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Inside

Backyard poultry raising practices in Bangladesh: implications for risk of avian influenza infection in humans

Since March 2007, the Government of Bangladesh has been conducting a mass media campaign to disseminate 10 recommended precautions to prevent transmission of highly pathogenic avian influenza A virus subtype H5N1 from poultry to humans. We conducted this study to assess backyard poultry raisers' knowledge about avian influenza, commonly known in Bangladesh as 'bird flu,' and to find out if they were following the recommendations. We interviewed 1,883 primary backyard poultry raisers from 90 randomly selected villages from May 2009 to September 2011. More than half (56%) of the respondents had never heard of bird flu and government recommendations were infrequently followed by primary backyard poultry raisers. Persons who had heard of bird flu were more likely to follow government recommendations. Prevention messages should be re-evaluated to assess the acceptability and feasibility of

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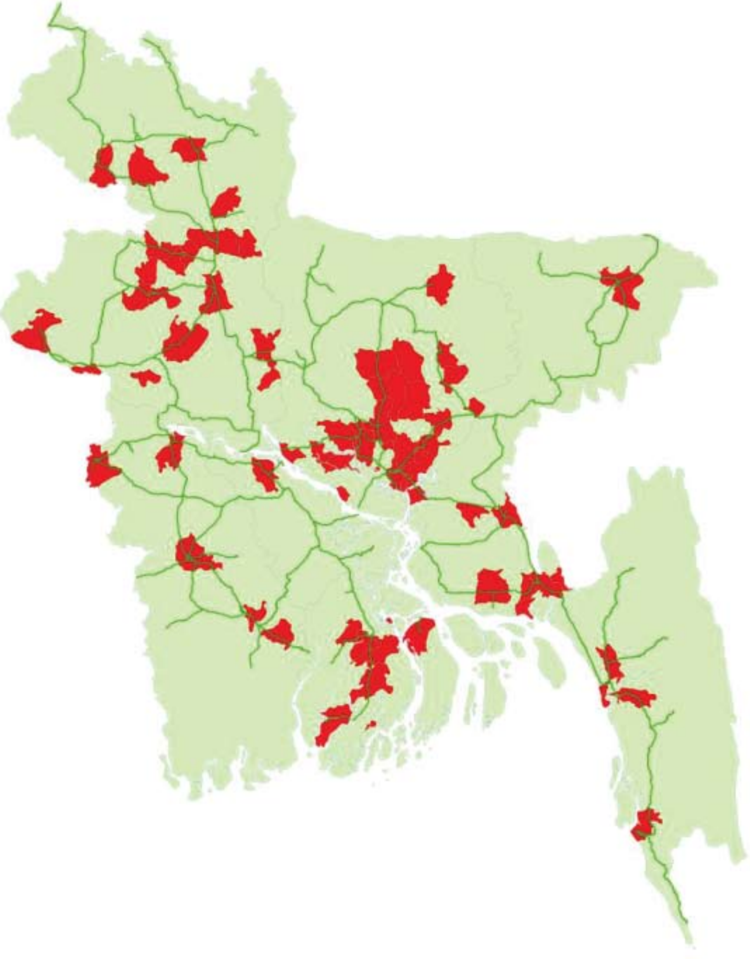
the proposed behaviours to reduce risk in the target communities. Optimal communication channels should be identified so messages can reach more rural backyard poultry raisers.

Bangladesh has one of the highest human population densities in the world, with 1,075 persons/km^2 (1). Poultry density in Bangladesh is also high at 1,460 birds/km^2 and 50% of poultry in Bangladesh is raised in backyards (1,2). This high human and animal population density provides frequent opportunities for human-animal contact and spread of infectious diseases from animals to humans (3). Inhalation or conjunctival deposition of large infectious droplets during handling and slaughtering of diseased poultry and handling of raw poultry meat or eggs are considered common routes of transmission of avian influenza to humans (4,5). Since 2007, highly pathogenic avian influenza A virus subtype H5N1 has been confirmed in poultry in 52 of 64 districts of Bangladesh and 57 outbreaks in backyard poultry have been officially reported (Figure 1). In 2008, a child from the icddr,b Kamalapur urban surveillance site in Dhaka tested positive for H5N1, along with another two children in 2011 (6,7). Three adult poultry workers from live bird markets of Dhaka tested positive for H5N1 in 2012 (8,9). All six had a history of close contact with poultry. Although all confirmed human cases of H5N1 infection identified in Bangladesh only developed mild illness, 358 deaths have occurred among 607 confirmed H5N1-infected cases reported worldwide since 2003 (10).

Starting on March 1, 2007, the Government of Bangladesh organized a mass media campaign to disseminate 10 recommended precautions to prevent H5N1 infection in humans (Table 1) (11). At various times, the campaign disseminated messages through radio, television, newspapers, and public meetings led by government veterinary officials from the Department of Livestock Services (DLS) with the help of World Bank and many of Bangladesh's other development partners including the Food and Agricultural Organization (FAO), World Health Organization (WHO), United Nations Development Programme (UNDP), United Nations Children's Fund (UNICEF), United States Agency for International Development (USAID), Danish International Development Agency (DANIDA), Asian Development Bank (ADB), and the Japanese Government (11). The recommendations were adapted from a publication by UNICEF in partnership with WHO, FAO, and the Government of Japan (12). This study aimed to assess poultry raisers' knowledge of avian influenza, commonly known in Bangladesh as 'bird flu,' and to compare current poultry raising practices to the practices recommended by the Government of Bangladesh.

