



WEEKLY EPIDEMIOLOGICAL REPORT

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Ministry of Health

231, de Saram Place, Colombo 01000, Sri Lanka
Tele: + 94 11 2695112, Fax: +94 11 2696583, E mail: epidunit@sltnet.lk
Epidemiologist: +94 11 2681548, E mail: chepid@sltnet.lk
Web: <http://www.epid.gov.lk>

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Pertussis Outbreak in the United States of America

Background

A substantial rise in pertussis cases was reported in the state of Washington in the United States of America since mid-2011. A pertussis epidemic was declared in April 2012 in the backdrop of this situation. By June 16th 2012, the reported number of cases in Washington had reached 2,520 (37.5 cases per 100,000 residents). This was a 1,300% increase compared to the same period in 2011 and the highest number of cases reported since 1942. To assess clinical, epidemiologic and laboratory factors associated with this increase, all pertussis cases reported during January 1st and June 16th 2012 were reviewed.

Consistent with national trends, high rates of pertussis were observed among infants aged <1 year and children aged 10 years. However, the incidence of pertussis in adolescents aged 13–14 years was also increased, despite high rates of vaccination with Tdap vaccine (Tdap vaccine contains tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine) between 11 and 12 years of age. This suggests early waning of immunity and Pertussis vaccination remains the single most effective strategy for prevention of pertussis infection.

Epidemiology

All cases of pertussis reported to the Washington State Department of Health between January 1st – and June 16th 2012 were reviewed and were included in this analysis. Cases were classified according to a standard case definition (Council of State and Territorial Epidemiologist's case definition). Cumulative incidence (both confirmed and probable cases were included) was calculated per 100,000 residents. Confirmed and probable cases reported in Washington were compared with U.S. national data for the same period of time.

A total of 2,520 pertussis cases were reported in Washington during this period and 2,069 were

confirmed cases (83.4% were laboratory-confirmed and 16.6% were epidemiologically linked) and 451 were probable (In comparison, only 180 case were reported during the same period in 2011).

Cases were reported from 32 of the 39 counties (median: 24 cases; range: 1–485 cases). Statewide incidence was 37.5 cases per 100,000 population, ranging from 4.9 to 414.9 by county. Incidence was highest in infants aged <1 year and children aged 10, 13 and 14 years. Of the 155 reported pertussis cases in infants aged <1 year, 34 (21.9%) were managed in a hospitals. Among hospitalized infants, 14 (41.2%) were <2 months old. Of the 2,360 cases involving children aged ≥1 year with a known outcome, 14 of the children (0.6%) were hospitalized. No fatalities were reported.

Compared with the incidence in Washington, the national incidence for the same period in 2012 was lower overall (4.2 cases per 100,000). However, the national incidence was increased among infants and children aged 10, 13 and 14 years, consistent with observations in Washington. Through June 14th 2012, eight deaths have been reported in the United States, with a provisional case-fatality rate of 0.62 per 1,000 for reported cases. In comparison, 0.79 to 2.3 deaths per 1,000 reported cases occurred annually during 2000–2011.

Laboratory Testing

Laboratory confirmation of pertussis cases in Washington was performed by clinical and state health laboratories.

Pertussis was laboratory-confirmed in 83.4% of cases: 94.7% by polymerase chain reaction (PCR) alone, 2.4% by culture alone, and 2.9% by both PCR and culture. To further confirm *Bordetella pertussis* as the etiology and evaluate the contribution of other *Bordetella* species, multi-target PCR assays were performed at several

WEEKLY SRI LANKA - 2012

Contents	Page
1. <i>Leading Article – Pertussis Outbreak in the United States of America</i>	1
2. <i>Surveillance of vaccine preventable diseases & AFP (04th– 10th August 2012)</i>	3
3. <i>Summary of newly introduced notifiable diseases (04th– 10th August 2012)</i>	3
4. <i>Summary of selected notifiable diseases reported (04th– 10th August 2012)</i>	4

labs. Among 5,086 specimens tested at Seattle Children's Hospital, 193 had *Bordetella* DNA detected by PCR. Of these, 175 (90.7%) were positive for *B. pertussis*, 11 (5.7%) for *Bordetella parapertussis*, two (1.0%) for *Bordetella holmesii* and five (2.6%) were indeterminate. Culture was performed on all 193 PCR-confirmed specimens and no discrepancies were detected between culture identification and PCR.

