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From the Director...

Throughout its history, ICDDR,B has focused on health in Bangladesh from a global context. Research findings are disseminated internationally in scientific journals and at meetings. HSB is an initiative to more rapidly disseminate findings from surveillance, research and outbreak investigations to health providers, policy makers, public health professionals, and organizations at all levels.

Material presented in HSB is received from ICDDR,B staff and collaborating organizations. This information is presented in a news, rather than journal format. As such, the organizational source is credited rather than individual authors, but the work is dependent upon the dedication and skill of many people. We also accredit the Centre's donors whose sustained support and vision make our work possible.

We are grateful to the Canadian International Development Agency (CIDA) for supporting the publication of this Bulletin for the upcoming year. Initially, HSB will be published quarterly, but if conditions warrant, issues will be published more frequently. HSB will be accessible on the Internet at www.icddrb.org.

We appreciate your feedback on the value of HSB and ways that it could better serve you and your organization's needs. Survey forms will be provided in future issues and on the Internet.

I hope you enjoy the HSB and that it becomes a valuable resource for you.

Prof. David. A. Sack

Dengue Illnesses in Hospitalized Patients in Dhaka, 2001

In 2001, ICDDR,B established surveillance at two major Dhaka hospitals to define characteristics of dengue fever. In addition to fever, key clinical features were nausea and vomiting, headache, myalgias, bleeding manifestations, bone or joint pain and skin rash. Incidence of dengue increased with socioeconomic status, but mortality was highest among the poor and uneducated and may be related to delay in access to timely health care.

Epidemic dengue fever and dengue haemorrhagic fever (DHF) became recognized in Bangladesh during the summer of 2000. Surveillance was established by ICDDR,B at Dhaka Medical College Hospital and Holy Family Red Crescent Hospital in Dhaka to define characteristics of dengue illness. Clinical and epidemiologic information and blood specimens were collected systematically from patients hospitalized with fever and clinical suspicion of dengue. Serum specimens were assessed for presence of dengue antibody by IgG and IgM capture ELISA (1). In addition, sera collected during the first 5 days of illness were processed for presence of dengue virus ribonucleic acid (RNA) by reverse-transcriptase polymerase chain reaction (RT-PCR) (2).

Of 1297 patients evaluated for possible dengue during 2001, 935 (72.1%) had laboratory confirmation of dengue infection; 73.9% of dengue-confirmed cases were male. Mean age was 27.5 years (range 1–90 years; median = 25 years). Peak incidence of dengue occurred during August through November; the highest incidence was in October (Fig 1). Eleven (1.2%) dengue-confirmed patients died. Among the serologically confirmed dengue patients, 77.3% had an antibody pattern (IgM/IgG ratio <1.8) suggesting that there had been at least one previous exposure to dengue viruses and 22.7% had an antibody

Figure 1: Dengue hospitalizations at DMCH and HFRCH, by month of onset during 2001

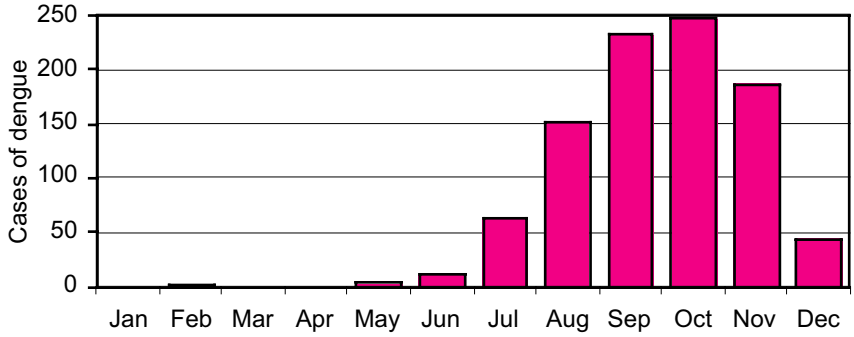

Table 1: Symptoms commonly experienced by hospitalized patients with dengue (N=935)

Symptom	Number (%)
Fever	935 (100%)
Nausea	896 (95.8%)
Headache	843 (91.2%)
Severe	662 (70.8%)
Myalgia	833 (89.1%)
Vomiting	777 (83.1%)
Bleeding manifestation (from at least one site)	720 (77%)
Melaena	482 (51.6%)
Gum bleeding	331 (35.4%)
Subconjunctival haemorrhage	297 (31.8%)
Haematemesis	143 (15.3%)
Epistaxis	51 (5.5%)
Skin rash	576 (61.6%)
Petechial rash	348 (37.2%)
Bone or joint pain	507 (54.2%)
Diarrhoea	334 (35.8%)
Pruritis	202 (21.6%)

pattern suggesting that this was the first dengue infection (3). Six patients had dengue RNA detected by RT-PCR (among 55 tested); 5 were dengue virus serotype 3 and 1 was dengue virus serotype 2.

