WEEKLY EPIDEMIOLOGICAL REPORT

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Pertussis vaccine – The current position of WHO

Background

Pertussis (whooping cough) is an important cause of death in infants worldwide, and continues to be a public health concern even in countries with high vaccination coverage. Estimates from WHO suggest that in 2008 about 16 million cases of pertussis occurred worldwide and 95% of which were in developing countries. About 195 000 children died from this disease. Pertussis is caused by the bacterium *Bordetella pertussis* which is transmitted from infected to susceptible individuals through droplets. Pertussis is highly communicable with a secondary attack rate of up to 90% among non immune household contacts in the early catarrhal stage. Untreated patients may be contagious for 3 weeks or more following the onset of typical coughing attacks, although communicability diminishes rapidly after the catarrhal stage. Chronic carriers of *B. pertussis* are uncommon.

Before vaccines became widely available, pertussis was one of the most common childhood diseases worldwide. A dramatic reduction (more than 90%) in incidence and mortality due to pertussis was observed in the industrialized world following large scale vaccination during the 1950s and 1960s. Pertussis vaccine (combined with diphtheria toxoid and tetanus toxoid) has been a part of WHO's Expanded Programme on Immunization since its inception in 1974, and in 2008 about 82% of all infants worldwide received 3 doses of pertussis vaccine. WHO estimates that vaccination against pertussis averted about 687 000 deaths globally in 2008.

The pathogen and the disease

B. pertussis is a small, fastidious Gram-negative coccobacillus with exclusive affinity for the mucosal layers of the human respiratory tract. Occasionally, other infectious agents, in particular *B. parapertussis*, may cause pertussis like disease.

Following an incubation period of 9–10 days (range 6–20 days), patients develop catarrhal symptoms, including cough. During the course of 1 –2 weeks, coughing paroxysms ending in the characteristic whoop may occur. In typical cases, cough is particularly severe at night and frequently followed by vomiting. In young infants, pertussis may cause apnoea and cyanosis without cough. Uncharacteristic, persistent cough may be the only manifestation in adolescents and adults . The catarrhal, paroxysmal and convalescent stages of the disease may last for several months.

Pertussis vaccine

Programmes which use good quality pertussis vaccines to immunize infants have been highly successful in preventing severe pertussis in infants worldwide for several decades. Two types of pertussis vaccines are available: whole cell (wP) vaccines based on killed *B. pertussis* organisms, and acellular (aP) vaccines based on highly purified, selected components of this agent.

Whole-cell pertussis vaccines (wP)

The wP vaccines are based on selected *B. pertussis* strains that are subsequently killed, usually by heating and treated with formalin. Each lot of vaccine undergoes extensive testing to assess potency, toxicity, sterility and bacterial concentration. Most wP vaccines are combined with other vaccines such as diphtheria toxoid, tetanus toxoid, Haemophilus influenzae type b (Hib), hepatitis B (HBV) and inactivated poliovirus (IPV). Vaccines containing wP must not be frozen but should be stored at 2 – 8 °C.

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Acellular pertussis vaccines

The first acellular pertussis (aP) vaccine was developed in Japan in 1981 and aP vaccines have gradually become the dominant type in the industrialized world. These vaccines contain more than one separately purified antigens. Vaccines that contain aP must not be frozen but should be stored at 2–8 °C.

Comparing the efficacy and safety of wP-containing and aP-containing vaccines

The scientific evidence demonstrates that a primary series of wP or aP vaccine induces protection against severe Pertussis in infants. Further research is unlikely to change the estimated effect on health outcomes.

Reviews such as Jefferson review which included 4 Randomized Control Studies assed the absolute efficacy of wP or combined DTwP vaccines. In all studies wP-containing vaccines scored better than placebo against severe Pertussis, but Vaccine Efficacy varied significantly. For DTwP vaccines vaccine efficacy ranged from 46% to 92%.

The same review assessed the absolute efficacy of aP containing vaccines using 5 Randomized Control Studies. Pooled efficacy against severe pertussis was 73%. Vaccine Efficacy was 67-70% for 1 or 2 component aP vaccines, 84% for 3 component vaccines, 80% for 4 component vaccines and 84% for 5 component aP vaccines.

The scientific evidence demonstrates that both wP and aP vaccines are safe with regard to serious adverse events. Further research is unlikely to change the estimated effect on health outcomes.

