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Inside

Maternal mortality and health care survey 2010

The second Bangladesh national maternal mortality and health care survey was conducted in 2010. Maternal mortality has declined in Bangladesh by 40% in the last nine years to 194 maternal deaths per 100,000 live births. Factors that likely contributed to this decline include fertility reductions that lower the proportion of higher risk births, and the increased use of facilities for deliveries and for maternal complications. Bangladesh appears to be on track to achieve Millennium Development Goal 5 of reducing by three quarters the maternal mortality ratio between 1990 and 2015, but will need to make continued improvements to achieve the goal.

The second Bangladesh maternal mortality and health care survey was conducted in 2010. Its major objective was to provide a maternal mortality estimate for the period 2008 to 2010, to determine whether maternal mortality has declined significantly from the 1998 to 2001 survey (1) and to ascertain the causes of maternal death. This report is based on an initial summary of key findings from the 2010 survey (2).

The survey was carried out in a national sample of 175,000 households. Field workers interviewed ever

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married women 13 to 49 years old, and investigated any deaths to women of reproductive ages, especially maternal and pregnancy related deaths. The survey also collected information on the levels of use of antenatal care, postnatal care, skilled birth attendants at delivery and care seeking for maternal complications. Field workers collected survey data from January through August 2010.

Interviewers asked each household if any deaths had occurred since October 2007. If deaths were reported, the name, sex, and age at death were recorded. For deaths of each women 13 to 49 years old, interviewers asked additional questions to ascertain whether she was pregnant, delivering, or within six weeks of delivery, or any other pregnancy outcome at the time of death. For all household deaths of women 13 to 49 years old, interviewers administered a verbal autopsy form. At least two physicians reviewed and coded the cause of deaths based on the verbal autopsy information using the International Classification of Diseases, Version-10 (ICD-10).

Maternal mortality declined from 322 deaths per 100,000 live births in 2001 to 194 deaths per 100,000 live births in 2010, a 40% decline in nine years. The rate of decline was at an average of 5.5% per year, compared to the average annual rate reduction of 5.4% required for achieving the Millennium Development Goal 5 of reducing by three quarters the maternal mortality ratio between 1990 and 2015.

Maternal mortality declined in almost all ages between the two surveys. The entire decline in maternal mortality was due to reductions in direct obstetric deaths. Maternal mortality during pregnancy and delivery declined by 50%, and postpartum maternal deaths decreased by 34%. The dominant causes of direct obstetric deaths were hemorrhage (31%), eclampsia (20%), obstructed or prolonged labor (7%), and abortions (1%). Between 2001 and 2010 the maternal mortality ratio due to hemorrhage decreased by 35%, to eclampsia by 50% and to obstructed labor by 26%.

The proportion of women who delivered with a skilled birth attendant increased from 12.2% in 2001 to 26.5% in 2010. Only a small proportion of women (4.3%) used a medically trained provider to attend deliveries at home, which has changed little since 2001 (3.5%). By contrast, the proportion of women delivering in a facility increased from 9% in 2001 to 23% in 2010. Much of this increase has come through the private sector (2.7% to 11.3%), although public sector facility use also increased (5.8% to 10.0%). Between 2001 and 2010 there was a fivefold increase in the number of women who had cesarean section at delivery (2.6% to 12.2%), equivalent to 436,000 annually. Two-fifths of the women with secondary or higher education had a cesarean section. Women in the wealthiest quintile were also more likely to have cesarean section (32%), though even among women in the poorest quintile the proportion of women who received cesarean section

increased from 0.5% to 2.7%. One in three cesarean sections were performed on women who reported no obstetric complications.

Women with obstetric complications were more likely to seek treatment, including purchasing medicines from a pharmacy in the 2010 survey (68%) compared with 2001 (53%). Women with obstetric complications were much more likely to seek treatment from a facility in 2010 (29%) compared with 2001 (16%). Even among uneducated women the proportion who sought care for complications at a facility doubled between 2001 (8.6%) and 2010 (16.9%).

Mothers in the 2010 survey were substantially more educated, reflecting the overall increase in female literacy in Bangladesh, particularly among young women. The proportion of mothers in the survey with no education has halved (from 45% to 23%) since 2001 and the proportion with secondary or higher schooling nearly doubled (26% to 45%).

Although the rich have much more regular access to facilities, virtually all indicators of use of health services by the poorest quintile show considerable improvement and a reduction in inequities between rich and poor including a tripling of facility deliveries (2.5% in 2001 to 7.5% in 2010), use of medically trained assistants at delivery (3.6% to 9.2%) and seeking care for complications (6.7% to 14.5%).

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Comments

The decline in maternal mortality in Bangladesh over the last decade is a major public health achievement. Multiple factors likely contributed to this reduction. Life-threatening maternal hemorrhage and eclampsia normally require management at a facility for the mother to survive. The marked observed reduction in deaths from hemorrhage (31%) and eclampsia (20%), the increase in deliveries at facilities assisted by skilled birth attendants, and the increased proportion of women with obstetric complications who sought care at facilities suggest that women who need emergency care were more likely to receive it in 2008-2010 compared to nine years earlier. Since almost the entire increase in skilled attendance at delivery has been through facility deliveries, strategic investments in improving health services at facilities are likely to provide the greatest and quickest returns in terms of skilled attendance at delivery.

