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Inside

Cutaneous anthrax outbreaks in two districts of North-Western Bangladesh, August-October, 2009

During 24 August to 29 October 2009, a multi-disciplinary investigation team identified three outbreaks of sudden illness and death in cattle and goats, and skin lesions in humans in three villages in two districts in North-Western Bangladesh. The animal illness was characterized by sudden onset of convulsions or falling down, with or without previous reported fever, followed by death. The human illness was characterized by the development of skin lesions. Both the animal and human clinical presentations were typical of anthrax. The team identified 40 animals: 35 died and five were slaughtered. The team also identified 55 human cases, all except two who had a history of slaughtering sick animals, presence at the slaughtering site, or handling raw meat from the sick cows or goats. The cattle had not been periodically vaccinated and dead animals were disposed of in the river or flood water. Blood and bone marrow smears, and swabs in nutrient broth were collected from two slaughtered cows, a sick cow, a sick goat and a dead goat. Blood and vesicular swabs were collected from

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patients. The smear samples were stained and swab samples were cultured. The bacilli were identified by staining from animal and human specimens and *B. anthracis* was isolated by culture from human swab samples and ocular fluid from a dead goat. Regular anthrax vaccination for animals, improved knowledge about avoiding infection by not slaughtering sick animals, and proper disposal of dead animals could reduce the incidence and transmission of anthrax.

Anthrax is an acute infectious zoonotic disease caused by the spore-forming bacterium *Bacillus anthracis* (1-5). Anthrax commonly occurs in both wild and domestic animals (1,4,6). Humans are infected when they are exposed to an infected animal, or by handling infected animal products, e.g., skin, bone, or flesh, or by inhaling anthrax spores from contaminated animal by-products (1,3). Anthrax infection can occur in three forms: cutaneous, which affects the skin; inhalation, which affect lungs; and gastrointestinal, which affects the digestive tract (1-5).

On 24 August 2009, an ICDDR,B veterinarian received a message from a village in Pabna district, in the North of Bangladesh, that cattle were moribund with high fever and convulsions since 17 August. Two sick cows were reported slaughtered on 18 August and many people had skin lesions. The investigation team suspected that this outbreak might be due to anthrax because of development of skin lesions after slaughtering sick cows. A collaborative outbreak team from the Institute of Epidemiology, Disease Control and Research (IEDCR), the Department of Livestock Services (DLS) of the Government of Bangladesh, and ICDDR,B went to Pabna district to investigate on 26 August. On 29 September the team was notified of another outbreak of illness in humans after slaughtering a sick cow with symptoms similar to anthrax in a village in Sirajganj District, about 10 km from the first outbreak area. They investigated on 1 October. On a follow-up visit to that village on 29 October, the team discovered a third outbreak in an adjacent village.

Veterinarians from DLS and ICDDR,B gathered epidemiological and clinical information and explored the possible causes of illness and their transmission routes in the affected communities. All outbreaks had similar presentation e.g., sudden illness in cows or goats that led to slaughter, resulting in development of skin lesion in humans. Animal illness was defined as sudden death or convulsion, with or without fever, from 17 August 2009. The team talked to local veterinarians to explore the area's history of animal health, the anthrax vaccination policy and vaccine use.

From the first and second outbreaks we collected throat, nasal, rectal and urogenital swabs, blood smears from a sick cow and a sick goat, and a blood

smear and ocular fluid smear from a dead goat. Bone marrow smears were taken from frozen meat from two sick cows that had been slaughtered. The first outbreak specimens from animals were sent to Centers for Disease Control and Prevention (CDC) in Atlanta and the bone marrow smears were also tested at the Central Disease Investigation Laboratory (CDIL) in Dhaka.

We also investigated the epidemiological, clinical and exposure history of suspected human cases. We talked with local physicians to explore previous history of illness. Preliminary reports, along with initial gathering of clinical history and examination suggested that the outbreak was due to anthrax. Case-patients were defined as any person who suffered from acute onset of skin lesion with papule or vesicle or skin ulceration with raised margin and central black eschar since 18 August 2009. To determine the size and extent of the outbreak, the epidemiological team visited every household of the affected communities and collected data using a structured questionnaire. The characteristics of skin lesions were noted both by the case-patient's self reporting and by physical examination. From the identified cases in the first and second outbreak, the team collected blood samples for slide smears and culture, vesicular fluid for slide smears, and vesicular swabs in nutrient broth for culture. We sent the samples from the first outbreak to CDC for laboratory confirmation and genotyping of the isolates. Three blood cultures and four smear samples were tested in the microbiology laboratory at IEDCR. In the first outbreak, the team also took skin biopsies from three patients and sent them for immunohistochemistry (IHC) testing at CDC.

In the first and second outbreak areas, the anthropological team of ICDDR,B visited the affected communities and explored the peoples' perceptions and practices of slaughtering and eating sick animals and disposal of dead animals.

Forty sick animals were identified in the three outbreak areas: 34 (85%) cattle and 6 (15%) goats. Twenty-four (60%) were female. The median age of cattle was 24 months (range: 0.5-96 months) and the median age of goats was 4 months (range: 3-12 months). None of the 40 animals survived; 35 (88%) died and 5 (12%) were slaughtered. The most common clinical signs and symptoms were high fever, falling down, listlessness and convulsion (Table 1). The veterinarians also observed nasal bleeding after the death of one sick goat.

In the first outbreak area, 35 people developed skin lesions. Thirty-three were infected during the slaughtering of the two sick cows or handling the raw meat, or being close to that slaughtering site. The other two cases involved a grandmother, who arrived from a distant village five days after the slaughtering and developed a skin lesion 11 days after she had close personal contact over a seven day period with her grandchild, who had a

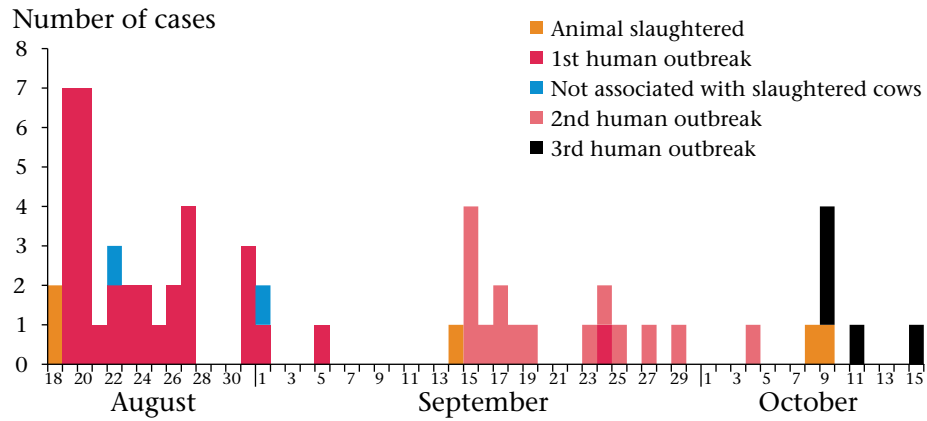
skin lesion; and a man, whose only reported exposure was washing his hands in the canal where a dead cow was floating, who then developed a skin lesion (Figure 1).

