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Multidrug-resistant pulmonary tuberculosis in Singapore, 2000 - 2006

Introduction

The advent of six-month (short-course) anti-tuberculosis (TB) chemotherapy in the 1970s led to the prospect that TB, the ancient scourge of man, could at last be conquered. This hope, sadly, remains unrealized. Instead, the 1990s saw the declaration of TB as a global health emergency by the World Health Organization (WHO) and the emergence of multidrug-resistant (MDR) TB, ie. *Mycobacterium tuberculosis* strains resistant to isoniazid and rifampicin, the cornerstone drugs of standard short-course TB chemotherapy. The emergence of drug-resistant TB is an entirely man-made phenomenon [1-4], due to failures in case management (ie. the use of inappropriate drug regimens and lack of attention to treatment adherence) and programme management (eg. inadequate funding resulting in poor laboratory support and irregular drug supply). WHO estimates a total number of 424,203 MDRTB cases world-wide or 4.3% of all new and previously treated TB cases, with China, India and the Russian Federation accounting for 62% of the global burden [5]. In a further indictment of public health failure in TB control, 2006 saw the recognition of the worldwide emergence of extensively drug-resistant TB (XDRTB), defined as MDRTB plus resistance to any fluoroquinolone and one of three injectable second-line drugs (kanamycin, amikacin or capreomycin) [6,7]. XDRTB may be virtually untreatable in the current absence of new TB drugs; thus its establishment in the community may herald a very worrying return to the pre-antibiotic era of TB treatment.

Globalization, mass migration and ease of travel have brought about the spread of infectious diseases across geographical bounda-

ries. We report the incidence of pulmonary MDRTB among residents and non-residents in Singapore for the period 2000 to 2006.

Methods

TB is a notifiable disease under the Infectious Disease Act in Singapore. With the launch of the Singapore TB Elimination Programme (STEP) in 1997 [8], the national TB notification registry was revamped to include information regarding each patient's immigration status, country of birth, year of arrival in Singapore, treatment plan and treatment centre. Each notified case enters the treatment surveillance module whereby the patient's treatment progress will be tracked at each physician visit until a final outcome is reached. Contact investigations are also initiated for notified infectious cases (ie. bacteriologically positive pulmonary or laryngeal TB cases).

There are currently two mycobacterial culture laboratories in Singapore. Before February 2005, the Central TB Laboratory, Dept of Pathology, Singapore General Hospital was the only laboratory to perform mycobacterial culture and drug sensitivity testing in the country. From February 2005, mycobacterial culture and drug sensitivity testing was also performed by the microbiology laboratory of the National University Hospital. Both laboratories routinely perform first-line drug-sensitivity testing; ie. to streptomycin, rifampicin, isoniazid and ethambutol, for patients with positive TB isolates. Second-line sensitivity testing to kanamycin, ethionamide and ofloxacin is routinely performed in isolates resistant to isoniazid and / or rifampicin. Both laboratories are electronically linked with the STEP notification registry, enabling all positive bacteriology results to be matched with TB notifications. Unnotified cases with positive TB cultures will therefore be captured by the STEP registry; in these instances, a letter will be sent to alert the physician who ordered the TB culture to notify the case.

The incidence of MDRTB pulmonary TB cases among Singapore residents (citizens and permanent residents) and non-residents (long and short-tem pass holders) was evaluated for the years 2000 to 2006. Information about new or previously treated / relapsed TB, immigration status and country of origin were obtained from the STEP notification registry. The findings presented pertain to MDRTB at the time of diagnosis (whether new or relapsed / previously treated cases) and do not include MDRTB subsequently acquired during the course of treatment of cases who were drug-sensitive at diagnosis.

Results

Seventy–five cases of MDR pulmonary TB cases (new and relapsed) were detected in Singapore in the years 2000 to 2006: 74 cases whose initial sputum isolates grew MDRTB and one case with culture-positive pulmonary and bone TB in whom the bone specimen grew MDRTB (no drug sensitivity testing was performed for the sputum specimen). Twenty-seven cases occurred among Singapore residents and 48 among non-residents.

MDR pulmonary TB among residents (citizens and permanent residents)

Among residents, the overall MDRTB rate was 0.3% (15/5,963) in new cases and 1.4% (12/845) in relapsed cases. No obvious trend was noted in the incidence of MDRTB over the study period (*Table 1*).

MDR pulmonary TB among non-residents

Non-residents comprise employment and work permit applicants / holders, long and short-term social visit and dependant pass holders / applicants, and illegal immigrants. The number and incidence of MDR pulmonary TB according to nationality is shown in *Table 2*. The overall MDRTB rate was 2.5% (48/1,935). The incidence of MDRTB was 1.7% (32/1,850) among new cases and 18.8% (16/85) among relapsed / previously treated cases. No obvious trend was noted in the incidence of MDRTB over the study period (*Table 1*).