Clinical data were collected only once for each patient, close to the time of admission, so information on evolution of signs and symptoms are not available from this surveillance period. In addition to fever which was universal, most commonly experienced symptoms included nausea, headache, myalgia, vomiting, any skin rash, petechial rash, arthralgia or bone pain, melaena/black tarry stools, abdominal pain, severe weakness, gum bleeding, and subconjunctival haemorrhage (Table 1).

A positive tourniquet test (>20 petechiae per square inch in the antecubital fossa, following five minutes of inflation of the blood pressure cuff midway between systolic and diastolic blood pressures) was present on admission in 698 (74.7%) of patients with dengue. Pulse pressure was ≤30 mm Hg among 40.8% of patients and ≤20 mm Hg among 9.2% of patients on admission; 15.5% of patients had systolic blood pressure ≤90 mm Hg.

When compared with the 362 hospitalized patients in whom laboratory tests for dengue were negative, dengue patients were more likely to have experienced pruritis, gum bleeding, any skin rash, petechial skin rash, nausea, arthralgias, and melaena. Dengue patients were less likely to have rhinitis, jaundice, disorientation, and restlessness.

Tourniquet test was positive on admission in 74.7% of dengue confirmed patients compared with 38.9% of patients without laboratory confirmation of dengue (RR=2.98;95% CI=2.49-3.58).

Table 2: Socioeconomic parameters for patients with laboratory-confirmed dengue and patients initially suspected to have dengue for whom laboratory tests for dengue were negative

	Dengue cases (n=935) %	Non-dengue cases (n=362) %	Relative Risk	95% CI*	p value**
Achieved higher than primary education	75.6%	63.9%	1.18	1.18-1.29	<0.001
Income >6000 taka/month	59.7%	49.3%	1.13	1.05-1.21	<0.001

* 95% confidence interval indicates that there is a 95% probability that the true relatrive risk is within the range shown. A comparison is considered statistically significant if the confidence interval does not overlap 1.0.

** p value. A p value is a statistical test that considers the likelihood that a difference between two observation is due to chance. In most cases, a p value of <0.05 is considered statistically significant. A p value of <0.05 means that there is < than a 5% chance that the differences observed are due to chance. A p value of <0.001 means that there is < 1 in 1000 chance that the differences are due to chance.

Dengue patients had higher monthly incomes and education levels compared with the 362 patients without laboratory confirmation of dengue (Table 2). In contrast, death was much more likely to occur among dengue patients with income <6000 taka/month (2.5%) than among dengue patients with higher incomes ≥6000 taka/month (0.4%) (RR=6.67;95% CI=1.45-30.7). All 11 deaths occurred among dengue patients with no education or no greater than primary education (p<0.0001, when compared with dengue patients with more education).

For patients with income <6000 taka/month, 47.2% had >5 days of fever before hospitalization compared with 30.8% among dengue patients with income ≥6000 taka/month (RR=1.53;95% CI=1.3-1.8). Likewise, duration of fever before hospitalization was longer for those with less education. For dengue patients with no more than primary education, 45.8% had >5 days of fever before hospitalization compared with 34.8% among dengue patients with more education (RR=1.32;95% CI=1.11-1.57).

Reported by Dhaka Medical College Hospital, Holy Family Red Crescent Hospital, Health Systems and Infectious Diseases Division (HSID), Laboratory Sciences Division (LSD) and Clinical Sciences Division (CSD), ICDDR,B

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Comments

Dengue has emerged as a serious problem in Bangladesh. The Directorate General for Health Services of the Ministry of Health and Family Welfare is reporting cases from urban and semi-urban areas around the country.

Serological evidence of previous exposure to dengue suggests that while dengue was recently recognized in the country, dengue viruses have likely been circulating, at least sporadically, for a prolonged period in Dhaka.

In adults, disease incidence appears to be highest among those relatively young. This surveillance was focused primarily among adult hospital wards, so it is not possible to reach conclusions about relative impact of dengue in adults versus children.

