WEEKLY EPIDEMIOLOGICAL REPORT
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Haemophilus influenzae type b - Hib disease

Epidemiology Unit has been able to solicit support of Global Alliance for Vaccine & Immunization [GAVI] to introduce Hib vaccine into the National Immunization Programme in Sri Lanka with effect from year 2008. This article describes the epidemiology of the Hib disease.

In the next edition of the WER we hope to describe the rationale of introducing Hib vaccine in to our EPI programme and about the Hib vaccine.

Haemophilus influenzae is a cause of bacterial infections that are often severe, particularly among infants. It was first described by Pfeiffer in 1892. During an outbreak of influenza he found the bacteria in sputum of patients and proposed a causal association between this bacterium and the clinical syndrome known as influenza. The organism was given the name *Haemophilus* by Winslow, et al. in 1920. It was not until 1933 that Smith, et al. established that influenza was caused by a virus and that *H. influenzae* was a cause of secondary bacterial infection.

Haemophilus influenzae is a gram-negative coccobacillus. It is generally aerobic but can grow as a facultative anaerobe. The outermost structure of *H. influenzae* is composed of polyribosyl-ribitol phosphate (PRP), a polysaccharide that is responsible for virulence and immunity. Six antigenically and biochemically distinct capsular polysaccharide serotypes have been described; these are designated types "a" through "f". In the prevaccine era, type b organisms accounted for 95% of all strains that caused invasive disease.

Before the introduction of effective vaccines, *H. influenzae* type b (Hib) was the leading cause of bacterial meningitis and other invasive bacterial disease among children younger than 5 years of age; approximately one in 200 children in this age group developed invasive Hib disease. Nearly all Hib infections occurred among children younger than 5 years of age, and approximately two-thirds of all cases occurred among children younger than 18 months of age. Hib, is a bacterium estimated to be responsible for some three million serious illnesses and an estimated 386 000 deaths per year, chiefly through meningitis and pneumonia.

In developing countries, where the vast majority of Hib deaths occur, pneumonia accounts for a larger number of deaths than meningitis. However, Hib meningitis is also a serious problem in such countries with mortality rates several times higher than seen in developed countries; it leaves 15 to 35% of survivors with permanent disabilities such as mental retardation or deafness. Contrary to what the name Haemophilus influenzae suggests, the bacterium does not cause influenza.

Pathogenesis : The organism enters the body through the nasopharynx. Organisms colonize the nasopharynx and may remain only transiently or for several months in the absence of symptoms (asymptomatic carrier). In the prevaccine era, Hib could be isolated from the nasopharynx of 0.5%–3% of normal infants and children but was not common in adults. Nontypeable (unencapsulated) strains are also frequent inhabitants of the human respiratory tract. In some persons, the organism causes an invasive infection. The exact mode of invasion to the bloodstream is unknown. Antecedent viral or

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mycoplasma infection of the upper respiratory tract may be a contributing factor. The bacteria spread in the bloodstream to distant sites in the body. Meninges are especially likely to be affected. The most striking feature of the Hib disease is age-dependent susceptibility. Hib disease is not common beyond 5 years of age.

Passive protection of some infants is provided by transplacentally acquired maternal IgG antibodies and breastfeeding during the first 6 months of life. In the prevaccine era peak attack rates occurred at 6–7 months of age, declining thereafter. The presumed reason for this age distribution is the acquisition of immunity to Hib with increasing age. Antibodies

to Hib capsular polysaccharide are protective. Acquisition of both anticapsular and serum bactericidal antibody is inversely related to the age-specific incidence of Hib disease. In the prevaccine era, most children acquired immunity by 5–6 years of age through asymptomatic infection by Hib bacteria. Since only a relatively small proportion of children carry Hib at any time, it has been postulated that exposure to organisms that share common antigenic structures with the capsule of Hib (so-called "cross-reacting organisms") may also stimulate the development of anticapsular antibodies against Hib. Natural exposure to Hib also induces antibodies to outer membrane proteins, lipopolysaccharides, and other antigens on the surface of the bacterium. The genetic constitution of the host may also be important in susceptibility to infection with Hib.