Most of the non-residents with MDRTB (60%) were short-term social visit pass holders, followed by

Table 1
Proportion (%) of sputum culture-positive pulmonary TB cases with MDRTB, 2000 - 2006

	2000	2001	2002	2003	2004	2005	2006	2000-2006
Residents, new cases	0.1	0.5	0.3	0.1	0.2	0.2	0.4	0.3
Residents, previously treated cases	0.8	0.8	1.5	3.0	0	1.0	3.0	1.4
Non-residents, new cases	2.8	1.4	1.5	0.7	1.1	2.2	2.2	1.7
Non-residents, previously treated cases	21.4	27.3	0	0	22.2	21.4	23.8	18.8

Table 2
MDR pulmonary TB (new and previously treated) in non-residents according to nationality, 2000-2006

Nationality	No. of MDR cases	Total sputum culture-positive cases	Proportion with MDR (%)
Burmese	8	130	6.2
Vietnamese	1	25	4.0
Indonesian	25	760	3.3
Chinese (Peoples' Republic of China)	5	158	3.2
Filipino	4	183	2.2
Indian	4	193	2.1
Malaysian	1	295	0.3
Bangladeshi	0	70	0
Hong Kong	0	5	0
Mongolian	0	3	0
Nigerian	0	3	0
Thai	0	44	0
USA	0	4	0
Others *	0	62	0
Total (all nationalities)	48	1935	2.5

* ie. other nationalities in which only one case of culture-positive pulmonary TB was notified in the period 2000-2006

work permit holders / applicants (17%) (*Fig 1*). Indonesians accounted for the highest number of pulmonary TB cases (n=760) and MDRTB cases (n=25) over the seven-year study period, while the highest incidence of pulmonary MDRTB occurred among the Burmese (6.2%; 8/130). There were no pulmonary MDRTB cases among patients from Bangladesh, Thailand and Hong Kong. There were two cases of XDRTB as currently defined over the study period; both were detected in Indonesian short-term social visitors in 2005.

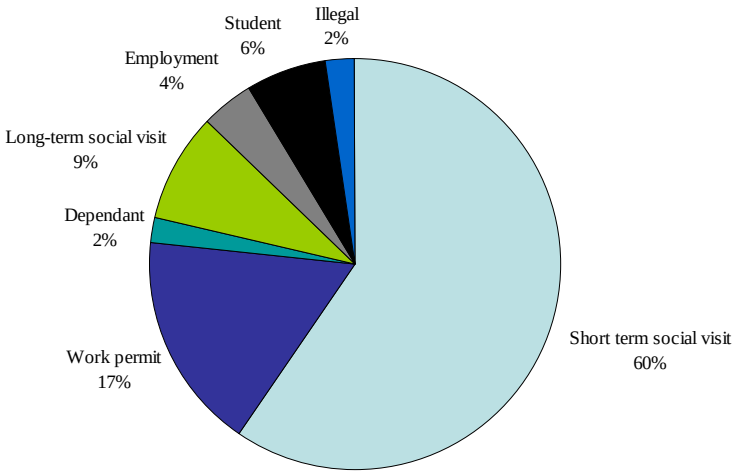
Discussion

MDRTB is fortunately still uncommon in Singapore residents with pulmonary TB, at 0.3% among new cases and 1.4% among relapsed cases. In contrast, the proportion of MDRTB among sputum positive non-residents is 1.7% for new cases, and close to 20% among previously treated / relapsed cases. This study documents the MDRTB rates among non-residents from various countries, mostly in the surrounding region, and may be useful in providing an index of suspicion for drug-resistant disease among patients from these areas.

The strengths of this study are the total capture of all TB cases with sputum mycobacterial cultures performed in Singapore, and that all patients with positive isolates have routine first-line drug sensitivity testing, with second-line testing in isolates resistant to isoniazid and/or rifampicin. This analysis is limited by the accuracy of the information provided to the STEP registry by the notifying sources, in particular the classification of new and previously treated / relapsed cases among non-residents. In addition, unnotified patients treated for pulmonary TB in whom no sputum specimens were sent for mycobacterial culture and drug-sensitivity testing will obviously be missed; the extent of this is unknown.

The strikingly high rate of MDRTB in previously treated non-residents (in the region of 20%) reiterates the importance of a high index of suspicion

Figure 1
Immigration pass status (holder / applicant) of non-residents with pulmonary MDRTB 2000-2006



for MDRTB in this category of patients. The high incidence of MDRTB among these cases in this study may however be influenced by the disproportionately high number of short-term visitors seeking medical opinion in Singapore in view of persistent symptoms despite treatment in their home country.

The MDRTB global epidemic resulted from deficiencies in TB case and programme management. MDRTB is of grave clinical and public health significance: its treatment is difficult as it involves the use of weaker, more toxic and more costly second-line TB drugs which have to be given for at least 18 months. The treatment success rate for MDRTB is much lower (~ 60% versus 90% for drug-susceptible TB), and mortality higher than that in patients with drug-susceptible TB. Unfortunately, there have been no new drugs for TB in the last 40 years. There has only recently been a resurgence of research activity in this field (after decades of neglect), and it will be some time before drugs currently in the discovery and development pipeline are introduced into mainstream therapy.

The prevention of MDRTB should therefore be of utmost priority in any TB programme. Key to this is the successful treatment of all drug-sensitive cases. To achieve this, physicians must firstly recognize the need to obtain samples for mycobacterial culture and drug sensitivity testing (in addition to performing microscopy for acid-fast bacilli) whenever TB is suspected. Obtaining specimens for mycobacterial culture and drug sensitivity testing is not only essential for proper diagnosis and treatment, but also to monitor treatment progress and response. Secondly, appropriate treatment regimens which include at least three drugs to which the organisms are expected to be sensitive should be prescribed in the initial phase of treatment (when the bacterial load is high). It is a good practice to ascertain that the infecting organisms are susceptible to rifampicin and isoniazid before reducing to the continuation phase of standard short-course therapy utilizing these two drugs. Ensuring patient adherence to the TB medications under directly observed therapy (DOT) for all infectious cases is vital and cannot be overemphasized.

The present low MDRTB incidence in Singapore is no reason for complacency. Our position as a global hub and the increasing influx of visitors and migrant workers renders the country vulnerable to the importation of various infectious diseases, including MDR and XDRTB. New and better tools for rapid and accurate identification of drug-resistant TB strains, more effective drugs and treatment regimens, and vaccines are urgently needed if this global killer is to be defeated. Meanwhile, it behoves the medical community to prevent the emergence of drug-resistant TB by the prescription of effective treatment regimens and ensuring treatment adherence for all TB cases treated in the country.