Educated women are more likely to use facilities, so the improvement in maternal education has likely contributed to the improved use of facilities.

However the greater use of facilities even among uneducated women suggests that improved awareness and availability also contributed. The government has markedly expanded emergency obstetric care services. Emergency obstetric care was available at only three upazila health centers in 2001, but was available at 132 upazila health centers by 2010. Improved communication, particularly the widespread availability of mobile phones, has likely improved contact between mothers in need and healthcare providers. Improvements in road infrastructure have also likely improved women's access to health care facilities. Most of the increase in facility usage was in the private sector, and the observation that one in three cesarean sections was performed on women not reporting any obstetric complications suggests that some of the increased obstetric procedures are not contributing to improved maternal outcomes.

Bangladesh's economy has grown steadily over the last 10 years, which is illustrated by improved housing and greater access to electricity. This presumably has also provided greater ability to mobilize funds for medical emergencies.

In order for Bangladesh to achieve Millennium Development Goal 5, which will require a further 25% reduction in the maternal mortality ratio by 2015, continued improvements will be important. The strategies that are most likely to be effective include a further reduction in fertility, which will shift births away from high parity higher risk mothers. Continued investment in female education can be expected to bring behaviour changes which favour more use of skilled birth attendants, more facility deliveries and more and quicker treatment seeking for complications. Since most of the improvements have apparently resulted from improved access to facilities continued attention to improving the quality of facility services will be crucial to attract and appropriately treat women at high risk. Other specific health interventions that can be scaled include distributing misopristol tablets to all pregnant women shortly before delivery to minimize the risk of hemorrhage, the use of delivery mats for aiding attendants to determine if blood loss is excessive, improved facility care, wider availability of transfusion services, and increasing the availability of magnesium sulfate for treatment of eclampsia at delivery.

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Outbreak of mild respiratory disease caused by H5N1 and H9N2 infections among young children in Dhaka, Bangladesh, 2011

In March 2011, two human cases of infection with avian influenza A (H5N1) and a human case of infection with avian influenza A (H9N2) viruses were detected through a population-based urban surveillance system in Bangladesh. A team of epidemiologists, veterinarians and anthropologists investigated this outbreak. All three cases were less than five years of age and presented with fever, cough and/or runny nose. All of them recovered without hospitalization and without sequelae. Both isolated H5N1 virus strains belonged to clade 2.2 and are closely related to virus circulating in poultry in Bangladesh. The H9N2 virus isolate belonged to the G1 lineage of H9 avian influenza viruses. Detection of cases of avian influenza in humans underscores the ongoing risk of human infection with new strains of influenza.

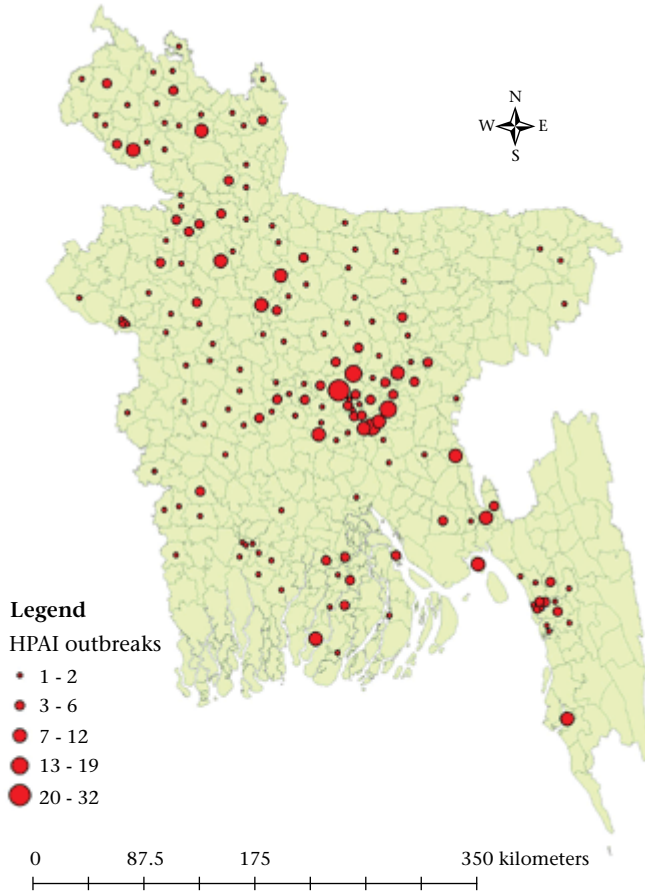
In May 1997, the first case of human infection with avian influenza A (H5N1) was documented in Hong Kong (1). Since then, 553 confirmed human cases of infection with H5N1 virus from 15 countries have been reported to WHO (2). Avian H9N2 influenza virus has also caused sporadic human infections in Asia since 1998 (3-5). The first H5N1 affected poultry farm was reported in Bangladesh in March 2007 (6). Since then, 519 outbreaks of H5N1 have been reported in Bangladesh through May 9, 2011 (7) (Figure 1). The only previously confirmed human case of avian influenza in Bangladesh was identified in Dhaka in 2008 within the Kamalapur urban surveillance project which conducts an intense active surveillance for influenza in an urban community (8).