The findings of this report suggest that while incidence of dengue illness may increase with socioeconomic status, the risk of death is greatest for the poorest of the poor. Impoverished and poorly educated people with dengue take longer to become hospitalized than others. Delay in hospitalization may contribute to mortality since careful fluid management is the most important factor for determining survival in DHF (4,5). The precise cause for the delay in hospitalization has not been defined; considerations include inequities in knowledge about dengue and its complications and in access to medical care, differences in health seeking behaviour, and a variety of economic/ financial considerations. Socio-behavioural and economic investigations may be helpful in identifying barriers to optimal medical care. In the meantime, efforts are needed to encourage more rapid assessment and therapy of impoverished patients with dengue-like symptoms.

The findings of this surveillance also suggest that key clinical features like a positive tourniquet test and presence of petechial rash, pruritis, gum bleeding, nausea, and arthralgias along with absence of rhinitis and jaundice may differentiate dengue illness from other serious febrile illness which occur in Dhaka, particularly during July through November when the disease appears to peak. The utility of the comparison is limited by the sensitivity of MAC-EIA for dengue illness which is estimated to be about 90% (6) indicating that it is likely that some of the patients without laboratory confirmation of dengue infection indeed had dengue. Also, some patients may have developed other symptoms or signs following the date of admission (which is when all of our clinical data, except mortality, were collected). In addition, we do not know what other aetiologies were responsible for most of the illnesses not confirmed to be dengue. Thus, signs and symptoms which differentiated dengue from other similar illnesses in hospitalized patients in Dhaka in 2001 may not be useful during other years or in other geographical settings. Confirmation of these findings is needed, as identifying discriminating clinical features would be helpful for targeting appropriate diagnostic tests and therapy in settings where resources are very limited, as is often the case in Bangladesh. Laboratory investigations of dengue negative hospitalized febrile patients are needed to identify other aetiologies for serious febrile illness which may be confused with dengue.

References

1. Vaughn DW, Nisalak A, Solomon T, et al. Rapid serological diagnosis of dengue virus infection using a commercial capture ELISA that distinguishes primary and secondary infections. *Am J Trop Med Hyg* 1999;60(4):693–8.

2. Lanciotti RS, Calisher CH, Gubler DJ, et al. Rapid detection and typing of dengue viruses from clinical samples by using reverse transcriptase polymerase chain reaction. *J Clin Microbiol* 1992;30(3):545–51.

3. Innis BL, Nisalak A, Nimmannitya S, et al. An enzyme-linked immunosorbent assay to characterize dengue infections where dengue and Japanese encephalitis co-circulate. *Am J Trop Med Hyg* 1989;40(4):418–27.

4. Libraty DH, Endy TP, Kalayanarooj S, et al. Assessment of body fluid compartment volumes by multifrequency bioelectrical impedance spectroscopy in children with dengue. *Trans R Soc Trop Med Hyg* 2002;96(3):295–9.

5. Halstead SB, O'Rourke EJ. Editorial response: Resuscitation of patients with dengue hemorrhagic fever/dengue shock syndrome. *Clin Infect Dis* 1999;29(4):795–6.

6. Kit Lam S, Lan Ew C, Mitchell JL, et al. Evaluation of a capture screening enzyme-linked immunosorbent assay for combined determination of immunoglobulin M and G antibodies produced during dengue infection. *Clin Diagn Lab Immunol* 2000;7(5):850–2.

Surveillance for Multidrug Resistant *Mycobacterium tuberculosis*, 2001–2002

ICDDR,B has established surveillance for tuberculosis (TB) in urban Dhaka and rural Matlab to characterize the epidemiology of TB and drug susceptibility patterns. There was a higher isolation of acid-fast bacilli (AFB) in men with a predominance in the >25 years of age group. Diagnostic bias may have contributed to the gender imbalance. Multi-drug resistance (isoniazid and rifampicin) was particularly common among patients with TB who had already received at least one month of anti-tuberculosis therapy. Acquired resistance may be due to poor compliance suggesting the need for sustained, active, directly observed treatment to prevent persistent transmission of multi-resistant strains.

Recently ICDDR,B has initiated a tuberculosis surveillance system in a rural area and in urban Dhaka, to characterize the epidemiology of tuberculosis and its drug susceptibility patterns. With the assistance of a variety of donors, including Unocal and USAID, ICDDR,B has established quality controlled laboratories meeting biological safety standards for isolation of *Mycobacterium tuberculosis* at Shyamoli Tuberculosis Clinic in the Mirpur area of Dhaka and at ICDDR,B.

