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EV71-associated epidemic hand, foot and mouth disease in Singapore

Introduction

Hand, foot and mouth disease (HFMD) is a common childhood viral disease characterized by brief prodromal fever, followed by pharyngitis, mouth ulcers and rash on the hands and feet. Children may have reduced appetite due to painful oral ulcers erupting on the tongue, gums or buccal mucosa. A non-pruritic vesicular rash or red spots typically appears on the hands and feet, most commonly on the palms and soles. The common causative agents for HFMD are *coxsackievirus* type A (CA), *echovirus* (EC) and *enterovirus 71* (EV71). HFMD can be transmitted from person to person through the faecal-oral or respiratory route¹.

From end of March to May 2008, a nationwide epidemic of EV71-associated HFMD occurred. The last EV71-associated HFMD epidemic was in 2006². In this study, we describe the epidemiology of HFMD in Singapore during the epidemic period in 2008, with particular reference to the prevention and control measures in preschool centres.

Materials and methods

Epidemiological data from all clinical cases as well as clusters of HFMD cases in educational institutions notified to the Ministry of Health (MOH) were analysed. The attack rates of institutional outbreaks were calculated based on the student and staff population provided by the affected centres and schools. We also examined laboratory data on enteroviruses tested by the National Public Health Laboratory, MOH, Microbiology Laboratory, KK Women's and Children's Hospital, and

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Virology Laboratory of the Department of Pathology, Singapore General Hospital.

Results

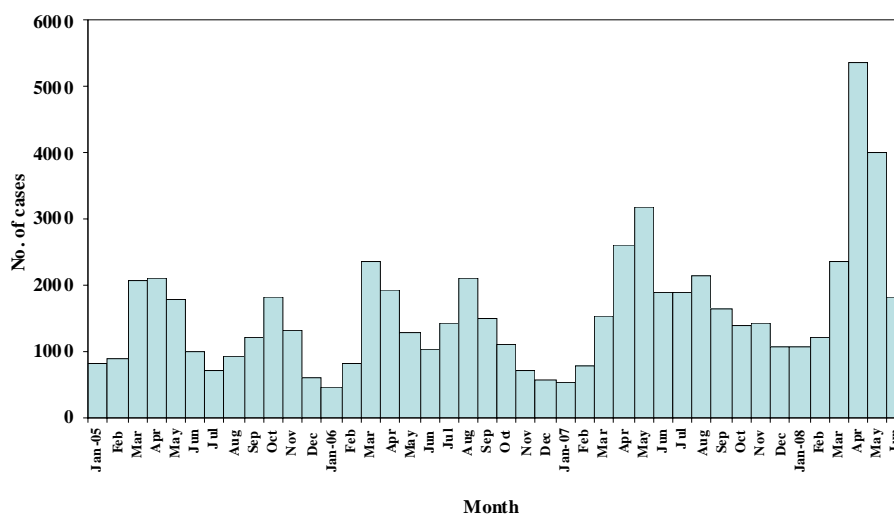
In the first 24 weeks of 2008, there were 15,030 cases of HFMD, a two-fold increase compared to the same period in 2006. From the notifications received in 2005 – 2008, 2 peaks were observed each year; March and October in 2005, March and August in 2006, and May and August in 2007³ (Fig. 1). The predominant strain isolated during the epidemic period was CA16 in 2005 and 2007, and EV71 in 2006 and 2008.

The incidence rate was highest in the 0-4 year age group; it increased from 4807.7 per 100,000 in 2005 to 5975.5 per 100,000 in 2007. There was a significant increase in the proportion of HFMD cases in the 5-9 year age group ($P < 0.05$, Chi-square test for trend) (Fig 2).

During the epidemic period from week 6 to week 16 in 2006, EV71 constituted 20.5% of the total samples tested (95% CI: 14.4% - 28.3%). For the epidemic period from week 8 to week 24 in 2008, EV71 constituted 33.2% of the samples tested (95% CI: 28.7% - 37.9%) (Fig 3). The EV71 positivity was significantly higher during the epidemic period in 2008 than in 2006 ($P < 0.05$).

In view of the unabated increase in the incidence of HFMD cases against a background of high EV71 circulation in week 17 of 2008, the HFMD Task Force decided to tighten the criteria on the closure of childcare centres. All childcare centres/preschools/playgroups with more than 15 days of disease transmission would hit the trigger for voluntary closure. If the transmission period lasted for more than 15 days together with either more than 13 cases or more than 18% of the enrolment infected, mandatory closure would be enforced for a period of 10 days. The purpose was to break the chain of transmission in these

Figure 1
Monthly incidence of reported HFMD cases, 2005-2008



institutions and for thorough cleaning and disinfection of the premises before re-opening.

The number of institutional outbreaks increased three-fold from 1443 during week 1 to week 24 in 2006 and to 3157 in the same period in 2008. Manda-

tory and voluntary closure of preschools was implemented for the first time in Singapore during the epidemic phase in 2008.

