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Inside

First identified outbreak of Chikungunya in Bangladesh, 2008

During December 2008, an investigation team from the Institute of Epidemiology, Disease Control and Research (IEDCR) and ICDDR,B investigated the first outbreak of Chikungunya fever, a viral mosquito borne disease, in Rajshahi and Chapianawabganj districts of Bangladesh. We identified 39 case patients with no fatalities. Case-patients (74%) still continued to suffer from incapacitating joint pain one to two months after recovering from the infection. Dissemination of health awareness messages about mosquito control may prevent future outbreaks. Establishing syndromic surveillance for the disease, supported by prompt laboratory investigation, could help in guiding prevention and control strategies in areas with high incidence rates.

Chikungunya is a viral mosquito borne disease caused by the Chikungunya virus, a type of Alpha virus. *Aedes aegypti* and *Aedes albopictus* mosquitoes are the main vectors of Chikungunya in Asia and the Indian Ocean islands (1). Chikungunya infection is characterized by sudden onset of fever, incapacitating multiple

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joint pain involving mainly the ankle, wrist and phalanges but may also involve large joints. Occasional joint swelling and maculopapular skin rash or localized petechiae is also seen in 40-50% of patients (1). The word 'Chikungunya' means "to walk bent over" in some East African languages indicating the severe arthalgia experienced by persons with the disease (1). Severe arthralgia distinguishes Chikungunya from dengue infection which otherwise has the same vector and symptoms (1). Treatment of Chikungunya fever is symptomatic and use of non-salicylate analgesics and non-steroidal anti-inflammatory drugs to alleviate joint pain is recommended (1).

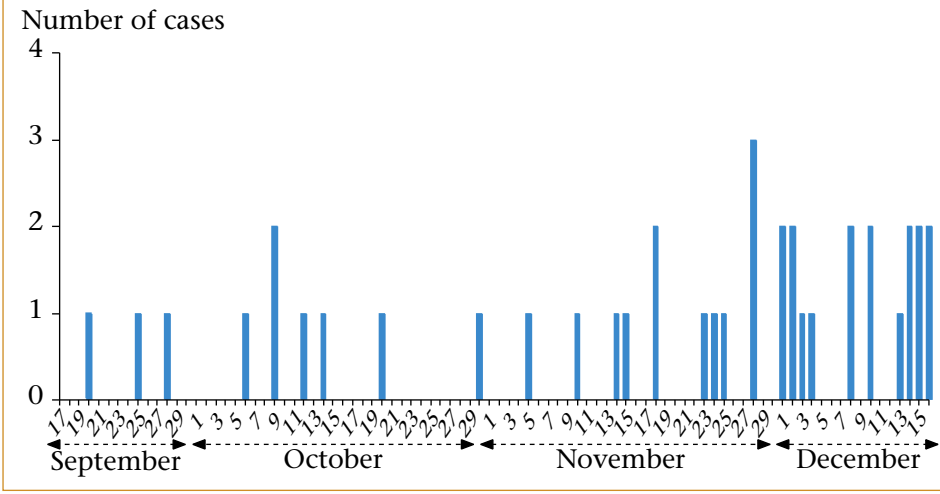
The first Chikungunya epidemic was recorded in Tanzania in 1952 and since then Chikungunya has been reported in Burma, Thailand, Cambodia, Vietnam, India, Sri Lanka, Indonesia, West Africa and the Philippines (1). In India, Chikungunya was first reported during an outbreak in Kolkata during 1963 with several more outbreaks occurring in different parts of the country until 1971. Chikungunya did not re-emerge as a public health problem again until several districts of Andhra Pradesh and Karnataka reported large numbers of Chikungunya cases during 2005-2006 (2). In 2006, this increase in the incidence of Chikungunya in India prompted testing of serum samples collected from febrile patients from two different surveillance projects in Dhaka city. One hundred sevety-five serum samples were tested and none tested positive for antibody against Chikungunya virus (3).

On 18 December 2008, the Civil Surgeon of Rajshahi district sent a line list of case-patients and a brief report of increased incidence of fever and joint pain among residents of a village of Poba Upazila (sub-district) to the Director of the Institute of Epidemiology, Disease Control and Research (IEDCR) at the Ministry of Health and Family Welfare. A joint investigating team from IEDCR and ICDDR,B went to Rajshahi district on 20 December 2008 to identify the aetiology of the outbreak, including the associated environmental factors. We interviewed all the case-patients from the line list sent by the local health authority, to collect information on illness onset, disease symptoms, treatment history, and travel history. We searched for other cases by asking case-patients if they were aware of any of their neighbours suffering from a similar illness. We also visited houses neighbouring case-patients from the line list to identify active cases suffering from fever with joint pain during the time of investigation. We collected blood samples from the case-patients centrifuged in the field and carried them to IEDCR on ice. If more than one case-patient was identified from one household, we collected a blood sample from only one randomly selected case-patient in that household.