(Reported by Chee CBE[1], Khin Mar K[1], Lim L K Y[1], Cutter J[2], James L[2], Sng LH[3], Lin RTP[2], Wang YT[1], TB Control Unit, Tan Tock Seng Hospital[1] , Dept of Pathology, Singapore General Hospital[3] and Communicable Disease Division, Ministry of Health[2])

References

1. *Crofton J. Possible causes of the failure of the treatment of pulmonary tuberculosis : how to avoid them. Bull Int Union Against Tuberculosis, 1980;55:93-101*

2. *Mahmoudi A, Iseman MD. Pitfalls in the care of patients with tuberculosis. Common errors and their association with the acquisition of drug resistance. JAMA 1993;270:65-8*

3. *Cohn ML, Middlebrook G, Russell WF Jr. Combined drug treatment of tuberculosis. I. Prevention of emergence of mutant populations of tubercle bacilli resistant to both streptomycin and isoniazid in vitro. J Clin Investigation 1959;38:1349-55*

4. *Zignol M, Hosseini MS, Wright A et al. Global incidence of multidrug-resistant tuberculosis. J Infect Dis 2006;194:479-85*

5. *Centres for Disease Control and Prevention. Emergence of* Mycobacterium tuberculosis *with extensive resistance to second-line drugs - worldwide, 2000-2004. MMWR Morb Mortal Wkly Rep 2006;55:301-5*

6. *Van Rie A, Enarson D. XDR tuberculosis: an indicator of public-health negligence. Lancet 2006; 369:1554-6*

7. *Raviglione MC, Smith IM. XDRTB – implications for global public health. N Engl J Med 2007;356:656-9*

8. *Chee CBE, James L. The Singapore Tuberculosis Elimination Programme: the first five years. Bull Wld Hlth Organ 2003;81:217-22*

An outbreak of vivax malaria in the off shore islands, July-Sept 2006

Notifications

On 19 July 2006, the Ministry of Health (MOH) identified a cluster of vivax malaria cases involving two Indian foreign workers who had no recent travel history outside Singapore. Both of them had been in Singapore since September 2005 and were involved in a construction project in Jurong Island. Their onset of illness was on 28 June and 12 July 07, respectively.

Epidemiological investigations

As soon as local transmission was suspected, MOH conducted a joint site inspection with the National Environment Agency (NEA) and vector surveillance, fever surveys and screening of foreign construction workers for malaria parasites were carried out. Medical practitioners in the vicinity were alerted and reminded to notify all reported cases to MOH. The records of all cases of malaria notified in 2006 were reviewed to find out whether any of the previously reported cases could be epidemiologically linked to these two cases by person, place and time.

Malaria screening was carried out at the construction site in Jurong Island and the workers' dormitory at Upper Jurong Road on 21, 24, 27 and 28 July. It was subsequently extended to all workers at the construction site in the neighbouring off shore island, Pulau Busing, on 7, 10, 22, 24 August and 8 September. (*Fig 2*)

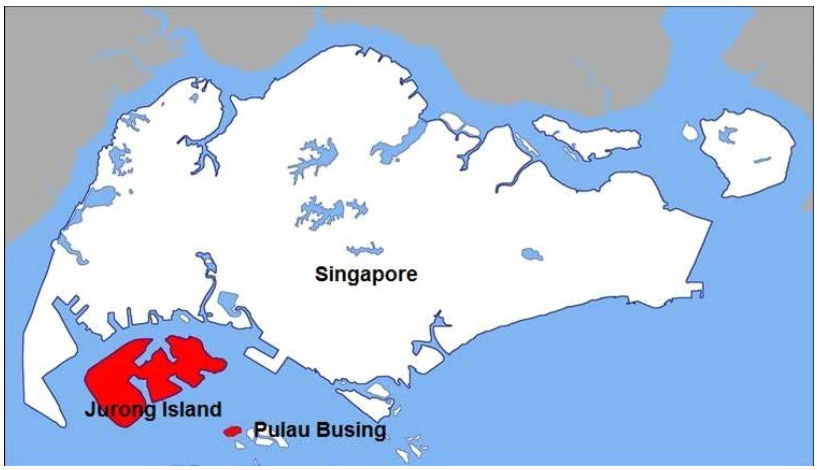
Results

A foreign worker with fever was picked up by the construction company and referred to Alexandra Hospital on 22 July. He came to Singapore from India in April 06 and developed illness three months later on 20 July 06. He was confirmed to have vivax malaria.

Retrospective analysis of malaria cases reported in 2006 revealed that an additional four cases of vivax malaria were epidemiologically linked to the three cases described above.

On 4 August 06, another Indian foreign construction worker with onset of symptoms on 31 July

Figure 2
Map of Singapore, showing the location of Jurong Island and Pulau Busing (in red).



was confirmed to have vivax malaria. He had been working in the construction site in Jurong Island till 21 July 06 when he was transferred to another construction site managed by the same company in Pulau Busing. He was not in Jurong Island when blood screening was conducted there. Epidemiological and vector surveillance and control were immediately extended to this island..

Another five construction workers with vivax malaria were subsequently notified. Their onset of illness was between 5 and 29 August. These included one symptomatic and one asymptomatic cases who were picked up through examinations of 3083 blood films collected during mass blood surveys between 21 July and 8 September.

