WEEKLY EPIDEMIOLOGICAL REPORT

A publication of the Epidemiology Unit
Ministry of Healthcare and Nutrition

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WER SRI LANKA - 2010

Vol. 37 No.17 24th - 30th April 2010

Immunization against diseases of public health importance (part 1)

The benefits of immunization

Vaccines which protect against disease by inducing immunity are widely and routinely administered around the world based on the commonsense principle that it is better to keep people from falling ill than to treat them once they are ill. Suffering, disability, and death are avoided. Immunization averted about two million deaths in 2002. In addition, contagion is reduced, strain on health-care systems is eased, and money is frequently saved that can be used for other health services.

Immunization is a proven tool for controlling and even eradicating disease. An immunization campaign carried out by the World Health Organization (WHO) from 1967 to 1977 eradicated the natural occurrence of smallpox. When the programme began, the disease still threatened 60% of the world's population and killed every fourth victim. Eradication of poliomyelitis is within reach. Since the launch by WHO and its partners of the Global Polio Eradication Initiative in 1988, infections have fallen by 99%, and some five million people have escaped paralysis. Between 1999 and 2003, measles deaths dropped worldwide by almost 40%, and some regions have set a target of eliminating the disease. Maternal and neonatal tetanus will soon be eliminated in 14 of 57 high-risk countries.

New vaccines also have been introduced with significant results, including the first vaccine to help prevent liver cancer, hepatitis B vaccine, which is now routinely given to infants in 77% of WHO's Member States. Rapid progress in the development of new vaccines means protection will be available in the near future against a wider range of serious infectious diseases.

History

Introducing a small amount of smallpox virus by inhaling through the nose or by making a number of small pricks through the skin (variolation) to create resistance to the disease appears to have begun in the 10th or 11th century in Central Asia. The practice spread; in Asia and Africa, the method was nasal, while in Europe it involved skin punctures. Variolation was introduced into England in 1721. There, in 1798, Edward Jenner, having studied the success of variolation with cowpox, a mild illness in protecting against smallpox, began to carry out inoculations against smallpox, the first systematic effort to control a disease through immunization.

In 1885, Louis Pasteur developed the first vaccine to protect humans against rabies. Toxoids against diphtheria and tetanus were introduced in the early 1900s; the bacillus Calmette-Guérin vaccine (against tuberculosis) in 1927, the Salk polio vaccine in 1955, and vaccines against measles and mumps in the 1960s.

Commonly used vaccines

Routine vaccination is now provided in all developing countries against measles, polio, diphtheria, tetanus, pertussis, and tuberculosis. To this basic package of vaccines, which served as the standard for years, have new additions now. Immunization against hepatitis B is now recommended by WHO for all nations, and currently is offered to infants in 147 of 192 WHO Member States. Immunization against Haemophilus influenza type b (Hib) is recommended where resources permit its use and the burden of disease is established. It is provided in 89 countries (only in selected parts of two of those countries). Yellow fever vaccine is offered in about two thirds of the nations at risk for yellow fever outbreaks.

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Routine immunization against rubella is provided in 111 countries.

In industrialized countries a wider span of protection is typically provided than in developing countries, often including vaccines against influenza, predominant strains of pneumococcal disease, and mumps (usually in combination with measles and rubella vaccine). Immunization programmes may be aimed at adolescents or adults, depending on the disease concerned, as well as at infants and children.

Global immunization coverage

Coverage has greatly increased since WHO's Expanded Programme on Immunization began in 1974. In 2003, global DTP3 (three doses of the diphtheria-tetanus-pertussis combination vaccine) coverage was 78% up from 20% in 1980. However, 27 million children worldwide were not reached by DTP3 in 2003, including 9.9 million in South Asia and 9.6 million in sub-Saharan Africa. Those who miss out on routine vaccination programmes tend to be people living in remote locations, urban slums and border areas. They also include indigenous groups, displaced populations, those lacking access to vaccination because of various social barriers, those lacking awareness or motivation to be vaccinated and those who refuse.

An estimated 2.1 million people around the world died in 2002 of diseases preventable by widely used vaccines. This toll included 1.4 million children under the age of five. Among these childhood deaths, over 500 000 were caused by measles; nearly 400 000 by Hib; nearly 300 000 by pertussis; and 180 000 by neonatal tetanus.