In the second outbreak, 15 people were identified with skin lesions after slaughtering a sick cow or handling the meat on 14 September. In the third outbreak, five people were identified with skin lesions after slaughtering two sick goats or handling the meat on 8-9 October 2009 (Figure 1).

Table 1: Demographic and clinical characteristic of illness of animals (N=40)

Demographic	n	%
Cattle	34	85.0
Goat	6	15.0
Age in months		
Cattle: Median (range)	24 (0.5-96)	-
Goat: Median (range)	4 (3-12)	-
Clinical characteristics		
Fever	24	60.0
Fallen down	18	45.0
Anorexia	16	40.0
Listlessness	11	27.5
Convulsion	9	22.5
Depression	10	25.0
Diarrhoea	4	10.0
Respiratory distress	4	10.0
Drop in milk production	1	2.5
Muscle tremor	2	5.0
Outcome of illness		
Death	35	88.0
<24 hours of illness onset	23	58.0
1-7 days	12	30.0
Slaughtered	5	12.0

*Figure 1: Human illness in relation with outbreaks and slaughtered animals**



*Two cases in 1st outbreak were not related with sick slaughtered cows

Out of a total of 55 people identified with skin lesions in these three outbreak communities, 31 (56%) were males. The median age of case-patients with cutaneous lesions was 25 years (range: 1-70 years). The mean age was 28 years. The mean duration from exposure to onset of illness was 5 days (Table 2). All patients had skin lesions, accompanied by itching skin, fever, weakness, nausea, headache and abdominal pain. The skin lesion was characterized by the presence of papule and/or vesicle, ulcer, erythema, central black eschar, surrounding oedema and tenderness (Table 2 & Figure 2). The lesions were mostly distributed in upper limbs (75%), but were also present on lower limbs, face, chest, back, neck and scalp (Table 3).

Table 2 : Demographic and clinical presentation of human cases (N=55)

Demographic characteristics	n (%)
Age group in years	
1-10	11 (20.0)
11-20	13 (24.0)
21-30	10 (18.0)
31-40	8 (15.0)
>40	13 (24.0)
Sex	
Male	31 (56.0)
Female	24 (44.0)
Clinical presentation	
Skin lesion	55 (100.0)
Itching skin	39 (71.0)
Fever	36 (65.0)
Fatigue/weakness	24 (44.0)
Headache	20 (37.0)
Nausea	15 (28.0)
Abdominal pain	6 (11.0)
Cough	5 (9.0)
Diarrhoea	1 (2.0)
Median age in years (range)	25 (1-70)

Almost all of the cases with cutaneous lesion (96%) had slaughtered sick cattle or handled raw meat or were present at the slaughtering site. Eighty-seven percent of case patients ate meat from a sick animal, 80% handled raw meat of a sick animal, 33% slaughtered sick cows or goats, 33% came in contact with a sick animal, and 13% came in contact with a dead animal (Table 4). The physicians from Upazila Health Complex treated all case-patients with ciprofloxacin.

Figure 2: Laboratory confirmed cutaneous anthrax

Smears of bone marrow of the

slaughtered cow from the first outbreak were stained with polychrome methylene blue at CDIL and gram positive capsulated bacilli were identified. The rod shaped bacilli were also identified from three patients by gram staining at the microbiology laboratory of IEDCR and were suspected of being *Bacillus anthracis*. CDC isolated growth of *B. anthracis* from swabs of two patients and ocular fluid of a dead goat. Multiple-locus variable-number tandem repeat analysis (MLVA) was performed at CDC on the animal and human isolates and confirmed both were infected by isolates of the same genotype. *B. anthracis* was also detected in three tissue biopsies and four vesicular swab smears by IHC and M'Fadyean staining respectively. An enzyme-linked immuno-absorbent assay (ELISA) was performed at CDC to determine if the case-patients generated an immune response against the *B. anthracis* toxin protein protective antigen (PA). Fifteen of the 26 case-patients, who had acute and convalescent sera tested, exhibited a four-fold increase in anti-PA titre (sero-converted).

Table 3: Characteristics and distribution of skin lesions in humans (N=55)

Characteristics of skin lesion	n (%)
Papule	43 (80.0)
Vesicle	37 (67.0)
Ulcer	39 (71.0)
Surrounding erythema	36 (68.0)
Central black eschar	34 (62.0)
Surrounding oedema	31 (59.0)
Distribution of skin lesion	
Upper limbs	41 (75.0)
Lower limbs	10 (18.0)
Face	5 (9.0)
Chest	5 (9.0)
Back	2 (4.0)
Neck	1 (2.0)
Abdomen	1 (2.0)
Scalp	1 (2.0)

Table 4: Exposure history of cases since August 18, 2009 (N=55)

Exposure	n (%)
Ate meat of sick animal	48 (87.0)
Handle raw meat of sick animal	44 (80.0)
Slaughtered sick animal	18 (33.0)
Contact with sick animal	17 (31.0)
Contact with dead animal	7 (13.0)
Contact with healthy animal	26 (48.0)
Exposure to onset of illness	
Median (range) in days	4 (1-8)

Reported by: Programme on Infectious Disease and Vaccine Sciences, ICDDR,B and Institute of Epidemiology, Disease Control and Research (IEDCR), Ministry of Health and Family Welfare, Department of Livestock Services (DLS), Government of the People's Republic of Bangladesh

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Comments

The clinical and laboratory findings of case-patients in this investigation indicate that these outbreaks were caused by anthrax bacillus, a zoonotic disease that can be transmitted to humans. The clinical presentation in affected animals, e.g., onset of sudden moribund illness, with or without fever and convulsion, were suggestive of anthrax. In humans, the patients had characteristic signs and symptoms of cutaneous anthrax (1,3). Furthermore, isolation of *B. anthracis* from vesicular swabs from some patients, and sero-conversion of most patients by anti-PA ELISA, confirmed anthrax as the disease responsible for the outbreak. Although the samples were not tested in the second or third outbreaks, they had epidemiological links and similar clinical presentation that suggested anthrax.

In outbreak areas, people manifested with cutaneous anthrax after coming in contact with infected animal by-products. Although anthrax is reported to only rarely be transmitted by human to human contact (1), the team found one case, with no history of handling infected raw meat, who was likely infected after seven days of close personal contact with another case-patient near the slaughtering site.

Although the team has identified three outbreaks since August 2009, the community residents reported that many cattle have been dying due to *tarka*, the local term for anthrax, for many years. They also reported similar skin lesions in community members after slaughtering sick cows. Thus, even though anthrax has not been reported from this area for the past 25 years, it is likely endemic (7). Several factors might be responsible for the persistent of anthrax in this area. The cattle population is very dense, with the majority of households using their courtyards for cattle rearing and milk production. They don't disinfect this area when cows or goats die. This area is low lying and flooded during the annual rainy season and farmers usually dispose of any animal that dies at this time in the flood water. As anthrax is a spore bearing bacterium that can persist in the soil for many years (6), this practice most likely contributes to the spread of the disease as the animal carcasses flow with the water's current, which eventually becomes stagnant.

