Jun 16 - Jun 29 2019 WEEKS 25 - 26 VOL 16 ISSUE N⁰ 13

Communicable Diseases WATCH

 This biweekly publication is produced by the Centre for Health Protection (CHP) of the Department of Health, 147C, Argyle Street, Kowloon, Hong Kong **ISSN** 1818-4111 Please send enquiries to cdssinfo@dh.gov.hk.

FEATURE IN FOCUS

Immunisation Coverage of Vaccines under the Hong Kong Childhood Immunisation Programme - Findings of the 2018 Immunisation Survey on Preschool Children

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Introduction

The incidence of vaccine preventable diseases in Hong Kong has decreased markedly in the past few decades after the introduction of universal vaccination programmes for children. Maintaining high immunisation coverage is essential for the prevention of vaccine-preventable diseases. The Department of Health (DH) regularly conducts territory-wide immunisation surveys to estimate the immunisation coverage among children attending preschools. Six rounds of immunisation surveys had been conducted in 2001[1], 2003[2], 2006[3], 2009[4], 2012[5] and 2015[6] respectively, covering birth cohorts of 1995 to 2011. We found that the overall immunisation coverage for vaccines included in the Hong Kong Childhood Immunisation Programme (HKCIP)[7] was consistently high (above 95%) for preschool children.

Method

In 2018, we conducted another round of cross-sectional survey to assess the coverage and timeliness of vaccinations under HKCIP among preschool children. The study population was children aged three to five (defined as children born in 2012, 2013 and 2014) attending preschool institutions in Hong Kong. The subjects were selected by stratified cluster sampling of kindergarten (KG) and kindergarten-cum-childcare centre (KG-cum-CCC). For all the children in the sampled preschool institutions, we obtained written consent from parents/guardians, collected demographic information of consented children through a self-administered questionnaire, and collected copies of their immunisation records for vaccination history since birth. We also obtained the children's electronic immunisation record in DH's Maternal and Child Health Centres (MCHCs) for cross checking. We followed up with the preschool institutions to remind parents of children with incomplete immunisation records to re-submit all relevant documentation.

We calculated the coverage for each vaccine as the proportion of children vaccinated divided by the total number of consented children with complete vaccination records. Immunisation coverage was stratified by year of birth (cohort) and local versus non-local children. We defined local children as those who were born in Hong Kong, resided in Hong Kong before two years of age and lived in Hong Kong at the time of the survey. All other children who did not fulfill all the above three criteria were defined as non-local children. We computed the risk ratio of coverage and its 95% confidence interval (95% CI) among local and non-local children for each vaccine. To study the timeliness of vaccination, we compared the actual age of vaccination with the recommended age of vaccination.

Results

We recruited 18 local and international preschool institutions which covered about 2% of the 1 005 preschool institutions registered as at September 1, 2017. Among the 3 732 children attending these 18 preschool institutions, 2 830 (76%) responded to our survey with submission of valid immunisation records. Two hundred and eight (7%) respondents who were not born between 2012 and 2014 were excluded from the analysis. Overall, 2 622 children were included in the analysis on immunisation coverage. Of these valid respondents, 59% attended KG while the remaining 41% attended KG-cum-CCC. Eighty-nine percent of them were local children and 53% were male (Table 1).

Table 1 - Descriptive characteristics of the survey participants (2 622), Hong Kong Immunisation Coverage Survey 2018.

Characteristics		Number of participants	Percentage
Year of birth	2012	832	31.7
	2013	814	31.0
	2014	976	37.2
Gender	Male	1 389	53.0
	Female	1 233	47.0
Birth & residential status*	Local	2 342	89.3
	Non-local	265	10.1
	Unknown	15	0.6
Preschool type	KG	1 552	59.2
	KG-cum-CCC	1 070	40.8
Total		2 622	100

**Local children were defined as those who were born in Hong Kong, resided in Hong Kong before two years of age and lived in Hong Kong at the time of the survey. Children who did not fulfill all the above three criteria were defined as non-local children.*
(Note: percentage may not add up to 100% due to round-off to one decimal place.)