Surveillance is being conducted at Matlab where ICDDR,B maintains an intensive health and demographic surveillance system (HDSS) in a defined population of about 106,000. A community health research worker (CHRW) visits all households in the HDSS area monthly. A possible case of TB is defined as a person with cough >21 days. On each visit, the CHRW inquires if any member of the household ≥15 years of age has had cough >21 days. Sociodemographic data are collected from possible cases, as well as information on previous treatment for tuberculosis (if any), contact with tuberculosis patients, BCG vaccination status, and current symptoms. Field workers refer all possible cases to Matlab Thana Health Complex for examination of sputum for acid-fast bacilli (AFB). AFB-positive sputum specimens from Matlab are transported to the Shyamoli clinic in Dhaka for culture and susceptibility tests

In addition to population-based surveillance for TB in Matlab, antimicrobial resistance patterns of *M. tuberculosis* have been monitored at Shyamoli TB Clinic since July 2001. All sputum AFB-positive specimens from Matlab and the first three AFB-positive specimens daily from Shyamoli are cultured for *Mycobacteria.* All mycobacterial isolates undergo drug susceptibility testing, using conventional methods (1).

Between July and October, 2001 trained field workers interviewed 57,726 (85%) persons aged >15 years living in the intervention area of Matlab HDSS to detect possible cases of tuberculosis. The prevalence of "possible TB" was 7%; a higher proportion of males (9.1%) than females (5.6%) reported cough >21 days ($p<0.0001$). The highest proportion was observed among persons aged ≥45 years (11.3%) and lowest among 15-24 year olds (3.4%).

At Matlab, 2,524 sputum samples were examined microscopically for AFB; AFB were seen in 45 (1.8%) (Table 1). AFB positive smears were more

Table 1: Age and sex distribution of AFB positive cases, Matlab

Age (years)	Sex				Total	
	Male		Female			
	Tested	Sputum positive	Tested	Sputum positive	Tested	Sputum positive
15-24	149	3 (2.0)	121	3 (2.5)	270	6 (2.2)
25-34	143	4 (2.8)	172	1 (0.6)	315	5 (1.6)
35-44	228	8 (3.5)	292	2 (0.7)	520	10 (1.9)
>45	826	20 (2.4)	593	4 (0.7)	1,419	24 (1.7)
All	1,346	35 (2.6)*	1,178	10 (0.8)*	2,524	45 (1.8)

* $p<0.01$ (when comparing data from males with those from females)

Table 2: Age and sex distribution of culture positive cases, Dhaka and Matlab

Age (years)	Male (%)	Female (%)	To t a l
15-24	26 (41.9)	36 (58.1)	62
25-34	24 (70.6)	10 (29.4)	34
35-44	30 (93.8)	2 (6.2)	32
>45	30 ((90.9)	3 (9.1)	33
To t a l	110 (68.3)	51 (31.7)	161

common among males (2.6%) when compared with females (0.8%) ($p<0.05$). The highest proportion of positive specimens were among males 35-44 years of age (Table 1).

Up to 15 October, 161 *M. tuberculosis* isolates (152 from Shyamoli and 9 from Matlab) have been tested for drug susceptibility. More than two-thirds of culture positive cases were in males; however, among 15-24 year olds, the majority of cases were in females (Table 2). Sixty percent of all culture positive cases were in people <35 years of age.

Resistance to streptomycin, isoniazid, ethambutol and rifampicin was observed in 45.3%, 17.4%, 9.9% and 7.4%, respectively. Multidrug resistance, defined as resistance to both isoniazid and rifampicin, was observed in 6.8% of isolates (Table 3). However, among 32 patients who had relapsing or persistent disease following at least one month of anti-tuberculosis treatment, 37.5% had isolates which showed resistance to INH, including 15.6% with multidrug resistance.

Table 3: Antimicrobial resistance patterns of 161 M. tuberculosis isolates

Drugs	Resistance type		Total
	Primary (N=129)	Acquired *(N=32)	(N=161)
Streptomycin	56 (43.4)	17 (53.1)	73 (45.3)
Isoniazid (INH)	16 (12.4)	12 (37.5)	28 (17.4)
Ethambutol	9 (7.0)	7 (21.9)	16 (9.9)
Rifampicin	7 (5.4)	5 (15.6)	12 (7.4)
MDR (INH+Rifampicin)	6 (4.7)	5 (15.6)	11 (6.8)
Any drug	59 (45.7)	19 (59.4)	78 (48.4)

( ) column percentages

* Antituberculous drugs received for 1 month or more

Reported by Shyamoli Chest Clinic, Matlab Thana Health Complex, Child Health Unit, and Matlab Health Research Centre, Public Health Sciences Division (PHSD) and Mycobacteriology Laboratory, Laboratory Sciences Division (LSD), ICDDR,B.

