ORIGINAL ARTICLE

Rubella Outbreak Amongst Residential Students in a Military Vocational School of Malaysia

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Summary

An outbreak of rubella occurred amongst 303 newly recruited residential Form IV students in a military vocational training school in Malaysia. Of the 303 Form IV students, 77 gave a history of acute illness. Rubella specific IgM was detected in the sera of 46.5% (141/303) whereas rubella specific IgG was detected in 100% of all Form IV students. Sixty five students with no clinical history of acute illness during the outbreak period had detectable rubella IgM in their sera and rubella specific IgM was detected in the sera of all symptomatic students except one. Maculopapular rash was the commonest presenting clinical feature among students with acute rubella infection in this outbreak (97.4%) followed by fever (88.2%). The duration of rash ranged from one to nine days with a mean of 4.6 days. Of the 65 students that had both fever and rash, 56 (85.2%) students had maculopapular skin eruption on the same day as the date of onset of fever, six (9.2%) developed the rash a day after the onset of fever and three (4.6%) had the rash after two days of fever. The duration of fever ranged from one to eight days with a mean of 3.5 days. The duration of conjunctivitis ranged from one to four days with a mean of 2.3 days, and all those who developed conjunctivitis had mild eye-discharge without photophobia. The duration of arthralgia ranged from one to three days with a mean of 2.1 days. The commonest type of joints affected was knee joints (66.7%, 12/18), followed by elbow and shoulder joints (27.8%, 5/18) and wrist joints (5.6%, 1/18). A good clinical history of the temporal relationship between the occurrence of rash and fever during the outbreak could easily differentiate rubella illness from that of measles.

Key Words: Rubella, Outbreak, Malaysia

Introduction

Rubella virus is a small spherical enveloped single-stranded positive sense RNA virus measuring 60-70 nm in diameter. It is a member of the family, *Togaviridae* and remains the only member of the genus *Rubivirus*[1]. Unlike most other togaviruses, rubella virus has no known invertebrate host, and man is the only known natural reservoir for the virus. Thus, transmission among susceptible human hosts is through shedding of virus in nasopharyngeal secretions[1,2].

The infection caused by rubella virus in childhood or adult life is usually mild and self-limiting, with most cases passed as subclinical or unrecognized events. Following an incubation period of seven to nine days, clinically apparent rubella is characterized by any combination of clinical features that include maculopapular exanthema, lymphadenopathy, low grade-grade fever, conjunctivitis, sore throat, and arthralgia[1,2]. The rash is the most prominent feature of the illness and is the first manifestation of the disease in more than 90% of cases that typically begins on the

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face and spread in centripetal fashion[1,2]. An associated posterior cervical and suboccipital lymphadenopathy is characteristic. The entire clinical syndrome clears rapidly in days and is very rarely accompanied by other significant symptoms or complications such as arthropathy, thrombocytopenia, and encephalopathy [1-3].

The live attenuated rubella vaccine was developed in 1969 and licensed for use in United States of America under the Universal Rubella Vaccination Programme to stop the indigenous transmission of virus and prevent occurrence of congenital rubella infection. Five years after its introduction, the incidence of congenital infection dropped dramatically and there has been no report of endogenous congenital infection for the last decade in USA. A recent review shows that rubella is no more endemic in the country[4]. The United Kingdom adopted the Selective Rubella Vaccination Programme since 1970 and despite its intensive vaccination programme, outbreaks of rubella with congenitally infected babies continue to occur. By 1988, UK has switched over to the Universal Vaccination Programme as adopted by USA[2]. Malaysia adopted the previous UK system of Selective Rubella Vaccination Programme in 1985 and was intensified in 1990 (Source: Department of Health, Ministry of Health Malaysia). Similar to the scenario in UK, the Selective Programme failed to prevent the occurrence of congenital rubella syndrome[5]. In 2002, Universal Rubella Vaccination Programme was adopted as part of the childhood measles, mumps and rubella (MMR) vaccination strategy. The disease burden and outbreak of rubella infection in Malaysia during the pre- and post-vaccination era was not known since it is neither a notifiable disease nor fully investigated. Presently we described an outbreak of rubella amongst residential students newly recruited into a military vocational training school in Peninsular Malaysia.

Materials and Methods

Background:

Sekolah Perantis Pertukangan Tentera Darat (SPPTD) is an all-male residential vocational training centre located in Port Dickson, Peninsular Malaysia. Annually, the institution recruits a new batch of male students from all parts of Malaysia who have completed their lower secondary school education to begin their 2-year training programme in the month of February of each calendar year.