For children born between 2012 and 2014, the immunisation coverage for all vaccines under HKCIP was at least 95%, except for varicella vaccine among children born in 2012 before the introduction of universal varicella vaccination (UVV) into HKCIP (Table 2). Varicella vaccination coverage was only 55% for the 2012 cohort. In contrast, the varicella vaccination coverage among children born in 2013 and 2014 who were eligible for UVV increased to ≥99%. The coverage of four doses of pneumococcal conjugate vaccine (PCV) was 95.5% which was slightly lower than the range of 98.7% to 99.8% for other vaccines (except varicella) under HKCIP. There was a large difference in the coverage of PCV among local and non-local children (99.5% versus 60.4%), which accounted for the relatively lower overall coverage of PCV than other vaccines. Excluding varicella vaccine and PCV, the overall immunisation coverage among children born between 2012 and 2014 was 98.0% which was higher than 95.8% in the previous survey for children born between 2009 and 2012.

Local children were more likely to have completed their vaccinations under HKCIP (risk ratio = 1.03, 95% CI: 1.00-1.06) than non-local children (Table 2). The risk ratios were above 1 for all vaccines, meaning that non-local children were of a higher risk of incomplete vaccination when compared to local children. However, it was statistically significant only for varicella vaccine and PCV.

Table 2 - Immunisation coverage of vaccines included in HKCIP among children from birth cohorts 2012 to 2014, Hong Kong Immunisation Coverage Survey.

Type of vaccine	2012			2013			2014			2012-2014			Risk ratio (95% CI)
	Local (n=726)	Non-local (n=101)	Total (n=832)	Local (n=731)	Non-local (n=80)	Total (n=814)	Local (n=885)	Non-local (n=84)	Total (n=976)	Local (n=2 341)	Non-local (n=265)	Total (n=2 622)	Local vs Non-local
B.C.G	100.0	100.0	100.0	99.8	98.3	99.7	99.9	98.3	99.8	99.9	98.9	99.8	1.01 (1.00-1.02)
Hepatitis B 3rd dose	99.7	100.0	99.8	99.4	100.0	99.5	99.7	100.0	99.7	99.6	100.0	99.7	1.00 (0.99-1.00)
Polio booster	99.0	97.0	98.7	99.0	98.3	99.0	98.8	96.1	98.6	99.0	97.1	98.7	1.02 (1.00-1.04)
DTP booster	99.0	99.0	98.9	99.0	98.8	99.0	98.9	96.6	98.7	99.0	98.2	98.9	1.01 (0.99-1.03)
Measles*	99.7	100.0	99.8	100.0	100.0	100.0	99.5	100.0	99.6	99.7	100.0	99.8	1.00 (1.00-1.00)
Mumps*	99.7	100.0	99.6	100.0	100.0	100.0	99.5	96.4	99.3	99.7	98.8	99.6	1.01 (1.00-1.02)
Rubella*	99.7	100.0	99.8	100.0	100.0	100.0	99.5	97.5	99.4	99.7	99.2	99.7	1.01 (0.99-1.02)
Varicella^	56.2	48.7	55.1	99.2	97.6	99.0	99.7	96.6	99.4	86.1	78.9	85.3	1.10 (1.03-1.17)
PCV 1st dose	100.0	70.5	96.5	100.0	80.7	98.1	99.9	87.3	98.8	100.0	79.0	97.8	1.27 (1.20-1.36)
PCV 2nd dose	100.0	54.8	94.5	100.0	73.4	97.4	99.7	81.5	98.1	99.9	69.0	96.7	1.46 (1.34-1.59)
PCV 3rd dose	99.7	51.8	93.8	100.0	73.4	97.4	99.7	79.9	97.9	99.8	67.4	96.5	1.49 (1.37-1.62)
PCV booster	99.0	46.9	92.6	99.9	68.0	96.7	99.6	68.9	96.9	99.5	60.4	95.5	1.65 (1.50-1.83)
Complete immunisation#	98.5	97.0	98.2	98.3	97.1	98.2	98.3	90.8	97.6	98.3	95.0	98.0	1.03 (1.00-1.06)