Clinical Features: Invasive disease caused by *H. influenzae* type b can affect many organ systems. The most common types of invasive disease are meningitis, epiglottitis, pneumonia, arthritis, and cellulitis. Meningitis is infection of the membranes covering the brain and is the most common clinical manifestation of invasive Hib disease, accounting for 50%–65% of cases in the prevaccine era. Hallmarks of Hib meningitis are fever, decreased mental status, and stiff neck (these symptoms also occur with meningitis caused by other bacteria). Hearing impairment or other neurologic sequelae occur in 15%–30% of the survivors. The case-fatality rate is 2%–5%, despite appropriate antimicrobial therapy. Epiglottitis is an infection and swelling of the epiglottis, the tissue in the throat that covers and protects the larynx during swallowing. Epiglottitis may cause life-threatening airway obstruction. Septic arthritis (joint infection), cellulitis (rapidly progressing skin infection which usually involves face, head, or neck), and pneumonia (which can be mild focal or severe empyema) are common manifestations of invasive disease. Osteomyelitis (bone infection) and pericarditis (infection of the sac covering the heart) are less common forms of invasive disease. strains accounting for only 5%–10% of *H. influenzae* causing otitis media. Nontypeable (unencapsulated) strains may cause invasive disease but are generally less virulent than encapsulated strains. Nontypeable strains are rare causes of serious infection among children but are a common cause of ear infections in children and bronchitis in adults.

Laboratory Diagnosis: A Gram stain of an infected body fluid may demonstrate small gram-negative coccobacilli suggestive of invasive *Haemophilus* disease. CSF, blood, pleural fluid, joint fluid, and middle ear aspirates should be cultured on appropriate media. A positive culture for *H. influenzae* establishes the diagnosis. All isolates of *H. influenzae* should be serotyped. This is an extremely important laboratory procedure that should be performed on every isolate of *H. influenzae*, especially those obtained from children younger than15 years of age. This test determines whether an isolate is type b, which is the only type that is potentially vaccine preventable.

Antigen detection may be used as an adjunct to culture, particularly in diagnosing *H. influenzae* infection in patients who have been partially treated with antimicrobial agents, in which case the organism may not be viable on culture. Two tests are available. Latex agglutination is a rapid, sensitive, and specific method to detect Hib capsular polysaccharide antigen in CSF, but a negative test does not exclude the diagnosis, and false-positive tests have been reported. .

Medical Management : Hospitalization is generally required for invasive Hib disease. Antimicrobial therapy with an effective third-generation cephalosporin (cefotaxime or ceftriaxone), or chloramphenicol in combination with ampicillin should be begun immediately. Children with life-threatening illness in which Hib may be the etiologic agent should not receive ampicillin alone as initial empiric therapy.

Epidemiology: **Occurrence:** Hib disease occurs worldwide. However, the incidence outside the United States and Europe has not been determined.

Reservoir: Humans (asymptomatic carriers) are the only known reservoir. Hib does not survive in the environment on inanimate surfaces.

Transmission: The primary mode of Hib transmission is presumably by respiratory droplet spread, although firm evidence for this mechanism is lacking.

Incubation period: Unknown;probably short, 2-4 days

Communicability: The contagious potential of invasive Hib disease is considered to be limited. However, certain circumstances, particularly close contact with a case-patient (e.g., household, child care, or institutional setting) can lead to outbreaks or direct secondary transmission of the disease.

Source: CDC National Immunization Program (NIP): Epidemiology and Prevention of Vaccine-Preventable Diseases -- NIP: Pubs/Pink Book/Epi. Prevention of VPD Course Textbook

Table 1: Vaccine-preventable Diseases & AFP

8th - 14th September 2007 (37th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Number of cases during same week in 2006	Total number of cases to date in 2007	Total number of cases to date in 2006	Difference between the number of cases to date between 2007 & 2006
	W	C	S	NE	NW	NC	U	Sab					
Acute Flaccid Paralysis	01 GA=1	00	00	00	00	00	00	00	01	03	62	89	-30.3%
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00.0%
Measles	00	00	00	00	00	00	00	00	00	00	49	29	+69.0%
Tetanus	00	00	00	00	00	00	00	00	00	02	26	35	-25.7%
Whooping Cough	00	00	00	00	00	00	00	00	00	01	32	65	-50.8%
Tuberculosis	36	31	112	70	20	29	15	37	350	120	7350	7256	+1.3%

Table 2: Diseases under Special Surveillance

8th - 14th September 2007 (37th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Number of cases during same week in 2006	Total number of cases to date in 2007	Total number of cases to date in 2006	Difference between the number of cases to date between 2007 & 2006
	W	C	S	NE	NW	NC	U	Sab					
DF/DHF*	75	07	13	06	25	07	08	18	159	208	3983	7510	-47.0%
Encephalitis	01 CB=1	00	01 HB=1	01 BT=1	00	00	00	00	03	01	151	92	+64.1%
Human Rabies	00	00	03 MT=3	00	00	01 AP=1	00	00	04	01	49	47	+4.3%

Table 3: Newly Introduced Notifiable Diseases

8th - 14th September 2007 (37th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Total number of cases to date in 2007
	W	C	S	NE	NW	NC	U	Sab		
Chickenpox	12	07	11	10	09	10	03	12	74	2457
Meningitis	01 C B=1	01 KD=1	01 GL=1	00	03 KR=3	00	02 BD=2	08 KG=5 RP=3	16	425
Mumps	11	04	08	55	12	10	01	04	105	1454

*DF / DHF refers to Dengue Fever / Dengue Haemorrhagic Fever.
NA= Not Available.