The scientific evidence suggests that protection against Pertussis wanes in subsequent years following a primary series of vaccination with wP or aP vaccines. However, further research is likely to change the estimated effects on health outcomes.

A 10 year observational study in the USA found that wP vaccine effectiveness fell from 100% in the 1st year, 84% in the 4th, 52% in the 5th, to 46% in the 7th year following vaccination. Epidemiological researches support the assumption that immunity wanes with age by the observed increase of Pertussis in adolescents and young adults. Based on age specific incidence rates of Pertussis, the long-term effectiveness of aP vaccination given at 3, 5, and 12 months of age as part of the Swedish national immunization programmme seems to wane with age (Pertussis incidence is 11 to 16 per 100,000 after 5years of vaccination as opposed to 32 and 48 per 100,000 at ages 6 and 8 years respectively).

Same applies to Australia and it is evident by the fact that Pertussis is well controlled in less than 10 year olds but is increasing in the adolescents and young adults, and the highest number of cases(63%) being reported by the 20-59 year group.
Therefore those countries which have used aP vaccines have introduced booster doses around 5years of age and another during the adolescent period. Whether children who were vaccinated with wP vaccine also require booster doses is yet to be decided.

Adverse events following pertussis vaccination

Immunization with wP vaccines is frequently associated with minor adverse reactions (1 in 2–10 injections), such as local redness and swelling, induration, fever and agitation. Prolonged crying anda febrile convulsions are less common (<1 in 100 injections); hypotonic–hyporesponsive episodes are rare (<1 in 1000–2000 injections). The frequency of adverse events following primary aP vaccination did not differ from that observed in the control group, regardless of the number of vaccine components included. However, after the primary series, the rate and severity of local reactions tend to increase with each successive DTaP dose. Transient, benign and painless swelling, sometimes involving the entire limb, occurs in 2–6% of children who receive booster doses of DTaP vaccines. Similar swellings have rarely been associated with other childhood immunizations.

There is no evidence to suggest that wP vaccines cause brain damage or severe neurological disorder.

There are no contraindications to the use of these vaccines except for the rare anaphylactic reactions that may follow administration of wP vaccines or aP vaccines.

Choice of vaccines

Protection against severe pertussis in infancy and early childhood can be obtained after a primary series of vaccination with wP or aP vaccine. The best aP vaccines have higher efficacy than low-efficacy wP vaccines but they may be less efficacious than the highest efficacy wP vaccines in preventing whooping cough.
Although local and systemic reactogenicity are more commonly associated with wP containing vaccines, both aP containing and wP containing vaccines have excellent safety records. The aP containing vaccines continue to be significantly more expensive than wP containing vaccines, and for many countries there is insufficient marginal benefit to consider changing from wP containing vaccine to aP containing vaccine. However, the use of aP vaccine may help to improve acceptability in countries where the higher non-serious reactogenicity of wP would be an impediment to high vaccination coverage.

Sources

WH0 Vaccine Position Paper on Pertussis (October 2010), available from
http://www.who.int/wer/2010/wer8540.pdf
Grading of scientific evidence (safety), available from
http://www.who.int/immunization/pertussis_grad_safety.pdf
Grading of scientific evidence (efficacy/effectiveness), available from
http://www.who.int/immunization/pertussis_grad_efficacy.pdf
Grading of scientific evidence (duration), available from
http://www.who.int/immunization/documents/positionpapers/en/

Compiled by ***Dr. Sudath Peiris, Assistant Epidemiologist***

Table 1: Vaccine-preventable Diseases & AFP

06th – 12th August 2011 (32nd Week)

Disease	No. of Cases by Province									Number of cases during current week in 2011	Number of cases during same week in 2010	Total number of cases to date in 2011	Total number of cases to date in 2010	Difference between the number of cases to date in 2011 & 2010
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	01	00	00	00	00	00	00	00	01	00	57	58	- 01.7 %
Diphtheria	00	00	00	00	00	00	00	00	00	-	-	-	-	-
Measles	01	00	00	00	00	00	00	00	00	01	01	93	62	+ 50.0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	13	16	- 18.7 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	25	20	+ 25.0 %
Tuberculosis	140	230	13	30	15	20	07	13	45	523	184	5648	5668	- 0.4 %

Table 2: Newly Introduced Notifiable Disease

06th – 12th August 2011 (32nd Week)