DTP – Diphtheria, Tetanus and Pertussis

Remarks:
Those with unknown residential status (n=15) were only included in the results of the total children in the above table.
**In Hong Kong, children receive Measles, Mumps and Rubella vaccine according to HKCIP.*
^Varicella vaccine has been included in HKCIP for children born or after January 1, 2013.
#Excluding PCV and varicella

Regarding the places of vaccination, local children received over 90% of their vaccines in MCHCs. In contrast, non-local children received 54% and 36% of their routine vaccines in MCHCs and the Mainland China respectively (Figure 1). Regarding the timeliness of vaccination, both local and non-local children received vaccines under HKCIP according to the recommended age (Table 3).

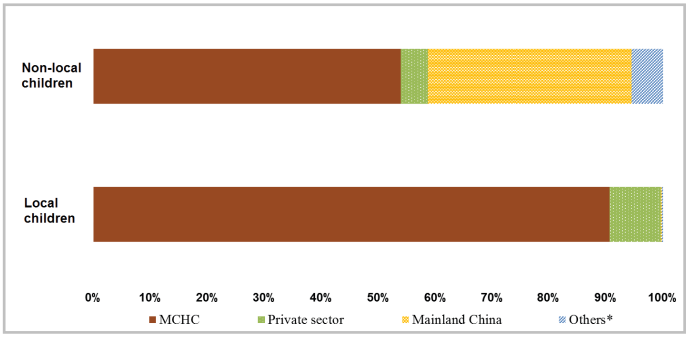

Figure 1 - Proportion of HKCIP vaccines received in different settings by place of birth/residence, birth cohorts (2012 to 2014), Hong Kong Immunisation Coverage Survey 2018.

Remarks:
**Others include facilities in the Hospital Authority, Macau, other overseas places and unknown. Included HKCIP vaccines scheduled before two years of age, except those given at birth (BCG and Hepatitis B 1st dose). For varicella vaccine, only those born in 2013 and after are included in the analysis.*

Discussion

The survey showed that the coverage of vaccines under HKCIP remained high among preschool children in Hong Kong. Introduction of the varicella vaccination programme into HKCIP led to a marked increase in varicella vaccination coverage, from 55% among non-eligible children born in 2012 to ≥99% among eligible children born in 2013 and 2014. Lower coverage among non-local children was observed for varicella vaccine and PCV. As PCV is not included in the national immunisation programme of Mainland China, non-local children who resided in Mainland China before attending preschool institution in Hong Kong were less likely to complete their PCV immunisation before two years old. In view of the lower PCV uptake among non-local children and updated recommendation on catch-up PCV vaccination for children by the World Health Organization, the Scientific Committee on Vaccine Preventable Diseases of the Centre for Health Protection has made an updated recommendation in March 2019 that a single dose of 13-valent PCV (PCV13) should be provided to children who have not received any booster dose of PCV13 between the age of one year to less than six years[8] (one year to less than ***two*** years in the previous recommendation). DH has already adopted this practice starting in July 2019. Regarding the timeliness of vaccination, surveyed children generally received vaccines under HKCIP according to the recommended ages of vaccination.

Table 3 - Timeliness of HKCIP vaccines received by local children, birth cohorts 2012 to 2014[1], Hong Kong Immunisation Coverage Survey 2018.