From May 2009 to September 2011, the icddr,b field team selected 90 village clusters in Bangladesh by probability proportionate to population size. Upon reaching a selected village, the study team asked the residents to point out

Figure 1: Areas (sub-districts) of Bangladesh where 57 outbreaks of avian influenza A/H5N1 in backyard poultry have been officially reported, 2011



Source: Food and Agriculture Organization

the most popular tea stall in the village. Starting at the identified tea stall, they identified the closest residence. If there was no place to purchase tea in the village, the team asked the residents to identify the center of the village, which they used as the starting point. After enrolling a household, the team skipped the next two closest households and selected the third closest household having at least one, but less than 50, backyard poultry. This process was repeated until 20 households were enrolled from the selected village. After obtaining written consent from each primary poultry raiser, researchers administered a structured questionnaire about poultry raising practices. We used statistical software STATA 10.10 to determine the frequency of participants' responses and used generalized estimating equation (GEE) to account for clustering in our observations. We also stratified poultry raising practices of respondents based on who had heard of avian influenza and who had never heard of it, and compared the difference in percentage using regression analysis adjusted for clustering to identify any significant differences in frequency of responses between the two groups. The protocol was reviewed and approved by icddr,b's research review committee and ethical review committee.

Table 1: Government of Bangladesh's 10 recommended precautions to prevent transmission of avian influenza from poultry to humans

1.	Do not touch or handle sick birds, or those that have died unexpectedly.
2.	Do not remove feathers or slaughter or handle infected birds at home.
3.	Children should not be allowed to touch, carry or play with birds since they may carry the virus.
4.	Always wash hands with soap and water after handling birds.
5.	Wear a mask or cover the nose and mouth with a thick cloth when handling birds, especially chickens. Be careful not to rub your eyes, nose or mouth after touching birds.
6.	Cook poultry meat well before eating. Raw poultry products should not be eaten.
7.	If you live in an area where there are bird flu outbreaks, avoid going to places where live birds are sold or slaughtered.*
8.	Chicken droppings should not be used as fertilizer.
9.	Report unusual death of birds to local authorities. Precaution should be taken while disposing dead birds.
10.	Immediately consult a doctor if you or someone you know develops flu like illness after contact with birds. Visit the nearest health center or hospital for check-up and treatment; inform them of your contact with sick, dying or dead birds.

**This item not included in the questionnaire.*

We interviewed 1,883 backyard poultry raisers: 99% were female, 38% had finished primary school, and 37% had never attended school. Thirteen percent of respondents had a radio and 31% had a television in their homes, yet many respondents had never listened to radio (83%) or never watched television (42%). Half of the respondents did not have electricity in their homes.

Regardless of their knowledge of avian influenza, 85% typically handled sick or dead birds, 55% kept sick birds inside the house, 52% slaughtered sick birds, 47% used poultry manure as fertilizer, 42% reported never washing their hands with soap after handling poultry, and almost no one (0.4%) reported covering their nose and mouth with a cloth when handling poultry. Thirty-nine percent of poultry raisers reported that children touched or played with poultry and 17% reported that children slaughtered poultry for consumption. Of the 680 households that experienced unusual poultry deaths in the two months prior to the interview, only 2% reported the deaths to authorities. When poultry raisers experienced flu-like illness, 15% reported consulting a medical doctor. The only recommended practice that more than three-fourths of respondents followed was fully cooking poultry products before consumption, reported by 84%.

To assess respondents' knowledge of avian influenza, we asked "Have you ever heard of avian influenza, also known as bird flu?" More than half (56%) responded "no." Compared with persons who had never heard of bird flu, respondents who had heard of bird flu were significantly more likely to practice six of the recommended precautions including not allowing children to touch poultry, not slaughtering sick birds for consumption, washing hands with soap after handling poultry, reporting poultry deaths to local authorities and immediately seeking medical care when they acquired flu-like illness (Figure 2). Among those who had heard of bird flu (N=823), 62% could identify at least one sign of bird flu in poultry, 30% could identify at least one symptom in humans and 71% could identify at least one route of transmission from poultry to humans. However, 72% did not know how to report poultry deaths and 24% did not think reporting was important.

Reported by: Zoonotic Diseases Research Group, Centre for Communicable Diseases, icddr,b

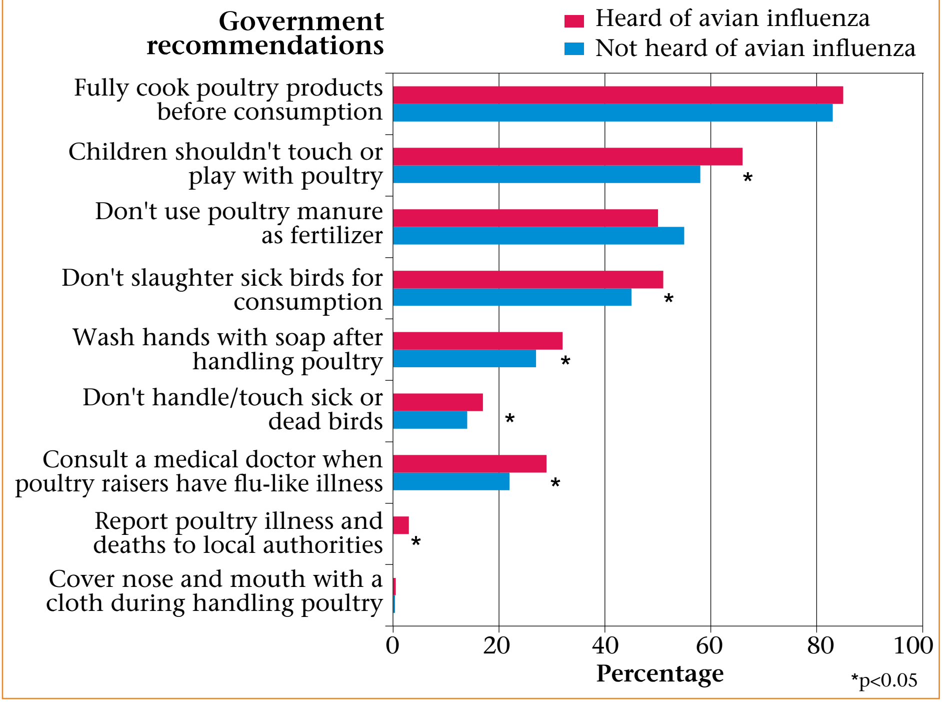
Supported by: Centers for Disease Control and Prevention, Atlanta, GA, USA