On March 13, 2011, the Kamalapur urban surveillance site reported a human case of avian influenza A (H5N1). The same surveillance site reported two more human cases, one with avian influenza A (H5N1) and another with avian influenza A (H9N2) in the following 10 days.

Immediately after the first case was reported, the Institute of Epidemiology, Disease Control and Research (IEDCR) and International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR,B) jointly formed a collaborative team of epidemiologists, veterinarians and anthropologists to conduct an outbreak investigation. The objective of this investigation was to understand the pathway of transmission and to explore the factors that contributed to the occurrence of these three human cases of avian influenza. In this report

we present the epidemiological, clinical and virological findings of these cases.

Figure 1: Bangladesh map showing highly pathogenic avian influenza (HPAI) outbreaks in poultry in Bangladesh, March 2007-May 2011



Source: http://www.aitubd.org/inner.php?Page=5

We reviewed preliminary information about the cases from the Kamalapur surveillance team. We collected clinical, epidemiological and exposure history of the cases during the 15 days prior to their onset of illness using a structured questionnaire and by conducting an in-depth interview with the parents of the cases as proxies for the respondents since all the cases were less than five years of age. We visited the households of the cases to better understand the possible exposure history given by the parents and to explore potential environmental exposures. We collected repeated

follow-up nasopharyngeal wash (NPW) from the cases (Figure 2). We also collected NPW or nasopharyngeal swab samples from the parents of each case and two other contacts for Case A, who took care of the case during her illness. Samples were tested in IEDCR & ICDDR,B for influenza viruses by real time reverse transcriptase polymerase chain reaction (RT-PCR). We also sent samples to the Centers for Disease Control (CDC), Atlanta for further characterization of the viruses. We collected fecal samples from two live bird markets located close to the houses of these three cases in Kamalapur.

Case A was a 13 month old girl who developed a cough on March 5 followed by fever on March 7. She visited the ICDDR,B Kamalapur Field Clinic on March 9. On examination she had fever (39°C) with otherwise normal findings (Table 1). Physician on duty classified her as a case of influenza like illness (ILI) and collected a NPW specimen from her as part of the ongoing influenza surveillance. The NPW specimen tested positive by real-time RT-PCR for influenza A (H5) on March 13, and IEDCR immediately reported the case to the World Health Organization as per the International Health Regulations. On March 14, when we interviewed the case, she reported no fever since March 11 but she still had cough and had one episode of loose motion on that day (Figure 2).

Table 1: Clinical features of human cases of avian influenza H5N1 and H9N2 infection in Bangladesh, February-March 2011

Case	Age (Mohths)	Sex	Date of onset of illness	Symptoms	Temperature	Duration of symptoms	Day of collection of NPW	Avian influenza A subtype
A	13	Female	05 March 2011	Fever, cough & diarrhoea	39°C	22 days	9 March 2011	H5N1
B	31	Male	01 March 2011	Fever, cough, runny nose, conjunctivitis, vomiting and diarrhoea	38.8°C	12 days	7 March 2011	H5N1
C	51	Female	25 February 2011	Fever, headache, runny nose, cough and sneezing	38.2°C	3 days	26 February 2011	H9N2

Seven days before her onset of illness, seven chickens were slaughtered, defeathered and skinned inside Case A's home while she was at home. Case A visited her grandparents house in Munshiganj district for three days, five days before her symptoms began. While in Munshiganj, she was in the company of her great grandmother, who was diagnosed with bronchial asthma and was suffering from respiratory distress during that period.

There were reports of crow die-offs in the village in recent weeks and the investigative team observed one sick crow and five dead crows, as well as freely roaming chickens raised by neighbours.

Case B, a 31 month old boy, developed cough and runny nose on March 1, and conjunctivitis on March 2. On March 5 the child developed fever and on March 6 he had one episode of vomiting and loose motion (Table 1). On March 7, the physician at the Kamalapur Field Clinic found his tonsils inflamed and as the case fulfilled the recruitment criteria of ILI collected his NPW specimen. The physician treated him with amoxicillin with clavulanic acid syrup. The child's NPW tested positive for influenza A (H5) on March 15 (Figure 2).

Ten or twelve days before his illness Case B touched live poultry while his mother purchased a live chicken from a roaming vendor. The child was present when the chicken was eviscerated. His mother also mentioned that the child had cut his hand with a knife while she was preparing the chicken and she pressed her hand on his wound to stop the bleeding while her hand was still contaminated with raw chicken. Many of their neighbours in the slum where they live raised ducks, chicken and quail in the yard where the child played. The mother took the child along with her inside the wet market where poultry are sold during the week prior to his illness.