Sources:

Weekly Return of Communicable Diseases:
Diphtheria, Measles, Tetanus, Whooping Cough, Human Rabies, Dengue Haemorrhagic Fever, Japanese Encephalitis, Chickenpox, Meningitis, Mumps.

Special Surveillance:
Acute Flaccid Paralysis.

National Control Program for Tuberculosis and Chest Diseases:
Tuberculosis.

Details by districts are given in Table 5.

Provinces: W=Western, C=Central, S=Southern, NE=North & 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.

Table 4: Laboratory Surveillance of Dengue Fever

8th - 14th September 2007 (37th Week)

Samples	Number tested	Number positive *	Serotypes				
			D_1	D_2	D_3	D_4	Negative
Number for current week	06	00	00	00	00	00	00
Total number to date in 2007	410	42	01	21	12	00	07

Source: Genetech Molecular Diagnostics & School of Gene Technology, Colombo. * Not all positives are subjected to serotyping.

Table 5: Selected notifiable diseases reported by Medical Officers of Health

8th - 14th September 2007 (37th Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptos-pirosis		Typhus Fever		Viral Hepatitis		Returns Re-ceived Timely**
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	34	1070	02	283	01	09	01	56	01	56	05	105	00	03	03	110	**85**
Gampaha	28	454	00	272	00	22	02	57	00	45	02	165	00	14	03	155	**100**
Kalutara	13	266	05	371	00	04	01	37	01	32	06	86	00	01	02	51	**100**
Kandy	06	309	06	231	00	03	02	51	00	08	02	65	06	62	33	1820	**95**
Matale	01	81	09	164	00	06	02	19	00	12	01	42	00	05	03	117	**92**
Nuwara Eliya	00	35	00	208	00	02	01	103	00	368	00	08	00	30	07	469	**86**
Galle	05	72	02	132	00	09	00	18	01	37	07	44	00	24	00	15	**88**
Hambantota	03`	53	00	134	01	06	00	20	00	17	00	34	01	45	02	17	**100**
Matara	05	123	00	238	00	08	01	33	00	24	03	146	10	179	00	27	**94**
Jaffna	04	51	09	144	00	02	00	361	00	07	00	00	00	81	00	20	**88**
Kilinochchi	00	01	00	00	00	00	00	05	00	00	00	00	00	02	00	04	**00**
Mannar	00	07	00	15	00	00	00	65	00	00	01	02	00	00	00	11	**50**
Vavuniya	02	17	00	40	00	04	01	14	00	51	00	02	00	00	00	08	**100**
Mullaitivu	00	03	00	24	00	08	00	20	00	01	00	00	00	00	00	09	**60**
Batticaloa	00	72	00	445	01	09	01	18	00	10	00	00	00	22	22	921	**64**
Ampara	00	03	00	76	00	00	00	03	00	00	00	02	00	01	01	24	**71**
Trincomalee	00	54	06	195	00	03	00	23	00	23	00	09	00	13	01	99	**67**
Kurunegala	20	471	05	340	00	06	00	54	00	25	01	22	00	35	03	61	**89**
Puttalam	05	103	03	97	00	11	01	69	00	04	02	21	01	06	02	72	**100**
Anuradhapura	05	142	02	86	00	08	00	20	00	15	00	18	00	18	01	37	**68**
Polonnaruwa	02	53	04	72	00	02	01	10	00	04	01	20	00	00	05	35	**100**
Badulla	07	46	09	458	00	02	00	73	00	10	02	44	04	130	14	274	**87**
Monaragala	01	32	03	269	00	02	00	45	00	18	00	40	01	64	01	36	**70**
Ratnapura	11	281	13	451	00	16	01	55	00	17	02	51	00	22	02	79	**81**
Kegalle	07	184	08	230	00	08	01	40	00	04	01	85	03	31	12	168	**100**
Kalmunai	0	03	07	153	00	01	00	08	00	06	01	01	00	02	01	101	**77**
SRI LANKA	**159**	**3983**	**93**	**5128**	**03**	**151**	**19**	**1276**	**03**	**794**	**37**	**1008**	**26**	**790**	**118**	**4740**	**85**

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 22 September. 2007. Total number of reporting units =290. Number of reporting units data provided for the current week: 204

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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.

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