Comments

Four years after the first report of poultry infections with influenza A/H5N1 virus in Bangladesh, over half of rural, backyard poultry raisers interviewed had not heard of avian influenza, or bird flu, and the 10 precautions recommended by the government to prevent avian influenza infection in humans were infrequently followed by backyard poultry producers.

However, the significant differences of practices among the poultry raisers who had heard of bird flu and those who had not suggest that the respondents who had received the messages may have changed some of their poultry raising practices.

Figure 2: Percentage of respondents who followed government recommendations to prevent the transmission of avian influenza, stratified by those who had and those who had not heard of avian influenza or bird flu (study period from 2009-2011).



Several factors may help explain why poultry raisers in Bangladesh have little knowledge of avian influenza and why their current poultry rearing practices are different than those recommended to prevent the spread of avian influenza in humans. More than half of the participants had never heard of avian influenza, or bird flu, perhaps because many did not own or have exposure to radio or television and thus may not have had access to government messages disseminated through these channels. More than one-third of participants had no formal education so they were unlikely to be able to read printed communication messages. Furthermore, almost all participants were females who may have had little exposure to newspapers, radios and television programmes in and outside of their home (12,13).

More than two-thirds of primary poultry raisers handled sick poultry. Since there have been so few confirmed human cases of avian influenza virus infection in Bangladesh and none of them have been fatal, poultry raisers may perceive minimal risk of acquiring infection through handling sick birds. Half of the households consumed sick birds as they wanted to salvage some of their investment when they realized that their birds might die from illness (14).

Some recommended precautions may not have been feasible for all backyard poultry raisers to implement. For example, one message says, "Wear a mask or cover the nose and mouth with a thick cloth when handling birds, especially chickens." However, it may be difficult for poultry raisers to identify discrete handling events as backyard poultry roam freely in and around households. In addition, wearing a mask when handling poultry is difficult in the hot (32°C to 38°C in summer) and humid (80% humidity from June to September) weather that Bangladesh experiences (15-17). One major barrier may be that most people do not own masks and may not know where to get them. Another message says, "Report unusual deaths of birds to local authorities." Yet poultry raisers also need to know how to contact those authorities. Lack of this information may have contributed to the low rate of reporting in the past.

Preventive messages should be concise and focus on poultry raising practices related to slaughtering and butchering of sick poultry. Revised messages could also include specific signs and symptoms of bird flu in humans and poultry, modes of transmission of the influenza virus from poultry to poultry and from poultry to humans, and an explanation of its public health importance, which could help poultry raisers to understand the disease better thus reducing the risk of avian influenza in both humans and poultry in their communities. Backyard poultry raisers in Bangladesh may be more likely to follow preventive measures that promote both poultry health and overall household profitability from poultry raising (14). Messages should explain how to report unusual poultry deaths to the proper local authorities, while also possibly providing an incentive for reporting. Finally, optimal communication channels should be identified for dissemination of messages as most of the poultry raisers had minimal exposure to radio and television as well as printed media. Government primary school teachers, community health workers and/or non-government organization staff in rural areas could be involved in this campaign and could not only distribute leaflets or posters, but could also explain the messages to ensure that they reach their intended recipients and are clearly understood.

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Risk of infection from the physical environment in Bangladeshi hospitals: putting infection control into context

This report describes the physical environment of three Bangladeshi tertiary hospitals to understand risks and opportunities to control infection. We mapped and conducted 48 hours of observation in six wards. A median of four people were present per 100 sq ft of floor space and a median of five uncovered coughs or sneezes were observed per 100 sq ft per hour in the wards. The floors were frequently soiled with bodily secretions. Among 28 handwashing stations, seven had running water and soap. Medical equipment was used without disinfection. Inadequate infrastructure and poor hygiene created numerous opportunities for infection transmission. Infection control interventions should focus on ensuring basic infrastructure.

Hospital-acquired infection represents a major public health concern for low-income countries (1). The hospital environment is associated with risk of transmission of infectious diseases through airborne particles, respiratory droplets or direct contact with infectious bodily fluids (2-4). Elements of the hospital environment, including surfaces, air, sanitary facilities, medical equipment and hospital waste, have been found to be potential sources of infectious pathogens (3,5). International infection control guidelines to prevent these infections exist (2,4) but assume a level of basic infrastructure that may not be present in low-income settings. This report describes the physical structure and contamination of the environment of selected wards in three hospitals to understand the risks and opportunities to control infection.