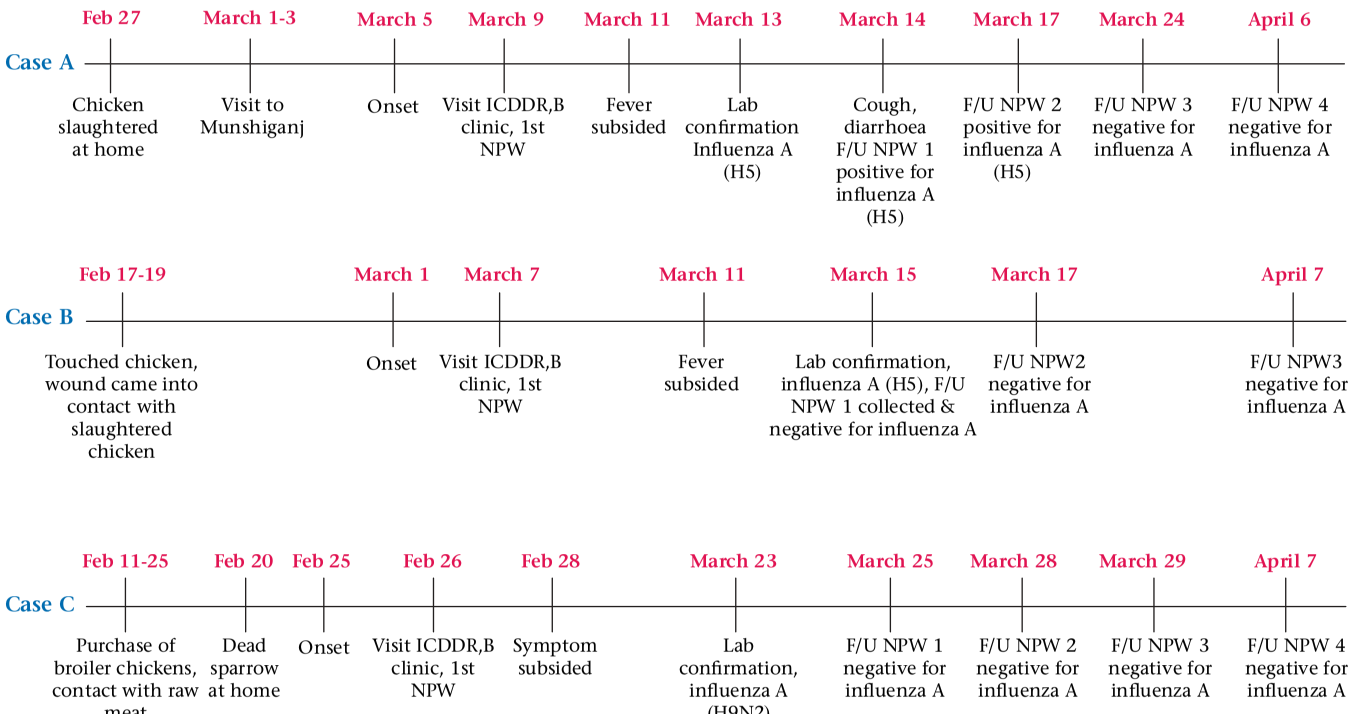
Case C, a 51 month old girl developed fever and headache on February 25. The following day she developed runny nose, cough and sneezing and her mother took her to the Kamalapur Field Clinic on that day. Clinic staff measured her temperature to be 38.2°C (Table 1) and collected her NPW specimen. The physician on duty gave her paracetamol and oral rehydration solution. She recovered on 28 February. Virologists of ICDDR,B found her NPW specimen influenza A positive (untypable) by RT-PCR and sent it to CDC, Atlanta for further characterization. The specimen was found positive for influenza A (H9N2) by partial sequencing at CDC on March 23 (Figure 2).

According to her parents, Case C always took part in cutting chicken into pieces and washing the meat. During the 15 days prior to her onset of illness, her father bought defeathered and eviscerated chickens on four occasions. Approximately five days prior to her onset of illness, the mother found a dead sparrow in the veranda of their home. She called her child over to look at it, but did not remember whether the child touched the dead sparrow or not.

None of these three cases required hospitalization and all of them recovered uneventfully. NPW and nasopharyngeal swab of all family members tested negative for influenza A by real-time RT-PCR.

Viruses were isolated from NPW specimens of all three cases and full genome sequencing of the cultured isolates was performed. Phylogenetic analysis of the two isolated H5N1 viruses indicates that they belong to the clade 2.2 lineage and that they are closely related to H5N1 virus isolates of avian origin

Figure 2: Time line of events of human cases of avian influenza H5N1 and H9N2 infection in Bangladesh, February-March 2011



NPW: Nasopharyngeal wash
F/U: Follow-up

recently collected in Bangladesh. The H9N2 virus isolate belongs to the G1 lineage of H9 avian influenza viruses. Functional antiviral susceptibility assays against three neuraminidase inhibitors tested (oseltamivir, zanamivir and peramivir) showed that the viruses were sensitive to all.

A pool of chicken fecal samples from two live bird markets located close to the houses of these three cases in Kamalapur tested positive for influenza A (H5) by RT-PCR.

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Comments

This was an outbreak of human infection with avian influenza viruses in Bangladesh with three epidemiologically unrelated cases; two cases of influenza A (H5N1) and a case of influenza A (H9N2) detected within a period of two weeks in late February and early March 2011. All these were pediatric cases with mild symptoms and were detected within the intensive population based influenza surveillance ongoing in an urban community in Kamalapur, Dhaka.