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Comment

Tuberculosis remains a leading cause of morbidity and mortality in developing countries. In Bangladesh, tuberculosis is considered a major public health problem; however there is a scarcity of epidemiological data (incidence, prevalence, age distribution, transmission patterns, antimicrobial resistance). A recent analysis by the World Health Organization indicated that Bangladesh ranked fifth in tuberculosis disease burden in the world, after India, China,

Indonesia and Nigeria (2). In Bangladesh about 300,000 new cases of TB are estimated to occur annually with 70,000 deaths (3).

Findings of this preliminary report suggest that while drug resistant *M. tuberculosis* strains are present in Bangladesh, most cases can be effectively treated with INH and rifampicin. With good clinical follow-up, other antimicrobials may be needed for cases which do not respond well or which relapse following a therapeutic course. Further evaluation will be needed to explain the high proportion of streptomycin resistant *M. tuberculosis* observed, since streptomycin is not recommended currently for use in uncomplicated tuberculosis, and the drug is not widely available in Bangladesh.

The male predominance for persistent cough and for AFB positive sputum is consistent with data from other countries and could reflect occupational, behavioural or immunologic components of risk (4-6). However, the explanation may be more related to gender inequities and diagnostic bias. One study in Bangladesh suggested that woman have less access to public clinics, and that they are less likely to undergo sputum smear examination when they present with chronic cough (7). The authors of the Bangladeshi study hypothesized that women might give poorer quality specimens than men which would be less likely to reveal AFB (7). Studies from Viet Nam and Zambia have also suggested that gender differences in diagnosis reflect inequities in health care (8,9). Closer evaluation of risk factors for tuberculosis in Bangladesh may suggest strategies for prevention (education and behaviour modification) and for targeted diagnosis and treatment.

Directly observed treatment, short course (DOTS) has been shown to be >80% effective in treating TB; however, fewer than 30% of patients with active tuberculosis receive DOTS (2). Incomplete therapy results in persistent transmission and promotes spread of drug-resistant strains. This may be responsible for the higher levels of drug resistance and multidrug resistance observed in many patients with persistent disease. Reduction of inequities and improved access and use of health care facilities with enhanced capacity for diagnosis of tuberculosis are urgently needed for patients with chronic cough and possible tuberculosis.

References

1. Isenberg HD. Essential procedures for clinical microbiology. Washington, DC: ASM Press, 1998. 838 p.

2. World Health Organization. Global tuberculosis control : surveillance, planning, financing. Geneva: World Health Organization, 2002. 227 p. (WHO/CDS/TB/2002.295).

3. Hoque S. The National Tuberculosis Control Programme. *Bangladesh Med Res Counc Bull* 1999;25(3): 55-70.

4. Hudelson P. Gender differentials in tuberculosis: the role of socio-economic and cultural factors. *Tuber Lung Dis* 1996;77(5):391–400.

5. Borgdorff MW, Nagelkerke NJ, Dye C, Nunn P. Gender and tuberculosis: a comparison of prevalence surveys with notification data to explore sex differences in case detection. *Int J Tuberc Lung Dis* 2000;4(2):123–32.

6. Yamasaki-Nakagawa M, Ozasa K, Yamada N, et al. Gender difference in delays to diagnosis and health care seeking behaviour in a rural area of Nepal. *Int J Tuberc Lung Dis* 2001;5(1):24–31.

7. Begum V, de Colombani P, Das Gupta S, et al. Tuberculosis and patient gender in Bangladesh : sex differences in diagnosis and treatment outcome. *Int J Tuberc Lung Dis* 2001;5(7):604–10.

8. Thorson A, Diwan VK. Gender inequalities in tuberculosis: aspects of infection, notification rates, and compliance. *Curr Opin Pulm Med* 2001;7(3):165–9.

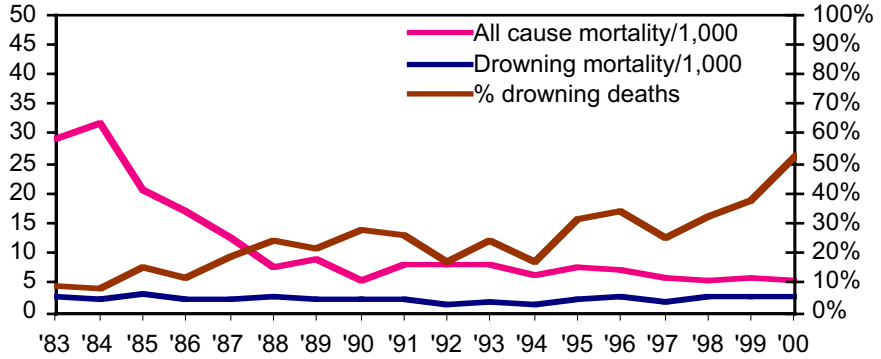
9. Needham DM, Foster SD, Tomlinson G, Godfrey-Faussett P. Socio-economic, gender and health services factors affecting diagnostic delay for tuberculosis patients in urban Zambia. *Trop Med Int Health* 2001;6(4):256–9.

