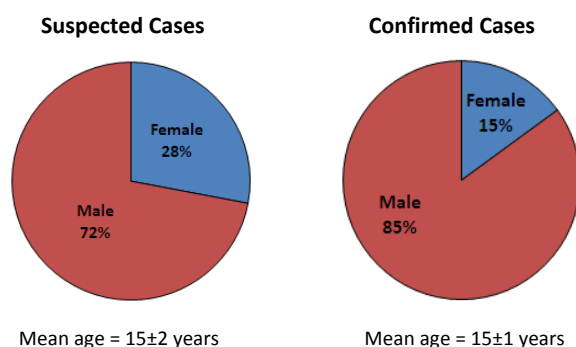


Figure 2. Distribution of cases by gender

Retrospective case-records search done at the nearest health center did not show any unusual cluster of similar cases prior to this outbreak. All cases presented with maculopapular rash. Figure 3 shows the maculopapular rash as seen on one of the infected students. Eighty eight percent presented with fever with mean body temperature of 37.7°C. Other manifestations are as shown in figure 4.



Figure 3. Maculopapular skin rash on the back and chest of a student

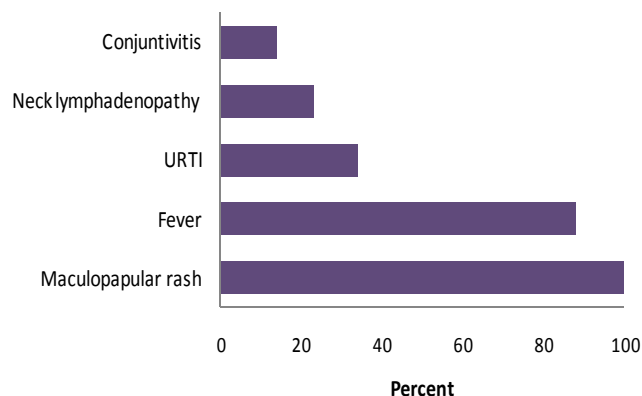


Figure 4. Distribution of clinical presentations of cases

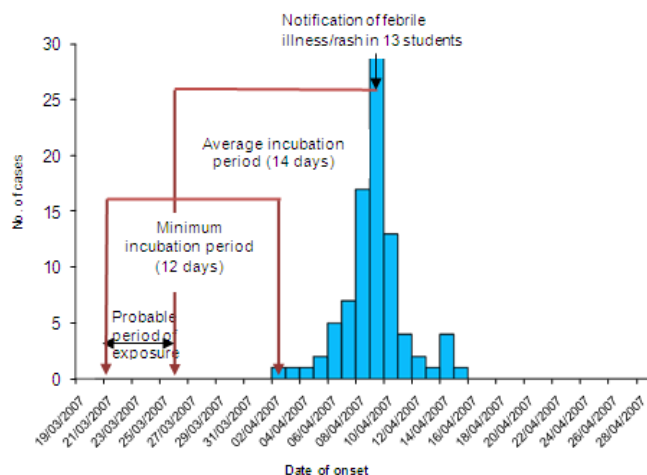


Figure 5. Epidemic curve showing onset dates of cases

The epidemic curve illustrates a common source infection with a steady increase in the number of cases over time. The onset of illness for the first case was on 2 Apr 2007, the cases peaked on 9 Apr 2007 and declined thereafter for a period of six days. There were no new cases reported after 16 Apr 2007.

A 13-year-old boy was the case with the earliest onset. He did not have any history of contact with anyone with similar illness. We were not able to identify the index case in this outbreak. Based on the epidemic curve and incubation period of rubella, the probable period of exposure was between 21 to 26 Mar 2007.



Figure 6. Environmental inspection of one of the dormitory

From the environmental inspection, each dormitory was 48 square meter in size which housed 18 to 20 students. The ventilation was good with adequate windows, and there were 6 wall fans attached to each dorm as shown in figure 6. General sanitation of the dormitories, toilets and surrounding areas were satisfactory.