A total of 13 cases of vivax malaria aged 20 -47 years were reported in Jurong Island and Palau Busing between 24 Mar and 11 Sept 06. All of them were male Indian nationals who came from different parts of India. They developed febrile illness one to 11 months after arrival. The cases stayed in different parts of Singapore, including the workers' dormitories in Upper Jurong Road, Soon Lee Road, Woodlands St 13, Sungei Kadut Drive and Pulau Busing construction site. All recovered after treatment in hospital. The epidemiological profile and time distribution of the 13 reported cases are shown in *Table 3* and *Fig 3*, respectively.

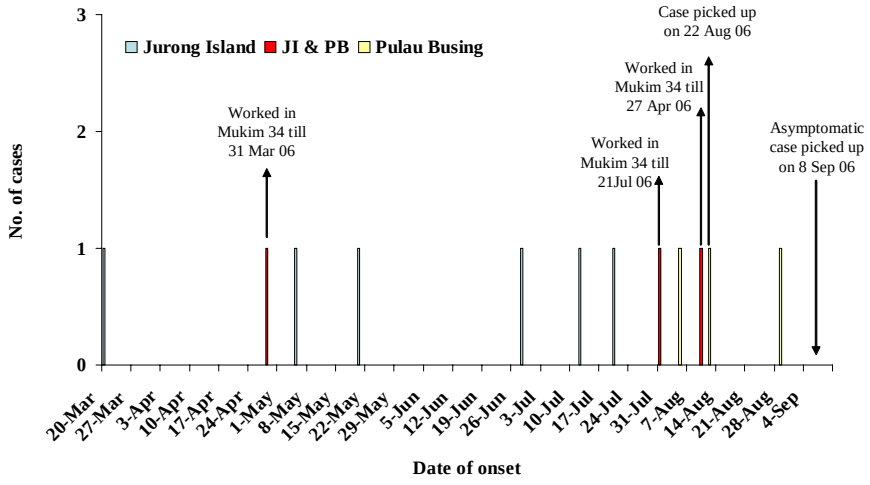
Vector control operations

'Search and destroy' operations, including outdoor thermal fogging at night and residual spraying of living quarters and worksites in Jurong Island and Pulau Busing were conducted by NEA and the pest control company engaged by the construction company. There was no evidence of *Anopheles* larval breeding. No adult vectors could be found through light trapping. Only *Culex* and *Aedes* breedings were detected. The general housekeeping of the worksites was satisfactory. All potential *Anopheles* breeding sites were destroyed or treated with larvicide.

Table 3
Epidemiological profile of 12 reported symptomatic and one asymptomatic vivax malaria cases in Jurong Island and Pulau Busing, March – August 2006

S/No	Age	Sex	Occupation	Workplace	Notification date	Onset date	Date arrived in S'pore	Interval (months) between arrival in S'pore and onset of symptoms
1	27	Male	Construction worker	Jurong Island	24-Mar-06	20-Mar-06	01-Sep-05	7
2	29	Male	Construction worker	Jurong Island & Pulau Busing	03-May-06	28-Apr-06	12-Jan-06	4
3	29	Male	Construction worker	Jurong Island	10-May-06	05-May-06	03-Feb-06	4
4	36	Male	Construction worker	Jurong Island	24-May-06	20-May-06	24-Feb-06	4
5	24	Male	Construction worker	Jurong Island	19-Jul-06	28-Jun-06	20-Sep-05	10
6	47	Male	Construction worker	Jurong Island	19-Jul-06	12-Jul-06	30-Sep-05	11
7	20	Male	Construction worker	Jurong Island	23-Jul-06	20-Jul-06	18-Apr-06	4
8	20	Male	Construction worker	Jurong Island & Pulau Busing	03-Aug-06	31-Jul-06	20-Jan-06	7
9	31	Male	Construction worker	Pulau Busing	07-Aug-06	05-Aug-06	03-May-06	4
10	34	Male	Construction worker	Jurong Island & Pulau Busing	16-Aug-06	10-Aug-06	21-Jan-06	8
11	39	Male	Construction worker	Pulau Busing	23-Aug-06	12-Aug-06	21-Jul-06	1
12	25	Male	Construction worker	Pulau Busing	02-Sep-06	29-Aug-06	25-Apr-06	5
13	22	Male	Construction worker	Pulau Busing	11-Sep-06	Asymptomatic	06-Jul-06	N.A.

Figure 3
Time distribution of 12 reported symptomatic and one asymptomatic vivax malaria cases in Jurong Island and Pulau Busing, March – September 2006



Comments

Although declared free of indigenous malaria by the World Health Organization in 1982[1], Singapore is vulnerable to the threat of malaria via the introduction of cases and carriers from endemic countries around the region. The city state remains receptive to malaria transmission due to the presence of *Anopheles* mosquitoes.

Periodic outbreaks of malaria remind us of the ever-present threat of reintroduction of malaria into Singapore[2]. The combination of the presence of vectors and the high volume of travellers and foreign workers from malaria-endemic countries necessitates the need to remain vigilant. This is done by instituting a comprehensive malaria control programme incorporating vector and disease surveillance and control, and public education in Singapore.

(Contributed by Lim J, Han HK, Lim S, Ooi PL, Communicable Diseases Division, Ministry of Health)

Editorial comments

This cluster of cases could have been classified as relapsing vivax malaria (imported) as all of them were foreign construction workers coming from malaria endemic areas in India. Imported cases of vivax malaria cases are known to have a relapse as long as 30 weeks after arrival in Singapore[3]. However, careful enquiries showed that only 6 of the cases had had a history of similar symptoms in their hometowns. The two main malaria vectors in Singapore are *Anopheles sundaicus* and *Anopheles maculatus* which are occasionally found in brackish water of coastal areas and in clean seepage water of hilly terrains, respectively.. As the vector population is extremely low, they are seldom detected in a number of incidents where local transmission was suspected.