Patients and study design:

A cross-sectional study was carried out a month (20/5/2005) after the outbreak of rubella was confirmed (20/4/2005) to occur involving new student recruits in the institution. The study included all residential students in their first year of the training programme (Form IV). A pre-designed questionnaire was used to collect patients' epidemiological and clinical data. All information specified in the questionnaire was collected by medical personnel (doctors and medical assistants) via direct interview with the students. The information gathered from those students with clinical illness during the outbreak period was verified by counter-checking with their medical records. Five milliliter of venous blood was collected from each student by venepuncture soon after the interview.

Serological assay for rubella specific antibodies:

The venous blood samples were allowed to clot at room temperature and subsequently transported back to laboratory on the day of collection. In the laboratory, individual patient's serum was transferred into a sterile plastic serum vial after separation from the clot by centrifugation at 1000g for ten minutes. The serum samples were stored at -20°C freezer till the time of serological assay for rubella antibodies was performed.

Commercial kits, Enzygnost* Anti-Rubella-Virus/IgG and Enzygnost* Anti-Rubella-Virus/IgM (Dade Behring, Germany) were used to assay for the presence of rubella specific IgG and IgM in patients' sera. The procedures of performing the assay were strictly followed as specified in the assay kits. The analysis and interpretation of test results were also adhered according to the recommendation of the assay system.

Data management and statistical analysis:

The patients' epidemiological and clinical data as well as test results were tabulated in Microsoft Excel spread sheet. Data analysis was performed using Epi Info6 computer free software programme from Center for Disease Control and Prevention, Atlanta, USA. A probability (p) value of 0.05 or less was taken as the level of significant association for each ordinal variable with the relevant adjusting variables.

Results

In this outbreak, the first case of acute febrile rash illness was recognized on 24/3/2005 which was 32 days

(the new batch reported on 26/2/2005) after the recruitment of a new batch of form IV students into the residential school. The last student came down with the illness on 27th April 2005 and the epidemic curve of the outbreak is shown in Figure 1. The epidemic curve of the outbreak showed a propagated transmission (direct contact) with two peaks and the period between the peaks was about 14 days (one incubation period). The duration of the outbreak was 40 days. During the outbreak period, there were 648 male students in the residential school. Three hundred and three were newly recruited Form IV students (age ranged from 15 to 18 years old with a mean of 16.2) and the rest were Form V students. Outbreak of acute febrile illness occurred only amongst Form IV students and none of the Form V students came down with the illness. Of the 303 Form IV students, 77 gave a history of acute illness. None of the students had the history of being given rubella vaccination. Rubella specific IgG was detected in the sera of all the Form IV students. Rubella specific IgM was detected in the sera of 46.5% (141/303) of all Form IV students. Sixty five (141-76) students with no clinical history of acute illness during the outbreak period had detectable rubella IgM in their sera and rubella specific IgM was detected in the sera of all symptomatic students except one who had just two days of fever and mild headache without rash (Table I).

The clinical features of 76 students with a history of acute illness and detectable rubella specific IgM in their sera during the outbreak is shown in Table II. Maculopapular rash was the commonest presenting clinical feature among students with acute rubella infection in this outbreak (97.4%) followed by fever (88.2%). Sixty-five students had both fever and rash manifestations whereas nine students had rash without fever and two students had fever without rash as the presenting clinical features.

Maculopapular rash eruption was described as the sole type of skin manifestation of the illness. As for the pattern of exanthemata, 71.6% (53/74) of students had rash distributed all over the body, 16 (21.6%) had rash eruption confined to the trunk and five (6.8%) had the eruption confined mainly to the extremities. The duration of rash ranged from one to nine days with a mean of 4.6 days. In relationship to the time of onset of fever, 85.2% (56/65) of students had maculopapular skin eruption on the same day as the date of onset of fever, six (9.2%) developed the rash a day after the onset of fever and three (4.6%) had the rash after two days of fever.

As for the length of other clinical symptoms, the duration of fever ranged from one to eight days with a mean of 3.5 days. The duration of conjunctivitis ranged from one to four days with a mean of 2.3 days, and all those who developed conjunctivitis had mild eye-discharge without photophobia. The duration of arthralgia ranged from one to three days with a mean 2.1 days. The commonest type of joints affected was knee joints (66.7%, 12/18), followed by elbow and shoulder joints (27.8%, 5/18) and wrist joints (5.6%, 1/18). None of the patients who had arthralgia proceed to develop frank arthritis with joint swelling. No patient developed neurological complication in this outbreak.