Through this longitudinal population-based surveillance in Kamalapur, where 6,600 households are under active surveillance, more than 6,000 NPW specimens were collected from participants presenting with fever and/or respiratory infection from January 1, 2010 until March 31, 2011. All four cases of human infection with avian influenza identified so far in Bangladesh have been detected in this urban community, which underscores the value of intensive population based surveillance for the detection of novel influenza strains. This surveillance platform supplements the national sentinel surveillance systems, where samples are collected among more severely ill patients in a hospital setting.

Avian influenza was circulating concurrently in Bangladeshi poultry before and during this outbreak (7, 9). All these cases had a history of contact with poultry within 15 days prior to the onset of their illness (Figure 2). The incubation period of H5N1 infection in human ranges from two to eight days and possibly as long as 17 days (10) and so the contact with poultry is the likely source of these children's illness.

Human infections with avian influenza (H5N1) virus have a high case fatality ratio of 58%, but mild cases have also been identified (1, 11). All three cases of human infection with avian influenza A (H5N1) identified so far in Bangladesh were pediatric cases without any severe symptoms. The close

household interactions of these children with poultry is a common exposure throughout Bangladesh. Therefore the repeated isolation of avian influenza viruses from children in this one location, where intensive surveillance is ongoing, suggests that there is likely transmission of avian influenza to people in many other places in Bangladesh, though we have not detected severe cases in the hospital based influenza surveillance. Because milder cases are less likely to be investigated and reported it is possible that the case fatality ratio calculated for human avian influenza A (H5N1) overestimates the severity of disease.

Avian influenza A (H9N2) virus is a low-pathogenic virus with widespread distribution in Asia (12). H9N2 circulation within live bird markets in Bangladesh has recently been reported (9). Sporadic cases of human infection with avian influenza A (H9N2) usually present with relatively mild symptoms in humans (3,4). H9N2 virus remains a pandemic concern for humans as it is a novel strain with a high level of genetic plasticity, exhibiting extensive evolution and a propensity for reassortment, and has already demonstrated the ability to infect humans and cause disease. Therefore every introduction of H9N2 virus into humans may create opportunities for reassortment with co-circulating human viruses and an opportunity for the genesis of new influenza strains with pandemic potential. Thus, studies should be done to understand the characteristics of this low pathogenic avian influenza virus.

Evidence of human infection with avian influenza viruses and the ongoing widespread outbreaks of H5N1 influenza in poultry in Bangladesh suggest that physicians should consider the possibility of avian influenza in both mild and severe cases of respiratory infection in humans, explore possible exposure with sick or dead birds and report clusters of respiratory illness to government authorities.

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Nipah outbreak in Lalmonirhat district, 2011

In February 2011, we investigated an outbreak of encephalitis in Hatibandha sub-district of Lalmonirhat district. Twenty residents of the sub-district became ill with fever and altered mental status from 26 January to 02 February. All of them died. We collected blood specimens from nine cases, among them eight cases had IgM antibodies against Nipah virus by enzyme-linked immunosorbent assay. Onset of illness of all cases within a short period of time and history of consumption of raw date palm sap in 65% of cases indicate raw date palm sap as the likely source for acquiring Nipah virus infection in this outbreak. For the first time the Government of Bangladesh explicitly recommended that people avoid drinking raw date palm sap to prevent Nipah transmission. Family members of cases reported unwillingness of tertiary hospitals to admit encephalitis cases and reluctance of health care providers to care for hospitalized cases. Health care workers should be trained and provided with necessary personal protective equipment to ensure both safety of the health care providers and quality care for the patients.

Nipah virus is a paramyxovirus that causes highly fatal encephalitis in humans (1). Fruit bats of the genus *Pteropus* are the apparent natural reservoir for the virus and may shed Nipah virus through their saliva and urine (2). Bats frequently visit date palm trees, lick the sap stream and their saliva and/or urine gets mixed with the sap which can contaminate it with Nipah virus (3). Previous outbreak investigations in Bangladesh have identified drinking raw date palm sap as a risk factor for Nipah virus transmission (2). Nipah virus also transmits from person to person (2,4). Nine outbreaks of Nipah encephalitis have been identified in Bangladesh during 2001 to 2010 (5). Among the 153 cases detected in outbreaks and as sporadic cases during this period, 111 (73%) died.

On 01 February 2011, the surveillance physician working in the Nipah surveillance site at Rangpur Medical College Hospital reported admission of two siblings with encephalitis from Hatibandha sub-district of Lalmonirhat district. On the following day, the surveillance physician, the Civil Surgeon of Lalmonirhat, as well as a national daily newspaper reported the deaths of three encephalitis cases and hospitalization of more cases with similar symptoms from the same sub-district. A collaborative team of epidemiologists, veterinarians and qualitative investigators from Institute of Epidemiology, Disease Control and Research (IEDCR) and International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR,B) began the outbreak investigation on the same day. The objectives of the investigation were to explore the cause of the outbreak and the risk factors for acquiring

the illness. We present here the preliminary findings of the investigation.

Immediately after arriving in the outbreak area, we met the local administrators and health authorities and collected the line list of encephalitis cases, including living cases either hospitalized or in the community, and deceased cases. Based on the preliminary information and our experience of previous Nipah encephalitis outbreaks we defined a suspected case as any person from Hatibandha, living or deceased, with fever and new onset of altered mental status or respiratory difficulty since 01 January 2011 to the date of investigation (6). We identified suspected cases admitted in Rangpur Medical College Hospital, Hatibandha Upazilla Health Complex and in the outbreak community by collecting information through group discussion and unstructured interviews with the physicians, community health workers, local journalists, family members and neighbours of cases. We used a structured questionnaire to collect demographic information and clinical and exposure histories of the suspected cases.