In fact, no *Anopheles* mosquitoes could be detected despite extensive vector surveillance in one of the largest localized outbreaks of vivax malaria (40 cases) which occurred at Tanjong Rhu/East Coast Park from Sept 1993 to Jan 1994[4]. The initial focus of transmission was among foreign construction workers living and working at the worksites before it spread widely to the local population in the surrounding areas.

In the Jurong Island/Palau Busing outbreak, analyses of the epidemiological data by person, place and time suggest that these foreign workers most probably acquired the infection in these islands, although no *Anopheles* vectors could be detected. However, this can only be confirmed by molecular typing of the malaria parasites.

Based on past experience, whenever a cluster of two or more malaria cases, including foreign workers from endemic countries, with no recent travel history are detected in a locality, local transmission should be suspected and epidemic control measures implemented to prevent further spread.

References

1. *Goh KT. Eradication of malaria from Singapore. Singapore Med J, 1983; 24: 255-68.*
2. *Ooi PL, Goh KT, Lee KM. Local Transmission of* Plasmodium vivax *malaria in Singapore. Ann Aca Med Singapore 1997, 26: 588-92.*
3. *Committee on Epidemic Diseases. Imported malaria in Singapore, 1989. Epidem News Bull 1990; 16: 21-3.*
4. *Committee on Epidemic Diseases. Malaria outbreak at Tanjong Rhu/East Coast Park, 1993. Epidem News Bull 1994;20:13-5*

Human metapneumovirus in children, Singapore – commentary

Human metapneumovirus (hMPV) was first discovered in 2001 by a Dutch team headed by Van den Hoogen [1]. Since then, numerous studies have shown that hMPV is a cause of acute respiratory tract infection. A study was carried out by by Loo et. al. to assess the importance of hMPV infection in hospitalized paediatric patients in Singapore[2].

In this study, nasopharyngeal swabs were collected from 400 paediatric patients with lower respiratory tract infections (LRTI) and upper respiratory tract infections (URTI) from October 2005 to January 2007 at KK Women's and Children's Hospital. Specimens were routinely tested for influenza A and B viruses, respiratory syncytial virus (RSV), adenovirus and parainfluenza viruses (serotypes 1-3). These were then stored before testing for hMPV.

Specimens were tested by reverse transcriptase polymerase chain reaction (RT PCR) directed at the N gene of the virus. Positive samples were then sequenced to confirm the identity of the virus and to determine the genotype.

Twenty-one out of the 400 samples (5.3%) were positive for HMPV infection. This was second only to RSV which had an incidence of 11.5% (46 positives) in this study. There was no evidence of co-infections in any of the specimens tested here, which is in contrast to other studies from Europe [3,4].

DNA sequence analysis of the hMPV showed that the Singapore strains clustered mainly around representative hMPV strains in lineage A (approx 67% of hMPV isolates). 11 of the 21 children (52%) with hMPV infection presented with LRTI.

Given the reported incidence of hMPV infections in this study, testing for hMPV should eventually form part of respiratory virus panel testing, and be considered an aetiological possibility for severe infections**.** Management of hMPV infection remains supportive pending the outcome of controlled clinical trials on the use of ribavirin; there has been at least one case report of a patient with severe hMPV infection treated successfully with ribavirin [5].

hMPV would have accounted for at least some of those LRTIs and URTIs for which no organism was implicated in the past. In any new outbreak of respiratory viral illness, detection of hMPV should be considered for inclusion in public health surveillance and investigation. However, the mere detection of the virus may not necessarily indicate aetiology, as dual infections can occur. hMPV was, after all, detected in some cases of severe acute respiratory infection (SARS)[6].

Further issues are whether or not dual infections with viruses and bacteria cause more severe disease[3,4]. As this local study shows, hMPV is not a homogenous strain but has different genotypes which vary according to geographical distribution. The clinical and epidemiological implications of this needs further clarification. The clinical impact of the virus on various patients groups, including adults and the immunocompromised, warrant further study.

New techniques will enable us to detect more respiratory viruses now and in the future. Despite this, many cases of LRTI and URTI still lack a laboratory-confirmed aetiology. Newer laboratory strategies may be required to improve our ability to detect and identify novel respiratory pathogens. For the expanding range of known pathogens, many research groups and manufacturers of diagnostic kits are seeking ways to test, in a single reaction, a panel of respiratory pathogens which may readily exceed 12 agents. Accurate, sensitive, fast and cheap panel testing poses a challenge to the ingenuity of scientists; such panel tests would be invaluable in any future epidemic of severe respiratory illness, but the value of such panel tests in routine clinical management is less clear.

Currently, Tan Tock Seng Hospital and the National University Hospital are collaborators of a Ministry of Health's Health Service Development Programme (HSDP) project which includes evaluating new technologies for respiratory panel testing and finding strategies for novel pathogen discovery.