The Emergence of Drowning as a Principal Cause of Childhood Death in Bangladesh

Child mortality rates from infectious diseases in under-five years old children in Bangladesh have declined dramatically. As a result, drowning deaths, which have not declined, now account for over half the number of deaths in children 1–4 years old in Matlab. Interventions to address both prevention and management of drowning warrant urgent attention.

The ICDDR,B health and demographic surveillance system in Matlab shows that while all cause mortality has dropped dramatically since the early 1980s, largely related to reduction in deaths from infectious diseases, deaths from drowning (Figure 1) remained stable at around 2 deaths per 1000 children (1–4 years old) per year (1). As a result, the proportion of deaths attributable to drowning increased from 9% of all deaths among 1 to 4 year old children in 1983 to 53% in 2000. Drowning deaths in Matlab were most common among 12–23 month old children. The peak period for drowning appears to be to April to October when 82% of drowning deaths occurred (1). The rates of drowning are similar for boys and girls, 1 to 4 years of age (though a higher proportion of deaths in boys are due to drowning, since girls have a 1.7 fold higher overall mortality rate than boys). Sixty-one percent of drowning deaths occurred before noontime, when mothers were likely busy with housework; 66% of deaths occurred within neighbouring ponds and ditches. At least one parent was at home at the time of 88% of drownings.

Figure 1: Trends in drowning deaths in 1–4 year-old children in Matlab, 1983–2000



Reported by: Child Health Unit and Health and Demographic Surveillance Unit, Public Health Sciences Division (PHSD), ICDDR,B.

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Comment

Recent years have seen an impressive decline in child mortality in Bangladesh with under-5 mortality rates declining to 94 per 1,000 live births. This is attributable to success in reducing deaths from infectious diseases. However, as a consequence of this, drowning has now become increasingly predominant. In a national cause-of-death verbal autopsy survey for childhood deaths conducted as a follow-on to the 1996–97 Bangladesh Demographic and Health Survey, drowning was responsible for 6% of all under-5 childhood deaths in 1992–96. However, among children aged 1–4 years, drowning was responsible for 20% of childhood deaths in the country (2). During the same period, the proportion of deaths attributed to drowning was 25% in Matlab. The findings from this study suggest that the proportion of deaths attributable to drowning has continued to increase so that drowning accounted for more than half of deaths among 1–4 year old children in 2000. Drowning is primarily a rural problem. More than half of the urban-rural differences in mortality among 1–4 year olds appears to be accountable to differences in rates of drowning deaths. Drowning is particularly frequent during the rainy season, when water levels are high and collections of water are closest to house premises.

The contribution of childhood drowning to mortality and morbidity in Bangladesh will likely continue to grow in the future. Interventions aimed at reducing mortality and morbidity from childhood drowning need to focus on both prevention and management. Targeting drowning as a public health priority will require shifts in routine strategies and evaluation of novel or

traditional approaches. Traditional approaches which may need to be re-evaluated and promoted include placing bells around the waist of toddlers and establishing toddler-proof barriers (3,4) around ponds and areas where water collects during heavy rain. Initial explorations in the community suggest that development and introduction of interventions, including those to increase awareness of the problem may be feasible. Caretakers need to identify a specific person to look after toddlers during hours when the mother is busy with cooking and other household work. Training in resuscitation techniques should also be evaluated as a strategy to reduce deaths by drowning. One hurdle is to assure that parents and communities, health workers, programme managers, health professionals and policy makers recognize drowning as a public health problem.

References

1. Ahmed MK, Rahman M, van Ginneken J. Epidemiology of child deaths due to drowning in Matlab, Bangladesh. *Int J Epidem* 1999;28:306–311.

2. Baqui AH, Sabir AA, Begum N, et al. Causes of childhood deaths in Bangladesh: an update. *Acta Paediatr* 2001;90:682–90.

3. Blum C, Shield J. Toddler drowning in domestic swimming pools. *Inj Prev* 2000;6:288–90.

4. Fergusson DM, Horwood LJ. Risks of drowning in fenced and unfenced domestic swimming pools. *NZ Med J* 184;97:777–779.