Disease	No. of Cases by Province									Number of cases during current week in 2011	Number of cases during same week in 2010	Total number of cases to date in 2011	Total number of cases to date in 2010	Difference between the number of cases to date in 2011 & 2010
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	06	02	16	01	00	05	02	03	07	42	38	2834	2170	+ 30.6 %
Meningitis	03 GM=3	00	00	01 Mu=1	01 BT=1	00	05 AP=5	00	00	10	19	558	1127	- 190.2 %
Mumps	04	07	15	08	20	16	05	06	18	99	23	1959	675	+ 190.2 %
Leishmaniasis	00	01 ML=1	11 MT=3 HB=8	00	00	00	07 AP=4 PO=3	00	00	19	06	461	189	+ 143.9 %

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

Reduce, Reuse or Recycle the plastic and polythene collected in your home and help to minimize dengue mosquito breeding

Table 4: Selected notifiable diseases reported by Medical Officers of Health

06th – 12th August 2011 (32nd Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received Timely**
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	149	6345	2	138	0	6	11	110	0	48	4	278	0	6	2	43	0	2	**77**
Gampaha	100	2441	1	97	3	14	5	46	0	27	4	379	1	20	180	184	0	6	**93**
Kalutara	19	861	1	99	0	4	0	40	1	21	1	196	0	1	0	5	0	0	**58**
Kandy	18	543	4	297	0	6	0	22	0	36	0	123	2	82	0	43	0	0	**96**
Matale	2	226	0	119	0	3	2	24	0	18	0	148	0	13	0	6	0	0	**92**
Nuwara	3	130	2	288	0	3	0	39	0	89	1	35	0	51	2	17	0	1	**92**
Galle	6	529	0	66	0	6	0	9	0	6	0	117	0	29	0	8	0	5	**74**
Hambantota	7	316	5	39	0	4	0	3	0	20	4	422	0	45	0	7	0	1	**92**
Matara	2	323	3	59	0	2	0	10	1	28	1	203	1	52	0	14	0	1	**100**
Jaffna	9	211	11	157	0	3	2	188	0	68	0	2	0	189	0	19	0	1	**100**
Kilinochchi	3	42	3	15	0	3	0	9	0	12	0	2	0	8	0	3	0	0	**75**
Mannar	0	25	1	14	0	0	0	22	0	78	0	12	0	30	0	2	0	0	**40**
Vavuniya	0	63	0	24	0	10	0	8	8	47	0	39	0	2	0	1	0	0	**75**
Mullaitivu	0	15	2	38	0	1	0	3	0	9	0	5	0	1	0	2	0	0	**100**
Batticaloa	2	674	3	518	0	4	0	5	0	25	0	24	0	3	0	2	0	5	**79**
Ampara	2	101	3	88	0	1	1	9	0	28	0	54	0	1	0	7	0	0	**86**
Trincomalee	2	128	7	551	0	2	0	5	0	8	0	84	0	7	0	7	0	0	**83**
Kurunegala	17	627	6	245	1	10	3	72	0	68	5	1387	5	60	1	24	0	4	**78**
Puttalam	4	355	2	138	0	1	0	23	0	9	0	98	0	17	0	6	0	1	**58**
Anuradhapu	2	193	1	93	0	1	0	3	9	33	0	236	0	16	1	14	0	1	**84**
Polonnaruw	3	217	2	93	0	1	0	9	0	22	1	76	0	1	1	15	0	0	**86**
Badulla	13	416	7	250	0	5	0	44	2	9	2	56	2	59	2	45	0	0	**88**
Monaragala	3	162	3	66	0	4	3	26	0	10	0	170	0	53	2	45	0	0	**91**
Ratnapura	12	622	4	394	0	5	2	38	0	17	4	373	0	25	0	31	0	2	**72**
Kegalle	17	471	1	86	0	12	1	53	0	22	1	256	2	24	3	128	0	0	**82**
Kalmune	0	27	4	485	0	0	0	1	1	19	0	5	0	2	0	2	0	1	**85**
SRI LANKA	**395**	**16063**	**78**	**4457**	**04**	**111**	**30**	**821**	**22**	**777**	**28**	**4780**	**13**	**797**	**32**	**680**	**00**	**31**	**83**

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 12th August , 2011 Total number of reporting units =327. Number of reporting units data provided for the current week: 273
A = Cases reported during the current week. **B** = Cumulative cases for the year.

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