(Reported by Chan DSG, National Healthcare Group, and Lin RTP, National Public Health Laboratory, Communicable Diseases Division, Ministry of Health)

References

1. *Van den Hoogen BG, de Jong JC, Groen J et al. A newly discovered human pneumovirus isolated from young children with respiratory tract disease. Nature Med 2001; 7:719-24.*
2. *Loo LH, Tan BH, Ng LM et al. Human metapneumovirus in children, Singapore. Emerg Infect Dis 2007; 13:1396-8.*
3. *Greensill J, McNamara PS, Dove W et al.. Human metapneumovirus in severe respiratory syncytial virus bronchiolitis. Emerg Infect Dis 2003; 9:372-5*
4. *Konig B, Konig W, Arnold R et al. Prospective study of human metapneumovirus infection in children less than 3 years of age. J Clin Micro 2004; 42:4632-5*
5. *Raza K, Ismailjee SB, Crespo M et al. Successful outcome of human metapneumovirus (hMPV) pneumonia in a lung transplant recipient treated with intravenous ribavirin. J Heart Lung Trans 2007; 26:862-4*
6. *Chan KSP, Tam JS, Lam CW et al. Human metapneumovirus detection in patients with severe acute respiratory syndrome. Emerg Infect Dis 2003; 9: 1058-63*

Investigations into an outbreak of norovirus gastroenteritis in a primary school

Introduction

On 25 Jul 2007, the Ministry of Health (MOH) was notified of an outbreak of suspected food poisoning which affected many students in a primary school. This was a two-session school with an enrolment of 1,885 students supported by 98 teaching and 21 non-teaching staff. The school had shifted to a temporary premise in Dec 2006 while upgrading was being carried out at its original location. There was a school

canteen with 13 food handlers working in eight food stalls.

As soon as the notification was received, epidemiological investigations were conducted to determine the extent of the outbreak, source of infection and mode of transmission.

Epidemiological findings

A total of 147 cases reported symptoms of acute gastroenteritis between 21 and 27 Jul 2007 (*Fig.4*). They comprised 113 students from the morning session (Primary 3-6), 26 students from the afternoon session (Primary 1-2), four teachers, two food handlers, a cleaner and a security guard. The symptoms were vomiting (93%), abdominal pain (72%), fever (69%), diarrhoea (55%), headache (29%), and nausea (14%). 112 (76%) of them required outpatient treatment while the rest self-medicated. None were hospitalized.

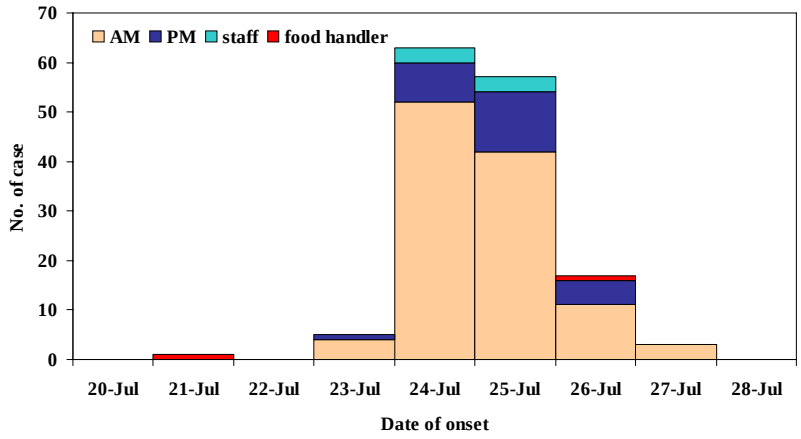
The affected students were distributed across Primary 1-6 with class-specific attack rates ranging from 3.7-9.7%. Case-control analysis to determine the food-specific attack rates based on the food items consumed prior to onset of illness did not implicate any specific item as the vehicle of transmission. The incubation period based on food consumed during recess time ranged from 23-45 hours.

During epidemiological investigations, a food handler from the implicated food stall was found to be ill since 21 Jul 2007. She had vomiting and diarrhoea while in the school on 23 Jul 2007. Despite her symptoms, she continued to prepare drinks in the canteen until the school ordered her home on 25 Jul 2007.

The canteen was inspected and found to be satisfactorily maintained. However, it was observed that the dedicated toilet for the exclusive use of food handlers and security guard had soap for hand washing but no toilet papers. The users were expected to bring their own toilet papers.

A total of six food samples, one water sample, and two environmental swabs were collected for microbial testing. *S. aureus* was found in a sample of ice

Figure 4
Onset of 147 acute gastroenteritis cases in a primary school, 21-27 Jul 2007



and a styrofoam box (both from the implicated food stall) as well as in a canteen water tap.

All the 13 food handlers were referred to the Communicable Disease Centre (CDC), Tan Tock Seng Hospital for medical screening. Norovirus was identified in the stools of six of them, including the sick food handler from the implicated stall.

Prevention and control

The principal of the school was advised to undertake the following measures to break the chain of transmission and prevent a recurrence of the outbreak:

- prohibit infected food handlers from preparing food until they are certified free of infection and to refrain from handling food if they are unwell;
- remind food handlers to observe good food and personal hygiene, including use of properly maintained containers for ice-making;
- ensure that the school premises, including the canteen are cleaned and well maintained;
- make sure that foods are thoroughly cooked before serving and there is no cross-contamination between raw and cooked foods;
- ensure that toilets are in a sanitary condition and adequately equipped with soap and toilet papers;
- promote frequent hand washing, especially after toilet visits and before eating or preparing food;
- observe personal hygiene etiquette, including covering of mouth when coughing/ sneezing and washing hands thereafter;
- detect and isolate cases early;
- clean and disinfect areas contaminated by stool/ vomitus immediately by using household bleach;
- wash mop in a proper designated basin; and
- have adequate ventilation in places of congregation and avoid overcrowding.

Comments

This was an outbreak of norovirus gastroenteritis established by the detection of the aetiological agent in stool samples. Our investigative findings with vomiting as the predominant symptom, and of an incubation period falling within the range of 12-48 hours were consistent with the clinical and epidemiological features of this viral infection. The source of infection was traced to an infected food handler who was ill since 21 Jul 2007 but continued to prepare drinks in the canteen from 23-25 Jul 2007 until she was sent home. No further cases were reported after 27 Jul 2007.