From March through September 2007, we collected data from one paediatric and one adult male medicine ward from each of the government public tertiary teaching hospitals in three districts (Hospitals A, B, and C). We mapped the wards to describe the physical layout and calculate the area of the wards. Next, we conducted a total of 48 hours of observation in 22 sessions: three to four sessions of one to three hours in each of the six wards. To capture the variation in activities at different times of the day, the sessions were held during three non-overlapping periods from morning to night. Since Hospital C had two fixed days in a week when new patients were admitted, while the other two hospitals admitted patients every day, we conducted three hours of additional observation in each of the wards in Hospital C on admission days. We recorded number of ward occupants, contamination of ward environment from body secretions and excretions, use of medical equipment and personal protective equipment, handwashing behaviour, toileting behaviour, presence of animals and waste disposal practices. We also recorded handwashing opportunities that included frequencies of events when the hands of patients, caregivers and healthcare workers were contaminated with body secretions and excretions or when their hands required washing before and/or after an event (e.g., after covering one's mouth while coughing and sneezing, before and after providing care to a patient, and at eating times).

The wards at each hospital had either an open floor-plan or cubicles with four-foot high divider walls and were ventilated with ceiling fans, adjacent verandas and windows, and/or doors on opposite sides of the rooms. Only seven of the 16 handwashing stations dedicated for healthcare workers had soap, and most of these were exclusively reserved for use by senior doctors. Only two of the 12 patient handwashing stations had running water (Table 1) and there was no soap in any of these stations. Of 2,709 handwashing opportunities noted, we observed handwashing with soap on only 32 (1.2%) occasions.

Table 1: Characteristics of six wards in three hospitals, 2007

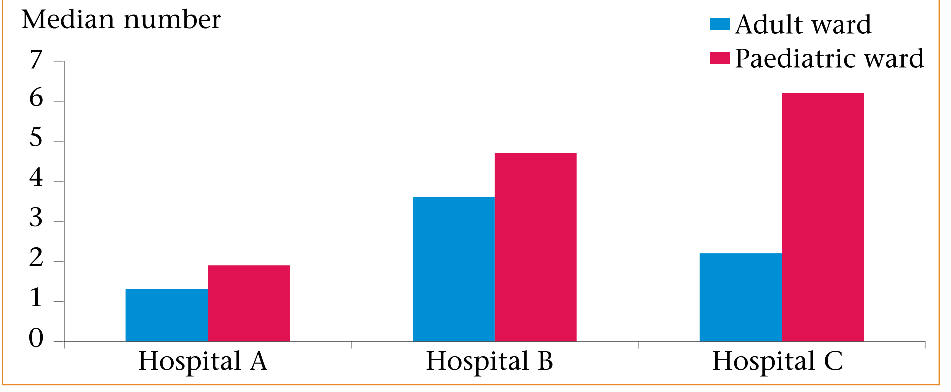
Ward structure		Hospital A		Hospital B		Hospital C	
		Adult	Paediatric	Adult	Paediatric	Adult	Paediatric
Ward area for general patients (sq ft)*		3,407	2,590	2,800	1,083	2,202	1,880
Bed capacity		35	31	30	15	30	33
Average distance between patient beds (ft)		2.5	2.4	3.7	2.1	2.5	1.9
No. of toilets	Staff	2	1	1	2	2	8
	Patients and visitors	4	1	4	2	4	2
Functioning handwashing station	Staff	2	1	1	2	4	6
	Patients and visitors	0	0	0	0	2	0

**Ward area included patient beds and nursing stations*

The hospital wards were crowded: an overall median of 3.6 (95% confidence interval [CI]: 2.3, 4.3) people, including patients, caregivers, visitors, and healthcare workers were present per 100 sq ft of floor space in the wards. Wards in Hospitals B and C had an average of 1.2 times more patients than beds, whereas in Hospital A, we observed a patient-to-bed ratio of approximately 0.7. Patients were cared for on mattresses or blankets on the floor in front of or between patient beds or on the verandas when beds were unavailable. Paediatric wards were more crowded than adult wards (Figure 1). In the paediatric wards in Hospital B and C, we observed some occasions in which 2-3 patients shared one bed. Below is a description of the paediatric ward of Hospital C on admission day:

> The ward became crowded; even the verandas are filled with patients and caregivers. Some of the patients' mothers have another healthy child staying with them in the ward. Caregivers gathered around the nursing stations with patients. On the examination bed and nursing table, doctors and nurses are quickly examining 2-3 patients at a time, giving them medicines, injections or nebulizers, placing and removing canula and drawing blood.

Figure 1: Median number of staff, patients, caregivers, and visitors present per 100 sq ft by type of ward in three hospitals, 2007



Although the participating hospitals had fixed visiting hours, visitors were observed to enter wards at almost any time. In Hospital A and C, vendors moved from ward to ward selling tea, water or snacks. In one adult ward, a barber was offering haircutting service to the patients.

We observed a median of five (95% CI: 4, 6) uncovered coughs or sneezes per 100 sq ft per hour. Caregivers and staff coughed and sneezed while caring for patients. Only 1% of these coughs and sneezes were covered and no person was observed to wash his/her hands after coughing or sneezing.