Pulsed-Field Gel Electrophoresis (PFGE) testing was done on 55 isolates and 30 (54.5%) of the isolates represented the four most commonly identified profiles in the national database. Of the remaining isolates, 20 demonstrated seven of the less common PFGE profiles and five had three PFGE profiles not previously seen in the national database.

Vaccination Status

The vaccination status of patients was determined by review of medical records and by patient or parent report. Vaccination was considered up-to-date if the minimum number of doses by age had been received, as recommended by the Advisory Committee on Immunization Practices. Patients with invalid dose dates (e.g. date of dose preceding date of birth) were excluded from the vaccination status analysis. Individual doses were excluded if administered <14 days before onset of symptoms. Valid vaccination history was available for 1,829 of 2,006 (91.2%) patients aged 3 months–19 years. Overall, 758 of 1,000 (75.8%) patients aged 3 months–10 years were up to date with the childhood diphtheria and tetanus toxoids and acellular pertussis (DTaP) doses. Receipt of Tdap was documented in 97 of 225 (43.1%) patients aged 11–12 years and in 466 of 604 (77.2%) patients aged 13–19 years. Estimated DTaP coverage in Washington among children aged 19–35 months was 93.2% for ≥3 doses and 81.9% for ≥4 doses in 2010; Tdap coverage in adolescents aged 13–17 years was estimated at 70.6%.

Epidemic Response

In response to the ongoing epidemic, the state health department established an incident command structure to coordinate epidemic response and surveillance activities. State guidance for case investigations was modified to prioritize identification of persons at high risk (i.e. infants and pregnant women). Healthcare provider education has focused on clinical presentation, appropriate diagnostic testing and treatment and preventive recommendations with specific emphasis on preventing transmission to persons at high risk through vaccination and targeted antibiotic chemoprophylaxis. Public awareness efforts have focused on informing residents about the signs and symptoms of pertussis and vaccination recommendations.

Recommended vaccines for children aged ≤18 years are provided by Washington's Universal Childhood Vaccine Program. Tdap receipt among adults increased substantially; from March 25 to May 26, 2012, the state immunization registry recorded a 140% increase of Tdap in adults aged ≥19 years, compared to 2011. An additional 27,000 doses of Tdap were allocated for uninsured or underinsured adults.

Note

Pertussis is endemic in the United States. Although cyclical in nature, a gradual and sustained increase has been observed in the United States after reaching historic lows in the 1970s. In 2010, 27,550 pertussis cases were reported. Year-to-date case counts from 2012 have surpassed those from the previous 5 years for the same period. The high rates of pertussis among adolescents aged 13–14 years in Washington reflect national

trends in the United States and provide observational data suggesting early waning of immunity from acellular vaccines. Acellular and whole-cell vaccines both have high efficacy during the first 2 years after vaccination, but recent changes in the epidemiology of pertussis in the United States strongly suggest diminished duration of protection afforded by childhood acellular vaccine (DTaP) compared with that of diphtheria and tetanus toxoids and whole-cell pertussis (DTwP) vaccine. In contrast with acellular vaccines, which contain several specific antigens, whole-cell vaccines are suspensions of entire killed *B. pertussis* organisms. The additional antigenic components in DTwP vaccines might induce immune responses with greater durability. Concerns about adverse events associated with DTwP led to replacement with DTaP for the complete childhood series in 1997. Since the mid-2000s, the incidence of pertussis among children aged 7–10 years has increased. Moreover, the observed increase in risk by year of life from age 7–10 years suggests a cohort effect of increasing susceptibility as those children who exclusively received acellular vaccines continue to age.