The anthropological team found that a common practice is to eat the meat of slaughtered sick cows and goats. People were not aware of the danger of being infected with anthrax because of slaughtering, handling or eating the meat of sick animals. The cattle owners emphasized that to recover some money due to the loss of a cow they enlist the help of community members to slaughter the sick animal. The price of this meat is low, and as

most people cannot afford to buy meat regularly, they are eager to purchase it. The community members are also not aware of the environmental hazards of disposing of infected dead animals in open spaces or in the flood waters. Increasing awareness among community members about avoiding slaughtering, handling or eating the contaminated meat and encouraging proper disposal by burying dead animals in deep pits or by burning them (1) may prevent future human outbreaks. In humans, the initial clinical presentation should signal treatment with ciprofloxacin.

As cattle are both a major source of livelihood and a source of protein for most rural communities in Bangladesh, protecting these animals by regular annual vaccination is the best way to prevent anthrax. According to the Ministry of Fisheries and Livestock, 90 million doses of anthrax vaccine are required to immunize domestic animals in Bangladesh, but the total annual vaccine production is only 1.5 million doses. An increased capacity for vaccine production and implementation of a successful vaccination programme would be an effective way to prevent anthrax in this region. To estimate the burden of the disease a surveillance system should be put in place to monitor and provide early detection and treatment to control anthrax outbreaks in both animals and humans.

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Reaching women and girls: Experiences of a national HIV prevention programme in Bangladesh

In 2003, the Government of Bangladesh launched a national HIV project focused on preventing HIV infection among young people. Analysis of data from two national surveys and three other studies conducted under this project highlight that female youth have differential access to HIV information and face social and cultural barriers in getting information about HIV. Overall, the correct knowledge about HIV is low among youth, but it is even lower for female youth. Public health programmes, with information components, need to take these differences into account when planning communication strategies to ensure that messages reach all relevant audiences.

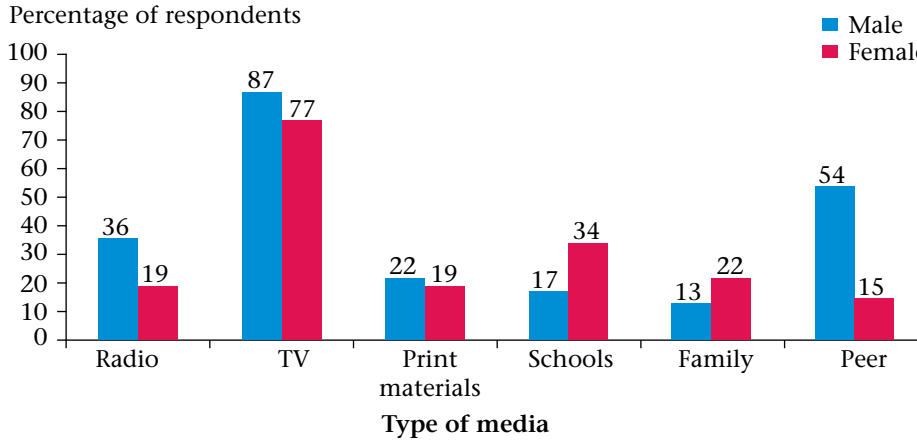
In 2003, the Government of Bangladesh launched a project entitled "Prevention of HIV/AIDS among young people in Bangladesh". The project aimed to help prevent HIV infection in young people age 15 to 24 years and thereby help avert a generalized HIV epidemic in Bangladesh. Specific activities included mass and print media campaigns, delivery of life skills education through youth organizations, integration of HIV prevention into secondary and higher secondary curricula, and making health services more youth friendly. The project aimed to promote gender awareness and increase gender equality in accessing HIV prevention programmes. The purpose of this paper is to examine gender differences in access to HIV information and to highlight the difficulties in ensuring gender equity in access to such information.

The data for this article comes from two national surveys of youth conducted in 2005 and 2008 under the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), along with three other studies that are detailed in one published report (1) and four other reports soon to be published by the National AIDS/STD Programme (NASP), Save the Children-USA, and ICDDR,B. These unpublished reports include an 'Assessment of HIV/AIDS related knowledge and attitudes among youth, gatekeepers, community leaders and policy makers in Bangladesh' (2), the 'Impact of an HIV/AIDS prevention entertainment-education programme' (3), the 'Rapid assessment of a short film on HIV/AIDS in Bangladesh' (4), and the 'Rapid assessment of the role of teachers' training in HIV/AIDS prevention in two selected districts in Bangladesh' (5).

Gender differences in sources of information

In the 2008 national survey, with the exception of print materials and health workers, the proportion of males learning about HIV from a particular source varied significantly the proportion of females learning about HIV from the same source. Figure 1 shows that unmarried males were more likely to have heard about HIV from broadcast media (radio and TV) and from peers, whereas unmarried females were more likely to have heard about HIV from schools and family. Similar patterns were seen among married youth, although they had more limited access to information overall. Almost twice as many females reported learning about HIV in school than did males, and while 57% of unmarried female youth reported attending a class on HIV, only 46% of unmarried male youth did. Married male and female youth did not differ in terms of access to information about HIV through schools, although only about one quarter of married youth had attended a class that provided information about HIV.

Figure 1: Proportion of unmarried youth who learned about HIV from common sources, by sex, Bangladesh, 2008

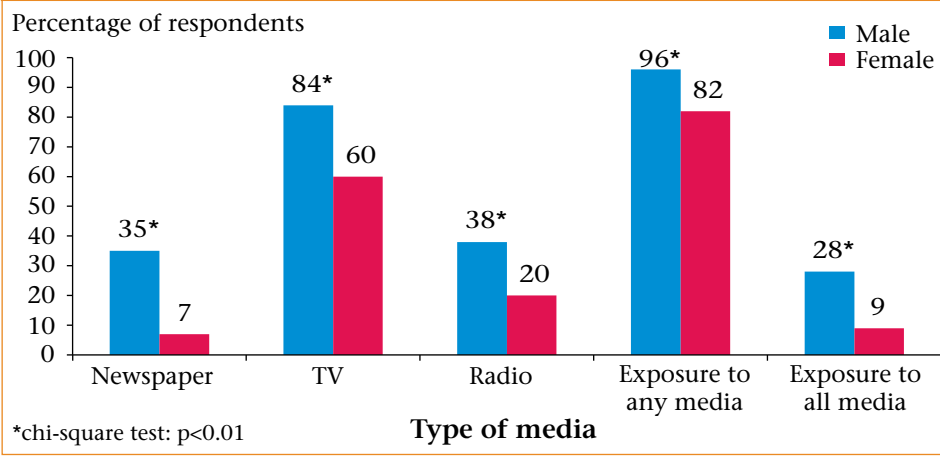


Gender differences in access to sources of information

Women in Bangladesh have more limited access to mass media than men (2,6,7). When asked about exposure to television, radio and newspaper, three times as many male youth were exposed to all three media on a weekly basis compared to females. This was also true for each media individually (Figure 2). The differences are smallest for TV, where just 24% fewer females reported weekly exposure. These gender differences were even greater among rural and married youth, particularly highlighting the limited exposure of rural, married females. For example, 23% of rural

females and 22% of married females had no access to any of these media compared to 4% of rural males and 5% of married males.