From week 17 when the voluntary/mandatory closure was first enforced till control measures were

Figure 2
Distribution (%) of HFMD cases by age group, 2005-2008

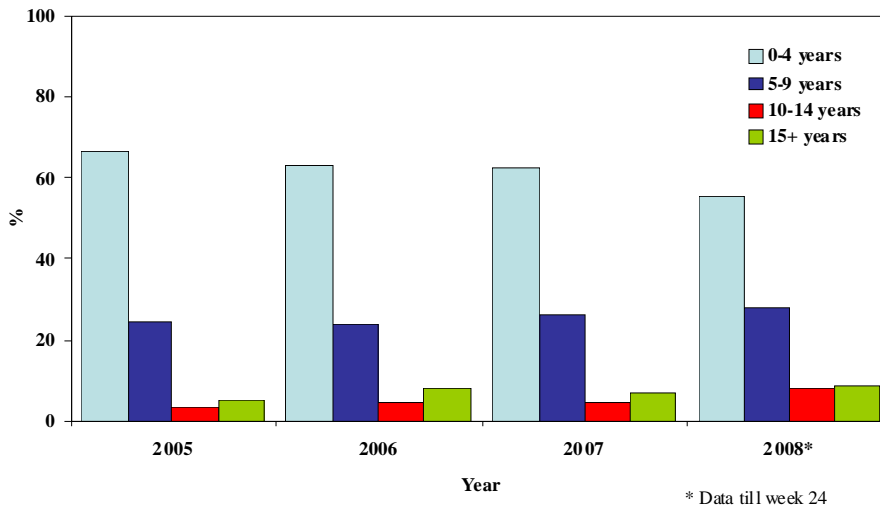
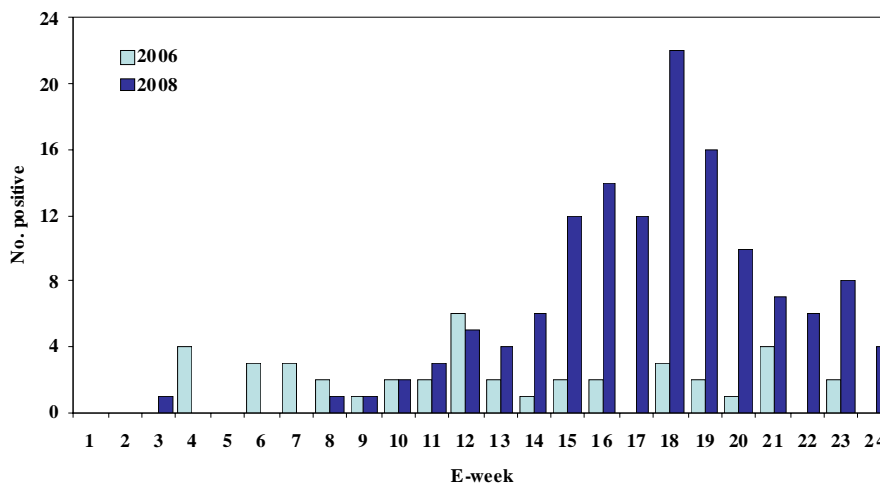


Figure 3
Number of samples tested positive for EV71 in the first 24 weeks of 2006 and 2008



reverted to the endemic phase in week 28, 35 centres/preschools were subjected to mandatory closure and 95 were placed on recommended voluntary closure list (*Table 1*). Of the 95 institutions in the second category, 27 were subsequently closed, 5 reached the trigger for mandatory closure and one nursery was partially closed.

When these institutions were opened, recurrences of at least one additional case were observed in 5 institutions subjected to mandatory closure and 4 institutions which closed voluntarily. This could be due to the continual presence of the virus in the environment. Further control measures were immediately undertaken to break the chain of transmission following the reappearance of the disease.

Comments

In Singapore, a bimodal pattern has been consistently observed since 2005, with a lower peak in the second wave. From 2005 to 2008, the predominant circulating enterovirus changed from year to year, and alternated between CA16 and EV71 during the epidemic period.

Table 1
Number of institutions hitting triggers for mandatory and voluntary closure, 2008

E-week	Mandatory closure	Voluntary closure
17	11	12
18	6	27
19	4	15
20	1	17
21	1	5
22	4	5
23	4	5
24	2	5
25	2	0
26	0	0
27	0	3
28	0	1
Total	35	95

The stringent measures implemented at preschool centres had resulted in a significant shift in the age distribution of cases to older children. This suggests that these control measures may have delayed the onset of infection. Since HFMD is endemic in Singapore with periodic resurgence, there is a need to evaluate the impact of closure of institutions in bringing the outbreak under control.

(Reported by Toh HY, Ang LW, Lim S, Foong BH and Ooi PL. Communicable Diseases Division, Ministry of Health, Singapore)

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3. Ang LW. *A review of hand, foot and mouth disease situation in Singapore*. *Epidemiol News Bull* 2007; 33: 45-9.



Seroepidemiology of rubella in Singapore, 2004

Monovalent rubella vaccine was introduced into the national childhood immunisation programme for female primary school leavers (aged 11 to 12 years) in November 1976, and it was later extended to include male primary school leavers and national servicemen in April 1982. In January 1990, the rubella immunisation schedule was modified with the introduction of the trivalent mumps, measles and rubella (MMR) vaccine given to one-year-old children. Following a 'catch-up' measles vaccination programme using the MMR vaccine for adolescents aged 12-18 years in 1997, the monovalent rubella vaccine given to primary school leavers was replaced by the second dose of MMR vaccine in 1998.