Trends in Aetiologies for Diarrhoeal Diseases, Dhaka

Surveillance for aetiologies of diarrhoea at the Dhaka hospital of ICDDR,B has been in place since 1979 to identify trends in isolation and antimicrobial susceptibility patterns to common isolates, and to detect emergence of new pathogens and re emergence of traditional pathogens as well as outbreaks. Through this system pathogens can be identified in about 80% of cases. A third of cases present with multiple pathogens. The three most common pathogens identified are *V. cholerae*, rotavirus and ETEC. A combination vaccine to immunize children < 5 years of age against these three pathogens would prevent two-thirds of diarrhoea hospitalizations.

Surveillance for aetiology of diarrhoeal diseases presenting at ICDDR,B hospital in Dhaka is ongoing since 1979. While aetiologic surveillance is also ongoing at ICDDR,B's Matlab hospital, the focus of this report is on data from surveillance in Dhaka.

Diarrhoeal stool is cultured from every 50th patient who presents at ICDDR,B. This 2% sample results in more than 2,000 diarrhoeal specimens cultured annually including a mean of >1300 specimens from children <5 years of

Table 1: Aetiology of diarrhoea: Surveillance 1996–2001

Aetiology Pathogen Identified	All patients (n=13984)		<5 years old (n=8021)	
V. cholerae O1	20.0		12.1	
V. cholerae O139	2.9		0.6	
Shigella	6.0		5.6	
Shig. dys 1		0.3		0.4
Shig. flexneri		3.5		3.2
Shig. dys 2-10		0.5		0.3
Shig. boydii		1.1		0.9
Shig. sonnei		0.6		0.8
Rotavirus	23.7		37.9	
E. coli	34.9		43.6	
Enterotoxigenic		12.7		14.4
Enteropathogenic		8.1		11.5
Enteroaggregative		6.9		9.4
Diffuse Adherent		7.2		8.3
Campylobacter	9.5		11.0	
Salmonella	2.0		1.6	
E. histolytica	1.2		0.3	
Giardia lamblia	1.6		0.8	
Cryptosporidium	0.7		1.1	
No pathogen identified	19.6		17.5	
Mixed pathogen	31.6		36.0	

age. Stools are cultured for a variety of bacterial pathogens, tested for rotavirus, and evaluated for parasitic pathogens by a variety of methods (1).

From 1996 through 2001, among nearly 14,000 stool specimens evaluated, rotavirus (23.7%), *Vibrio cholerae* (22.9%) and a variety of types of *Escherichia coli* (34.9%), were responsible for 81.5% of episodes (Table 1). Among children <5 years of age (from >8,000 stools tested), rotavirus was responsible for 37.9% of cases (Table 1).

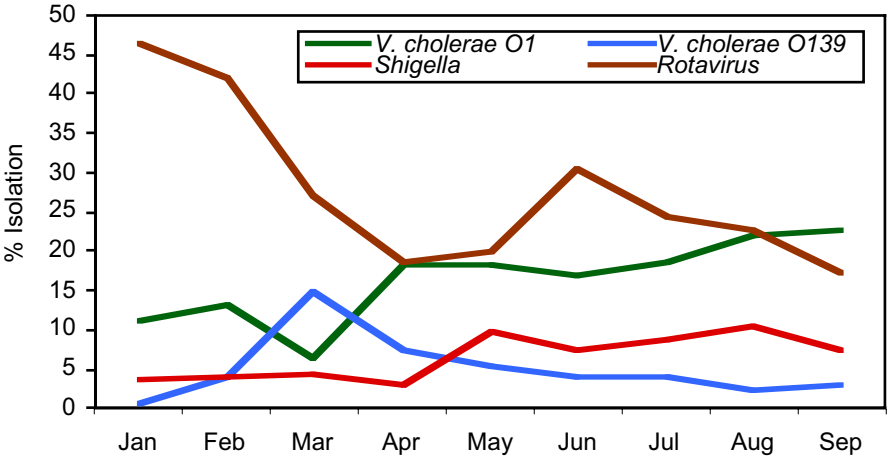
Monthly surveillance during 2002 showed that *V. cholerae* O139 clustered during March and *V. cholerae* O1 rose steadily during the summer months, coinciding with the rainy season. While rotavirus was particularly prevalent during the early months of 2002, *V. cholerae* is dominant during the late summer months into September (Figure 1).

Drug susceptibility testing shows that thus far in 2002, 100% of *V. cholerae* are susceptible to tetracyclines and to erythromycin (Table 2).

Among 92 *Shigella* isolates tested in 2002, approximately 50% are susceptible to nalidixic acid, ampicillin and cotrimoxazole (TMP-SMX), and 100% are susceptible to mecillinam and to ciprofloxacin (based on existing breakpoints established by the National Committee on Clinical Laboratory Standards [NCCLS]) (Table 3).