Vaccines included in HKCIP	Recommended Age	Local children		Non-local children	
		Number of children studied	Time of vaccination Median (interquartile range) (months)[2]	Number of children studied	Time of vaccination Median (interquartile range) (months)[2]
B.C.G. Vaccine	Newborn	2 338	1 (1-3) (days)	277	1 (1-2) (days)
Hepatitis B Vaccine – 1st dose		2 326	0 (0-1) (days)	280	0 (0-1) (days)
Hepatitis B Vaccine – 2nd dose	1 month	2 336	1.1 (1.0-1.2)	280	1.1 (1.1-1.3)
DTP Vaccine[3] – 1st dose	2 months	2 340	2.1 (2.0-2.2)	279	2.3 (2.1-3.2)
Polio Vaccine[3] – 1st dose		2 340	2.1 (2.0-2.2)	279	2.2 (2.1-2.3)
PCV[1] – 1st dose		2 017	2.1 (2.1-2.2)	193	2.2 (2.1-3.5)
DTP Vaccine[3] – 2nd dose	4 months	2 341	4.2 (4.1-4.3)	279	4.3 (4.1-4.6)
Polio Vaccine[3] – 2nd dose		2 341	4.2 (4.1-4.3)	279	4.1 (3.5-4.3)
PCV[1] – 2nd dose		2 015	4.2 (4.1-4.3)	172	4.2 (4.1-4.6)
DTP Vaccine[3] – 3rd dose	6 months	2 338	6.2 (6.1-6.4)	279	6.3 (6.0-6.5)
Polio Vaccine[3] – 3rd dose		2 338	6.2 (6.1-6.4)	278	6.2 (5.0-6.4)
PCV[1] – 3rd dose		2 011	6.1 (6.2-6.4)	169	6.3 (6.2-6.8)
Hepatitis B Vaccine – 3rd dose		2 326	6.2 (6.1-6.4)	279	6.4 (6.2-6.9)
Measles Vaccine – 1st dose[4]	12 months	2 328	12.3 (12.2-12.5)	279	12.5 (12.2-18.4)
Mumps Vaccine – 1st dose[4]		2 328	12.3 (12.2-12.5)	275	12.6 (12.2-18.4)
Rubella Vaccine – 1st dose[4]		2 328	12.3 (12.2-12.5)	278	12.2 (10.3-12.7)
PCV[1] – booster		1 990	12.2 (12.3-12.4)	151	12.3 (12.2-12.7)
DTP Vaccine[3] – booster	18 months	2 307	18.4 (18.3-18.6)	272	18.5 (18.3-19.6)
Polio Vaccine[3] – booster		2 309	18.4 (18.3-18.6)	270	18.5 (18.3-19.1)

Remarks:
1. *Except for B.C.G. and first dose of Hepatitis B vaccine which are presented in days, time of vaccination for other vaccines are presented in months.*
2. *Combined Diphtheria, Tetanus, acellular Pertussis & Inactivated Poliovirus Vaccine is recommended in HKCIP but children receiving any forms of diphtheria, tetanus, pertussis and poliovirus containing vaccines were included in the analysis.*
3. *Combined Measles, Mumps and Rubella vaccine is recommended in Hong Kong but children receiving any forms of measles, mumps and rubella containing vaccines were included in the analysis.*
4. *Timeliness of varicella vaccination was not included since the vaccine was included in HKCIP for children born on or after January 1, 2013, starting in July 2014.*

There are several limitations in our study. First, there was a remote possibility of incomplete documentation of vaccination history. Ascertainment of vaccination status was based on information retrieved from copies of immunisation records and supplemented by the electronic records of DH's MCHCs. For children who received vaccines in Mainland China, their vaccination status could only be ascertained by the submitted paper immunisation records. Second, we selected only children attending KG and KG-cum-CCC but not CCC, for the fact that less than 1% of preschool children aged three to five attended CCC according to statistics from the Education Bureau (EDB) and the Social Welfare Department. Nevertheless, our previous analyses showed that the immunisation coverage for children attending different types of preschools, including CCC, were comparable. Third, preschool education is not mandatory in Hong Kong. Although 93% of children aged three to five attended preschool institutions according to EDB, those who did not attend any preschool institutions were not included in this survey, making the findings less generalisable to the corresponding population in Hong Kong if their coverage were very different.

In conclusion, HKCIP vaccination coverage remained high among preschool children and they were vaccinated in a timely manner. In addition, varicella vaccination coverage increased to a very high level after the start of the universal vaccination in 2014. Non-local children had relatively lower documented coverage of varicella vaccine and PCV. To protect the public from vaccine preventable diseases, healthcare workers are urged to take every encounter as an opportunity to promote and provide childhood immunisation to young children especially non-local children, so that a very high overall coverage in the community can be maintained for herd protection.