The floors, walls, grills of windows and verandas, bedrails, nursing tabletops, bedcovers, mattresses and blankets were soiled with body secretions and excretions of patients and family caregivers. Below is an excerpt from an observation conducted in an adult ward:

> While setting a blood bag in a patient's hand, the doctor accidentally dripped blood on the bed and floor. The family caregiver wiped the blood with a piece of paper, but the bloodstain remained visible and no one cleaned it during observation hours. While wiping blood from the floor, the caregiver wiped his nose with the opposite side of his palm.

Cleaners swept the ward floors with dry brooms daily. We never observed anyone cleaning window grills, bedrails, cabinets or walls. The floors of the patients' and visitors' toilet areas were wet, slippery and soiled with body secretions and excretions and food remnants. Medical equipment, such as nebulizers, oxygen tubes, stethoscopes and blood pressure cuffs, was not observed to be disinfected before or after use.

There were open bowls or buckets under patients' beds to temporarily store waste (used medical supplies including used sharps, patient body fluids, and discarded food and other refuse). Cleaning staff emptied these bowls or buckets into large buckets or drums once a day and discarded the waste on the hospital grounds adjacent to the hospital building. Feral cats were commonly observed in all of the wards, scavenging for food and climbing on patient beds. We also observed a mole, cockroaches, flies and mosquitoes inside the wards. Patients used mosquito nets at night in Hospitals A and C, but not in Hospital B. We observed dogs and grazing cattle in each of the hospital grounds.

Reported by: Centre for Communicable Diseases, icddr,b

Supported by: Centers for Disease Control and Prevention (CDC), USA

Comments

Overcrowding, inadequate sanitary facilities, lack of routine cleaning and basic infection control measures (e.g., coughing etiquette, disinfecting medical equipment before/after use) and improper waste management combined to create numerous opportunities for transmission of infection in observed hospital wards. This environment posed a threat of infection particularly through contact with contaminated hands, objects or surfaces, to all individuals on the wards, including patients, family caregivers, visitors and hospital staff.

The study wards were overburdened with patients and caregivers, resulting in decreased space between patients and close physical proximity for all people present. Crowding in hospitals appears to play a significant role in the spread of many diseases (6,7). A cross-sectional study in the surgical wards in a Bangladeshi tertiary hospital showed a direct relationship between prevalence of nosocomial infection and increased number of visitors, with an average of five visitors per patient per day (8). Sharing of beds in the wards may also facilitate transmission of diseases. For example, a study reported transmission of Nipah encephalitis from a Nipah patient to a caregiver while sharing a bed (5). A range of diseases, such as severe acute respiratory syndrome, Nipah, tuberculosis, measles, influenza, chickenpox, meningitis, mumps and aspergillosis can be spread by airborne or droplet transmission from coughing, sneezing or inadequate ventilation (2,3).

Hospital environmental surfaces, such as floors, walls, grills, bedrails, nursing tabletops and linens, could be potential reservoirs of nosocomial pathogens that can survive on these surfaces for weeks or months and become sources of infectious outbreaks (3). Potentially contaminated toilet floors, taps, door handles, water pots and walls could be potential sites for colonization of pathogens and transmission of diseases such as cholera (9), hepatitis A (10), vancomycin-resistant enterococci (11) and puerperal fever (12). Medical equipment that has been reused between patients without disinfection can also act as fomites for pathogens such as gram-negative bacilli, coagulase-negative staphylococci and methicillin-resistant *Staphylococcus aureus*. Irregular cleaning and frequent contact with soiled surfaces, as were observed in this study, increase the potential for transmission of pathogens. Most infections are acquired in the hospital via direct contact (3), and hand contact is a major route of transmission (13). Thus hand hygiene is considered to be the single most effective measure of infection control. The lack of functioning and accessible handwashing stations in the study wards is one reason that handwashing with soap was so infrequent. It has been demonstrated in other studies that hand hygiene compliance improved after providing numerous conveniently located handwashing stations (14).

Improper handling and unsafe disposal of hospital waste, as observed in our study wards, are public health concerns globally (15) and in Bangladesh. Particular risks include unsafe repackaging and reuse of contaminated medical equipment. Disposing of used sharps in open buckets along with other waste on open grounds in these hospitals could create occupational hazards to health workers and also cause injuries and increase the potential for transmitting diseases to staff who handle waste and the general public who scavenge in those open grounds. The presence of animals inside the wards and on hospital grounds poses the threat of transmission of zoonotic diseases. Insects that were present in the wards could also serve as vectors for transmitting diseases (2). Dengue patients are often hospitalized in Bangladesh (16) and abundance of mosquitoes in hospital wards creates an opportunity for nosocomial spread of dengue.

This study was conducted in only three government tertiary hospitals that were not randomly chosen to participate and therefore the findings cannot be generalized to other government tertiary care hospitals in Bangladesh or to private clinics or other non-governmental hospitals in Bangladesh that are less crowded and have fewer resource constraints. Since each researcher involved in data collection was assigned to observe the activities of multiple persons, it is possible that some events were not observed and we assume that the frequency of events reported here is underestimated. Since hospital staff was aware about the study and presence of the observation team, it might have affected their behaviour.

This study highlights multiple opportunities for contamination of the hospital environment and numerous difficulties faced by the participating institutions. Unlike hospitals in high-income countries, many of the recommendations of the international infection control guidelines cannot be applied in these hospitals due to resource constraints. Findings of this study could be used to develop interventions that may help these institutions provide the best health care possible and protect healthcare workers. Infection control interventions should focus on ensuring that basic infrastructure is in place. At a minimum, toilets and handwashing stations with soap should be accessible and functional for use by all staff, patients, caregivers and visitors. Wards should have designated disposal bins for medical waste and incinerators to dispose of bio-hazardous waste.