We identified 32 case-patients who resided in 'Block' A of Bashontopur village of Poba upazila in Rajshahi district. Patient WX (a 36 year old

female), the first case interviewed in 'Block A', reported illness onset on 14 October 2008, when she returned home after visiting her parents' house in 'Block B' of Baroghoria village of sadar upazila of Chapainawabganj district where she celebrated *Durga Puja* (the biggest religious festival celebrated by Bengali Hindus on 9 October 2008). Five of her family members in her parent's house were suffering from fever with excruciating joint pain. Another case-patient from 'Block A' had also visited the same area in Chapainawabganj during *Durga Puja*. He returned on 15 October 2008 with fever and joint pain. Subsequently during October and December the disease spread sporadically to many people in 'Block A' (Figure 1).

Figure1: Distribution of cases (n=39) by date of onset of illness in Bashontopur village of Rajshahi district and Baroghoria village of Chapainawabganj district, September-December 2008



The team then went to 'Block B' of Baroghoria village of sadar upazila in Chapainawabganj district to visit patient WX's parent's house where we identified 7 case patients. In 'Block B', patient YZ (brother of patient WX) informed us that he was the first one to develop fever with severe joint pain in that area on the 20 September 2008. His wife, two children, and his brother subsequently developed illness within 20 days of his illness onset. Though we do not have the exact number of households affected, patient YZ informed us that several families in their area were affected by similar symptoms of fever with joint pain. We did not find any case-patient suffering from fever with joint pain in either of the two districts during our investigation, however.

Case-patients in the affected areas were largely Hindus (87%) and the majority of the case-patients (64%) were potters. The mean age of case

patients was 34 years and 49% (19/39) were males. Clinical onset was abrupt. Fever with multiple joint pain was the first presenting feature of the illness. Fever was associated with chills and 7 (18%) of 39 case-patients who recorded their fever at home reported it was as high as 103–104°F. Case-patients described the joint pain to be so severe that they could not lift things using their hands and limped while walking. The presentation of severe arthralgia and fever became widely known as *lengra jor* (limping fever) in the communities. The pain frequently involved the wrist, knee and ankle joints, and the phalanges, and was associated with swelling of the joints (Table1). Case-patients (29/39) informed us that they still suffered from joint pain, one to two months after recovering from fever. None of the case-patients required hospitalization. They all sought medical treatment from the informal health sector and were prescribed steroids as analgesic and broad spectrum antibiotic which is traditionally prescribed by informal medical practitioners in the villages for any illness episode of fever.

Table1: Clinical profile of case-patients in Bashontopur village of Rajshahi district and Baroghoria village of Chapainawabganj district

Characteristics	N=39(%)
Age (years)	
Mean	34
Median	35
Male	19 (49)
Fever	39 (100)
Joint pain (all type)	39 (100)
Myalgia	24 (62)
Patechial and/or maculopapular rash	15 (39)
Oral ulcer	3 (8)

Both of the affected districts are close to the Indian border. Chapainawabganj district is bounded by West Bengal of India in the north, south and the west, and Rajshahi and Naogaon districts in the east. Though 2 of the (5%) of 39 case-patients had a history of travel between the two affected districts, which are about 50 kilometers apart, none reported any travel to India. A 60 year old male relative and neighbour of patient YZ, however, reportedly visited India during the second week of July 2008 with two other men from his neighbourhood. None of them reported of any illness during their trip or after their return.

We collected 17 serum samples from the two affected villages. All the samples tested negative for antibodies against dengue. We tested 4 samples at IEDCR, including specimens from patients WX and YZ, for antibodies against leptospirosis and Chikungunya. All the samples were negative for leptospirosis, but 2 samples from Patient WX and YZ tested positive for immunoglobulin M against Chikungunya virus.

An entomological team conducted a larval survey in the two outbreak areas. They visited the houses of the 2 laboratory confirmed Chikungunya case-patients and another 22 houses within 500 meters of the case-patients' as the flight range of *Aedes aegypti* is 100 meters and *Aedes albopictus* is between

400-600 meters (1,4). They inspected and collected larva from indoor and outdoor water receptacles (including the numerous receptacle manufactured by the community of potters) that might hold water in all houses visited and collected 371 larvae. The larvae were transferred to glass vials for transportation to the IEDCR laboratory where they were identified and quantified using the WHO Comprehensive Guidelines for larval speciation (4). Among the larva collected, the majority (351/371 [95%]) were identified as *A. albopictus*. A few (5%) were identified as *Cx. Quinquefasciatus*. Among the house containers examined all the water containing wet earthen pots with *pitun* (a wooden instrument used in making earthen pots), wet earthen pots with paint and wet clay pots had larva of *A. albopictus* mosquito.

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Supported by: World Health Organization

Comment

The clinical features and laboratory results suggest that this was the first identified Chikungunya outbreak in Bangladesh. The larval survey showed that predominant mosquito species in the outbreak areas was *A. albopictus*, a known vector for Chikungunya. Though there is limited information regarding density of *A. albopictus* mosquito in Bangladesh, the species has also been implicated during a dengue outbreak in Dhaka city (5). As most of the case-patients were potters, a high concentration of *A. albopictus* in wet earthen pots and clay pots in case households may have precipitated this outbreaks.

A. albopictus has spread throughout the world via containerized shipments of used tires (6). It is possible that infected mosquitoes traveled into Chapainawabganj district from India and the favourable breeding grounds helped in rapid multiplication. Once infected, humans may act as reservoirs for Chikungunya virus during an outbreak (1) as suggested by the infection of case patients who travelled between the two affected districts.