In 2006, Tdap was recommended for adults and adolescents with routine vaccination recommended at age 11–12 years. Although the relative reduction in incidence of pertussis among adolescents aged 11–12 years demonstrates immediate vaccine effectiveness, the increasing number of cases in adolescents aged 13–14 years in both Washington and the United States suggests immunity wanes after Tdap vaccination in those adolescents fully vaccinated with acellular vaccines during childhood. In observational studies, Tdap effectiveness was 66%–72% among adolescents who largely received DTwP for some of the childhood doses. Studies evaluating Tdap effectiveness and duration of protection in adolescents fully vaccinated with DTaP are being conducted in Washington and California.

Investigation of the Washington epidemic demonstrates multiple *B. pertussis* strains causing infection, primarily in vaccinated persons. Given the high transmissibility of *B. pertussis*, a proportion of vaccinated persons remains susceptible and can become infected during a pertussis outbreak. Unvaccinated children have at least an eightfold greater risk for pertussis than children fully vaccinated with DTaP. However, because in most of the cases the patients were vaccinated, the 4.5% of Washington school children who were exempted from vaccination during 2011–2012 represented only a small proportion of those at risk for pertussis in the state. Although vaccinated children can develop pertussis, they are less infectious, have milder symptoms and shorter illness duration and are at reduced risk for severe outcomes, including hospitalization.

The ongoing pertussis epidemic in Washington reflects the evolving epidemiology of pertussis in the United States. **Although acellular pertussis vaccines provide excellent short-term protection, early waning of immunity might be contributing to increasing population-level susceptibility.**

[Sri Lanka is currently using whole-cell pertussis (wP) vaccines in the Expanded Programme on Immunization (EPI)]

Compiled by Dr. Madhava Gunasekera of the Epidemiology Unit

Source—Pertussis Epidemic — Washington, 2012, available from

www.cdc.gov/mmwr/pdf/wk/mm6128.pdf

Table 1: Vaccine-preventable Diseases & AFP

04th - 10th August 2012 (32thWeek)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	01	00	00	00	00	00	00	00	00	01	01	50	57	- 12.3 %
Diphtheria	00	00	00	00	00	00	00	00	00	-	-	-	-	-
Measles	00	00	00	00	00	00	00	00	00	00	01	32	93	- 65.6 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	08	13	- 38.5 %
Whooping Cough	01	00	00	01	00	00	01	00	00	02	00	51	25	+ 104.0 %
Tuberculosis	104	12	17	14	19	23	00	00	09	198	523	5673	5648	-0.44 %

Table 2: Newly Introduced Notifiable Disease

04th - 10th August 2012 (32thWeek)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	07	01	02	01	04	10	01	08	06	40	42	2810	2834	- 01.0 %
Meningitis	02 GM=1 KL=1	00	01 MT=1	03 JF=1 VU=2	01 TR=1	02 KR=2	00	00	03 KG=3	12	10	431	558	- 22.7 %
Mumps	03	04	08	01	02	06	10	01	19	57	99	2924	1959	+ 49.2 %
Leishmaniasis	00	02 ML=2	02 MT=2	00	00	00	18 AP=18	00	00	22	19	527	461	- 14.3 %

Key to Table 1 & 2

Provinces: W: Western, C: Central, S: Southern, N: North, E: East, NC: North Central, NW: North Western, U: Uva, Sab: Sabaragamuwa.
DPDHS Divisions: CB: Colombo, GM: Gampaha, KL: Kalutara, KD: Kandy, ML: Matale, NE: Nuwara Eliya, GL: Galle, HB: Hambantota, MT: Matara, JF: Jaffna, KN: Killinochchi, MN: Mannar, VA: Vavuniya, MU: Mullaitivu, BT: Batticaloa, AM: Ampara, TR: Trincomalee, KM: Kalmunai, KR: Kurunegala, PU: Puttalam, AP: Anuradhapura, PO: Polonnaruwa, BD: Badulla, MO: Moneragala, RP: Ratnapura, KG: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008.