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Cell phone use for detection and treatment of malaria cases in an endemic, remote district of Bangladesh

The recent introduction of cell phones in rural areas of Bandarban District has provided an opportunity to improve malaria surveillance. icddr,b, in collaboration with the Johns Hopkins Malaria Research Institute, added cell phone reporting of fever to the existing passive malaria surveillance platform in 2010. From June 2010 to June 2012, 986 telephone calls were received, leading to 1,046 people being tested for malaria, of whom 265 (25%) tested positive for malaria. Of 509 malaria cases reported via passive surveillance during this period, a cell phone was used to initiate testing and treatment for 265 (52%). The use of cell phones helped the study team identify cases and provided the community with increased access to care and treatment. Cell phone-based case reporting could improve detection and treatment of malaria and other febrile illnesses in other hard-to-reach areas.

Bangladesh is among the 109 countries that the World Health Organization has designated as malaria-endemic (1). Approximately 10.9 million people live within the 13 endemic districts of Bangladesh (2). Between 2008 and 2011, confirmed malaria cases in Bangladesh dropped from 84,690 to

51,773 and malaria-related deaths dropped from 154 to 36 (2). However, these national statistics may not accurately portray malaria morbidity and mortality for all areas of Bangladesh. In the south-eastern hill tracts region, where risk for malaria is highest and over 80% of documented annual malaria cases and deaths occur, less than 2% of the population at risk of malaria is screened every year due to lack of surveillance (3).

In late 2009, icddr,b, in collaboration with the Johns Hopkins Malaria Research Institute, initiated a study to describe the epidemiology of malaria in Bangladesh in Kuhalong and Rajbila unions, in the Bandarban Sadar Upazila of Bandarban District. The study is being conducted in an area covering more than 172 square kilometres with a population of approximately 22,000. The details of this project have been reported previously (1); in short, data collection includes both active and passive surveillance for malaria and annual demographic surveys, which include information about cell phone ownership.

Each week, five teams enrolled 12 households in the demographic survey and asked about cell phone access. Passive surveillance used a variety of ways to identify individuals who reported fever and were subsequently diagnosed with malaria. While visiting communities, study teams were frequently notified of possible malaria cases. When they were informed of a potential case, rapid diagnostic testing for malaria and microscopy for malaria parasites was conducted. Persons diagnosed with malaria were treated according to national guidelines and followed up on days 2, 7 and 28 following treatment.

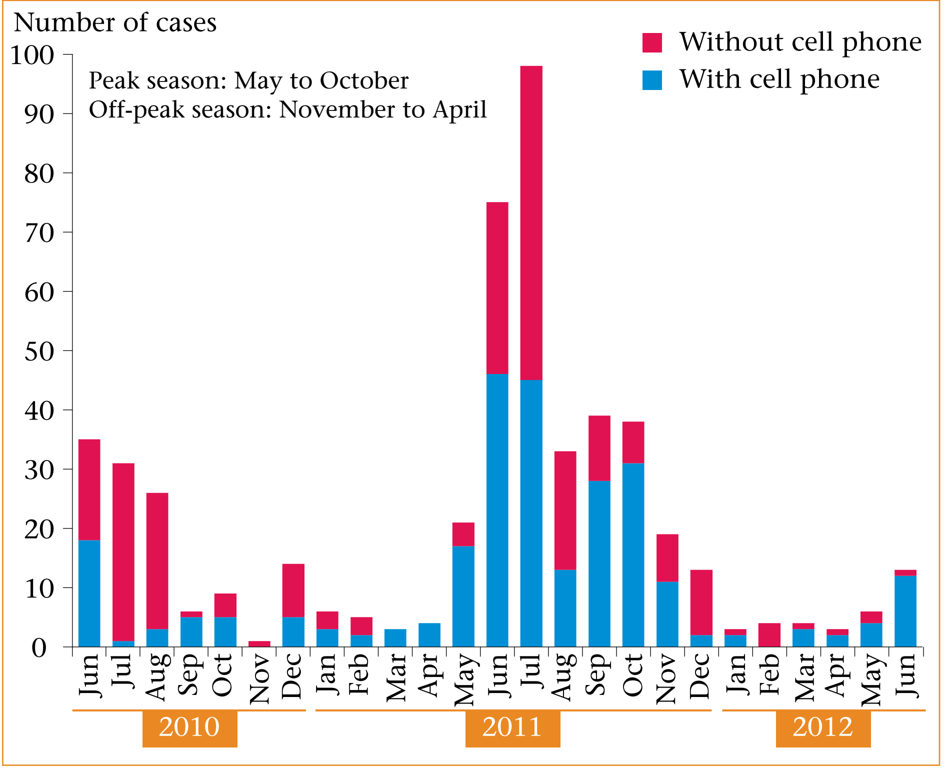
Beginning in June 2010, persons from the study area were asked to report persons with fever to the passive surveillance system using cell phones. The objective of this report is to describe the role of cell phones in enhancing passive malaria case detection and improving care and treatment of malaria.