We collected blood samples from living suspected cases. Samples were centrifuged in the field, aliquoted and transported in liquid nitrogen to IEDCR virology laboratory. The samples were tested for Nipah IgM antibodies using enzyme-linked immunosorbent assay at IEDCR. The suspected cases that tested positive for Nipah IgM were categorized as confirmed cases. The suspected cases who died before a sample could be obtained, or from whom only a single serum sample could be collected within five days of onset of illness and were negative for Nipah IgM, we categorized as probable cases.

To explore cases' history of exposures and illness, and community understanding about the disease, qualitative investigators conducted in-depth interviews and group discussions with the families and their relatives of each confirmed and probable case. We also interviewed date palm sap harvesters who collected and distributed sap in the outbreak community. To raise awareness regarding prevention of Nipah virus transmission, the team held community group meetings where we disseminated culturally appropriate messages based on scientific findings from previous Nipah studies to explain the cause of illness, symptoms, route of transmission and methods of prevention.

We identified 20 Nipah encephalitis cases in Hatibandha. Among the nine cases from whom a blood specimen could be collected, eight were confirmed cases with positive Nipah IgM antibodies. All others were probable cases. The median age of the cases was 18 years (range: 2-55 years); 17 (85%) were male. The onset of illness of the cases was from 26 January 2011 to 02 February 2011 (Figure 1). The cases were spread over five adjacent villages in Hatibandha. Among the 20 cases, the illness started in 19 (95%) cases with fever; headache was the first symptom in the other case. All the cases eventually developed altered mental status and unconsciousness. Fourteen

(70%) cases developed difficulty in breathing that began on the day of death or just a few hours before death. All cases died. The median duration from onset of illness to death was 5 days (range: 1-22 days) (Table 1). Thirteen (65%) of the 20 cases drank raw date palm sap within 30 days prior to the onset of their illness.

Figure 1: Distribution of Nipah cases in Hatibandha by date of onset of illness, January-February 2011

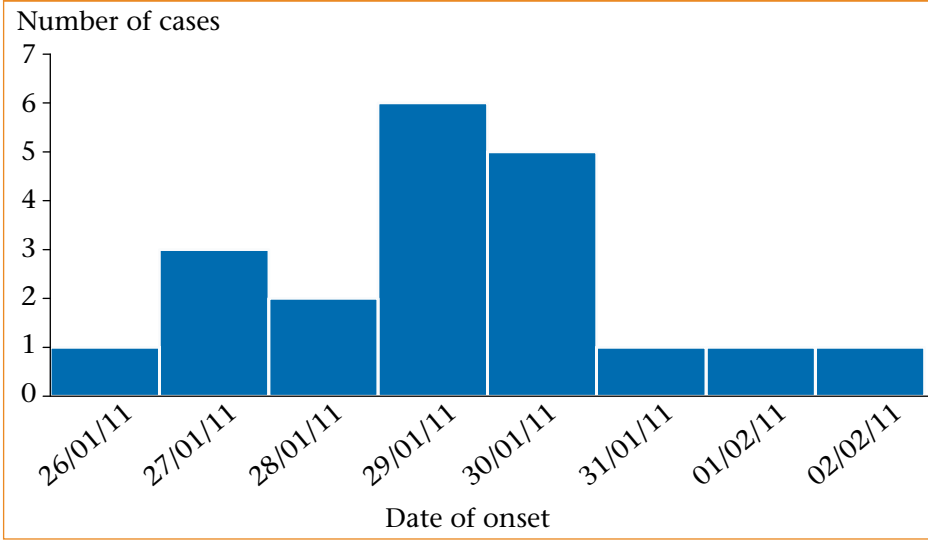

Table 1: Clinical characteristics of Nipah encephalitis cases in Hatibandha sub-district, Lalmonirhat District, Bangladesh, January-February 2011.

Clinical characteristics	n (%)
Fever	20 (100)
Altered mental status	20 (100)
Unconsciousness	20 (100)
Headache	17 (85)
Difficulty breathing	14 (70)
Cough	14 (70)
Severe weakness	14 (70)
Drowsiness	14 (70)
Vomiting	11 (55)
Convulsion	10 (50)
Muscle pain	7 (35)
Joint pain	5 (25)
Outcome - Death	20 (100)
Median time from onset of illness to death in days (range)	5 (1-22)

Family members of cases reported unwillingness of some hospital authorities to admit encephalitis patients, especially if they had history of consumption of date palm sap or were from the outbreak area. Also, in some instances health care providers were unwilling to attend admitted encephalitis patients.

Approximately 500-2,000 community residents participated in each of the nine Nipah information dissemination meetings. To prevent person-to-person transmission we provided four behavioural messages to reduce possible exposure to respiratory secretions, including washing hands with soap before eating and after cleaning and feeding patients; not eating patient's leftover food; sleeping in a separate bed or in the opposite direction; and maintaining more than a hand's distance from the patient's face while giving care. To prevent Nipah virus transmission from bats to humans, we recommended avoiding drinking raw date palm sap. The Government of Bangladesh also disseminated communication messages through newspapers and television channels, recommending that people avoid consumption of raw date palm sap to prevent Nipah transmission.