Chikungunya infection in travelers returning from high incidence areas has been reported in Europe and the United States (1). Asymptomatic infection of Chikungunya is rare and the incubation period of Chikungunya infection is between 2-12 days (7). It is therefore unlikely that the asymptomatic neighbor of patient YZ brought the infection from India (7), because the outbreak was reported more than two months after his travel to India.

We have insufficient information on the extent of the outbreak and it is possbile that outbreaks extended to neighbouring districts. Chikungunya outbreaks have been reported to affect a large numbers of people (1,2); however, we received no information from the local health authority or from the electronic media about additional patients in the surrounding

area. Another limitation of our investigation was that we tested only four of the samples for antibody against Chikungunya virus, so we do not know the exact number of confirmed case-patients. Nevertheless, all the case-patients had compatible symptoms and it is not necessary to confirm all reported cases in the laboratory (8).

As no vaccine is yet available for preventing Chikungunya disease, reducing mosquito populations is an important method to limit transmission of the virus (6). *A. albopictus* mosquitoes are aggressive, silent, and diurnal; therefore bed nets do not provide effective protection against Chikungunya transmission (1). It is difficult to attain sustainable control of mosquitoes in Bangladesh and *A. albopictus* have developed different degrees of resistance against insecticide (1). Although future outbreaks are likely to occur, steps initiated to control the vector as soon as clusters are identified might minimize the spread of the epidemic. Destroying or frequently emptying potential breeding sites and cleaning or treating these places with insecticides may help control mosquito populations (1). Also establishing syndromic surveillance for identifying patients with fever and severe joint pain supported by prompt laboratory diagnosis of mosquito-borne diseases, such as, dengue and Chikungunya infection by using capture enzyme-linked immunosorbent assay (3), will alert public health authorities of incipient outbreaks and guide future Chikungunya prevention and control efforts. Wider dissemination of case definitions and standardized treatment guidelines may also prevent the inappropriate management of Chikungunya with medication such as antibiotics and steroids.

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National Rickets Survey in Bangladesh, 2008

Rickets is a softening of the bones in children that can lead to fractures and permanent deformities. This study was conducted to measure the overall national prevalence of rickets among Bangladeshi children aged 1-15 years. Data were collected from 20,000 children in all six divisions in Bangladesh. Among these children, 197 (0.99%) had rickets. The prevalence was highest in children aged 1-5 years. Rickets was found in every division, with the highest prevalence reported in Chittagong division. According to radiological findings, 24% of the children with rickets had active disease. Twenty percent of children with rickets were from low income (Tk. <3,000/month) families and 56% of children were from middle income (Tk. 5,001-8,000/month) families. Children with signs of active rickets or growing phase of rickets should have their dietary deficiency corrected and severe cases should be evaluated for appropriate surgical therapy.

Rickets is a softening of the bones in children that can lead to fractures and permanent deformities. It is usually identified by a visible varus (bowing of legs) and/or valgus (knock knee) deformities. Rickets was first reported in Europe in the mid-1600s (1), and was first described in Bangladesh by the NGO 'Social Assistance and Rehabilitation of the Physically Vulnerable' (SARPV) operating in the Chakaria upazila (sub-district) of Cox's Bazar district, after the devastating cyclone in 1991.

The Institute of Child and Mother Health (ICMH) conducted a detailed survey in the Chittagong division in 1998, and observed at least one clinical feature indicative of rickets in 8.7% of children surveyed: 4% had lower limb deformities, 0.9% had radiological evidence of active rickets, and 2.2% had elevated levels of serum alkaline phosphatase (2). BRAC conducted a survey among persons 1-20 years of age of Chittagong division in 2003 and identified rachitic deformities in 0.9% (3). Helen Keller International (HKI) conducted surveys in 28 upazilas of Bangladesh in 2000 and 2004. Rachitic deformities were observed in 0.26% of 21,571 children surveyed in 2000 and in 0.12% of 10,005 children surveyed in 2004. Rickets was identified in over half of these upazilas, with the highest prevalence in Sylhet (north-east) and Chittagong (south-east) divisions. The highest prevalence of visible rachitic deformities in children aged 1-15 years was 1.4% noted in Cox's Bazar upazila (4).

Both dietary calcium and vitamin D deficiency can lead to rickets. In Bangladesh, earlier studies suggested that vitamin D deficiency was not a major causal factor for rickets, and calcium deficiency was assumed to

be the primary aetiologic factor (5). The aim of the present survey was to determine the overall national prevalence of rickets among Bangladeshi children aged 1-15 years, and examine its association with their nutritional status and dietary intake of calcium and other nutrients.