Figure 2: Proportion of youth exposed to media on a weekly basis, by sex, Bangladesh, 2008



These differences in access to technology are not reflected in exposure to specific HIV prevention messages. For example, although female youth had less access to television, they were more likely (26%) to report watching *Heeraphool*, an HIV prevention series aired on Bangladesh TV (BTV), than were male youth (16%, chi-square p<0.01). This discrepancy seems to match with differences in viewing patterns. Data from a baseline survey conducted for the *Heeraphool* evaluation (3) showed that while male and female youth were equally likely to have reported watching BTV the last time they watched TV, boys were more likely to report also watching other channels. Likewise, while the same percentage of males and females reported watching dramas at last viewing, more boys also reported watching sports and news.

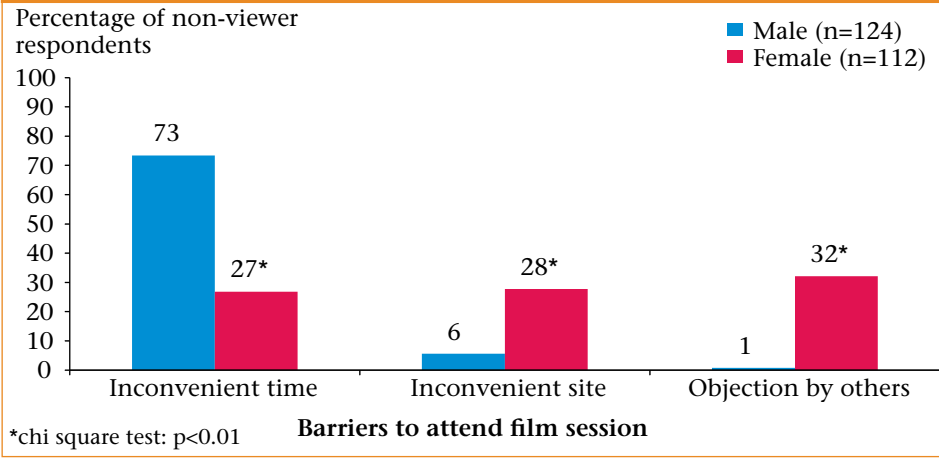
Gender barriers limiting access to sources of information

Females also face a number of social barriers that limit their access to information on HIV/AIDS and other health issues. During the evaluation of a short film that was shown via mobile vans, barriers to viewing were assessed through a survey among non-viewers who knew about the film session (4). The barriers to attending the film session differed for males and females (Figure 3). For females, the most commonly reported barrier was opposition from family (32%), followed by inconvenient time (27%) and inconvenient site (28%). On the other hand, 73% males did not attend because the time was not appropriate and they were busy with work or

other activities. Opposition from spouse or family members was only an issue for females and more married female youth faced such objections than did unmarried youth or married adults. The objections were largely related to the time, site and the presence of men at the film session, which took place in the evening in an open school or village field. The following quote from a married female youth, who did not see the film, reflected the general view of females who faced this problem:

"…the film was shown in the evening in the school field and many males were there. That's why my family members did not allow me to go there and sit with other men to watch the film…"

Figure 3: Reported barriers to attending a public film session among non-viewers who were interested to attend, by sex, Bangladesh, 2008



*chi square test: p<0.01

Other cultural norms that limit access were noted in the evaluation of Heerpahool. As part of the study, groups of youth were asked about their contact with other media including billboards. While more female than male participants had seen the billboards, the females gave examples of the way in which social norms limited their access. When they stopped to read the billboards, one female youth said:

"…some young men made bad comments and teased me while I was reading a billboard on the road..."

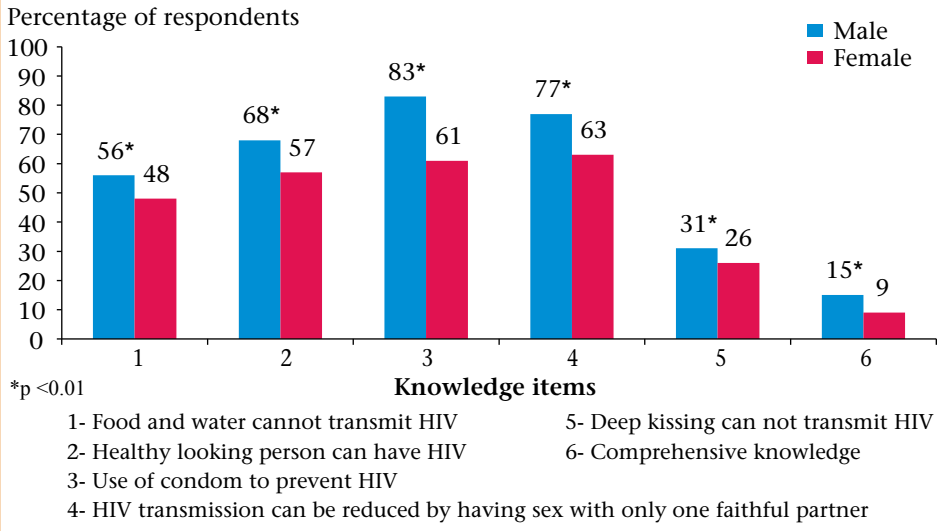
Gender norms may also affect how information is received and used. For example, 86% of teachers surveyed reported that boys were more likely to ask questions when the HIV curriculum was taught. Analysis of the discussions about *Heeraphool* showed that males and females engaged with the content differently. In general, the male groups discussed the messages in the series in terms of their own lives, where as the female viewers only

repeated the content.

Potential impact: Sex differences in knowledge of HIV

The health communication efforts seem to have less impact on females. Comprehensive knowledge of HIV, defined as the "percentage of youth who both correctly identify ways of preventing the sexual transmission of HIV and who reject major misconceptions about HIV transmission", was generally low among youth, but was lower among female youth. Only 9% of females had comprehensive knowledge compared to 15% of males (Figure 4). Similar differences are seen in all categories with more unmarried males having comprehensive knowledge than unmarried females (17% and 10%, p≤0.001) and more married males having comprehensive knowledge than married females (10% and 8%, p≤0.05). In addition, a higher proportion of males had comprehensive knowledge than females in both urban (19% and 10%) and rural (14% and 8%) settings.