From our 2011 survey that asked about household ownership of cell phones, we found that 968 (21%) of 4,628 households in the area owned at least one cell phone and another 81 (2%) reported that they would have access to a cell phone from friends or neighbours in case of an emergency. All of the households in the Kuhalong and Rajbila area were provided with phone numbers of our project personnel and, between June 2010 and June 2012, they were asked to call if someone in the household complained of symptoms commonly associated with malaria, such as fever, frequent vomiting, altered mental status, convulsions or yellow discolouration of the eyes. Surveillance staff responded to 986 phone calls about potential malaria cases and tested one or more than one person in response to each call. Of 1,046 persons tested for malaria, 265 (25%) had evidence of infection by rapid diagnostic tests and/or microscopy. A total of 228 (86%) of 265 cases identified using cell phones occurred during peak malaria months (May-October), whereas only

37 (14%) of these cases were identified during off-peak months (November-April). Thirty-two (38%) of 84 calls yielded confirmed malaria cases during the 2010 peak season; 180 (36%) of 500 calls yielded confirmed cases during the 2011 peak season; and 16 (19%) of 84 calls yielded confirmed cases during the first two months of the 2012 peak season.

Of 509 malaria cases detected through passive surveillance from June 2010 to June 2012, 265 (52%) were identified through use of cell phones. The percentage of passive cases identified through cell phone reporting increased from 30% (32 malaria-confirmed cases out of 107 calls) in the peak season of 2010 to 59% (180 malaria-confirmed cases out of 304 calls) in the peak season of 2011. However, during off-peak seasons the percentage decreased; from 52% (17 malaria-confirmed cases out of 33 calls) in the off-peak months of November 2010 to April 2011 to 43% (20 malaria-confirmed cases out of 46 calls) in those same months from 2011-2012 (Figure 1).

Figure 1: The number of malaria cases identified by passive surveillance that were detected with and without cell phones in Kuhalong and Rajbila, Bandarban District, Bangladesh, June 2010-June 2012



Reported by: icddr,b and Johns Hopkins Malaria Research Institute

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Comments

Even though the majority of homes (77%) in Kuhalong and Rajbila reported that they did not have access to a cell phone, the number of confirmed malaria cases identified through use of cell phones during peak malaria seasons increased six-fold, from 32 cases in 2010 to 180 cases of 2011, indicating a substantial increase in the use of cell phones to report potential cases during these years. This study demonstrates that cell phones can play an important role in the detection of malaria cases as well as in reducing transmission. Because care and treatment of malaria depends on diagnosis of infection, the addition of cell phones to passive malaria reporting is expected to increase access to appropriate health care. In addition, cell phones can also be used to monitor response to treatment and ensure follow up. Cell phones can be an important part of the arsenal to detect malaria and with expected increases in cell phone ownership, we expect even more cases to be detected and treated.

A recent study from this region has shown that in spite of free malaria treatment provided by Bangladesh's National Malaria Control Programme, local community residents prefer to obtain treatment directly from drug vendors without a diagnosis (3). This can enhance anti-malarial drug resistance. However, if patients know they can receive quick and efficient services as a result of a cell phone call, they may be less likely to seek care and treatment from drug vendors and thus resistance to anti-malarial drugs can be contained.

Our study is subject to at least two limitations. First, we present data from only two unions and our findings may not be generalizable to all communities in Bangladesh. Second, because fewer than 25% of the population own or have access to cell phones, the number of malaria cases identified in our study by passive surveillance is likely to still be an underestimate of the number of cases, even after incorporating cell phone reporting.

The Malaria Control Programme of the Bangladesh government is planning to implement a malaria pre-elimination programme in eight upazilas (two from each district - Mymensingh, Netrokona, Sherpur and Kurigram) where malaria prevalence has been low (<1%) towards the end of 2012. Evidence from this study suggests that promotion of the use of cell phones for reporting cases of febrile illness in remote districts of Bangladesh, such as the hill tracts, is feasible and could increase case detection of malaria substantially. In addition, this kind of surveillance could also be used to increase detection of other diseases in hard-to-reach areas where access to care is limited by cost or geographic distance. Initiating a dialogue between policymakers and cell phone companies to expand coverage in these and other hard-to-reach areas could benefit public health.

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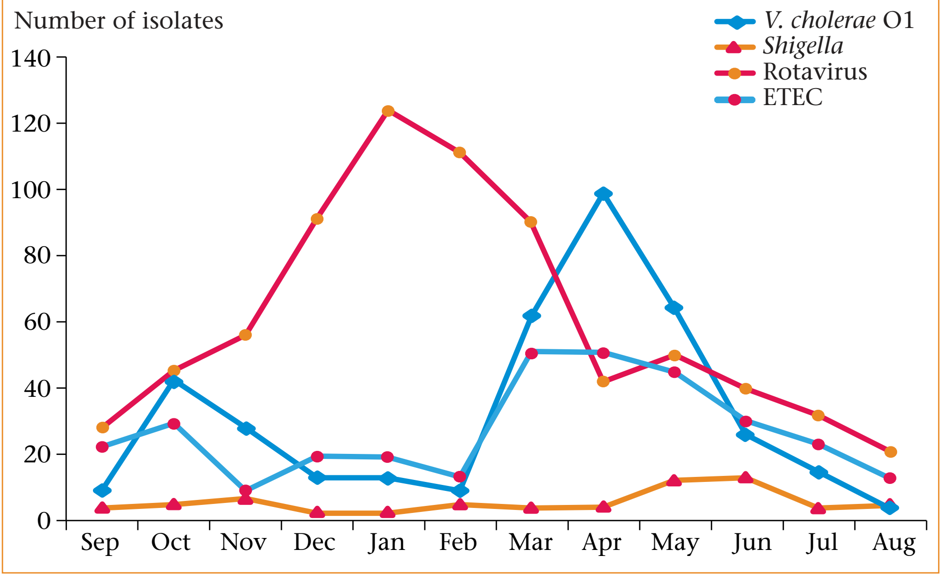
Surveillance updates