In this outbreak, transmission probably occurred not only through the faecal-oral route, but also by environmental contact[1, 2]. Infection could have spread from the index case to other food handlers through close contact at work and sharing of common toilet facilities. Poor hygienic practices, as evidenced by the detection of *S. aureus* in food and environmental samples, contributed to further spread of infection. As to why fewer cases were reported from the afternoon session, this could be due to diminished viral contact among the primary 1-2 students who brought their own food for consumption and stayed away from the canteen. The findings of this outbreak highlighted the importance of maintaining a high standard of good food and personal hygiene, and of prohibiting food handlers from preparing food when they are ill with gastroenteritis. Institutional outbreaks of norovirus gastroenteritis implicating sick food handlers have been documented[3].

(Contributed by Suhana S, Chan PP, Han HK, Lalitha K, Lim S, Ooi PL, Surveillance & Response Branch, Communicable Diseases Division, Ministry of Health)

References

1. *Uchino K, Miyoshi T, Matsuo M, et al. Combined genogroup I and II norovirus infection at a nursery. Jpn J Infect Dis 2006; 59: 270-2.*

2. *Evans MR, Meldrum R, Lane W et al. An outbreak of viral gastroenteritis following environmental contamination at a concert hall. Epidem Infect 2002; 129: 355-60.*

3. *US Centers for Disease Control and Prevention. Norovirus and food handler, National Center for Infectious Diseases, Respiratory and Enteric Viruses Branch, http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-foodhandlers.htm*

A 17-year review of the chickenpox situation in Singapore, 1990-2006

Introduction

Varicella, commonly known as chickenpox, is an acute and highly contagious viral disease with worldwide distribution. The disease is caused by infection with the varicella zoster virus, which causes relatively mild illness of fever and an itchy rash that usually lasts about 5 to 10 days. In children, chickenpox is very common and spreads readily by coughing and sneezing, by direct contact, and by aerosolisation of virus from skin lesions[1].

Disease trend

The incidence rate of chickenpox had been declining from 1355.8 per 100,000 population in 1996 to 535.8 per 100,000 population in 2006 (*Fig 5*). The corresponding numbers of reported cases were 49,763 and 24,026, respectively. Outbreaks were reported from time to time in childcare centres, kindergartens, schools and other institutions where large numbers of susceptibles congregated[2,3].

Chickenpox cases were reported throughout the year and affected all age groups[4]. During the period 1990 -1993, the disease was seen more frequently in children and young adults 5-24 years of age. However, since 1996 the highest age-specific incidence rate was recorded in children less than 5 years of age (*Fig 6*). Among the three major ethnic groups, Malays had a higher incidence rate compared to Chinese and Indians (*Fig 7*).

In Singapore, only a small proportion of chickenpox cases were hospitalised. An annual average of 817 chickenpox cases (range 326 – 1785) were admitted to public and private hospitals during the period 1994 – 2006. Prior to 2005, foreigners were disproportionately represented, contributing almost 70% of chickenpox hospitalisations annually. Among local residents, the rate of chickenpox hospitalisations had declined steadily from 18.5 per 100,000 population in 1996 to 4.6 per 100,000 population in 2006 (*Fig 8*).

Figure 5
Notifications and incidence rates of reported chickenpox cases, 1990 – 2006