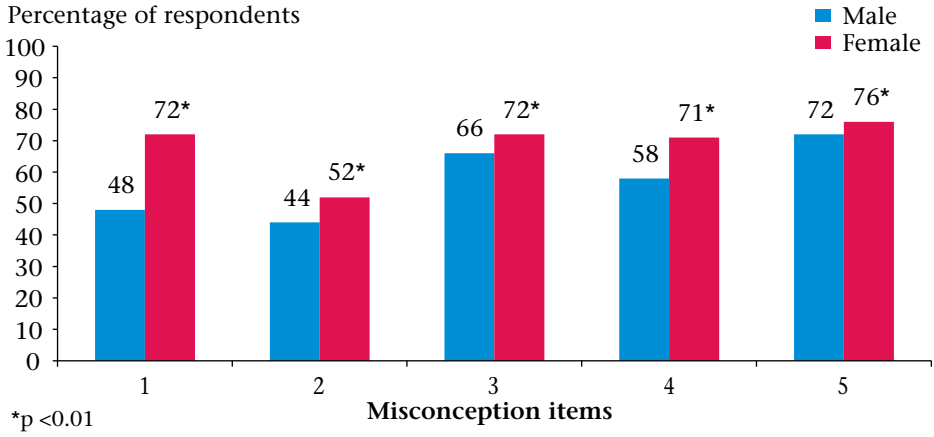
Figure 4: Percentage of youth who both correctly identify ways of preventing sexual transmission of HIV and who rejected major misconceptions about HIV transmission, by sex, Bangladesh, 2008



Misconceptions about HIV were also higher among female youth compared to male youth (Figure 5). The prevalence of these misconceptions has decreased significantly since 2005, but the decrease was more pronounced among males than females. For example, whereas 64% of both males and females at baseline reported that coughing and sneezing could transmit HIV, this had decreased to 48% among males, but just 56% among females.

Likewise, the misconception that HIV can be transmitted by sharing food or water was held by about 60% of both males and females at baseline compared to 44% of males and 52% of females at endline.

Figure 5: Misconceptions relating to HIV transmission among youth and adolescents, by sex, Bangladesh 2008



*p <0.01

1- Cough and sneeze can transmit HIV
2- HIV can be transmitted by bathing in the same pond
3- Washing genitals after sex prevents HIV
4- Vaccine can prevent HIV
5- Sex during menstruation prevents HIV

Reported by: National AIDS/STD Programme (NASP), Ministry of Health and Family Welfare; Department of Mass Communication, Ministry of Information; Ministry of Education, Government of the People's Republic of Bangladesh; Mattra; PIACT; Save the Children-USA; Health Systems and Infectious Diseases Division, ICDDR,B

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Comments

The results of these multiple studies show that gender affects access to HIV prevention information. Female youth have less knowledge about the infection and face more difficulties to reach information. Differences in the sources of information accessible to males and females do not necessarily favour males, given that more males had mentioned peers as their sources of HIV information, while more females had access to information through school. Getting information from peers may not be equally effective in improving knowledge, compared to getting information from school, as peers may hold insufficient or incorrect

information compared to the information given by teachers. However, even in the school setting, gender norms may affect the type of content that is provided. Teachers may not be effective in delivering the content of the HIV curriculum to students, especially to females, because of the cultural sensitivity that surrounds sexuality, and therefore information about sexual transmission. This issue is not specific to Bangladesh. In many places, social norms create a silence around sexual and reproductive health that limits access to correct information, particularly for young women (8).

Even though some improvements have been noted in the increase of HIV knowledge and decrease in misconceptions in recent years, prevention programmes need to identify better strategies to reach both males and females with the knowledge and skills they need to prevent HIV. This will require a more in-depth understanding of the obstacles that different groups of women face in accessing information. Particular attention is needed to reach married female youth given that they have particularly poor access and knowledge and that they are more likely to be exposed to HIV than their unmarried counterparts. In Bangladesh, heterosexual transmission within marriage is likely to be a growing means of transmission.

Targeted efforts are required that address both access to information sources and the information that is provided. For example, given the social restrictions placed on females in terms of their movements, they are less likely to attend social gatherings even if these are to provide useful information on health or illness. Alternative strategies to broaden the reach of such efforts might include arranging female only sessions in places that are more acceptable for women, like schools, or adopting new technologies like DVD players that could allow for sessions in smaller venues, including homes, as well as for daytime airings. Likewise, for males, attention must be given to ensuring that messages are aired using media they access and at times that are convenient. Such practical solutions are steps that can be taken immediately. At the same time, gender norms that limit access need to be addressed as well, through better sensitization of those who are imparting information. For example, teachers who present the HIV curriculum materials should be provided with in-depth training in gender issues, with ample opportunity to practice using their skills before classroom interaction with students. Pairing them with health care providers when they teach this content might ensure that comprehensive and correct information is provided. They also need to have community support, from both school leadership and parents, to empower them to teach sensitive topics. Ultimately, ensuring gender equity will require social change, but programmes need to be aware of the obstacles they face and consider strategies that will help them to meet the needs of the entire population.

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Focus on pandemic (H1N1) 2009: New respiratory ward at the Dhaka Hospital of ICDDR,B, Bangladesh

During March and early April 2009, pandemic (H1N1) 2009 virus emerged in Mexico and the United States. The virus quickly spread throughout many parts of the world. In Bangladesh, we identified the first confirmed case of novel H1N1 at ICDDR,B in June 2009. In response to a rising number of cases in the country, and in order to protect patients and staff from cross-infection, ICDDR,B established a respiratory ward at its Dhaka Hospital. This new ward started functioning on 6 September 2009. A total of 755 patients with fever and cough had attended the respiratory triage by the end of October. Eighty-seven (11%) patients were admitted and the rest were treated as outpatients. Of the admitted patients, 10 had pandemic (H1N1) 2009 virus infection confirmed by rT-PCR and they received oseltamivir in addition to antibiotics; all improved and were discharged.

Pandemic (H1N1) 2009 virus emerged in Mexico and the United States during March and early April 2009 (1). Within two months, the virus quickly spread globally (1). The currently circulating strain of pandemic (H1N1) 2009 influenza virus has undergone triple reassortment and contains genes from the avian, swine and human viruses (2). It is transmitted by inhalation of infectious droplets and droplet nuclei, by direct contact, and possibly, by indirect (fomite) contact, with self-inoculation on to the upper respiratory tract or conjunctival mucosa (1,3,4). The incubation period is usually one to seven days, but can be longer. Common clinical symptoms are indistinguishable from any other viral respiratory illness and usually include fever, cough, sore throat, anorexia, fatigue, headache and myalgia (1,3). In the majority of cases, these symptoms are common, with over 90% of individuals usually experiencing fever and cough (1,5). To our knowledge, there is no report on respiratory triage in Bangladesh during the first wave of pandemic (H1N1) 2009. Therefore, we conducted a retrospective review among hospitalized versus ambulatory patients at the Dhaka Hospital respiratory triage during September to October, 2009.