Discussion

This was a common source outbreak of rubella in a boarding school in Kuala Selangor which had lasted for 15 days. For a fairly large outbreak in a small geographical area, this outbreak was well contained within one incubation period. In situation like this,

there was potential for an extensive spread of rubella in a short duration of time because of its large population living in closed quarters. A similar outbreak with larger magnitude had been reported in previous year in a military vocational training school involving 303 cases⁴.

Measles is a notifiable disease in this country, but not rubella; hence, cases with maculopapular rash are often diagnosed and notified as measles especially by young doctors although the clinical presentation is more suggestive of rubella. However, the 'misdiagnosis' that led to 'misnotification' as seen in this outbreak had sparked the attention of the public health authorities to review the burden of rubella and its vaccination program in the country. Although the index case was not known in this outbreak, this is not surprising as rubella is a mild disease and often 20-50% of infected people may not notice any symptoms at all¹.

A mass measles immunization program was carried out extensively in this country in 2004. Therefore, most of the students, both male and female, would have received the monovalent measles vaccine, but not mumps or rubella through the MMR vaccination program. The youngest cohort of cases in this outbreak was born in 1994 while MMR was only introduced into the EPI in 2002. During the early phase of rubella vaccination, it was given only to females at the age of 12 years^{6,7}. With the selective vaccination strategy adopted by the Ministry of Health Malaysia, those who were not in the target group for vaccination remained as potential sources of infection, and this explains why males were predominantly affected in this outbreak. This study showed that only 21% (164) of the students were vaccinated for rubella, and they were all female; a level far below the rubella immunity threshold of 80-85% needed to give protection to the subpopulation in order to prevent an outbreak.

During the investigation, we also encountered a female confirmed case who had received vaccination (batch no. EU 394) approximately nine months prior to this outbreak. This has raised the possibility of vaccination failure. In a study of rubella immunity and response to vaccination, it was reported that the seroconversion rate was 92%⁹. In another study by Ehrengut and Florent, there were cases reported to have been repeatedly vaccinated with rubella but failed to seroconvert. The reason for these apparent vaccination failure could be a residual immunity following either rubella infection in utero or in earliest childhood¹⁰. A seroprevalence study would

be useful to evaluate the effectiveness of the vaccination program in this country.

Public Health Action and Recommendations

Rubella was confirmed as the cause of this outbreak. The outbreak was contained within 15 days because of the confined locality which enabled prompt actions to be taken. This study illustrated the importance of vaccination to all students irrespective of gender. It has also showed that vaccination of students joining residential schools is crucial. Therefore, it is recommended that students born before the incorporation of MMR vaccination into the national EPI should be given rubella vaccination, especially those in residential boarding schools.

Since the inception of the EPI in Malaysia, measles and rubella cases have become rare. Hence, younger doctors may not be able to differentiate the two diseases. It is highly recommended that doctors should update their knowledge and expertise on immunizable diseases. Where difficulty in differentiating the diseases clinically arises, laboratory confirmation should become a priority.

Remedial actions were instituted promptly to prevent further transmission. These included setting up of a mobile clinic within the school premise to identify and treat all symptomatic cases. The symptomatics were cohorted in designated dormitories as shown in figure 6 and were condoned from other students for a period of at least seven days from onset of rash since the period of infectivity was stated as seven days before and after onset of rash².



Figure 6. Students with symptoms were cohorted in designated dormitories as marked by the arrows

Pregnant staff were advised to keep away from the dormitories and health education was given on signs and symptoms of rubella. Anxious parents were allowed to bring their sick children home with advise to confine the children at home for one week and have no contact with pregnant women. Health talks on self hygiene and the possible risk of transmission to pregnant mothers was given to all

students, staff and guardians. Following this outbreak, rubella vaccination was not given to all students.

Awareness about rubella and measles was immediately circulated through a bulletin and updated to all doctors in the affected districts. Continuous Medical Education sessions were carried out at other districts in Selangor. The outbreak has also alerted the Ministry of Health (MOH) Malaysia to produce a guideline for rubella control. The MOH has also embarked on a laboratory-based surveillance for rubella, and NPHL as the reference laboratory for measles and rubella. This will provide a better picture of the burden of these diseases in this country.

Acknowledgements

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Suggested Citation

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