Serosurveillance is an important component of a comprehensive surveillance system for infectious diseases. It provides the gold standard for measuring either the level of acquired immunity or susceptibility to a disease in a population, and complements other surveillance components¹. Serosurveys have been conducted in many countries to determine the proportion of women in the reproductive age group who are susceptible to rubella, since the risk of infection of pregnant women underlines the public health burden of rubella². In Singapore, a number of serological surveys have also been carried out to assess the impact of the national immunisation programme on the herd immunity of the population against various vaccine-preventable diseases, including rubella³⁻⁵. We report the findings of the 2004 serological survey on the immune status against rubella of adults aged between 18 and 74 years.

Methods and materials

Sera were obtained from 4,153 participants of the National Health Survey (NHS) 2004⁶ aged 18-74 years who had given consent for future research on their blood specimens. The population sample was selected by a combination of disproportionate stratified sampling and systematic sampling and was representative of the Singapore resident population by age, gender and ethnicity. The sera which had been stored at -80°C at the Department of Pathology, Singapore General Hospital, were tested for rubella antibody at the Department of Laboratory Medicine, National University Hospital. Rubella IgG antibody titres were determined using the Abbott AXSYM system rubella IgG assay (Abbott Park, IL), a microparticle enzyme immunoassay. A titre of 10 IU/ml or greater was considered positive.

Statistical analysis was performed using the statistical software package, Statistical Package for Social Sciences (SPSS) 14.0. The impact of non-response weights computed for NHS04 was found to be insignificant on the findings, hence they were not incorporated in the data analysis. Bivariate analysis was performed using chi-square test or Fisher's exact test for categorical data; $p < 0.05$ was taken as statistically significant.

Results

Of the 4,153 blood samples tested, 84.0% (95% CI: 82.9% – 85.1%) were found to possess IgG antibody against rubella. There was no statistical difference in the overall seroprevalence between men and women. Men in the oldest age group of 65 – 74 years



showed the highest seropositivity at 86.6%, while women in this age group and in the age group of 45 – 54 years had the lowest seropositivity (80.0%). The seroprevalence of women was highest at 85.5% in the age group of 35 – 44 years (Fig. 4).

In women in the reproductive age group of 18 – 44 years, 15.8% were susceptible to rubella. No significant ethnic differences in susceptibility were noted among this group of women (15.8% in Chinese, 13.8% in Malays and 16.7% in Indians).

Comments

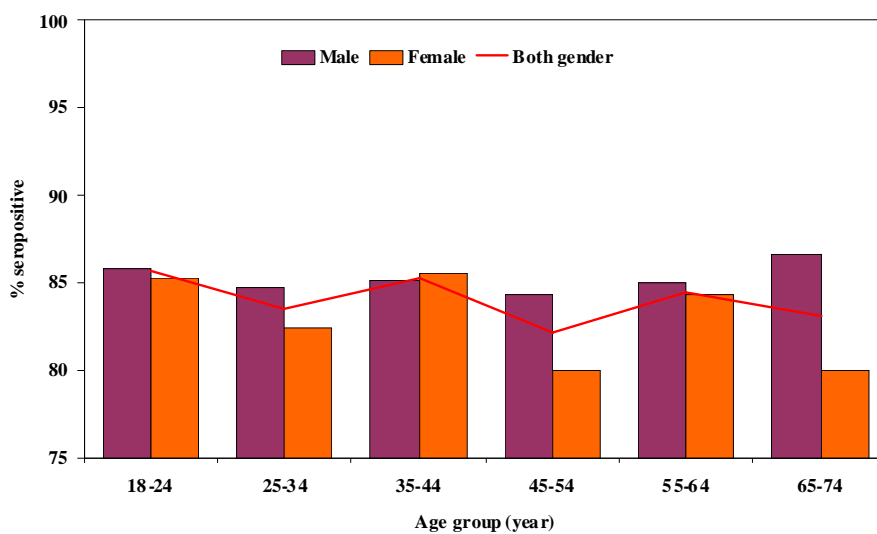
Based on past serological surveys, there had been a significant increase in the overall prevalence of antibody to rubella among healthy children and adults aged between six months and over 40 years from 47.6% in 1989/1990 to 71.7% in 1993, and 80.2% in 1998³⁻⁵ ($P < 0.0005$, chi-square test for trend).

The proportion of women 15 – 44 years of age susceptible to rubella infection decreased from more

than 20% in 1989-1990³ to 17% in 1993⁴, and 13.6% in 1998⁵. The 2004 survey showed that a considerable proportion (15.8%) of females aged 18 – 44 years in 2004 remained susceptible to rubella infection. Among females of the reproductive age group, the incidence of rubella notified to the Ministry of Health in 2004 was highest in the 25-34 year age group (4.7 per 100,000) which also had the lowest level of immunity (17.6%).