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Update on Global Situation of Nipah Virus Infection

Reported by Ms Sheree CHONG, Scientific Officer, Communicable Disease Surveillance and Intelligence Office, Surveillance and Epidemiology Branch, CHP.

Nipah virus infection, caused by Nipah virus (NiV), is an emerging zoonotic infection that can cause severe disease in both animals and humans[1]. Fruit bats of the *Pteropodidae* family are the natural host of NiV without apparent disease. They can shed the virus in their excretions and secretions, e.g. saliva, urine, semen and excreta. NiV infections have been reported in domestic animals, e.g. pigs, which can act as the intermediate hosts for the transmission of the virus to humans.

Global situation of human NiV infection

Malaysia and Singapore

NiV was first recognised during an outbreak in Kampung Sungai Nipah, Malaysia between September 1998 and April 1999[2]. Approximately 300 cases with over 100 deaths were reported[3]. The outbreak was linked to pigs, which acted as the intermediate hosts for the transmission of the virus to humans. Mass culling of over one million pigs was conducted[4]. Other measures, including a ban on transporting pigs within the country, education about avoiding contact with pigs and the proper use of personal protective equipment for those with exposure to pigs and the setup of a national surveillance and control system to detect and cull additional infected herds, were implemented to control the situation. An outbreak was also reported in Singapore in March 1999. Eleven abattoir workers developed febrile encephalitic or respiratory illnesses after having close contact with imported pigs from Malaysia. The outbreak in Singapore stopped after pig importation from Malaysia was ceased and the affected abattoirs were closed. Since then, no new outbreaks have been reported in Malaysia and Singapore.

In the past decade, cases and outbreaks of human infection with NiV were mainly reported from Bangladesh and India. Unlike the first NiV outbreak in Malaysia and Singapore in 1999 in which pigs were involved as the intermediate hosts for disease transmission, the outbreaks in Bangladesh and India were associated with consumption of fruits or fruit products (e.g. raw date palm sap) contaminated with urine or saliva from infected fruit bats[5]. Raw date palm sap is harvested by shaving one side of the date palm tree in a V shape and then a small wooden pipe is placed at the base of the V to allow the sap to flow into a clay pot for collection over the night. Bats frequently visit the harvested date palm trees and lick the sap stream that flows from the shaved part of the tree to the collection pot[6]. They may shed NiV into the sap and humans can acquire the infection through consumption of contaminated sap. Besides, there was evidence of human-to-human transmission in healthcare settings as well as among family and care givers of patients.

Bangladesh

In Bangladesh, the first NiV outbreak in humans occurred in Meherpur district in 2001, affecting a total of 13 cases with nine deaths[2]. Since then, NiV outbreaks have been reported almost every year in different districts of Bangladesh (Table 1)[7]. From 2001 to 2018, Bangladesh reported 303 NiV cases with 211 deaths (approximately a 70% case fatality rate). A recent study based on all NiV cases identified in Bangladesh between April 2001 and April 2014 found that 82 of the 248 cases identified were caused by human-to-human transmission[8]. According to this study, NiV was more likely to be transmitted among people when the patient was older (highest risk among patients aged 45 or above) and had difficulty in breathing. Moreover, spouses of the patients were more often infected than other close family members or contacts. The risk of infection increased with increased duration of exposure of the contacts and with exposure to body fluids.

Table 1 - Yearly distribution of NiV infection in Bangladesh, 2001 to 2018 (Source: Institute of Epidemiology, Disease Control and Research).

Year	Annual number of NiV cases	Annual number of NiV deaths	Case fatality rate (%)
2001	13	9	69.23
2002	0	0	-
2003	12	8	66.67
2004	67	50	74.63
2005	13	11	84.62
2006	0	0	-
2007	18	9	50.00
2008	11	9	81.82
2009	4	0	-
2010	18	16	88.89
2011	42	36	85.71
2012	18	13	72.22
2013	26	22	84.62
2014	38	15	39.47
2015	18	11	61.11
2016	0	0	-
2017	2	1	50.00
2018	3	1	33.33
Grand total	303	211	69.64

India

India reported two outbreaks of NiV infection in the eastern state of West Bengal, bordering Bangladesh, in 2001 and 2007 respectively. A total of 71 cases with 50 deaths (70%) were reported in these two outbreaks[9]. Nosocomial transmission accounted for around 75% of cases reported in the outbreak in India in 2001[1].