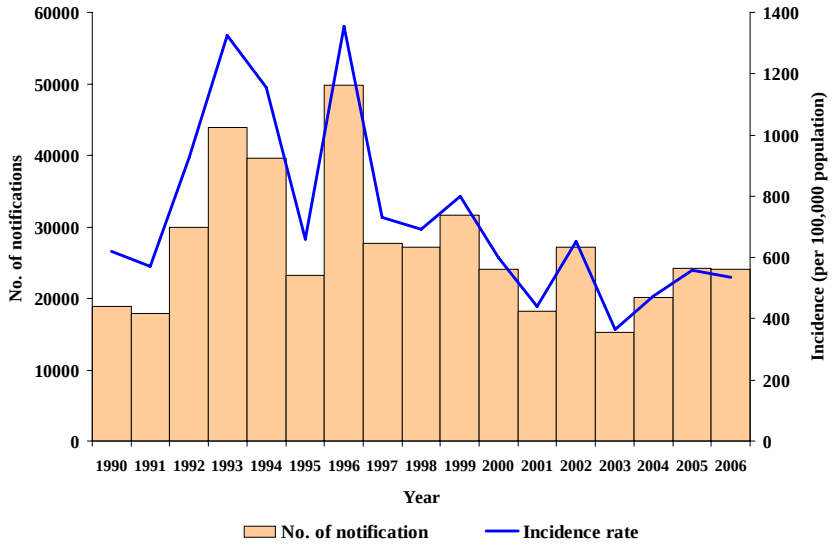


Figure 6
Age-specific incidence rates of reported chickenpox cases, 1990-2006

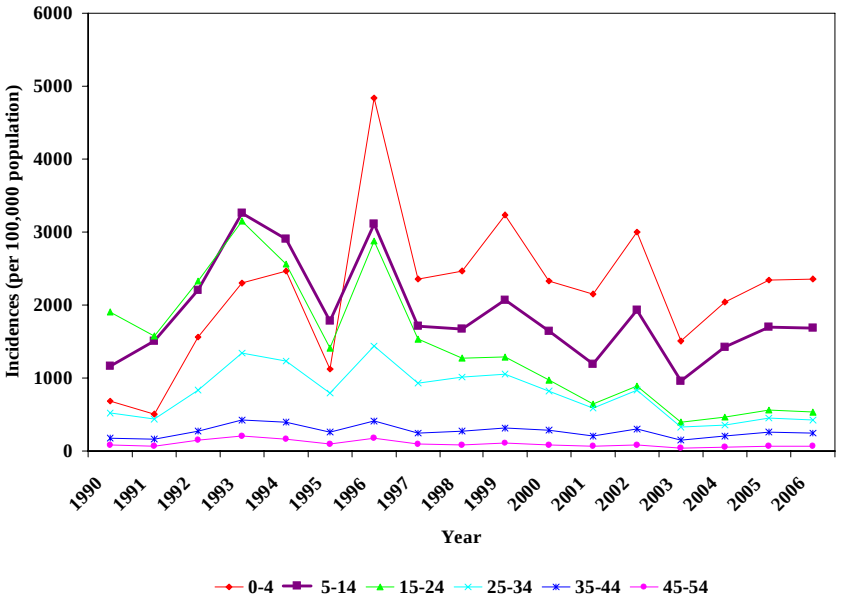


Figure 7
Ethnic-specific incidence rates of reported chickenpox cases, 1990-2006

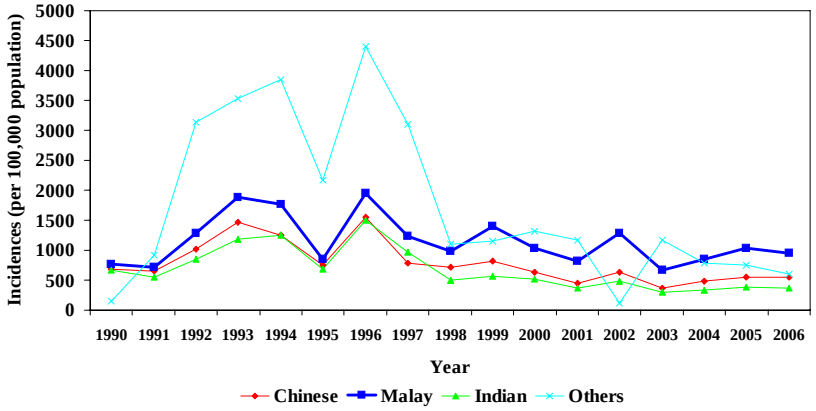
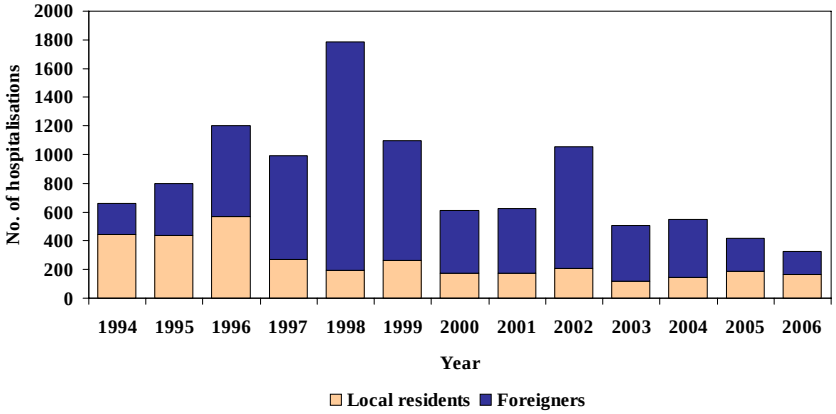


Figure 8
Chickenpox hospitalisation by local residents and foreigners, 1994 - 2006



Chickenpox-related deaths

Mortality due to chickenpox was very low. During 1995 – 2006, a total of 33 deaths with chickenpox either as the primary or contributory cause of death, were recorded in the Registry of Births and Deaths. The majority reportedly died of respiratory complications followed by other systemic complications such as septicemia and encephalitis. The annual number of chickenpox deaths in recent years had declined to fewer than 5, with none reported in 2006.

Comments

The epidemiology of chickenpox has changed during the period of review. There has been a shift in the age distribution of cases with the incidence rate highest in children below 5 years of age over the last decade. This could be due to more preschool children attending childcare centres where social interaction among the highly susceptible pre-schoolers increases the risk of infection and exposure to the varciella-zoster virus.

Chickenpox gives rise to few complications and has a low case-fatality rate in healthy children. Although not incorporated into the national childhood immunization programme, chickenpox vaccine has been licensed in Singapore since 1996[5]. To what extent immunization of the population who requested for it has contributed to the decline in the incidence of chickenpox over the last ten years is not known.

(Reported by Li HY, Communicable Diseases Division, Ministry of Health)

References

1. *Centres for Disease Control and Prevention. Varicella (chickenpox) in-short. Available from http://www.cdc.gov/vaccines/vpd-vac/varicella/in-short-adult.htm*

2. *Quarantine and Epidemiology Dept, National Environment Agency, Singapore. Communicable Diseases Surveillance in Singapore 1990 - 2002.*

3. *Ministry of Health, Singapore. Communicable Diseases Surveillance in Singapore 2003 - 2006.*

4. *Committee on Epidemic Diseases. Epidemiological surveillance of varicella-zoster virus infection in Singapore. Epidemiol News Bull 1996; 22:61-4.*

5. *Committee on Epidemic Diseases. Seroprevalence of varicella-zoster virus infection in Singapore. Epidemiol News Bull 2000; 26:59-62.*

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Any comments or questions should be addressed to:

The Editor
Epidemiological News Bulletin
Communicable Diseases Division, Ministry of Health
College of Medicine Building, 16 College Road,
Singapore 169854
E-mail : Goh_Kee_Tai@moh.gov.sg
Lyn_James@moh.gov.sg