Monitoring drug susceptibility for *Shigella* isolates over time has revealed steadily decreasing susceptibility to nalidixic acid (Figure 2).

Figure 1: Monthly isolations of V. cholerae O1, V. cholerae O139, Shigella and Rotavirus, January–September 2002



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Comment

The objective of diarrhoeal disease surveillance in Dhaka is to detect emergence of new pathogens and re-emergence of traditional pathogens, as well as outbreaks of diarrhoeal disease. In addition, the surveillance makes it possible to monitor changes in antimicrobial susceptibility patterns for use in guiding treatment strategies. The information is used also to identify knowledge gaps and research priorities.

Table 2: Antimicrobial susceptibility of Vibrio cholerae isolated from diarrhoea surveillance (January–August, 2002)

***V. cholerae O1* (n=225)**	
Tetracycline	100%
Erythromycin	100%
TMP-SMX*	0.4%
Ciprofloxacin	100%
V. cholerae O139 (n=81)	
Tetracycline	100%
Erythromycin	100%
TMP-SMX*	100%
Ciprofloxacin	100%

*Trimethoprim-sulphamethoxazole (Cotrimoxazole) (TMP-SMX)

Updated diarrhoea aetiology and antimicrobial susceptibility data from this surveillance will be provided with each issue of the *Health and Science Bulletin*. This information should be available on an ongoing basis to health care professionals, so that they can provide the most optimal management of diarrhoeal diseases. Continuously updated and easily accessible data may also be helpful to health care leaders who provide treatment recommendations and strategies.

Figure 2: Antimicrobial susceptibility of Shigella ,1994–2002

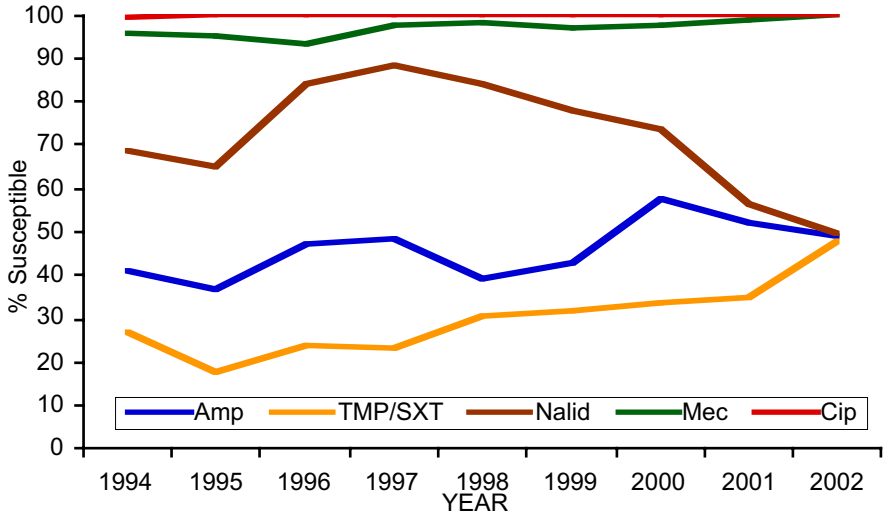

Table 3: Susceptibility of Shigella isolates from diarrhoea surveillance to commonly used antimicrobial drugs January–August, 2002 (n=92 isolates)

Nalidixic acid (Nalid)	50%
Mecillinam (Mec)	100%
Ampicillin (Amp)	48.9%
Trimethoprim-sulphamethoxazole (Cotrimoxazole) (TMP-SMX)	47.8%
Ciprofloxacin (Cip)	100%

Surveillance reveals the key importance of three pathogens for which vaccines are either currently available (*V. cholerae* O1) or under advanced development (rotavirus, ETEC, and new generation *V. cholerae* O1 and O139 vaccines). A combination of vaccines which immunize against these three pathogens would prevent 64% of hospitalizations due to diarrhoea among children <5 years of old, according to these surveillance data.

Decreasing susceptibility of *Shigella* isolates to nalidixic acid has occurred in Dhaka since 1997. While *Shigella* isolates appear to be routinely susceptible to ciprofloxacin, at the moment, resistance may develop over time, like with nalidixic acid. A low threshold should be maintained for changing therapy for shigellosis when the patient does not respond to ciprofloxacin therapy.

Reference

1. Stoll BJ, Glass RI, Huq MI, et al. Surveillance of patients attending a diarrhoeal disease hospital in Bangladesh. *Br Med J (Clin Res Ed)* 1982 Oct 23;285(6349):1185–8.

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