In May 2018, a third outbreak of NiV infection was reported in the Southern State of Kerala in India[10]. At the beginning, three deaths in the same family were reported in the Kozhikode district of Kerala. Field investigation revealed that there were bats living in an abandoned water well on the premises of a new house where the family had plans to move into after renovation. *Pteropus giganteus* bats were subsequently collected from areas around the house of the index case and 19% (10 of 52) of the bats were tested positive for NiV[11]. The outbreak affected a total of 19 reported cases (18 confirmed by laboratory tests and the deceased index case was suspected to have NiV but could not be tested) from two affected districts (Kozhikode and Malappuram) of Kerala State. Seventeen of the 19 reported cases died. Acute respiratory distress syndrome and encephalitis were observed among the patients.

In the first week of June 2019, the India National Centre for Disease Control reported that a 23-year-old male college student from the Ernakulum district of Kerala had NiV infection[12]. Multi-disciplinary teams were deployed to support the State in investigations, contact tracing, sample testing and management of the disease. As of June 9, 2019, it was reported that besides the 23-year-old student, there have been no additional cases of NiV infection detected[13]. Investigation found that out of 36 *Pteropus* bats collected, 12 (33%) were tested positive for anti-Nipah bat IgG antibodies[14].

Geographical distribution of NiV

Outbreaks of NiV in Southeast Asia have a strong seasonal pattern, usually during winter and spring from December to May, and a limited geographical range[2]. This could be related to the breeding season of the bats, increased shedding of virus by the bats and the date palm sap harvesting season. Apart from the four countries with human NiV outbreaks ever reported (Bangladesh, India, Malaysia and Singapore), other countries with *Pteropus* fruit bats are at potential risk of NiV infection. The distribution of these bats extends from the east coast of Africa, across South and Southeast Asia, east to the Philippines, Pacific islands and Australia[3,15]. NiV can potentially emerge as a human pathogen anywhere in these areas. Countries/areas with serological evidence or molecular detection of NiV in *Pteropus* and several other bat species include Bangladesh, Cambodia, Mainland China, Ghana, India, Indonesia, Madagascar, Papua New Guinea, the Philippines, Taiwan and Thailand.

Prevention of NiV infection

To reduce the risk of infection when travelling to places affected by NiV, the public should adopt the following measures:

- Avoid contact with farm animals or wild animals, especially bats and pigs.
- Observe good personal hygiene; wash hands frequently with liquid soap and water, especially after contact with animals or their droppings/secretions, and taking caring of or visiting sick people.
- Observe good food hygiene; fruits should be thoroughly washed and peeled before consumption. Avoid drinking raw date palm sap.

In Hong Kong, no cases of NiV infection have been reported to the Centre for Health Protection (CHP) of the Department of Health so far. CHP will continue to closely monitor the global situation, maintain close liaison with the World Health Organization and perform risk assessment based on the latest available information. Further information is available from the CHP's website (https://www.chp.gov.hk/en/healthtopics/content/24/100584.html).

Nipah virus (NiV) is an enveloped RNA virus of the family *Paramyxoviridae*, genus *Henipavirus*, and is closely related to Hendra virus. Fruit bats of the family *Pteropodidae* are the natural hosts for NiV. Transmission of the disease is mainly through direct contact with infected animal (usually bats and pigs) or their contaminated body fluids (e.g. respiratory droplets, throat or nasal secretions) or tissues. It can also be transmitted via the consumption of food products (e.g. raw date palm juice) contaminated with urine or saliva from infected fruit bats. Human-to-human transmission can occur through close contact with infected persons.