Vaccines under development

Numerous new vaccines with major potential for improving health in developing countries are in the research and development pipeline. They include vaccines for rotavirus diarrhoea, which kills 300 000 to 600 000 children under age five every year; human papiloma virus, a leading cause of cervical cancer, which afflicts some 500 000 women each year, 80% of them in developing countries; and pneumococcal disease, which causes a large fraction of the world's approximately two million annual deaths from childhood pneumonia. In addition, a conjugate vaccine now in development should be much more effective against Group A meningococcal disease (Men A), a frequently fatal form of meningitis that causes recurring epidemics in a number of countries in sub-Saharan Africa. Several of these vaccines ─ those against rotavirus, pneumococcal disease, and Men A may be available in developing countries by 2008-2009.

How vaccines work

Vaccines typically provide the immune system with harmless copies of an antigen: a portion of the surface of a bacterium or virus that the immune system recognizes as "foreign." (An antigen often plays a role in causing disease for example by enabling a virus or bacterium to attach to cells.) A vaccine may also provide a non-active version of a toxin, a poison produced by a bacterium, so that the body can devise a defense against it.

Once an antigen is detected by the immune system, white blood cells called B-lymphocytes create a protein called an antibody that is precisely designed to attach to that antigen. Many copies of this antibody are produced. If a true infection of the same disease occurs, still more antibodies are created, and as they attach to their targets they may block the activity of the virus or bacterial strain directly, thus combating infection. In addition, once in place, the antibodies make it much easier for other components of the immune system (particularly phagocytes) to recognize and destroy the invading agent.

Immune systems are designed to "remember" once exposed to a particular bacterium or virus, they retain immunity against it for years, decades, or even a lifetime and so are prepared to defeat a later infection, and to do so quickly. This ability, and the speed with which it occurs, is a huge benefit. A body encountering a germ for the first time may need from seven to 12 days to mount an effective defense, and by then serious illness and even death may occur.

Types of vaccines

Vaccines come in different forms. The injected polio vaccine is a killed, intact virus, the oral polio vaccine is a live, attenuated virus. The vaccine for typhoid is a killed, intact bacteria. Vaccines for measles and the other standard "childhood" diseases like mumps, chickenpox, and rubella are live, attenuated viruses. Vaccines for diphtheria and tetanus consist of toxins that have been "inactivated." Influenza vaccines often consist of killed, "disrupted" viruses (that is, the proteins on the coat of the virus have been released into a solution by solvents). Vaccines against Hib, pneumococcal disease, and meningococcal disease consist of highly purified complex sugars taken from bacterial coats or capsules.

Vaccines are frequently administered as combinations of antigens. The most widely used combinations are diphtheria-tetanus-pertussis (DTP); diphtheria-tetanus-pertussis-hepatitis B (DTP-HepB); pentavalent vaccine: diphtheria-tetanus-pertussis-hepatitis B-Hib; and measles-mumps-and rubella (MMR).

Effectiveness and safety

All vaccines used for routine immunization are very effective in preventing disease, although no vaccine attains 100% effectiveness. More than one dose of a vaccine is generally given to increase the chance of developing immunity.

Vaccines are very safe, and side effects are minor especially when compared to the diseases they are designed to prevent. Serious complications occur rarely. For example, severe allergic reactions result at a rate of one for every 100 000 doses of measles vaccine. Two to four cases of vaccine-associated paralytic polio have been reported for every one million children receiving oral polio vaccine.

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Table 1: Vaccine-preventable Diseases & AFP

17th - 23rd April 2010(16th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2010	Number of cases during same week in 2009	Total number of cases to date in 2010	Total number of cases to date in 2009	Difference between the number of cases to date in 2010 & 2009
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	00	00	00	00	00	00	00	00	00	02	29	23	- 26.1 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	-
Measles	00	00	00	00	00	00	00	00	00	0	00	31	44	- 29.5 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	08	09	- 11.1 %
Whooping Cough	01	00	00	00	00	00	00	00	01	02	02	07	22	- 68.1 %
Tuberculosis	22	29	07	64	62	02	24	12	67	289	00	2719	2407	+ 13.0 %