Following delivery of the prevention messages, community residents of the affected and neighbouring villages stopped consuming raw date palm sap and did not allow retailers selling raw date palm sap in the bazaar or any public place. Tree owners prohibited sap harvesters from shaving the date palm trees to collect sap. Community residents recommended widespread dissemination of Nipah prevention messages prior to the start of date palm sap harvesting season to raise public awareness of avoiding consumption of raw date palm sap to prevent Nipah transmission.

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Comments

The epidemiological, clinical and laboratory findings of this outbreak investigation suggest that this was an outbreak of Nipah encephalitis. Onset of illness of all cases within a short period of time and history of consumption of raw date palm sap in 65% of cases indicate raw date palm sap as the likely source for acquiring Nipah virus infection in this outbreak. This is consistent with the findings of our previous outbreak investigations regarding transmission of Nipah virus from bats to humans through consumption of raw date palm sap (2). Drinking raw date palm sap is a delicacy in Bangladesh, which is part of the rural culture, especially during

winter (3). This was the first time the Government of Bangladesh explicitly recommended that people avoid drinking raw date palm sap to prevent Nipah virus infection. To prevent future outbreaks, a mass communication campaign should be launched each year before the winter, the date palm harvesting season, to discourage consumption of raw date palm sap.

There was no evidence of person-to-person transmission of Nipah virus during this outbreak, despite the fact that family members and caregivers of cases had contact similar to those during previous outbreaks where person-to-person transmission occurred (4,7). Also, the case fatality ratio of 100% was higher than the previous outbreaks of Nipah encephalitis (1,4,7). Strains of Nipah virus isolated from affected persons in different Nipah outbreaks in Bangladesh have shown substantial genetic diversity (8). High case fatality during this outbreak might be related to a Nipah virus strain with higher virulence. Therefore, it will be worth comparing the genotype of the Nipah virus strains causing this outbreak with previously identified strains. Previous Nipah outbreaks in which consumption of raw date palm sap was identified as the risk factor had higher case fatality ratios than those in which person-to-person was the major route of transmission. Therefore, viral load in the sap or the route of transmission might be the factors associated with a high case fatality ratio. As we collected exposure history of cases from proxies, all possible exposures of the cases, including consumption of raw date palm sap, during the 30 day period prior to onset of illness might not have been identified for some cases.

Health care workers might have been afraid to provide care for or admit suspected Nipah encephalitis cases during this outbreak because of the high case fatality ratio, absence of specific treatment, evidence of person-to-person transmission and recent history of suspected nosocomial Nipah transmission to a physician (5). Reluctance of health care workers to provide hands-on care to Nipah cases was reported during previous Nipah outbreaks in Bangladesh (9). Providing necessary care to a patient is a professional and ethical obligation of health care workers. Instead of refusing suspected Nipah or other potential infectious patients, it is important for health care workers to take appropriate personal protective measures to prevent infection. Every health care worker should be given necessary training and be equipped with a sufficient supply of personal protective equipment to promote infection prevention measures while providing high quality care for potentially infectious patients.

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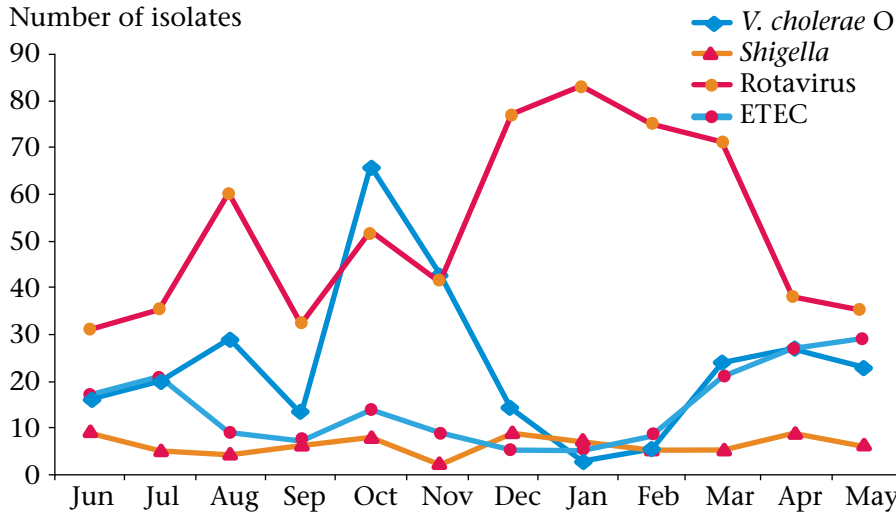
Surveillance updates

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: June 2010-May 2011

Antimicrobial agents	*Shigella* (n=75)	*V. cholerae* O1 (n=283)
Nalidixic acid	Not tested	Not tested
Mecillinam	63.5	Not tested
Ampicillin	57.3	Not tested
TMP-SMX	27.0	0.04
Ciprofloxacin	47.3	99.3
Tetracycline	Not tested	55.1
Erythromycin	Not tested	0.4
Furazolidine	Not tested	Not tested