ICDDR,B responded quickly to the emerging H1N1 influenza situation in Bangladesh. The ICDDR,B Dhaka Hospital established a separate acute respiratory infection treatment unit at the entrance to the hospital. This ward has a separate triage area where individuals with respiratory symptoms can be checked and appropriately advised and treated in a manner that limits the risk to ICDDR,B staff and other patients. Patients reporting

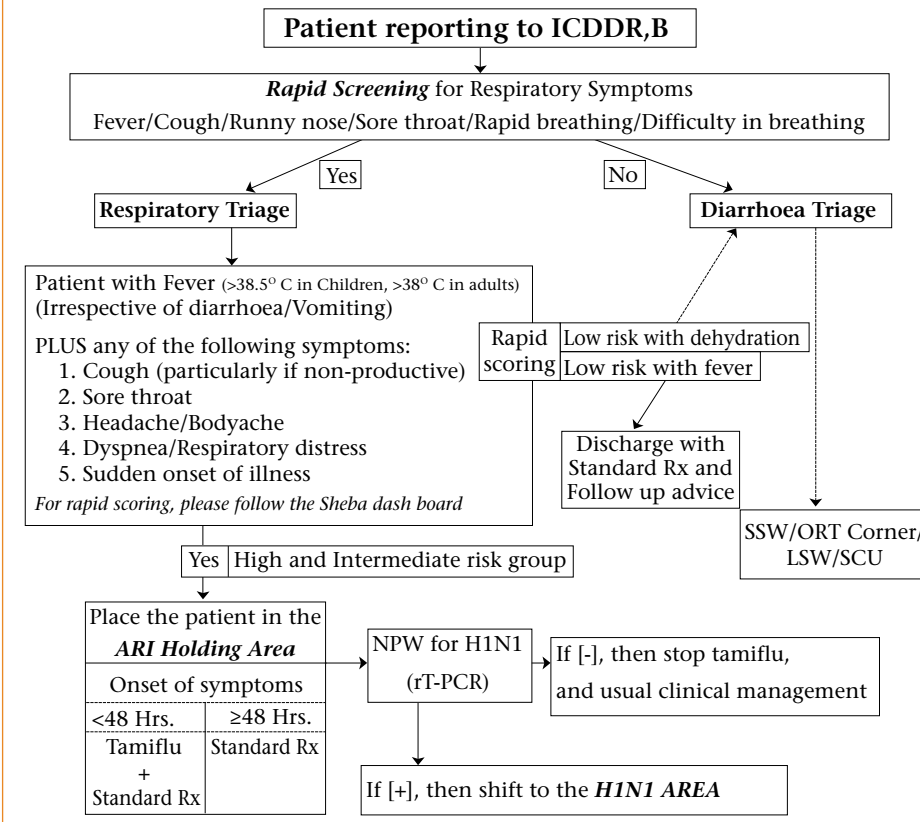
to Dhaka Hospital are rapidly screened for respiratory symptoms such as fever or cough, myalgia, headache, chills, fatigue, running nose, sore throat, rapid breathing and difficulty in breathing. When these symptoms are present, patients are referred to the respiratory triage where this information is recorded and scored in digital system. If these symptoms are not present, patients are referred to the diarrhoea triage. The respiratory triage prioritizes patients by severity according to a scoring system (Figure 1) that is based on a score card that was implemented at Hospital Civil de Guadalajara, Mexico at the beginning of the pandemic (5,6). Patients at low risk (scoring ≤6) were evaluated by physicians and were discharged from the triage with appropriate treatment and follow up advice. Patients at intermediate risk (scoring ≤7-15) and at high risk (scoring ≥16) were placed in the holding area where a nasopharyngeal wash for H1N1 test (rT-PCR) was performed for each patient (7).

Figure 1: Scoring card used at acute respiratory infection triage of Dhaka Hospital of ICDDR,B during the first wave of pandemic (H1N1) 2009

Factor	Score
Fever	2
Cough	2
Fever and cough	6
Headache	1
Myalgia	1
Chills	1
Fatigue	2
Diarrhoea	1
Dyspnea	2
Productive cough	-4
Rhinorrhea	-4
Lymphopenia	4
Thrombocytopenia	4
Leukocytosis	-4
Abnormal chest x-ray	4
>7 outpatients visits during the previous year	2
Previous hospitalization	2
Co-morbidities (pulmonary disease, heart disease, renal disease, solid organ transplantation, HIV, other immunosuppressant, neurological disease, and non-haematological or haematological cancer)	2
High risk	≥16
Intermediate risk	7-15
Low risk	≤6

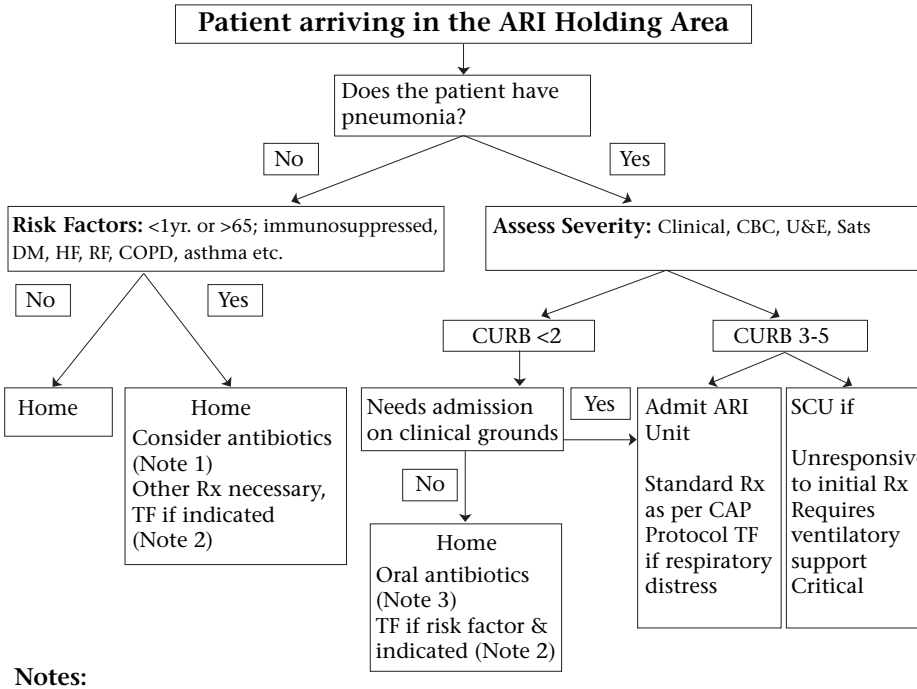
A temporary facility was constructed as an isolation ward for cohorting patients with suspected and confirmed pandemic (H1N1) 2009 virus. It is a well ventilated isolated tent with beds kept more than six feet apart. This facility is divided into three compartments; one is a reception unit for triage, another is a holding area where suspected patients are kept for observation, and the third is the pandemic (H1N1) 2009 virus ward where patients with confirmed pandemic (H1N1) 2009 virus infection are treated. We developed a management protocol (Figures 2 & 3) to deliver prompt and efficient treatment to all patients in this ward (8,9). Sufficient number of doctors, nurses and paramedical staff perform their duties during eitht hourly shifts. Equipment includes a portable x-ray machine, ambu bags, large oxygen cylinders, pulse oxymeters, and nebulizers. We prescribe

Figure 2: Management protocol at triage area followed at Dhaka Hospital of ICDDR,B during the first wave of pandemic (H1N1) 2009



SSW=Short Stay Ward, LSW=Long Stay Ward, SCU=Special Care Unit, Rx=Treatment, SHEBA dash board=Digital system, Tamiflu=Oseltamivir, NPW=Nasopharyngeal wash, ORT=Oral rehydration therapy

Figure 3: Management protocol at holding area followed at Dhaka Hospital of ICDDR,B during the first wave of pandemic (H1N1) 2009