In total, 16,000 children in rural areas and 4,000 children in low income urban areas were randomly selected from all 6 divisions of Bangladesh. From rural areas, 384 clusters/villages in 6 administrative divisions were selected with 42 children systematically chosen for interview per cluster/village. From urban areas, fifty wards from 6 cities were selected randomly. From the list of slums in a ward, 4 were selected randomly and 20 children in each slum were chosen for interview. After enrolment, the children were examined for presence of features of rickets and their parents/guardians were interviewed about current and past feeding practices of the children. Both qualitative and quantitative data was collected through anthropometrical measurement (weight, height, mid-upper arm circumference), and in-depth interviews. In clinically suspected cases, a radiological examination was done to identify radiological signs of active rickets. The signs and symptoms of rickets included rib beading, wrist enlargement, leg pain while walking, knock knee, bow leg, and the specific radiologic signs of a "windswept" or "sabre" tibia. Rickets was diagnosed when any three of the above clinical signs were present in any child below 5 years and any one visible sign was present in a child above 5 years. Staff used a multi-coloured poster depicting features of costal, lower and upper limb clinical rickets deformities to assist with diagnosis. Trained field workers collected qualitative data through in-depth interview. Field workers selected two caretakers of rickets-affected children and two caretakers of normal children from each of 6 divisions for in-depth interview.

Among 20,000 children 1-15 years of age, 197 (0.99 %) had rickets. Among the rachitic cases, 62% were under 5 years, 26% were 6-10 and 12% were 11-15 years. Sixty-one percent were male. The prevalence of rickets was highest in Chittagong division, (2.19%); the prevalence did not exceed 0.3% in any of the other divisions (Table 1). Both rural (1.1% prevalence) and urban areas (0.8% prevalence) had rickets cases.

Among the rachitic children, 37% had 3 clinical signs, 38% had 4 clinical signs and 11% of children had 5 clinical signs (Table 2). X-rays of both wrist joint and knee joint were taken from 156 cases of rachitic children. Radiological findings were classified into three groups and showed that 24% children had signs of active rickets, 35% had signs of growing phase of rickets and 41% had no sign of rickets.

About one-third of families had more than one rachitic child in Cox's Bazaar district. The southern division of Chittagong had the highest prevalence among districts selected.

The median monthly income of households with a rachitic child was Tk. 5,000-8,000 (US$ 75-120). Twenty percent of households with a rachitic child earned less than Tk. 3,000 (US$ 45) per month.

Table 1: Distribution of rachitic children by division

Division	Total Number	Rickets (n)	Prevalence (%)
Barisal	4,449	7	0.16
Chittagong	6,884	151	2.19
Dhaka	12,070	14	0.12
Khulna	6,764	5	0.07
Rajshahi	12,813	9	0.07
Sylhet	3,912	11	0.28

Table 2: Distribution of Rachitic boys and girls by number of clinical signs

Presence of signs	Boys		Girls		Total	
	(n)	(%)	(n)	(%)	(n)	(%)
<3 signs	7	5.8	8	10.4	15	7.6
3 signs	48	40.0	25	32.5	73	37.1
4 signs	44	36.7	32	41.5	76	38.5
5 signs	15	12.5	7	9.1	22	11.2
6 signs	6	5.0	5	6.5	11	5.6
Rechitic children	120	100.0	77	100.0	197	100.0

The mean age of rachitic children was 5.6 years and the mean weight was 13.9 kilograms. Among the 154 rachitic children aged 1-15 years measured for height, weight and arm circumference, 53% were severely stunted (height for age Z score <3 standard deviations from normal), and 22% were moderately stunted (height for age Z score between 2 and 3 standard deviations below normal. Seventy percent of the rachitic children were underweight and 40% severely underweight. Seventeen percent of rachitic children were wasted (weight for height <2 standard deviations below normal).

Seventy-six percent of rachitic children were breastfed within 24 hours of birth. The proportion of women initiating breastfeeding within one hour of birth was 7%. Overall, 75% of rachitic children were fed colostrum. Sixty-two percent of mothers knew that colostrum feeding would benefit the baby.

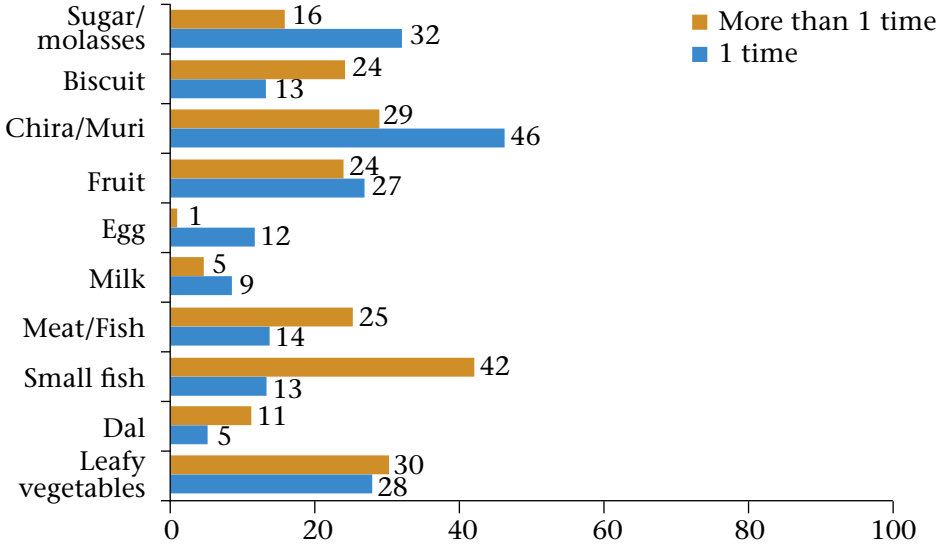
The parents of 14% rachitic children were blood related. Thirty-five percent of mothers reported that rickets were also found among their relatives. Most of the mothers of rachitic children did not know the source of calcium in diet.