Discussion

Rubella is still an endemic disease in many parts of the world, especially in developing countries with poor vaccine coverage and practicing selective vaccination strategy[6-11]. Outbreaks of rubella, in particular involving institutions, are common occurrences though they are often not being reported[12-14]. Although Malaysia has switched to the Universal Rubella Vaccination Strategy, which is integrated as part of the MMR (measles, mumps, rubella) childhood vaccination programme since the year 2000, outbreak of rubella that occurred in a residential school reported here which subsequently spread to other parts of the country (unpublished data) suggests the objective of the universal rubella vaccination strategy has yet to achieve its desired goal of interrupting the endemic transmission of rubella in the country.

Table I: The number of Form IV students with and without clinical illness in relationship to the detection of rubella specific IgM in their sera.

	Rubella specific IgM		
Students	**Detected**	**Not detected**	**Total**
Clinical illness	76	1	77
Asymptomatic	65	161	226
Total	**141**	**162**	**303**

Table II: The clinical features of seventy-six students with symptomatic acute rubella infection.

Clinical Features	Number	Percentage
Maculopapular rash	74	97.4
Fever	67	88.2
Malaise	45	59.2
Sore-throat	34	44.7
Headache	30	39.5
Cough	26	34.2
Arthralgia	18	23.7
Conjunctivitis	16	21.1
Lymphadenopathy	10	13.2
Arthritis	0	0
Neurological involvement	0	0

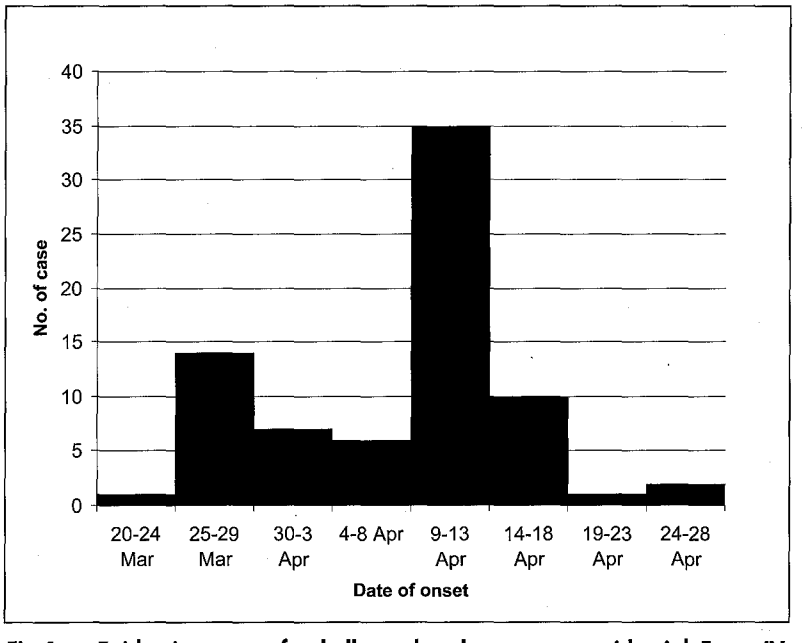

Fig 1: Epidemic curve of rubella outbreak amongst residential Form IV students in a military vocational training school in Peninsular Malaysia in March and April 2005.

In this relatively small outbreak, serological study showed that at the end of the outbreak, all students had detectable rubella IgG. The serological finding suggested that the transmission of rubella was very efficient among these newly recruited students in this residential institution. Prior to the establishment of rubella as the outbreak of acute febrile rash illness in this residential school, outbreaks of similar pattern of illness had been recorded among each newly recruited batch of students in this institution for the past couple of years (unpublished). For the previous outbreaks, though the aetiology of the acute febrile rash illness was not fully investigated, epidemiological and clinical pattern of previous outbreaks suggested rubella was

most probably the cause. This also probably explained the absence of similar illness among the senior Form V students during the outbreak though they were staying in the residential school. Thus, in the interim period, rubella vaccination should be considered for each new batch of students admitted to this residential school to prevent similar outbreak of rubella in the future.