Congenital rubella syndrome (CRS) has been brought under control through the comprehensive coverage of the national childhood immunisation programme against rubella. Between one and two cases of CRS were reported annually in Singapore from 1999 to 2005, and none in 2006 and 2007. However, more public health efforts should be taken to eliminate CRS by increasing the herd immunity of rubella among women in the reproductive age group. Rubella vaccination of non-immune women planning to start a family, married women and mothers who have just delivered their first babies should be stepped up.

Figure 4
Prevalence of IgG antibody against rubella in males and females aged 18-74 years, 2004



(Reported by Ang LW, Communicable Diseases Division, Ministry of Health)

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Cluster of pneumonia cases among foreign workers in Singapore

Notification

On 22 Apr 2008, the Communicable Diseases Division, Ministry of Health, Singapore, was notified by a tertiary healthcare institution of a suspected outbreak of pneumonia involving foreign workers. Epidemiological investigations were immediately carried out to identify the aetiological agent(s), the chain of transmission and the environmental risk factors.

Investigations

Active case detection for other unreported cases was conducted at the places of work and residence. Epidemiological information collected included age, gender, nationality, occupation and dates of onset of illness. Febrile contacts were referred to the Communi-

cable Disease Centre (CDC), Tan Tock Seng Hospital, for further investigation. The clinical laboratory investigation reports were traced and the findings analysed.

Results

A total of 22 cases of pneumonia were reported between 16 Apr 08 and 25 Apr 08, including 5 febrile roommates identified through temperature screening among 94 contacts from 23 Apr 08 to 25 Apr 08. Of the 5 cases referred to CDC, only one case had infiltrates seen on the chest x-ray while the rest had normal chest x-ray findings. The onset of illness was from 27 Mar 08 to 25 Apr 08. All the cases involved male foreign workers from Bangladesh and India. They were aged between 20 years and 38 years. All of them recovered after treatment.

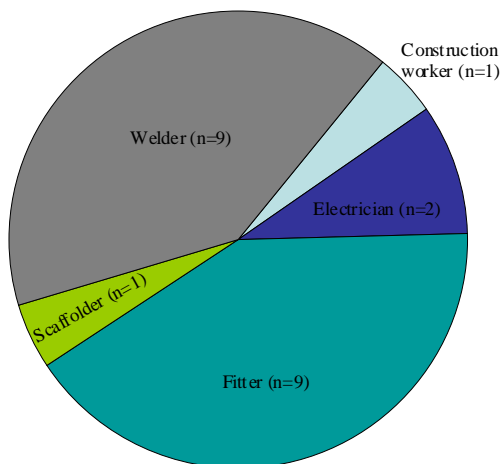


The cases stayed in 11 different dormitories. Only two of these dormitories had a cluster of two or more cases. One dormitory had a cluster of eight cases staying in the same room while another dormitory had four cases sharing a room. These two dormitories were crowded with poor ventilation. One was air-conditioned with ceiling air-conditioned units (100% recycled air) and the windows closed most of the time, while the other had all the windows closed in the daytime when the occupants were out at work.

Most of the cases worked in five shipyards as welders (9 cases), fitters (9 cases) and electricians (2 cases). The remaining two worked as scaffolder and construction worker in various construction sites (Fig 5).

Of the 12 cases in the two dormitory clusters, 11 were working in the same shipyard as fitters (5 cases) and welders (6 cases). Another case from a different dormitory also worked in the same shipyard as an electrician. Though these 12 cases were working in the same shipyard, they were employed by three different companies.

Figure 5
Distribution of 22 reported cases of pneumonia by occupation



The clinical specimens of 20 of the cases were tested using respiratory multiplex test kits which could detect a panel of respiratory pathogens including influenza A virus, influenza B virus, *Streptococcus pneumoniae* and *Haemophilus influenzae*.

One single respiratory pathogen was detected in the clinical specimens of 11 cases: *Streptococcus pneumoniae* in 3 cases, influenza A in 4 cases, influenza B in 3 cases and *Haemophilus influenzae* in 1 case (Fig 6).

Nine cases had more than one respiratory pathogen detected in the clinical specimens: 7 with two respiratory pathogens and 2 with three respiratory pathogens.

Of the 7 cases with two respiratory pathogens, *Streptococcus pneumoniae* and influenza A were detected in 1 case, *Streptococcus pneumoniae* and influenza B in 3 cases, *Haemophilus influenzae* and influenza B in 2 cases and *Haemophilus influenzae* and influenza A in 1 case.

Of the 2 cases from whom three respiratory pathogens were detected, *Streptococcus pneumoniae*, *Haemophilus influenzae* and influenza A were detected in one and *Streptococcus pneumoniae*, *Haemophilus influenzae* and influenza B in another.

Streptococcus pneumoniae was detected in one case using tests other than the respiratory multiplex kits.