During the last one year, 97% of these children experienced fever, 67% had episodes of diarrhoea, and 52% of children had dysentery. Mothers reported that 14% of their rachitic children suffered from pneumonia during the last one year.

Figure 1 shows calcium-rich food intake in the last 24 hours. Twenty-eight percent of rachitic children ate leafy vegetables at least once a day and 30% children ate more than once a day. About half of the rachitic children ate small fish more than once a day and only 13% of children ate small fish

once a day. Milk intake of rachitic children was very low: only 9% of children drank milk once a day and 5% of children drank milk more than once a day.

Figure 1: Food frequency for children in last 24-hour



Findings from the in-depth qualitative study suggested that most of the mothers of rachitic children had no idea about rickets. One of them said, "It is new for me. The baby walks with a waddling gait. The doctor can tell better." She noted that when the baby was learning to walk, she noticed the bending of the baby's lower legs (bow legs). Most of the rachitic children's mothers had no idea about calcium-rich food. On the other hand, non-rachitic children's mothers had some idea about calcium rich food. They reported that milk, eggs, leafy vegetables and fruit contained calcium.

Reported by: Nutrition Programme and members, Rickets Interest Group (RIG)

Supported by: CARE Bangladesh, UNICEF and National Nutrition Programme (NNP)

Comments

Based on this nationally representative survey we estimate that 550,000 children 1-15 years of age suffer from rickets in Bangladesh. Many rachitic children gradually deteriorate in their capacity for movement and become handicapped, thereby causing a burden to themselves, their families and the nation.

We do not yet fully understand the relative contribution of environmental, biological and dietary factors in Bangladesh that lead to such a high proportion of rickets. This is an important area for future research.

More immediately, we need to take steps to reduce the burden of rickets and to treat affected children. Intervention programmes should be planned and implemented for prevention and early detection of rickets. The medical officers in Upazila Health Complex and the Community Nutrition Promoters in the National Nutrition Programme can prevent rickets by promoting using calcium-rich food in children's diet, as well as highlighting the importance of breastfeeding after birth.

Children with signs of active rickets or growing phase of rickets should have their dietary deficiency corrected and severe cases should be evaluated for appropriate surgical therapy.

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A novel low cost method to estimate the incidence of Japanese encephalitis in north-west Bangladesh

Two surveillance projects were conducted at Rajshahi Medical Hospital to identify Japanese encephalitis (JE) cases among patients admitted with symptoms of meningo-encephalitis. As hospital surveillance can underestimate the real burden of a disease, we attempted a novel low-cost approach to estimate the population-based incidence of JE in the catchment area of this hospital by dividing the hospital-based rate by the proportion of cases of meningo-encephalitis in the catchment area who were admitted to Rajshahi Medical College. Traditional house-to-house surveys

to estimate incidence of a rare disease are expensive; therefore, we identified meningo-encephalitis cases using broader community awareness of serious illness. The proportion of people in the catchment area with symptoms of meningo-encephalitis who were admitted to the surveillance hospital was 0.11 (95% confidence interval, 0.06-0.16). Investigators estimated an incidence of JE in the catchment area of 3 per 100,000 population (95% confidence interval, 2.0-5.5 per 100,000 population), which is similar to incidence in other countries where JE vaccination was initiated. An inexpensive JE vaccine is available and we recommend introducing the vaccine in areas in Bangladesh where the incidence is high.

Japanese encephalitis virus (JEV), a flavivirus infection, chiefly transmitted by mosquitoes (most commonly *Culex* species), is the most frequently documented cause of viral encephalitis in Asia (1). It has a high case-fatality rate (10-30%) and 30-50% of survivors are left with long-term neurological sequelae (2). JE infections are transmitted between animal hosts, mainly pigs and mosquito vectors, where humans are frequently accidental hosts (2,3). In Bangladesh, there have been three JE studies; one describes the first documented outbreak of JE in Bangladesh during 1977 (4) and the other two present the findings of JE hospital based surveillance studies. The first hospital-based surveillance was conducted during June 2003-July 2005 in four tertiary care hospitals where every fourth patient of acute encephalitis with cerebrospinal fluid (CSF) pleocytosis was tested for JE with a JE specific IgM antibody. A total of 492 patients were tested for JE, of which 4% (20/492) were positive for JE. Out of patients who tested positive for JE, 55% (11/20) were identified from Rajshahi Medical College Hospital. The second surveillance project is ongoing in three medical college hospitals, including Rajshahi, where every patient with symptoms of meningo-encephalitis has specimens tested for JE specific IgM antibody. During October 2007 to mid August 2008, a total of 632 patients with symptoms of meningo-encephalitis were tested for JE, of which 6% (36/632) were JE positive. Out of these JE positive cases, 64% (23/36) were from Rajshahi Medical College Hospital.