Notes:

1. **Oral antibiotics (on pneumonia):**
   - **a. Adults:** amoxycillin 500 mg thrice daily for 5 days
   - **b. Child:** amoxycillin 125-250mg thrice daily (tds) for 5 days
2. **TF** (oseltamivir) may be used for those who have an acute influenza like illness, high fever, and symptoms for less than 48 hours. Decision to treat will rest on clinical and other (e.g. availability of drug) grounds
3. **Oral antibiotics (pneumonia):**
   - **a. Adults:** amoxycillin 500mg tds x 5 days; or levofloxacin 500mg once daily (od) for 5 days; or azithromycin 500mg stat then 250mg od x 4 days
   - **b. Child:** amoxycillin <1yr 30mg/kg; 1-5yrs. 125mg; 5-15yrs. 250mg; all tds x 5 days; or amoxycillin 50mg/kg twice daily (bd); or azithromycin 10mg/kg od x 5 days (but not >adult dose)

DM=Diabetes mellitus; HF=Heart failure; RF=Renal failure; COPD=Chronic obstructive pulmonary disease; CBC=Complete blood count; U&E=Blood urea & electrolytes, Sats=Arterial oxygen saturation; TF= Tamiflu (oseltamivir); CAP= Community acquired pneumonia.

oseltamivir, an antiviral drug, for suspected or confirmed pandemic (H1N1) 2009 virus infected patients, and use beta lactam, azithromycin or fluoroquinolone antibiotics to treat community acquired pneumonia diagnosed using WHO criteria. Standard operating procedures were formulated and are strictly enforced, with a high priority on implementing appropriate infection control precautions. All staff entering the room use

high efficiency masks, gowns, goggles, gloves, caps and shoe covers. The hospital authority also restrict the access of visitors to the ward. The authority instructed health care personnel working on the ward to monitor their own health and report any febrile illness. We dispose of waste according to standard infection control guidelines.

During the opening of this new ward on 6 September until the end of October 2009, a total of 15,520 patients presented to ICDDR,B for care. Of these, 755 had respiratory symptoms and 14,765 had diarrhoea. Patients who were triaged to the respiratory ward presented with fever and cough (Table 1). Other symptoms included dyspnoea, headache, myalgia, chills and fatigue. Thirty-five percent of all patients attending respiratory triage complained of respiratory difficulty and 12% had diarrhoea. During triage, 267 (35%) of the 755 scored ≤6 (low risk of complications from influenza), 488 (65%) scored ≤7-15 (intermediate risk) and none scored ≥16 (high risk). Those with intermediate risk, (median score of 9) were placed in the observation compartment of respiratory ward and were treated with weight appropriate oseltamivir twice daily for a median of three days after symptom onset. In addition, we provided antimicrobial therapy to treat lower respiratory tract infection as per clinical and radiological indications, and supportive care. Of the 87 patients (11%), who were admitted to the hospital's respiratory ward due to higher morbidity and greater respiratory illness, 83 recovered and were discharged, one left against medical advice, one left without notifying any staff and 2 died.

Table 1: Demographic features & self reported clinical symptoms at Dhaka Hospital of ICDDR,B during the first wave of pandemic (H1N1) 2009

Characteristics	Patients discharged from respiratory triage (n=668)	Patients admitted in respiratory ward (n=87)
Male patients	67%	75%
Fever	93%	98%
Cough	83%	94%
Headache	55%	47%
Myalgia	27%	34%
Chills	7%	11%
Fatigue	22%	9%
Dyspnoea	33%	55%
Diarrhoea	10%	21%

Ten (11%) cases of pandemic (H1N1) 2009 virus infection were confirmed in the laboratory among the patients admitted in the respiratory ward. All patients who tested positive for pandemic (H1N1) 2009 virus improved and were discharged. Influenza B was identified among three other admitted patients. They also improved and were discharged. Of the two children who

died, one had severe malnutrition and Down's syndrome. Both had acute watery diarrhoea and sepsis. Neither tested positive for pandemic (H1N1) 2009. None of the health staff working in this ward reported any respiratory illness and none of them required testing for detection of pandemic (H1N1) 2009 virus.

Table 2: Comparison of clinical presentations among hospitalized versus ambulatory patients at Dhaka Hospital triage during September-October, 2009

Variables	Patients admitted in ward (n=87)	Patients discharged from triage (n=668)	p-value
Duration of fever (day)	3.4±2.3	4.0±6.1	0.04
Duration of cough (day)	3.8±2.9	3.4±3.7	0.3
Duration of dyspnoea (day)	1.8±2.4	1.0±2.1	0.01
Duration of headache (day)	1.4±2.6	1.9±4.2	0.07
Duration of myalgia (day)	0.97±2.0	0.87±1.9	0.6
Duration of chills (day)	0.13±0.6	0.35±1.3	0.007
Temperature (^{O}C)	37.8±1.0	37.5±2.0	0.33
Pulse/min.	116±20	104±25	0.001
Respiration/min.	38±15	28±11	0.000
Arterial O_2 saturation (%)	94±14	97±9	0.06
Acute respiratory infection score recorded at triage	8.1±1.9	7.3±2.4	0.002

Table 3: Demographic, clinical & laboratory characteristics of patients who tested positive for pandemic (H1N1) 2009 at Dhaka Hospital triage during September-October, 2009 (n=10)

Variables	Median (minimum- maximum)
Age	13 y (3 months-63 y)
Sex (male/female)	4/6
Temperature (^{O}C) on admission	39 (38-39.9)
Respiration/minutes	34 (24-70)
Pulse/minutes	132 (88-170)
Arterial O_2 saturation (%)	96 (85-100)
White count (10^9/L)	8 (4-15)
Hospital stay (day)	4 (1-13)

Reported by: Dhaka Hospital, International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B)

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Comments

There are several lessons that can be learnt from this effort. First, despite providing high quality care free of cost to all comers during a time of acute media interest and some panic relating to pandemic (H1N1) 2009, the number of people presenting to the respiratory triage was less than 10% of those presenting with diarrhoea. This is a timely reminder that in developing countries the background burden of disease, especially from infectious diseases, is large and does not go away during a new pandemic. Rather the new cases simply add more stress to the already over-burdened health systems. We must not forget that these 'less exciting' problems still require research, funding and interventions.

Second, there is insufficient information to predict which people infected with pandemic (H1N1) 2009 virus are at high risk of serious illness and who should be prioritized for treatment when resources are limited. Nevertheless, this triage and guideline approach is evidence based and represents the best way for a country such as Bangladesh to use limited resources to address this pandemic: it minimizes unnecessary treatment and provides support to hard pressed physicians when anxious patients and parents demand oseltamivir or antibiotics. To date, all laboratory-confirmed pandemic (H1N1) 2009 cases identified through the triage system survived. In addition, none of our staff became ill with pandemic (H1N1) 2009. Bangladesh is likely to face a second large rise in the number of people infected with pandemic (H1N1) virus in April 2010 during the start of the influenza season. Dissemination and local adaptation of our treatment protocols, triage and isolation system by the health authorities in Bangladesh could significantly improve the country's ability to respond to the problem.

