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Inside . . .

Population-based influenza surveillance, Dhaka

We conducted population-based surveillance for influenza virus among children under age 5 years in the Kamalapur neighbourhood of Dhaka. Between April 2004 and November 2005, 14% of children with acute infectious respiratory illness had influenza virus isolated from their respiratory secretions. The incidence of influenza virus infection was 84.5 episodes/1000 children/year. 58% of isolates were influenza A (H3N2, H1N1) and 42% are influenza B (Shanghai and Hong Kong). Both strains of Influenza A virus and both strains of Influenza B virus that are circulating within Asia are circulating within Bangladesh.

The influenza pandemic of 1918-1919 killed an estimated 10 million persons in India and an estimated 40 million persons worldwide. The reason that this particular strain of influenza was so virulent and led to such a high case-fatality rate remains unclear, though recent data indicate that this virus was a direct adaptation of an avian to human strain (1). Influenza virus tends to mutate frequently, and because of these mutations, prior infection with influenza virus, or prior immunization may not be protective against new strains. Different strains of influenza are adapted to different species, though mutations in a strain of influenza or reassortment of genetic material in a person simultaneously infected with a human and avian influenza virus can permit the virus to acquire the potential to efficiently infect a different species.

A new strain of highly pathogenic avian influenza A (H5N1) has been circulating among domestic poultry and wild birds in eastern Asia since 1996 (2). Infections were first recognized in the Guangdong Province of China and Hong Kong. Since then influenza A (H5N1) has been identified in domestic poultry in 21 countries and in wild birds in 20 countries (3). Between January

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2004 and February 27, 2006, 173 human cases have been laboratory confirmed; 93 have died (4). So far this strain of influenza virus remains an avian virus that is poorly adapted to humans. Most human cases involve persons who had direct contact with infected poultry. There have been reports of mutations in H5N1 since the virus first appeared in 1996 (5). While these mutations do seem to have affected transmission patterns among wild and domestic fowl, they have not had any apparent effect on humans. The virus still does not easily spread from birds to humans or efficiently from human to human. However, previous human pandemics of influenza have been caused by influenza strains that develop the capacity to efficiently infect humans.

Bangladesh is near several countries that have reported avian influenza. Domestic poultry is raised on farms throughout Bangladesh, ranging from families raising a few chickens to produce eggs and meat for their own consumption, to small operators who sell eggs and poultry to their neighbours all the way up to large commercial enterprises. Many residents of Bangladesh have regular contact with live poultry. Bangladesh also has the highest human population density in the world, except for small city states (6). Thus, there is a higher risk of new influenza strains emerging from Bangladesh, than from most other countries.

We conducted population-based surveillance for influenza virus infection in Dhaka to determine the proportion of children with serious respiratory illness due to influenza, and to characterize the influenza strains that are circulating in Dhaka.

Kamalapur is a densely populated low-income community in Dhaka city. The community was divided into 377 household clusters; 168 of these household clusters were randomly selected to participate in surveillance. Within each selected household cluster field workers identified households with children under age 5 years and invited them to participate in the surveillance. Children who were born or moved into the surveillance cluster were enrolled. When a child reached 5 years of age, s/he was no longer followed.

Beginning in April 2004 approximately 5,000 children <5 year old were under regular weekly surveillance. Each week, 40 field workers visited every participating household, and using a standardized questionnaire for each child, asked about signs of illness for each day of the week since the last visit. Children with one major sign of illness – fever (either measured or reported), rapid, laboured or noisy breathing, lethargy, cyanosis, inability to drink or convulsions were referred to ICDDR,B's clinic in Kamalapur for medical evaluation. Similarly if a child had two minor symptoms or signs of illness including cough, runny nose, sore throat, muscle or joint pain, chills, headache, irritability, decreased activity or vomiting, the child was also referred to the clinic. All clinical evaluations were conducted at no cost to the patient. Participating families were encouraged to bring their children to the clinic if

they developed signs or symptoms of illness on days that the field worker did not come to visit them in the home.