An inexpensive JE vaccine is available and in use in many JE endemic countries (5). The decision to introduce a life saving vaccine in a low income country like Bangladesh depends on the cost-effectiveness of preventing the disease, which in turns depends on the incidence of that disease. Estimating the incidence of JE only from cases who present to surveillance hospitals may underestimate the burden of disease, because all ill persons may not seek care at study hospitals. Population-based incidence studies, however, are expensive for rare diseases. Thus ICDDR,B attempted a novel low-

cost approach to estimate JE incidence in the catchment area of Rajshahi Medical College Hospital, where the majority of JE cases were identified. Hospital based JE incidence was calculated by dividing the number of laboratory confirmed JE cases who sought care at our study hospital during the past one year who resided in the hospital catchment area by the total hospital catchment population; population based JE incidence was estimated by dividing this hospital rate by the proportion of cases of meningo-encephalitis in the catchment area who sought care and were admitted to Rajshahi Medical College Hospital.

We defined three districts (Naogaon, Chapainawabganj and Rajshahi) as the catchment area of Rajshahi Medical College Hospital because 58% of patients with symptoms of meningo-encephalitis admitted to this hospital during November 2007-April 2008 resided in these districts. To identify persons who experienced meningo-encephalitis in the catchment districts within the past year, we first selected 20 unions, smallest administrative areas, with the probability of selection proportional to population size.

Instead of traditional house-to-house surveys, we took advantage of close social networks to identify meningo-encephalitis cases in the hospital catchment area, because people in Bangladeshi rural communities actively discuss community events, such as family illness, and therefore generally able to report any serious health events experienced by their neighbours. We met with health care providers, educational institutions, groups in the local market and groups of women in a convenience sample of houses. After explaining meningo-encephalitis symptoms in local terms, we asked participants if they knew of anyone in the community who had developed fever with confusion, unconsciousness, or new onset seizures during the preceding year. If the team received any information about suspected meningo-encephalitis cases or any deaths in the community during the past year, they visited the household of the suspected case and documented the illness history and outcomes, along with demographic characteristics, healthcare seeking behaviour and socio-economic status. To calculate the incidence of meningo-encephalitis in the community, we defined a case of meningo-encephalitis as anyone with acute onset within last year of fever, with new onset seizure (jerking in body), or at least one hour of unconsciousness, or at least 6 hours of altered mental status. We excluded patients who had multiple seizures over a 6-month period within the last two years of interview date because we wanted to exclude from our analyses people with a chronic seizure disorder such as epilepsy.

We identified 267 cases of suspected meningo-encephalitis from the survey hospital catchment area with a total population of 438,000 during the 2001 census (61 per 100,000). Among the suspected meningo-encephalitis cases, more than half of the cases (53%) were aged <5 years (Table 1).

Table 1: Demographic characteristics of meningo-encephalitis cases

Demographic characteristics	Admitted at study hospital (N=29) %	Not admitted at study hospital (N=238) %	All cases (N=267) %
Sex of cases			
Male	66	62	63
Female	35	38	38
Age group of cases			
<1 year	3	3	3
1-5 years	35	52	50
6-15 years	21	20	20
16-45 years	24	20	20
45+ years	17	7	8

Suspected case-patients reported experiencing altered mental status (93%), unconsciousness (79%), new onset seizure (85%), and stiff neck during illness (16%) (Table 2). Altered mental status lasted more than 6 hours in most (76%) hospital cases while it lasted less than 6 hours in most (67%) other patients (*chi-square p-value* <0.001) (Table 2).

Table 2: Reported symptoms and current conditions of meningo-encephalitis cases

Symptoms and condition at the time of interview	Cases admitted at study hospital (N=29) %	Not admitted at study hospital (N=238) %	All cases (N=267) %
Symptoms of cases			
Altered mental status	93	93	93
<6 hours	17	67	61
>6 hours	76	26	32
Unconsciousness	62	81	79
<6 hours	24	73	67
>6 hours	38	8	12
New onset seizure	83	85	85
Siff neck	24	15	16
Current condition of case			
Fully recovered	62	90	87
still sick	0	4	3
Partially disabled	3	3	3
Dead	35	4	7

At the time of interview, we also asked about the current condition of suspected meningo-encephalitis cases. We found 231 (87%) cases fully recovered, 9 (3%) cases remained sick during our survey, 8 (3%) cases self-reported being partially disabled and 19 (7%) cases died after developing symptoms of meningo-encephalitis (Table 2). The median duration of illness of cases was 4 days. Patients admitted to Rajshahi Medical College Hospital were much more likely to die than those not admitted (35% vs. 4%) (*chi-square p-value* <0.001). Almost all patients (98%) with suspected meningo-encephalitis received treatment during their illness but only 11% patient sought care from the study hospital (Rajshahi Medical College Hospital) (Table 3). We constructed a wealth index using principle component analysis, but no significant association was found between socio-economic status of patient and seeking care at Rajshahi Medical College Hospital.