Comments

The findings of multiple respiratory pathogens and absence of a common source infection among the reported cases suggest that this was not an outbreak event. Even the 12 cases in the two dormitory clusters



were not infected by a common single respiratory pathogen (Fig 7)

It is likely that there is an increased susceptibility among Indian and Bangladeshi foreign workers to severe respiratory illness due to environmental fac-

tors related to overcrowding and poor indoor air quality in the dormitory and possibly stressors at work. Majority of these workers were employed in shipyards. Therefore, there might also have been exposures to industrial pollutants; e.g. fumes, that could worsen the respiratory infection leading to pneumonia. The spike

Figure 6
Respiratory pathogens detected from a cluster of 22 reported cases of pneumonia, Mar – April 2008

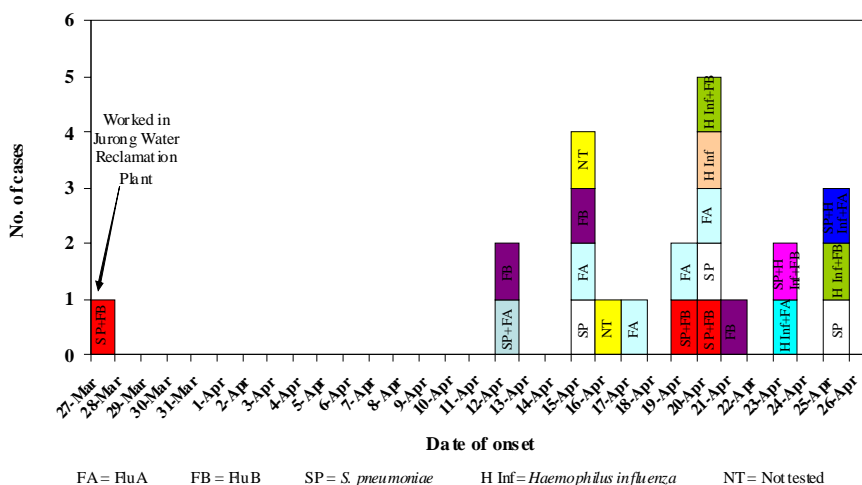
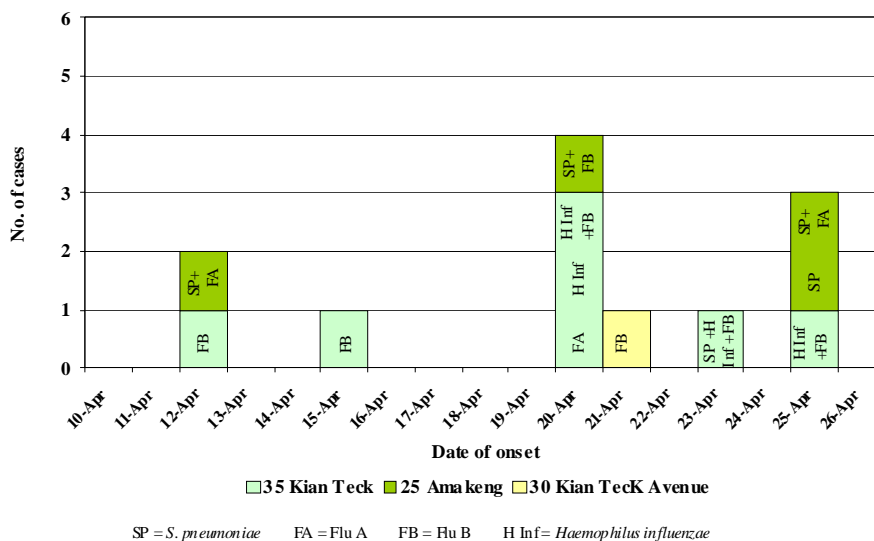


Figure 7
Distribution of 12 reported cases of pneumonia by respiratory pathogen and shipyard, April 2008



observed in a single tertiary hospital was incidental as it is located nearest to the places of work and residence of these workers.

This episode highlights a problem of susceptibility to air-borne infections among foreign workers that is related to their work, housing conditions and also perhaps host susceptibility. Studies¹⁻³ have shown that overcrowding and unhygienic housing conditions are often closely related to frequent respiratory infections. There is therefore a need to educate employers,

dormitories operators and foreign workers on the importance of basic preventive and control measures. Appropriate housing conditions with good ventilation, sanitary facilities and adequate bed space between each worker should be provided.

Further investigations such as case-control studies and measurements of ventilation, air quality, temperature, humidity of workers' dormitories could be done to evaluate the risk of susceptibility of these foreign workers to lower respiratory tract infections.

(Reported by Yew YW, Chua A, Chua LT and Ooi PL, Communicable Diseases Division, Ministry of Health, Singapore)

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Surveillance for HIV/AIDS in Singapore

Epidemiology

A total of 153 Singaporeans were found to be infected with the human immunodeficiency virus (HIV) in the first six months of 2008. The cumulative total number of HIV-infected Singaporeans as at end-June 2008 is 3,636 (*Table 2*). Of these, 1,619 are asymptomatic carriers, 841 have acquired immune deficiency syndrome (AIDS)-related illnesses and 1,176 have died.

In the first 6 months of 2008, nearly half (47%) of the new cases detected already had late-stage HIV

infection (CD4+ cell count of less than 200 per cu mm or AIDS-defining opportunistic infections or both) when they were diagnosed. This was similar to the pattern in previous years.