Monthly isolation of* V. cholerae *O1,* Shigella*, Rotavirus and ETEC June 2010-May 2011



Antimicrobial resistance patterns of 131 M. tuberculosis *isolates: May 2010-April 2011*

Drugs	Resistance type		Total n=131 (%)
	Primary n=119 (%)	Acquired* n=12 (%)	
Streptomycin	19 (16.0)	2 (16.7)	21 (16.0)
Isoniazid (INH)	3 (2.5)	0 (0.0)	3 (2.3)
Ethambutal	1 (0.8)	0 (0.0)	1 (0.8)
Rifampicin	4 (3.4)	1 (8.3)	5 (3.8)
MDR (INH+Rifampicin)	3 (2.5)	0 (0.0)	3 (2.3)
Any drugs	20 (16.8)	2 (16.7)	22 (16.8)

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

Antimicrobial susceptibility pattern of S. pneumoniae *among children <5 years during April-May 2011*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	11	11 (100.0)	0 (0.0)	0 (0.0)
Cotrimoxazole	10	2 (20.0)	0 (0.0)	8 (80.0)
Chloramphenicol	4	4 (100.0)	0 (0.0)	0 (0.0)
Ceftriaxone	11	11 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	11	11 (100.0)	0 (0.0)	0 (0.0)
Gentamicin	11	2 (18.0)	0 (0.0)	9 (82.0)
Oxacillin	11	10 (91.0)	0 (0.0)	1 (9.0)

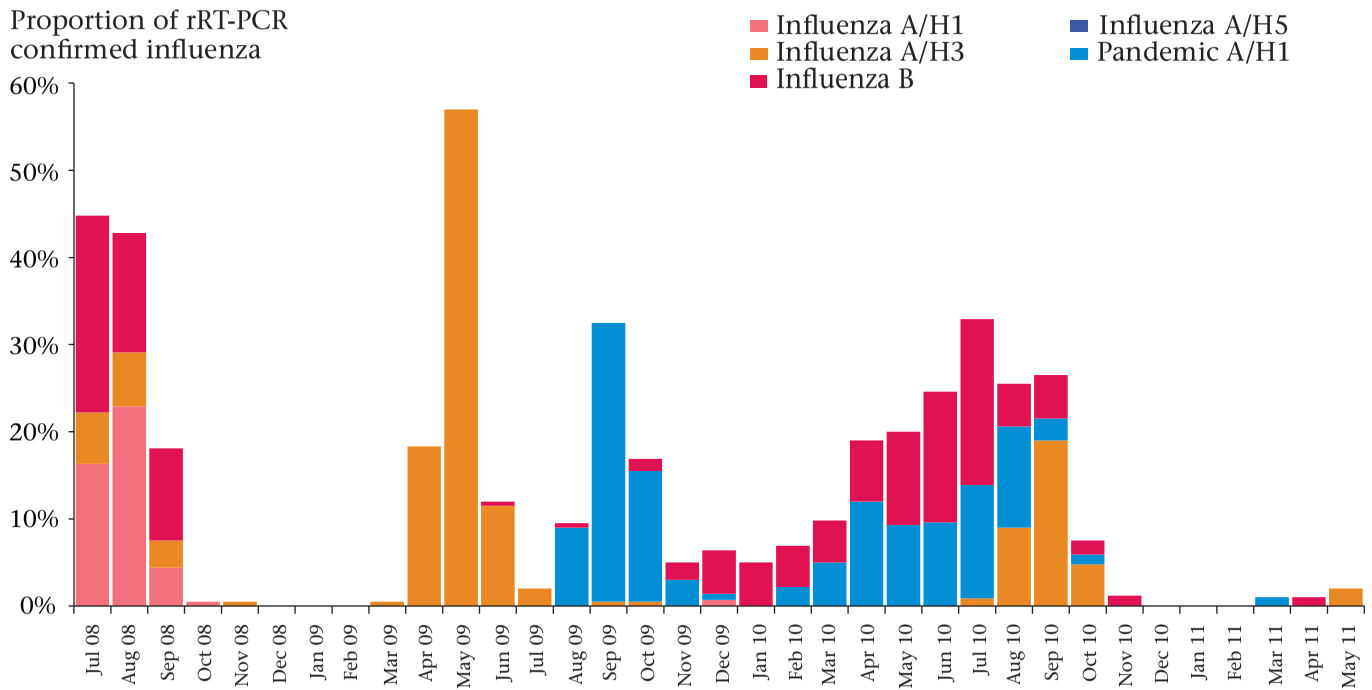
Source: ICDDR,B's urban surveillance in Kamalapur (Dhaka).

Antimicrobial susceptibility pattern of S. typhi *among children <5 years during April-June 2011*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	44	28 (64.0)	0 (0.0)	16 (36.0)
Cotrimoxazole	44	25 (57.0)	0 (0.0)	19 (43.0)
Chloramphenicol	44	25 (57.0)	0 (0.0)	19 (43.0)
Ceftriaxone	44	44 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	44	2 (4.0)	0 (0.0)	0 (0.0)
Nalidixic Acid	44	2 (4.0)	0 (0.0)	42 (96.0)

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 July 2008 and May 2011



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 roaming chicken vendor

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