Table 3: Healthcare seeking behaviour of meningo-encephalitis cases (multiple responses)

Healthcare seeking	Male (N = 167) %	Female (N = 100) %	All (N = 267) %
Rajshahi Medical College Hospital	11	10	11
Qualified practioners	28	35	31
Unqualified practioners	83	85	84

We estimated JE incidence in the catchment area of Rajshahi Medical College Hospital by dividing the hospital-based incidence by the proportion of meningo-encephalitis cases in the hospital catchment area who were admitted to this hospital using the following equation:

$$\frac{\text{Number of JE cases identified in the surveillance hospital from within the catchment area}}{\text{Population of the hospital catchment area *P* Duration of surveillance}}$$

Where P = Proportion of suspected meningo-encephalitis cases in the catchment area who were admitted to the Rajshahi Medical College Hospital

In the hospital surveillance during October 2007-mid August 2008, 17 JE cases were identified at Rajshahi Medical College Hospital who were admitted from the three catchment districts with a population of 6.1 million (population census 2001). In our hospital catchment survey, among the identified 267 suspected meningo-encephalitis cases, 29 people sought care at Rajshahi Medical College Hospital. We used linear mixed effect model to adjust for clustering and estimated the proportion of people with symptoms of meningo-encephalitis who were admitted to the study hospital as 0.11 (95% confidence interval, 0.06–0.16). Using this data,

investigators estimated a JE incidence of 3 per 100,000 population (95% confidence interval, 2.0-5.5 per 100,000 population) in the catchment area of Rajshahi Medical College Hospital.

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Comments

From the recent hospital-based acute meningo-encephalitis surveillance public health officials believe that JE is a frequent cause of hospitalization for encephalitis. We also now believe that the incidence of JE is high which highlights the importance of JE prevention. Our novel low-cost method to estimate incidence worked well, especially in rural areas where there is intense social networking. While we recorded caregivers' and patients' medical history and not medical diagnoses, we believe that reports of seizures and altered consciousness, especially coma, were reliably reported by lay persons. Investigators noted that the case fatality among patients admitted at Rajshahi Medical College Hospital was 8 times higher than the cases identified during this study who did not seek care at this hospital; it is possible that only patients with very severe disease sought care at this referral hospital.

Bangladesh should consider integrated vector control management for mosquitoes and introducing JE vaccination to prevent and control the high incidence of JE in communities like Rajshahi. It would be useful to understand the role of animal reservoirs and vectors in transmission of JE. Though pig raising is not common in this predominately Muslim country, other environmental factors conducive to the transmission of JE may include presence of wading birds, year-round rice cultivation and the constant presence of mosquito throughout the country. In addition to mosquito control and environmental modification, public health officials consider JE vaccination a good method to control JE (1). Both Taiwan and Nepal, with similar incidence of JE as Bangladesh, have introduced a vaccine for JE which has been shown to be effective in preventing disease (3,6,7). We recommend introducing a JE vaccine in areas of Bangladesh where the incidence is high, such as Rajshahi.

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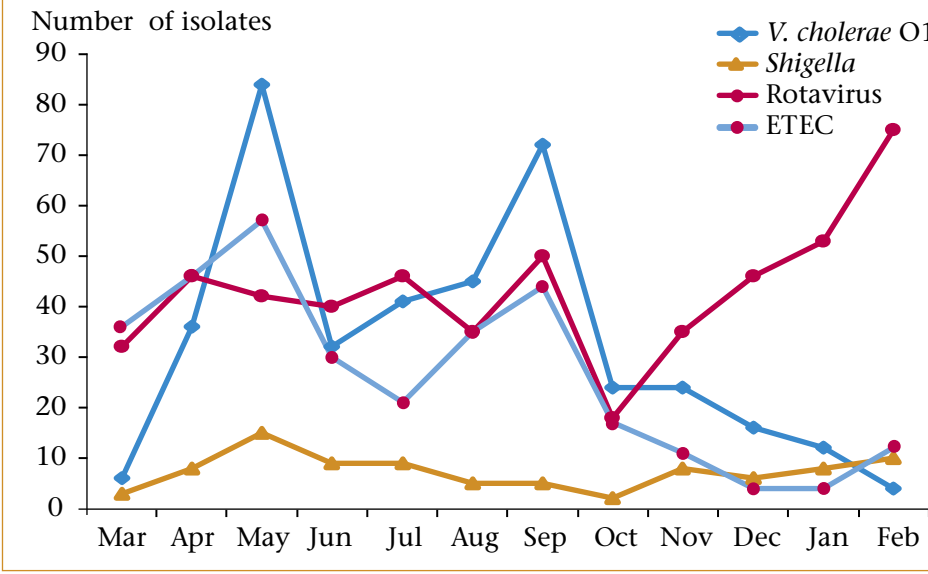
Surveillance Updates

With each issue of the HSB, updates of surveillance data described in earlier issues are provided. These updated tables and figures represent the most recent observation period available at the time of publication. We hope these updates will be helpful to health professionals who are interested in current patterns of disease and drug resistance.