More than half of the new cases in the first 6 months of 2008 (58%) had their HIV detected when they had HIV testing in the course of some form of medical care. 17% were detected as a result of voluntary HIV screening (17%). Another 20% of the cases were detected as a result of screening in prisons and drug rehabilitation centres. The rest were detected through contact tracing and other screening. When



differentiated by sexual orientation, a higher proportion of homosexuals had their HIV infection detected via voluntary screening compared to heterosexuals (38% vs 7%).

Heterosexual transmission has been the most common mode of HIV transmission among Singaporeans since 1991 (*Table 3*). Most of these cases contracted the infection through casual sex and sex with prostitutes in Singapore and overseas. Of the 153 cases reported in the first 6 months of 2008, 133 cases acquired the infection through the sexual route, with heterosexual transmission accounting for 50%

of infections, homosexual transmission 32% and bisexual transmission 5%. Intravenous drug use (13 cases) accounted for 8% — 11 of these cases were detected as a result of screening in prisons and drug rehabilitation centres, and 2 in the course of medical care.

The majority of HIV- infected Singaporeans are males with 3,252 cases; 384 are females (*Table 4*), giving a sex ratio of eight males to one female. Among the males, 61% were single at the point of diagnosis. For the females, however, the majority (60%) were married.

Table 2
Distribution of Singapore residents with HIV infection/AIDS by gender and incidence rate per million population, 1985-June 2008

Year	HIV/AIDS			
	Male	Female	Total	Rate*
1985	2	0	2	0.8
1986	6	1	7	2.8
1987	10	0	10	3.9
1988	15	0	15	5.8
1989	9	1	10	3.8
1990	17	0	17	6.2
1991	39	3	42	15.0
1992	49	6	55	19.3
1993	58	6	64	22.0
1994	76	10	86	29.1
1995	102	9	111	36.8
1996	123	16	139	45.3
1997	157	16	173	55.4
1998	167	32	199	62.6
1999	171	35	206	63.8
2000	193	33	226	69.0
2001	204	33	237	71.3
2002	206	28	234	69.2
2003	212	30	242	71.9
2004	290	21	311	91.1
2005	287	30	317	91.4
2006	325	32	357	101.3
2007	392	31	423	118.1
Jun 2008	142	11	153	-
Total	3,252	384	3,636	-

* per million population, based on yearly resident population estimates revised by Singapore Department of Statistics in February 2008.



About 83% of HIV cases are Chinese, 10% are Malays and 4% are Indians (*Table 5*). The majority of cases (59%) were diagnosed when they were between 30 and 49 years of age (*Table 6*). Nearly a fifth (17%) of cases were diagnosed when they were between 20 and 29 years of age.

Prevention

The most effective way to prevent HIV infection is to remain faithful to one's spouse/partner and to avoid casual sex and sex with prostitutes. A HIV-infected person looks and feels normal during the early

Table 3
Distribution of Singapore residents with HIV infection/AIDS by mode of transmission, 1985-June 2008

Mode of transmission	1985 – 2001	2002	2003	2004	2005	2006	2007	2008 Jan-Jun
Sexual transmission								
Heterosexual	1160	181	177	188	185	222	255	77
Homosexual	191	30	40	72	87	94	130	49
Bisexual	146	12	14	22	14	14	15	7
Intravenous drug use	32	6	4	7	4	14	7	13
Blood transfusion	3	0	0	0	0	0	1	0
Renal transplant overseas	5	0	0	0	0	0	0	0
Perinatal (mother to child)	15	2	1	4	3	2	2	0
Uncertain	47	3	6	18	24	11	13	7
Total	1599	234	242	311	317	357	423	153

Table 4
Distribution of Singapore residents with HIV infection/AIDS by marital status and gender, 1985-June 2008

Marital status	1985 – 2001	2002	2003	2004	2005	2006	2007	2008 Jan-Jun
Male								
Single	868	106	112	180	176	198	230	97
Married	376	71	65	74	82	92	114	27
Divorced/separated	119	25	28	25	27	30	42	18
Widowed	35	4	7	11	2	5	6	0
Female								
Single	40	6	3	7	7	8	6	1
Married	128	15	21	8	19	17	17	6
Divorced/separated	19	3	5	2	3	6	7	2
Widowed	14	4	1	4	1	1	1	2
Total								
Single	908	112	115	187	183	206	236	98
Married	504	86	86	82	101	109	131	33
Divorced/separated	138	28	33	27	30	36	49	20
Widowed	49	8	8	15	3	6	7	2



Table 5
Distribution of Singapore residents with HIV infection/AIDS by ethnic group, 1985-June 2008

Ethnic group	1985 – 2001	2002	2003	2004	2005	2006	2007	2008 Jan-Jun
Chinese	1340	201	201	261	252	291	355	120
Malays	114	23	27	29	48	46	47	21
Indians	84	5	6	16	12	12	11	7
Others	61	5	8	5	5	8	10	5

Table 6
Age-gender distribution of Singapore residents with HIV infection/AIDS, 1985-June 2008

