衞生防護中心
Centre for Health Protection

Scientific Committee on Vaccine Preventable Diseases

Consensus Recommendations on Pertussis Vaccination for Pregnant Women in Hong Kong

Background

Pertussis is an acute, highly contagious respiratory infection caused by the bacterium *Bordetella pertussis*. It is spread by droplets when an infected person coughs or sneezes, or via direct contact with respiratory secretion. The disease affects people of all ages, and infants who are too young to be vaccinated are most vulnerable. In adolescents and adults, the disease may have mild and non-specific symptoms. However, young children and particularly infants have a much higher risk of severe complications from the infection and the disease may be fatal.

2. In recent years, resurgence of pertussis has been observed in countries with high vaccination coverage, e.g. Australia, Japan, the United States (US) and a number of European countries including Portugal and the United Kingdom (UK). Regionally, there have also been significant increases in the number of reported pertussis cases in Mainland China including Guangdong province.

3. Pertussis-containing vaccine was first introduced in Hong Kong in 1957. Under the current Hong Kong Childhood Immunisation Programme, children receive a total of six doses of pertussis-containing vaccines, including the three primary doses at two, four and six months old and three booster doses at 18 months, Primary one and Primary six. The immunisation coverage rates of the 3-dose primary series and the booster doses of pertussis-containing vaccines have been maintained at a very high level of over 95% for many years according to regular

territory-wide immunisation surveys conducted among pre-school children attending pre-primary institutions and the administrative statistics of the School Immunisation Teams of the Department of Health (DH).

Situation of pertussis in Hong Kong in recent years

4. In Hong Kong, there has been an upsurge in the notified pertussis cases since 2017 and the increasing trend continued through 2018. The number of pertussis recorded by the Centre for Health protection (CHP) of DH has increased from 20-50 cases per year during 2011-2016 to 69 cases in 2017, and further to 110 cases in 2018 which was the highest annual number recorded in the past few decades. This may be partially contributed by a wider use of the highly sensitive polymerase chain reaction (PCR) for diagnosis of pertussis especially for adult cases.

5. In 2017-2018, 72 (40%) of the cases affected infants aged below six months and all had not completed the primary series of pertussis vaccination. Thirty-five cases (20% of all cases) were infants aged below two months who were not yet due for the first dose of pertussis-containing vaccine. There has been an increase in the proportion of adult cases in the past two years. Adults aged 18 years or above accounted for about 50% of the cases recorded in 2017-2018, as compared with about 20-35% during 2013-2016. Among the 93 adult cases recorded in 2017-2018, 77 (83%) had no or unknown history of pertussis vaccination and 45 (48%) were not born in Hong Kong and might not have received pertussis vaccine during their childhood. Among the female cases of prime child-bearing age (18-39 years), 39% were not born in Hong Kong.

6. The population incidence was highest among young children all along. In 2018, the incidence among children aged 0-4 years reached 17.6 cases per 100,000 population, followed by 1.3 among elderly aged 65 years or above, and 0.9 among adults aged 20-39 years.

7. The number of pertussis clusters also increased from 0-5 clusters during 2009-2016 to seven and 12 in 2017 and 2018 respectively. In the past five years (2014-2018), a total of 27 clusters were recorded by CHP. All were

small clusters involving 2-4 cases and all except one cluster[1] occurred in household setting. The household clusters mostly affected infants, their family members and other household contacts. Among the 60 cases involved in household clusters recorded in the past five years, 23 (38%) and 30 (50%) cases involved infants less than six months old and adults (e.g. mothers/carers and close contact of the infant cases) respectively. Ten of the 30 adult cases were mothers of the infant cases. Similar to sporadic cases, the majority of these adult cases had no or unknown vaccination against pertussis and about 63% of them were non-local born.