Locally adapted triage systems may facilitate development of infrastructure and improvement of case management in resource-poor settings. The new respiratory ward of Dhaka Hospital has locally appropriate triage and management protocols that might be considered to be reproduced in the same form, or with some modification, at other health care facilities in Bangladesh. This treatment unit could also serve as a model of a rational approach to meet the emerging pandemic (H1N1) 2009 virus influenza situation in other low income countries. As the pandemic progresses, our respiratory triage will continue to refer patients to both the respiratory ward and to the diarrhoea triage. The ICDDR,B authority is confident that its Dhaka Hospital can provide effective and efficient care for all that patients presenting with any symptom of pandemic (H1N1) 2009 virus infection.

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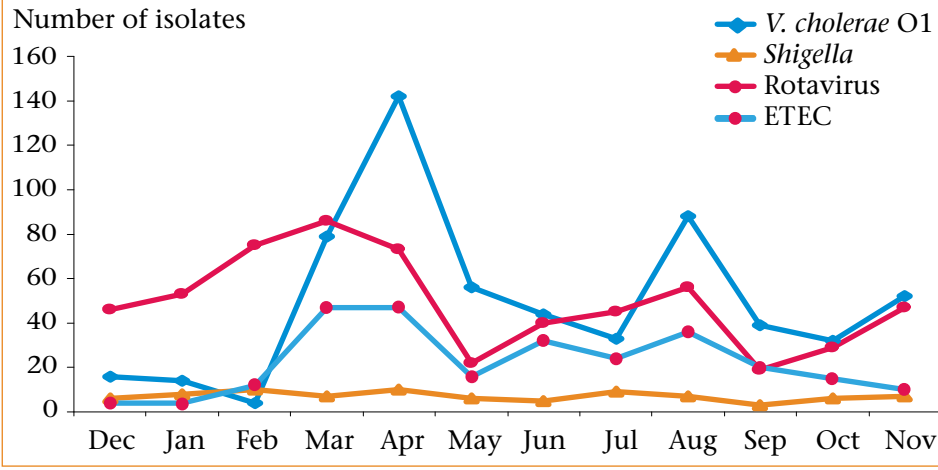
Surveillance updates

With each issue of 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 in Bangladesh.

Proportion of diarrhoeal pathogens susceptible to antimicrobial drugs: December 2008-November 2009

Antimicrobial agents	*Shigella* (n=85)	*V. cholerae* O1 (n=599)
Nalidixic acid	29.4	Not tested
Mecillinam	51.8	Not tested
Ampicillin	48.2	Not tested
TMP-SMX	37.6	0.3
Ciprofloxacin	78.8	99.5
Tetracycline	Not tested	17.9
Erythromycin	Not tested	0.0
Furazolidine	Not tested	0.0

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



Antimicrobial resistance patterns of 32 M. tuberculosis *isolates: July 2008-June 2009*

Drugs	Resistance type		Total n=32 (%)
	Primary n=31 (%)	Acquired* n=1 (%)	
Streptomycin	8 (25.8)	0 (0.0)	8 (25.0)
Isoniazid (INH)	2 (6.5)	0 (0.0)	2 (6.3)
Ethambutal	1 (3.2)	0 (0.0)	1 (3.1)
Rifampicin	0 (0.0)	0 (0.0)	0 (0.0)
MDR (INH+Rifampicin)	0 (0.0)	0 (0.0)	0 (0.0)
Any drugs	8 (25.8)	0 (0.0)	8 (25.0)

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

Antimicrobial susceptibility pattern of S. pneumoniae *among children <5 years during October-December 2009*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	1	1 (100.0)	0 (0.0)	0 (0.0)
Cotrimoxazole	1	0 (0.0)	0 (0.0)	1 (100.0)
Chloramphenicol	0	0 (0.0)	0 (0.0)	0 (0.0)
Ceftriaxone	1	1 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	1	1 (100.0)	0 (0.0)	0 (0.0)
Gentamicin	1	0 (0.0)	0 (0.0)	1 (100.0)
Oxacillin	1	1 (100.0)	0 (0.0)	0 (0.0)

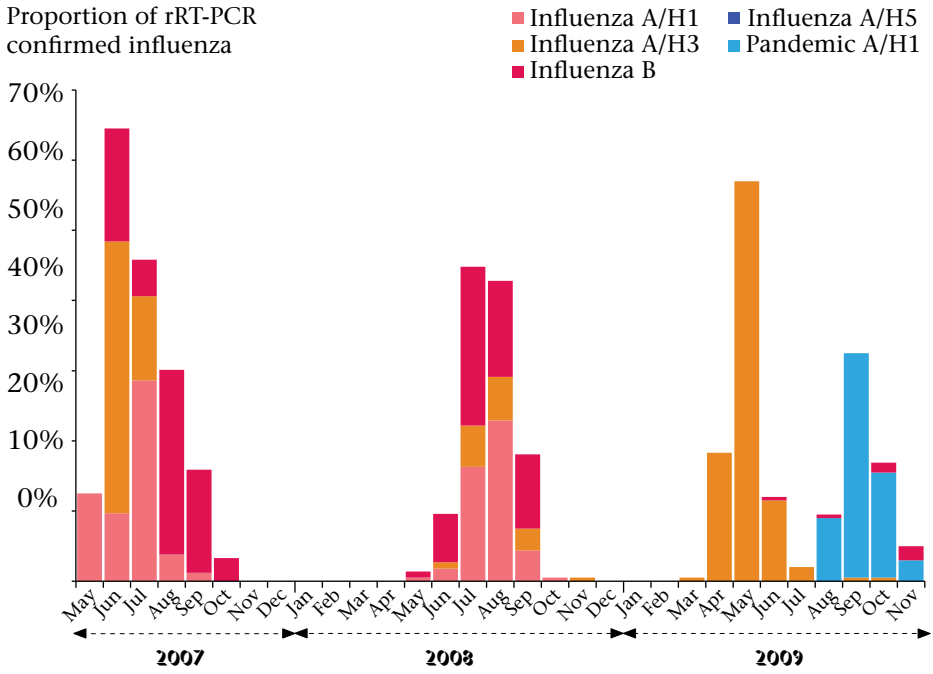
Source: ICDDR,B's urban surveillance in Kamalapur (Dhaka).

Antimicrobial susceptibility pattern of S. typhi *among children <5 years during October-December 2009*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	49	30 (61.0)	0 (0.0)	19 (39.0)
Cotrimoxazole	49	28 (57.0)	0 (0.0)	21 (43.0)
Chloramphenicol	49	29 (59.0)	0 (0.0)	20 (41.0)
Ceftriaxone	49	49 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	49	1 (2.0)	1 (2.0)	47 (96.0)
Nalidixic Acid	49	1 (2.0)	0 (0.0)	48 (98.0)

Source: ICDDR,B's urban surveillance in Kamalapur (Dhaka).

Proportion of laboratory confirmed influenza among hospitalized severe acute respiratory illness (SARI) and outpatient influenza like illness (ILI) cases between May 2007 and November 2009



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)

Laboratory confirmed cutaneous anthrax

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