Age group	1985 – 2001	2002	2003	2004	2005	2006	2007	2008 Jan-Jun
Male								
0 – 9	8	1	1	1	0	2	1	0
10 – 19	9	0	1	4	4	1	6	0
20 – 29	250	22	22	41	36	50	54	26
30 – 39	557	53	71	82	85	91	99	42
40 – 49	334	67	66	84	83	90	121	40
50 – 59	129	39	29	44	49	60	81	25
60 & above	111	24	22	34	30	31	30	9
Female								
0 – 9	7	1	0	2	3	1	1	0
10 – 19	3	1	0	0	0	1	3	0
20 – 29	81	10	7	6	8	7	1	2
30 – 39	53	3	12	7	10	8	7	4
40 – 49	28	6	8	5	1	7	13	3
50 – 59	17	6	3	0	7	6	6	1
60 & above	12	1	0	1	1	2	0	1
Total								
0 – 9	15	2	1	3	3	3	2	0
10 – 19	12	1	1	4	4	2	9	0
20 – 29	331	32	29	47	44	57	55	28
30 – 39	610	56	83	89	95	99	106	46
40 – 49	362	73	74	89	84	97	134	43
50 – 59	146	45	32	44	56	66	87	26
60 & above	123	25	22	35	31	33	30	10



stage of the infection. It is therefore not possible to tell if a person is infected or not by looking at his/her appearance.

Persons engaging in high-risk sexual behaviour, such as having multiple sexual partners, engaging in casual sex or sex with prostitutes, are strongly advised to use condoms to reduce their risk of HIV infection. Condoms should be used consistently and correctly during every sexual encounter. They should also go for regular HIV testing.

As more than 90% of people living with HIV in Singapore are adults in the prime working ages of 21 to 59 years, the Ministry of Health (MOH) strongly encourages employers to take a lead role in helping to create a supportive environment and promote greater understanding and acceptance of people living with HIV. MOH also urges employers to adopt a more proactive approach in HIV prevention and education at the workplace. The Health Promotion Board offers a range of HIV prevention and education programmes specially designed for the workplace.

The Singapore National Employers Federation (SNEF) has previously issued the "Guidelines on Managing HIV/AIDS at the Workplace". These guidelines advocate the provision of HIV education at the workplace, as well as provide guidance on the management of HIV-infected workers at the workplace.

Several companies such as Standard Chartered Bank and Shell Eastern Petroleum (Pte) Ltd have already actively taken up HIV/AIDS awareness programmes and established HIV/AIDS workplace policies within their company.

It is an offence under the Infectious Diseases (Amendment) Act 2008 if a person who has reason to

believe that he has, or has been exposed to a significant risk of contracting HIV/AIDS, does not take reasonable precautions to protect his sexual partner, such as by using condoms, even if he is ignorant of his HIV positive status. Alternatively, he can go for a HIV test to confirm that he is HIV-negative. Otherwise, he must inform his partner of the risk of contracting HIV from him, leaving the partner to voluntarily accept the risk, if he or she so wishes.

Comments

Between July and October 2008, another 229 new HIV cases were reported. Thus, In the first 10 months of 2008 (January-October), there were a total of 382 reported HIV-infected cases among Singapore residents compared with 423 cases notified for the whole of 2007. It can be expected that the total number of notified HIV cases in 2008 will exceed that of last year.

There has been an increase in the number of HIV tests done in Singapore in 2008, compared to 2007. The total number of HIV tests carried out for Singapore residents by local laboratories from January through September 2008 was 124,559, compared to 102,490 over the same time period in 2007. This represents a 22% increase this year.

There has also been an increase in anonymous HIV testing. The total number of anonymous HIV tests done between January through October 2008 was 6,983 compared to 6,706 tests done between January through October 2007.

With effect from 1 November 2008, four additional GP clinics have also begun to offer anonymous HIV testing. These four clinics have carried out a total of 175 tests in the first half of November 2008.



Although there is an increase in the number of notified HIV-infected cases, it does not necessarily mean that there are more new infections. As people who are infected with HIV may not present with symptoms for several years, people who are newly diagnosed to have HIV may in fact have acquired their infection several years ago.

The increase in HIV testing may also have contributed to the increased numbers of Singapore residents detected to have HIV infection.

(Reported by Ang LW and Tay J, Communicable Diseases Division, Ministry of Health)

MOH is encouraged by the increased awareness and uptake of HIV testing, and would like to continue urging those at risk of HIV infection and those who engage in risky sexual behaviour to go for regular HIV testing. Regular HIV testing can help an infected person to be diagnosed at an earlier stage of infection. Early diagnosis can afford a person earlier access to care and treatment, and also allow the person to receive counselling on how to protect their partners from infection.

An update on the global human avian influenza situation

Since the beginning of the current outbreak in November 2003, human cases of avian influenza have been reported in 15 countries (*Table 7*). In 2008, Indonesia has the highest number of reported cases (55.0%), followed by Egypt (20.0%).

To date, there have been 391 confirmed human cases of avian influenza A (H5N1) reported to WHO. Ages of cases ranged from 3 months to 81 years (median 20.0 years). 25.1% were less than 10 years old. Cases were distributed almost equally in females (51.7%) and in males.