World Health Organization's recommendations and overseas practices

8. In August 2015, the World Health Organization (WHO) updated its position paper on pertussis vaccines[2]. According to WHO, vaccination of pregnant women is likely the most cost-effective additional strategy for preventing pertussis in infants too young to be vaccinated. Maternal immunisation during pregnancy, which directly protects the infant primarily through transplacental transfer of maternal vaccine-induced antibodies from mother to foetus and also offers some protection through reduced risk of transmission of peri-partum pertussis from nursing mother. Countries may therefore consider the vaccination of pregnant women with one dose of diphtheria (reduced dose), tetanus & acellular pertussis (reduced dose) (dTap) vaccine in the second or third trimester and preferably at least 15 days before the end of pregnancy as a strategy additional to routine primary infant pertussis vaccination in countries or settings with high or increasing infant morbidity/mortality from pertussis.

9. Currently, pertussis vaccination during pregnancy is recommended in a number of overseas countries including Australia, Canada, Korea, New Zealand, Singapore, UK and US, as well as our neighbouring areas including Macao SAR and Taiwan. In most of these places, a single dose of dTap vaccine is recommended for woman in the second or third trimester of each pregnancy.

[1] The remaining one affected three neonates in a post-natal ward who were not due for the first dose of pertussis-containing vaccine.

[2] World Health Organization. Pertussis vaccines: WHO position paper - August 2015. Wkly Epidemiol Rec. 2015;35:433-60.

10. In some of these countries/areas, postpartum maternal vaccination is also recommended for women who have not received dTap vaccine during their pregnancy, either immediately after delivery or prior to hospital discharge. This can provide indirect protection to infants resulting from reduced risk of pertussis in the mother and infant exposure. A study showed that higher levels of pertussis antigen-specific antibodies were detected in breast milk of women vaccinated with dTap during pregnancy or shortly after/at delivery as compared with mothers with no recent (>five years) pertussis vaccination[3]. On the other hand, a study showed that dTap vaccination at 27–36 weeks gestation was 85% more effective than postpartum vaccination at preventing pertussis in infants less than eight weeks of age[4]. Therefore, efforts should be made to provide dTap vaccine to pregnant women during routine prenatal visits.

Effectiveness and safety of pertussis vaccination in pregnant women

I. Effectiveness of dTap vaccination in pregnant women

11. Substantial evidence supporting the effectiveness and safety of dTap vaccination in pregnancy has been documented in countries where maternal pertussis vaccination was implemented. In UK, assessment of the national maternal vaccination programme showed that vaccine effectiveness was estimated to be >90% for infants less than two months of age, whose mothers received dTap vaccine at least one week prior to delivery[5,6]. Similar findings were also reported in a retrospective cohort study conducted in US which showed that maternal dTap vaccine was 91.4% effective during the first two months of life and remained 69% effective through the entire first year of life even after the infants were immunised with diphtheria, tetanus & acellular pertussis (DTaP) vaccine[7]. A case-control evaluation conducted among

[3] De Schutter S, Maertens K, Baerts L, et al. Quantification of vaccine-induced anti-pertussis toxin secretory IgA antibodies in breast milk: Comparison of different vaccination strategies in women. Pediatr Infect Dis J. 2015;34:e149-52.

[4] Winter K, Nickell S, Powell M, Harriman K. Effectiveness of Prenatal Versus Postpartum Tetanus, Diphtheria, and Acellular Pertussis Vaccination in Preventing Infant Pertussis. Clin Infect Dis. 2017 Jan 1;64(1):3-8.

[5] Amirthalingam G, Andrews N, Campbell H, et al. Effectiveness of maternal pertussis vaccination in England: an observational study. Lancet 2014;384:1521-8.

[6] Amirthalingam G, Campbell H, Ribeiro S, et al. Sustained Effectiveness of the Maternal Pertussis Immunization Program in England 3 Years Following Introduction. Clin Infect Dis 2016;63:S236-S43.