The incubation period of NiV infection is around four to 14 days, but a period as long as 45 days was reported. Clinical manifestations range from asymptomatic infection to acute respiratory infection (mild to severe) and fatal encephalitis. Infected people initially develop influenza-like symptoms of fever, headaches, muscle pain, vomiting and sore throat. This can be followed by dizziness, drowsiness, altered consciousness, and neurological signs that indicate acute encephalitis. Some cases may develop atypical pneumonia and severe respiratory problems, including acute respiratory distress. Most people who survive acute encephalitis make a full recovery, but long term neurologic conditions have been reported in survivors. Approximately 20% of patients were left with residual neurological consequences such as seizure disorder and personality changes. The case fatality rate is estimated to range from 40% to 75%.

There are currently no drugs or vaccines specific for NiV infection. The primary treatment for human cases is intensive supportive care.

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NEWS IN BRIEF

A domestic cluster of pertussis

The Centre for Health Protection (CHP) of the Department of Health recorded a domestic cluster of pertussis in mid-June 2019, affecting a 64-year-old female and her 58-year-old younger sister. The elder sister had presented with fever, cough and shortness of breath since June 8 and was admitted to a public hospital on June 12. She was subsequently transferred to intensive care unit for increased difficulty in breathing. Her sputum collected on June 12 was tested positive for *Bordetella pertussis*. She was treated with azithromycin. She was transferred back to general medical ward on June 26 and her condition was currently stable.

Contact tracing revealed that her younger sister had developed cough with sputum since June 7. She was referred by CHP to a public hospital for management. Her pernasal swab collected on June 14 was tested positive for *Bordetella pertussis*. She was treated with azithromycin and did not require hospitalisation. Her condition was all along stable.

Both patients did not have travel history during the incubation period. Their vaccination history for pertussis was unknown. Two household contacts were asymptomatic and they refused chemoprophylaxis.

A possible sporadic case of Creutzfeldt-Jakob disease

On June 19, 2019, CHP recorded a possible case of sporadic Creutzfeldt-Jakob disease (CJD) affecting a 68-year-old woman with underlying illnesses. She had presented with unsteady gait and visual disturbance since March 2019 and was admitted to a public hospital on April 14. She was readmitted to the hospital on May 4 for persistent symptoms. Upon admission, she was found to have progressive dementia, diplopia, nystagmus and ataxia. She has developed myoclonus, akinetic mutism and rigidity since June 16. Finding of the electroencephalography was not typical for CJD. She had no known family history of CJD and had no reported risk factors for iatrogenic or variant CJD. She was classified as a possible case of sporadic CJD.

A sporadic case of leptospirosis

On June 19, CHP recorded a case of leptospirosis affecting a 67-year-old man with underlying illnesses. He presented with poor appetite and malaise since mid-May, and was admitted to a private hospital on May 27. Blood tests showed acute kidney injury and deranged liver function. His condition was stable and discharged on May 31. Paired sera taken on May 31 and Jun 11 showed more than four-fold rise in antibody titre against *Leptospira* by microscopic agglutination test. His home contact was asymptomatic and he refused to provide further information concerning his exposure history during the incubation period.

A sporadic case of listeriosis

On June 20, 2019, CHP recorded a case of listeriosis affecting an 82-year-old male with underlying illnesses. He had presented with fever since June 15 and was admitted to a private hospital on the same day. Blood collected on June 15 yielded *Listeria monocytogenes*. He was treated with antibiotic and his condition was stable. He had no travel history and did not recall consumption of any high risk food during the incubation period. His home contact was asymptomatic.

A sporadic case of psittacosis

On June 27, 2019, CHP recorded a sporadic case of psittacosis affecting a 69-year-old man with good past health. He had presented with fever, cough and shortness of breath since June 10 and was admitted to a public hospital on June 13. His chest X-ray showed left upper zone consolidation. The clinical diagnosis was pneumonia and he was treated with antibiotics. He remained stable and was discharged on June 27. His sputum collected on June 22 was tested positive for *Chlamydia psittaci* DNA by polymerase chain reaction. He had no recent travel history. He did not keep any pets at home and did not recall any contact with birds or bird droppings during the incubation period. His home contacts remained asymptomatic.