The result of rubella specific IgM showed that the symptomatic attack rate of rubella in this outbreak was 53.9% (76/141) and 46.1% (65/141) had asymptomatic rubella infection (Table I), a value which is higher than the usual 25% normally quoted in the standard textbook of virology.

The prominent maculopapular skin eruption coupled with the present of fever, conjunctivitis and cough observed in patients could be easily and often diagnosed as measles illness, especially among relatively inexperienced doctors. This was the case in this outbreak as it was initially diagnosed as outbreak of measles and only measles serology was requested. However, a carefully taken history on the temporal relationship of the onset of fever and rash could have ruled out measles. As described in the standard textbook of virology and also hold true till today, practically almost all students with acute symptomatic rubella infections, as in this outbreak, developed skin manifestations in the first or within the first two days of fever. In this outbreak, none of the patients developed skin eruption after three days of fever. This could be easily differentiated from acute measles illness where skin eruption only starts to appear after three days of fever[15].

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References

1. Wolinsky JS. Rubella. In: Fields BN, Knipe DM, Howley PM, etc. (3rd ed). Fields Virology. Philadelphia: Lippincott-Raven, 1995; 29; 899-929.
2. Best J M, Banatvala J E. Rubella. In: Zuckerman A J, Banatvala J E, Pattison J R. (3rd ed). Principles and Practice of Clinical Virology. Chichester: John Wiley & sons, 1995: 363-400.
3. Cooper L Z and Krugman S. Clinical manifestations of postnatal and congenital rubella. Arch Ophthalmol 1967; 77: 434-9.
4. CDC. Achievements in Public Health: Elimination of Rubella and Congenital Rubella Syndrome --- United States, 1969—2004. MMWR 2005; 54(11): 279-82.
5. Chua KB, Lam SK, Hooi PS, Chua BH, Lim CT. Retrospective Review of Serologic Rubella Activity in University Hospital Kuala Lumpur. Med J Malaysia 2000; 55: 299-303.
6. Puthavathana P, Wasi C, Kositanont U, Lamkon R, Thongcharoen P. Rubella outbreak in Thailand 1983-1984: a study at Siriraj Hospital. Southeast Asian J Trop Med Public Health. 1985; 16(2): 207-13.
7. Bakasub V, Suzanic-Karnincic J. A rubella outbreak in the region of Rijeka, Croatia. Int J Epidemiolo 1995; 24(2): 453-6.
8. Davaro-Holliday MC, LeBaron CW, Allensworth C, Raymond R, Borden TG, Murray AB, Icenogle JP, Reef SE. A large rubella outbreak with spread from the workplace to the community. JAMA 2000; 284: 2733-9.
9. Lanzieri TM, Segatto TC, Siquera MM, de Oliviera Santos EC, Jin L, Prevots DR. Burden of congenital rubella syndrome after a community-wide rubella outbreak, Rio Branco, Acre, Brazil, 2000 to 2001. Pediatr Infect Dis 2003; 22(4): 323-9.
10. Dayan GH, Zimmerman L, Shteinke L, Kasymbekova K, Uzicanin A, Strebel P, Reef S. Investigation of a rubella

outbreak in Kyrgzstan in 2001: implications for an integrated approach to measles elimination and prevention of congenital rubella syndrome. J Infect 2003; 187 suppl 1: S235-40.

11. Revello MG, Gorini G, Zavattoni M, Furione M, gerna G. Congenital rubella infection following rubella outbreak in northern Italy, 2002: need for an effective vaccination programme. Eur J Clin Microbiol Infect 2004; 23(10): 780-3.
12. Storch GA, Gruber C, Benz B, Beaudoin J, Hayes J. A rubella outbreak among dental students: description of the outbreak and analysis of control measures. Infect Control 1985; 6(4): 150-6.
13. Ziebold C, Hassenpflug B, Wegner-Brose H, Wegner K, Schmitt HJ. An outbreak of rubella abroad a ship of the Germany Navy. Infection 2003; 31(3): 136-42.
14. Nerome Y, Nishi J, Fujiyama R, Takei S, Yoshinaga M, Kawano Y. An outbreak of rubella among hospital personnel and measures taken against hospital infection-cost-benefits of the measure. Kansenshogaku Zasshi 2004: 78(11): 967-74.
15. Griffin DE and Bellini WJ. In: Fields BN, Knipe DM, Howley PM, etc. (3rd ed). Fields Virology. Philadelphia: Lippincott-Raven, 1995; 43: 1267-312.