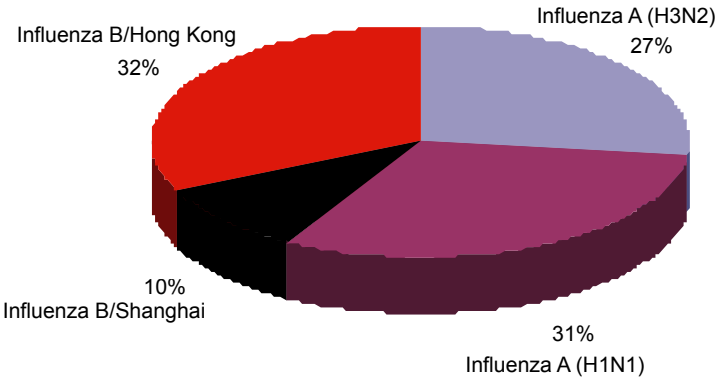
In the clinic, physicians performed a standardized exam, and ordered additional studies based on specific findings. Children with axillary temperature ≥38 °C or elevated respiratory rate (≥60/minute if <60 days of age, ≥50/minute if 60–365 days old, and ≥40/minute if 1–5 years old) and one additional sign localizing disease to the respiratory tract including cough, chest-indrawing, inspiratory crepitations, expiratory wheezes or ronchi were considered to have acute infectious respiratory illness. Every fifth child from the surveillance area who met the criteria for acute infectious respiratory illness had a nasopharyngeal wash specimen collected.

An aliquot of the nasopharyngeal washes was placed on tissue culture in the Virology Laboratory of ICDDR,B, and incubated. If cytopathic effect was noted, the tissue culture supernatant was collected and a haemagglutination inhibition test conducted using the standard WHO Influenza Reagent kits for Influenza A (H1N1), Influenza A (H3N2), Influenza B Shanghai and Influenza B/Hong Kong.

Between April 2004 and November 2005, the Kamalapur clinic evaluated 44,256 children. Of these 5129 met the case definition for acute infectious respiratory illness. Among the 1026 nasopharyngeal wash specimens collected to date, results are currently available on 816.

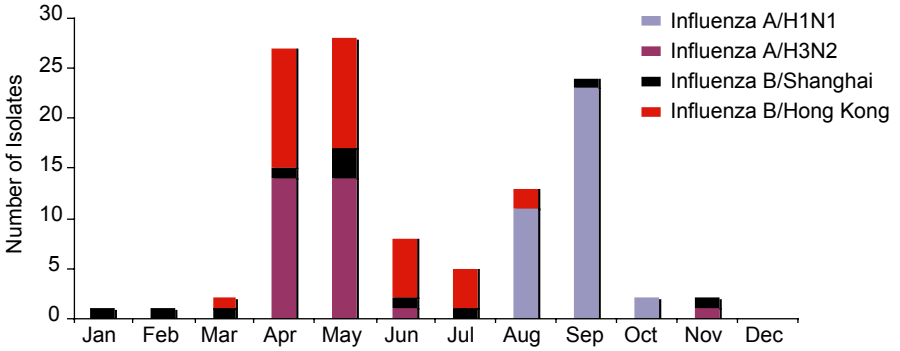
Of the 816 nasopharyngeal wash specimens so far tested 113 (14%) have yielded influenza virus. The adjusted incidence of influenza respiratory disease in this <5 y/o population is 84.5 episodes/1000 children/year. Through November 2005, 58% of isolates are influenza A (H3N2, H1N1) and 42% are influenza B (Shanghai and Hong Kong).

Figure 1: Distribution of influenza virus isolates: Kamalapur, April 2004-November 2005



Influenza virus was isolated year round with the greatest number of cases isolated in April, May and September.

Figure 2: Influenza virus was isolated year round with the greatest number of cases isolated in April, May and September



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Comment

Influenza virus is an important respiratory pathogen for children under the age of 5 years in Kamalapur. As pneumonia is the leading cause of death among children under age 5 years in Bangladesh (7), efforts to reduce childhood respiratory mortality should consider strategies for influenza prevention.

Both strains of Influenza A virus and both strains of Influenza B virus that are circulating within Asia are circulating within Bangladesh. This suggests that if H5N1 avian influenza is circulating among poultry in Bangladesh, there is an opportunity for human co-infection with human and avian influenza strains. Other strains of influenza may also be causing human disease in Bangladesh, though testing for this surveillance was restricted to a single geographic area and to the specific anti-sera that permitted identification of these four strains.

Although influenza virus was isolated more commonly between April and September, influenza transmission occurred year round. This may be important globally, as most temperate zones have peak transmissions during the late fall to winter months (November-March). Populations like Bangladesh may provide a supplemental reservoir, helping to keep the virus in circulation with opportunities for mutation until the following season. If these data are confirmed in other settings it suggests that influenza vaccination in Bangladesh would need to occur early in the year to prevent the high incidence season.

These are data from children under age 5 years. The impact of influenza infection on adult health in Bangladesh is unknown, but the high incidence among children and the multiple circulating strains suggest that influenza virus may also be an important respiratory pathogen in adults. Further research could clarify the magnitude of the problem and permit evaluation of the cost-effectiveness of routine influenza vaccination.

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