Dengue Prevention and Control Health Messages

Check the roof gutters regularly for water collection where dengue mosquitoes could breed.

Table 4: Selected notifiable diseases reported by Medical Officers of Health
04th – 10th August 2012 (32thWeek)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	136	5844	1	83	0	7	1	121	0	31	00	110	0	3	1	68	0	3	46
Gampaha	75	4014	3	52	0	8	1	40	0	19	2	116	0	10	5	177	0	0	53
Kalutara	32	1456	0	47	0	2	0	21	0	23	3	146	0	2	0	20	0	2	46
Kandy	36	1515	1	66	0	1	0	15	0	49	0	47	2	83	1	44	0	0	70
Matale	4	273	2	54	0	4	0	8	1	5	1	22	0	2	1	23	0	0	33
Nuwara	7	225	2	104	0	3	0	20	0	1	1	23	0	50	0	15	0	1	46
Galle	21	871	4	65	0	4	0	7	0	10	1	74	0	32	0	2	0	0	42
Hambantota	17	384	3	26	0	1	0	5	0	25	0	60	0	33	0	14	0	0	83
Matara	46	1032	4	40	0	8	1	15	0	19	0	95	3	49	3	81	0	0	82
Jaffna	11	298	4	116	0	12	14	271	5	66	0	2	0	247	1	10	0	0	83
Kilinochchi	0	56	0	7	0	2	1	25	0	40	0	4	0	29	0	4	0	1	25
Mannar	2	98	0	49	0	3	1	19	0	14	0	16	0	39	0	2	0	0	40
Vavuniya	4	41	3	19	0	21	0	6	2	15	0	17	1	1	0	1	0	0	75
Mullaitivu	1	13	0	11	0	1	1	5	0	2	0	3	0	5	0	0	0	0	25
Batticaloa	4	585	4	123	0	2	0	14	0	83	0	8	0	0	0	6	0	4	71
Ampara	1	79	2	51	0	0	0	3	0	8	0	19	0	0	0	2	0	0	29
Trincomalee	1	111	3	104	0	1	0	16	0	4	0	35	0	12	0	4	0	0	42
Kurunegala	70	1416	7	108	0	13	3	68	1	30	0	106	1	20	2	98	0	3	65
Puttalam	28	603	0	25	0	4	0	7	0	1	0	21	1	13	0	2	1	1	42
Anuradhapu	5	202	3	36	0	3	0	10	0	8	4	61	0	19	2	42	0	1	47
Polonnaruw	2	164	0	28	0	0	0	1	0	1	0	38	0	2	0	33	0	1	14
Badulla	10	186	0	67	0	3	1	39	0	2	0	25	3	64	0	32	0	0	59
Monaragala	5	162	0	43	0	4	0	15	0	7	0	53	0	58	1	121	0	2	45
Ratnapura	93	2258	2	146	0	25	0	37	0	11	1	190	0	31	3	68	0	1	67
Kegalle	66	1943	0	45	0	9	0	19	0	10	5	126	0	41	8	382	0	0	82
Kalmune	1	160	4	171	0	1	0	5	2	76	0	2	0	0	0	7	0	2	38
SRI LANKA	678	23989	52	1686	00	142	24	812	11	560	18	1419	11	0	28	1258	01	22	56

Source: Weekly Returns of Communicable Diseases WRCD).

*Dengue Fever / DHF refers to Dengue Fever / Dengue Haemorrhagic Fever.

**Timely refers to returns received on or before 10th August, 2012 Total number of reporting units 329. Number of reporting units data provided for the current week: 185

A = Cases reported during the current week. B = Cumulative cases for the year.

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Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to chepid@sltnet.lk.

ON STATE SERVICE

Dr. P. PALIHAWADANA
CHIEF EPIDEMIOLOGIST
EPIDEMIOLOGY UNIT
231, DE SARAM PLACE
COLOMBO 10