[7] Baxter R, Bartlett J, Fireman B, Lewis E, Klein NP. Effectiveness of Vaccination During Pregnancy to Prevent Infant Pertussis. Pediatrics 2017;139.

pertussis cases <2 months old by the US Centers for Disease Control and Prevention (US CDC) revealed a multivariable vaccine effectiveness estimate of 77.7% for dTap vaccine administered during the third trimester of pregnancy; and 90.5% against hospitalised cases only[8].

II. Safety of dTap vaccination in pregnant women

12. There has been an increasing amount of evidence on the safety of maternal pertussis immunisation from different countries in recent years, and available evidence so far did not suggest an increase in adverse events in both mothers and infants[9,10]. For example, a large observational study in UK examining the safety of pertussis vaccination in more than 20,000 pregnant women who received the vaccine in the third trimester found no evidence of an increased risk of any of an extensive pre-defined list of adverse events related to pregnancy including stillbirth, maternal or neonatal death, (pre-)eclampsia, placenta or vasa praevia[11].

13. Moreover, systems for post-marketing surveillance of adverse events and safety monitoring are in place in US. According to the Advisory Committee on Immunization Practice of US CDC, available data did not suggest any elevated risk for or unusual patterns of adverse events in pregnant women who received dTap or in their newborn infants, and the few serious adverse events reported were judged unlikely to have been caused by the vaccine[12].

Recommendations

14. After reviewing the local epidemiology of pertussis, recommendations of WHO, overseas practices, scientific evidence on the

[8] Skoff TH, Blain AE, Watt J, et al. Impact of the US Maternal Tetanus, Diphtheria, and Acellular Pertussis Vaccination Program on Preventing Pertussis in Infants <2 Months of Age: A Case-Control Evaluation. Clin Infect Dis 2017;65:1977-83.

[9] Abu Raya B, Edwards KM, Scheifele DW, Halperin SA. Pertussis and influenza immunisation during pregnancy: a landscape review. Lancet Infect Dis. 2017 Jul;17(7):e209-e222.

[10] Healy CM. Pertussis vaccination in pregnancy. Hum Vaccin Immunother. 2016 Aug 2;12(8):1972-1981.

[11] Donegan K, King B, Bryan P. Safety of pertussis vaccination in pregnant women in UK: observational study. BMJ 2014;349:g4219.

[12] Liang J, Tiwari T, Moro P, et al. Prevention of Pertussis, Tetanus, and Diphtheria with Vaccines in the United States: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2018;67(No. RR-2):1-44.

effectiveness and safety of maternal pertussis vaccination, the Scientific Committee on Vaccine Preventable Diseases made the following recommendations regarding the use of pertussis-containing vaccine for pregnant women in Hong Kong:

i. To provide direct protection for infants against pertussis, pregnant women are recommended to receive one dose of acellular pertussis-containing vaccine during each pregnancy as part and parcel of routine antenatal care regardless of previous vaccination and natural infection history against pertussis.

ii. The timing of vaccination is recommended to be anytime in the second or third trimester, preferably before 35 weeks of gestation for transplacental transfer of maternal vaccine-induced antibodies.

iii. Diphtheria (reduced dose), tetanus & acellular pertussis (reduced dose) (dTap) vaccine is recommended to be used while diphtheria (reduced dose), tetanus, acellular pertussis (reduced dose) & inactivated poliovirus (dTap-IPV) vaccine can also be used if available.

iv. For women who have not received any pertussis-containing vaccine during pregnancy, they would still be benefited by receiving one dose of dTap or dTap-IPV vaccine as early as possible after delivery, for indirect protection to infants, preferably before discharge from the hospital.

15. Of note, it requires two weeks for antibodies to develop after the vaccination and WHO recommended that the vaccine to be given preferably at least 15 days before the end of pregnancy. Moreover, pregnant women are recommended to receive annual inactivated seasonal influenza vaccine available for the season all along, and pertussis-containing vaccine and seasonal influenza vaccine can be administered at the same visit.

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