Table 2: Newly Introduced Notifiable Disease

17th - 23rd April 2010(16th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2010	Number of cases during same week in 2009	Total number of cases to date in 2010	Total number of cases to date in 2009	Difference between the number of cases to date in 2010 & 2009
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	21	08	13	07	13	07	12	14	09	105	469	1281	5451	- 76.5 %
Meningitis	07 CB=3 GM=2 KL=2	00	01 GL=1	00	03 TR=2 KM=1	07 KN=6 PU=1	01 AP=1	02 BD=2	09 RP=7 KG=2	30	13	473	329	+ 43.8 %
Mumps	02	02	02	00	03	00	00	01	04	14	21	263	587	- 55.2 %
Leishmaniasis	00	00	00	00	00	00	03	00	00	03	01	106	353	- 70.0 %

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.

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

17th - 23rd April 2010(16th Week)

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	42	1545	7	53	0	5	1	17	0	7	4	203	0	3	1	24	0	1	**69**
Gampaha	29	1538	0	11	1	9	1	14	0	8	6	148	0	1	1	33	0	1	**67**
Kalutara	30	448	1	45	0	6	1	7	0	23	4	123	0	0	0	14	0	1	**83**
Kandy	29	527	0	89	0	1	0	7	1	2	0	23	3	56	0	23	0	1	**74**
Matale	21	321	1	182	0	1	0	8	1	60	7	37	1	2	3	19	0	0	**83**
Nuwara	0	59	9	69	0	0	3	45	1	4	0	9	0	27	1	14	0	0	**92**
Galle	42	272	3	67	0	4	0	0	00	9	2	25	1	3	0	6	0	2	**89**
Hambant	6	284	0	13	0	2	0	1	0	3	0	21	2	42	0	4	0	0	**64**
Matara	11	138	2	37	0	1	0	1	0	39	8	117	1	64	0	9	0	0	**82**
Jaffna	30	1974	3	58	0	1	3	295	0	5	0	0	2	98	2	32	0	1	**67**
Kili-	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**0**
Mannar	4	76	0	13	0	0	1	24	0	2	0	0	0	0	1	11	0	0	**80**
Vavuniya	2	479	0	14	0	1	1	25	0	7	0	0	0	0	1	11	0	0	**75**
Mullaitivu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**0**
Batticaloa	37	936	4	40	0	2	2	12	0	11	2	4	0	1	0	0	0	1	**86**
Ampara	0	55	3	23	0	1	0	4	0	6	0	16	0	0	0	7	0	0	**57**
Trincomal	5	704	0	50	1	5	0	3	0	7	0	8	0	5	1	11	0	0	**70**
Kurunega	18	467	1	66	1	3	1	12	0	4	8	138	0	22	1	42	0	1	**80**
Puttalam	6	496	2	25	0	3	0	30	0	120	0	53	0	0	3	8	0	0	**78**
Anuradha	15	716	0	28	0	2	0	3	0	21	3	26	1	17	0	23	0	3	**84**
Polonnar	8	141	0	23	0	1	0	1	0	2	1	34	0	0	1	15	0	0	**100**
Badulla	13	224	1	57	0	1	2	43	0	12	2	26	2	31	4	34	0	0	**80**
Monaraga	20	181	3	66	0	0	0	18	0	4	0	15	0	20	2	47	0	1	**64**
Ratnapur	91	634	19	118	0	3	2	9	0	8	19	144	0	28	1	41	0	1	**67**
Kegalle	16	338	1	19	0	4	0	23	0	15	4	81	0	5	1	38	0	0	**91**
Kalmunai	8	436	4	61	0	0	0	5	0	0	0	0	0	0	0	7	0	1	**69**
SRI LANKA	**483**	**12990**	**64**	**1228**	**03**	**56**	**18**	**608**	**03**	**379**	**70**	**1251**	**13**	**425**	**24**	**472**	**01**	**05**	**75**

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 23rdApril, 2010 Total number of reporting units =311. Number of reporting units data provided for the current week: 205
A = Cases reported during the current week. B = Cumulative cases for the year.

PRINTING OF THIS PUBLICATION IS FUNDED BY THE WORLD HEALTH ORGANIZATION (WHO).

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.

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