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: September 2011-August 2012

Antimicrobial agents	*Shigella* (n=69)	*V. cholerae* O1 (n=386)
Nalidixic acid	Not tested	Not tested
Mecillinam	84.1	Not tested
Ampicillin	56.5	Not tested
TMP-SMX	24.6	2.1
Ciprofloxacin	58.0	100.0
Tetracycline	Not tested	14.8
Azithromycin	77.9	99.7
Ceftrioxone	98.5	Not tested

Monthly isolation of* V. cholerae O1, Shigella, *Rotavirus and ETEC: September 2011-August 2012



Antimicrobial resistance patterns of 13* M. tuberculosis *isolates: May 2011-February 2012

Drug	Resistance type		Total n=13 (%)
	Primary n=12 (%)	Acquired* n=1 (%)	
Streptomycin	6 (50.0)	0 (0.0)	6 (46.2)
Isoniazid (INH)	2 (16.7)	0 (0.0)	2 (15.4)
Ethambutal	0 (0.0)	0 (0.0)	0 (0.0)
Rifampicin	2 (16.7)	0 (0.0)	2 (15.4)
MDR (INH+Rifampicin)	0 (0.0)	0 (0.0)	0 (0.0)
Any drugs	6 (50.0)	0 (0.0)	6 (46.2)

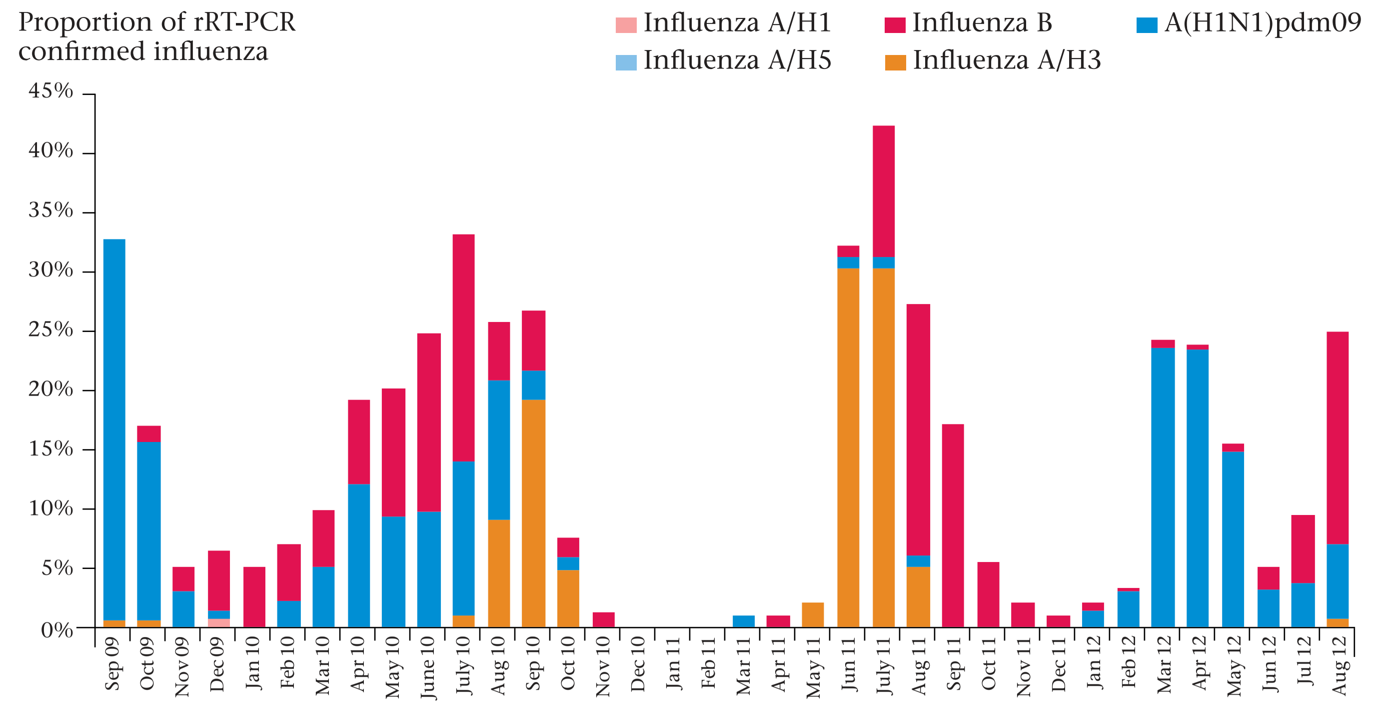
() column percentage *Antituberculous drugs received for 1 month or more

Antimicrobial susceptibility pattern of* S. typhi *among children <5 years during July-September 2012

Antimicrobial agent	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	52	45 (87.0)	0 (0.0)	7 (13.0)
Cotrimoxazole	52	43 (83.0)	0 (0.0)	9 (17.0)
Chloramphenicol	51	42 (82.0)	0 (0.0)	9 (18.0)
Ceftriaxone	52	52 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	52	3 (6.0)	49 (94.0)	0 (0.0)
Nalidixic Acid	52	3 (6.0)	0 (0.0)	49 (94.0)

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 September 2009 and August 2012



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)

Backyard poultry raising & processing of slaughtered poultry in a rural household

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