Proportion of diarrhoeal pathogens susceptible to antimicrobial drugs: March 2008- February 2009

Antimicrobial agents	*Shigella* (n=273)	*V. Cholerae* O1 (n=458)
Nalidixic acid	22.7	Not tested
Mecillinam	78.0	Not tested
Ampicillin	51.6	Not tested
TMP-SMX	36.6	1.3
Ciprofloxacin	77.3	100.0
Tetracycline	Not tested	28.2
Erythromycin	Not tested	1.7
Furazolidine	Not tested	0.2

Monthly isolation of* V. cholerae *O1,* Shigella*, Rotavirus and ETEC March 2008-February 2009



Antimicrobial resistance patterns of 50 M. tuberculosis *isolates: February 2008-September 2008*

Drugs	Resistance type		Total (n=50)
	Primary (n=46)	Acquired* (n=4)	
Streptomycin	8 (17.4)	2 (50.0)	10 (20.0)
Isoniazid (INH)	3 (6.5)	1 (25.0)	4 (8.0)
Ethambutal	1 (2.2)	0 (0.0)	1 (2.0)
Rifampicin	0 (0.0)	0 (0.0)	0 (0.0)
MDR (INH+Rifampicin)	0 (0.0)	0 (0.0)	0 (0.0)
Any drugs	9 (19.6)	2 (50.0)	11 (22.0)

() column percentage *Antituberculous drugs received for 1 month or more

Antimicrobial susceptibility pattern of S. pneumoniae *among children <5 years during October-December 2008*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	10	10 (100.0)	0 (0.0)	0 (0.0)
Cotrimoxazole	10	4 (40.0)	0 (0.0)	6 (6.0)
Chloramphenicol	10	9 (90.0)	0 (0.0)	1 (10.0)
Ceftriaxone	10	10 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	10	9 (90.0)	0 (0.0)	1 (10.0)
Gentamicin	10	7 (70.0)	1 (10.0)	2 (20.0)
Oxacillin	10	10 (100.0)	0 (0.0)	0 (0.0)

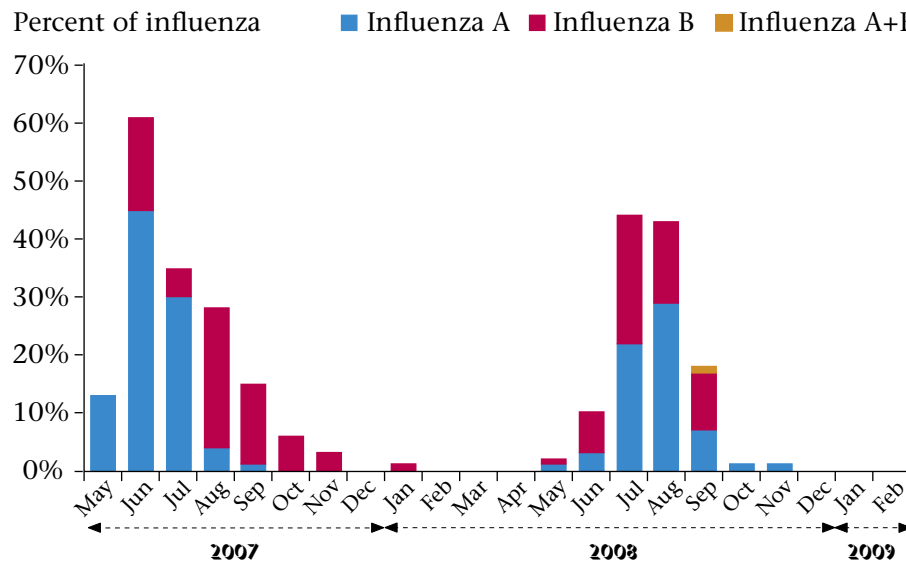
Source: Children participating in PneumoADIP surveillance in Dhaka Medical College Hospital; Chittagong Medical College Hospital; Sir Salimullah Medical College and Mitfort Hospital; ICH-Shishu Sasthya Foundation; Chittagong Maa Shishu O General Hospital; Dhaka Shishu Hospital; Kumudini Hospital, Mirzapur; and ICDDR,B's urban surveillance in Kamalapur (Dhaka) and rural surveillance in Mirzapur (Tangail).

Antimicrobial susceptibility pattern of S. typhi *among children <5 years during October-December 2008*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	94	35 (37.0)	0 (0.0)	59 (63.0)
Cotrimoxazole	94	54 (57.0)	0 (0.0)	40 (43.0)
Chloramphenicol	94	54 (57.0)	0 (0.0)	39 (42.0)
Ceftriaxone	94	94 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	94	38 (40.0)	49 (52.0)	7 (7.0)
Nalidixic Acid	94	1 (1.0)	0 (0.0)	93 (100.0)

Source: Children participating in PneumoADIP surveillance in Dhaka Medical College Hospital; Chittagong Medical College Hospital; Sir Salimullah Medical College and Mitfort Hospital; ICH-Shishu Sasthya Foundation; Chittagong Maa Shishu O General Hospital; Dhaka Shishu Hospital; Kumudini Hospital, Mirzapur; and ICDDR,B's urban surveillance in Kamalapur (Dhaka) and rural surveillance in Mirzapur (Tangail).

Percent of influenza positive specimens by month during May 2007-February 2008



Source: Patients participating in hospital based influenza surveillance in Dhaka National Medical College Hospital, Community Based Medical College Hospital (Mymensingh), Jahurul Islam Medical College Hospital (Kishoregonj), Rajshahi Medical College Hospital, Shaheed Ziaur Rahman Medical College Hospital (Bogra), LAMB Hospital (Dinajpur), Bangabandhu Memorial Hospital (Chittagong), Comilla Medical College Hospital, Khulna Medical College Hospital, Jessore General Hospital, Jalalabad Ragib-Rabeya Medical College Hospital (Sylhet) and Sher-e-Bangla Medical College Hospital (Barisal)

A rachitic children

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