247 of the total cases were fatal (CFR 63.2%). 49.4% (122/247) were less than 20 years old. Among countries with more than 10 cases, Indonesia has the highest CFR (81.3%).

The number of days from onset of symptoms to hospital admission ranged from 0 to 36 days (median

5.0, n=290). The number of days from onset of symptoms to death ranged from 1 to 38 days (median 9.0, n=221).

Current situations (countries and cases) in 2007 to 2008

Bangladesh

The case was identified retrospectively. The confirmed case which was verified by WHO on 28 May 2008 was a 16-month-old male from Komalapur, Dhaka. He developed symptom on 27 January 2008, and finally recovered. The case was exposed to live and slaughtered chickens at his home.

Cambodia

To date, Cambodia has reported 8 cases, of which 7 were fatal. The last confirmed case which was verified by WHO on 12 December 2009 was a 19-year-old male from Kandal Province. He devel-



Table 7
Cumulative number of confirmed human cases of avian influenza A (H5N1) reported to WHO as of 22 Dec 2008

Country	2003		2004		2005		2006		2007		2008		Total	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
Azerbaijan	0	0	0	0	0	0	8	5	0	0	0	0	8	5
Bangladesh	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Cambodia	0	0	0	0	4	4	2	2	1	1	1	0	8	7
China	1	1	0	0	8	5	13	8	5	3	3	3	30	20
Djibouti	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Egypt	0	0	0	0	0	0	18	10	25	9	8	4	51	23
Indonesia	0	0	0	0	20	13	55	45	42	37	22	18	139	113
Iraq	0	0	0	0	0	0	3	2	0	0	0	0	3	2
Lao People's Democratic Republic	0	0	0	0	0	0	0	0	2	2	0	0	2	2
Myanmar	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Nigeria	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Pakistan	0	0	0	0	0	0	0	0	3	1	0	0	3	1
Thailand	0	0	17	12	5	2	3	3	0	0	0	0	25	17
Turkey	0	0	0	0	0	0	12	4	0	0	0	0	12	4
Viet Nam	3	3	29	20	61	19	0	0	8	5	5	5	106	52
Total	4	4	46	32	98	43	115	79	88	59	40	30	391	247

Total number of cases includes number of deaths.

WHO reports only laboratory-confirmed cases.

All dates refer to onset of illness.

http://www.who.int/csr/disease/avian_influenza/country/en/index.html

oped symptoms on 28 November, was hospitalized on 2 December.

China

To date, China has reported 30 cases, of which 20 were fatal. The last confirmed case which was verified by WHO on 26 February 2008 was a 44-year-old female from Shanwei city, Guangdong province. She developed symptoms on 16 February, was hospitalized on 22 February, and died on 25 February.

Egypt

To date, Egypt has reported 51 cases, of which 23 were fatal. The last confirmed case which was verified by WHO on 16 December 2008 was a 16-year-old female from Assuit Governorate. She developed symptoms on 8 December, was hospitalized on 11 December, and died on 15 December.

Indonesia

To date, Indonesia has reported 139 cases, of which 113 were fatal. On 9 December 2008, 2 confirmed cases were verified by WHO. One of them was a 9-year-old female from Riau province who developed symptoms on 7 November, was hospitalized on 12 November, and discharged from hospital on 27 November. Another one was a 2 year-old female from East Jakarta who developed symptoms on 18 November, was hospitalized on 26 November and died on 29 November.

Lao PDR

To date, Lao PDR has reported 2 fatal cases. The last confirmed case which was verified by WHO on 16 March 2007 was a 42 year-old-female from Vientiane Province. She developed symptoms on 26



Feb, was hospitalized on 28 Feb, and died on 4 March.

Myanmar

To date, Myanmar has reported 1 case. This case was verified by WHO on 14 December 2007. A 7-year-old female from Kyaing Tone Township, Shan State (East) developed symptom on 21 November, was hospitalized on 27 November, and recovered.

Nigeria

To date, Nigeria has reported 1 case. This case was verified by WHO on 3 February 2007. A 22-year-old female from Lagos died on 16 January 2007.

Pakistan

To date, Pakistan has reported 3 cases, of which 1 was fatal. On 3 April 2008, 2 confirmed cases were verified by WHO. One of them was a 23-year-old male from the Peshawar area who developed symptoms on

29 October 2007, was hospitalized on 5 November, and was discharged on 16 November. The second case was a 24-year male who developed symptoms on 21 November 2007, and recovered without hospitalization.

Thailand

To date, Thailand has reported 25 cases, of which 17 were fatal. The last confirmed case which was verified by WHO on 27 September 2006 was a 59-year-old male from Nong Bua Lam Phu Province. He developed symptoms on 14 July 2006, was hospitalized on 24 July, and died on 10 August 2006.

Viet Nam

To date, Viet Nam has reported 106 cases, of which 52 were fatal. The last confirmed case which was verified by WHO on 18 March 2008 was a 11-year old male from Thanh Liem district, Ha Nam province. He developed symptoms on 4 March, was hospitalized on 9 March, and died on 14 March.

[Source: Avian influenza update number 179 (23 December 2008), Western Pacific Regional Office of the World Health Organization]

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