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Inside

Seroprevalence of dengue virus infection in Dhaka, Bangladesh, 2012

Dengue is an emerging health problem in Bangladesh but its distribution and the overall burden of the disease remain unknown. We conducted a cross-sectional population-based serosurvey in 12 wards of Dhaka city from mid-June to mid-July 2012 to determine the seroprevalence of dengue virus infection. On each ward, we superimposed 100 meter x 100 meter grid cells, then randomly selected 100 grid cells and after selected one household from each grid cell for participation. A total of 1,200 households were selected and at least one person from each household was asked to participate in the study. Demographic data and blood samples were collected from 1,128 healthy individuals from 740 households. Enzyme-linked immunosorbent assay based serological tests were performed to identify individuals with IgM and IgG antibodies to dengue virus. Nine hundred and two (80%) individuals tested positive for IgG antibodies and among them 23 (2%) also had IgM antibodies. These findings suggest that dengue virus infection is widespread across Dhaka City, the prevalence is high and the incidence is substantial. Effective disease control programmes need to be identified to prevent epidemics of severe dengue illness.

icddr,b

Dengue is caused by any of the four serotypes of the dengue virus. Dengue virus infection results in asymptomatic infection or a spectrum of diseases ranging from classic dengue fever (DF) to dengue haemorrhagic fever (DHF), and dengue shock syndrome. The spread of dengue virus and the resurgence of DF and DHF in Asia have been gradual but their magnitude has increased considerably in recent years. In Southeast Asia, DHF was detected in Thailand in the 1950s and subsequently identified in other neighbouring countries (1,2). Since 1964, there were some sporadic reports of dengue in the territory of Bangladesh. A subsequent entomological study carried out from 1977 to 1978 in Dhaka city identified presence of mosquito vector *Aedes aegypti* and *A. albopictus* (3). Serological studies conducted in Bangladesh in 1980 and later in 1996 to 1997 indicated the continued presence of dengue virus in the country (4,5). A World Health Organization collaborative study under the Integrated Control of Vector-Borne Diseases project was done in Chittagong Medical College Hospital over a period of one year during 1996 to 1997 among febrile paediatric patients and found dengue infection in 14% of 225 children sampled (6).

The first recorded epidemic of DHF in Bangladesh occurred in 2000 in the cities of Dhaka, Chittagong and Khulna. A total of 5,551 dengue infections (DF=4,385; DHF=1,166) were reported with a crude case fatality rate of 1.6% (7). Official data published by the Directorate of Health Services, Government of Bangladesh, revealed fluctuating numbers of dengue cases ranging between 6,132 in 2002 and 218 in 2010 and number of deaths ranging between 0 to 93 during 2000-2010 (7). Dengue has remained a major public health concern because of the potential for a dengue epidemic that could occur in any year. In view of the persistent trend of dengue infections in the country, particularly since 2000, public health policymakers and practitioners have expressed the critical need for systematically acquired data on dengue virus and its disease burden. Because surveillance methods have varied over time, the incidence and prevalence of dengue remain uncertain. We undertook a population-based serosurvey throughout Dhaka city during the 2012 dengue season to estimate the prevalence of dengue infection.

Dhaka City Corporation is comprised of 90 wards. The Delphi-first method was used to categorize high, medium, and low socio-economic status (SES) wards followed by probability proportional to size sampling to select two high, five medium and five low SES wards. Then on each ward, 100 meter x 100 meter grid cells were superimposed on Google Earth Maps, 100 grid cells were randomly chosen, and one household was selected from each grid cell. Two hundred high, 500 middle and 500 low SES households were selected. During mid-June to mid-July 2012, field workers approached heads of selected households and invited them to participate in the study. If households refused to participate, the closest neighborhood household within the grid cell was contacted until a consenting household was found.

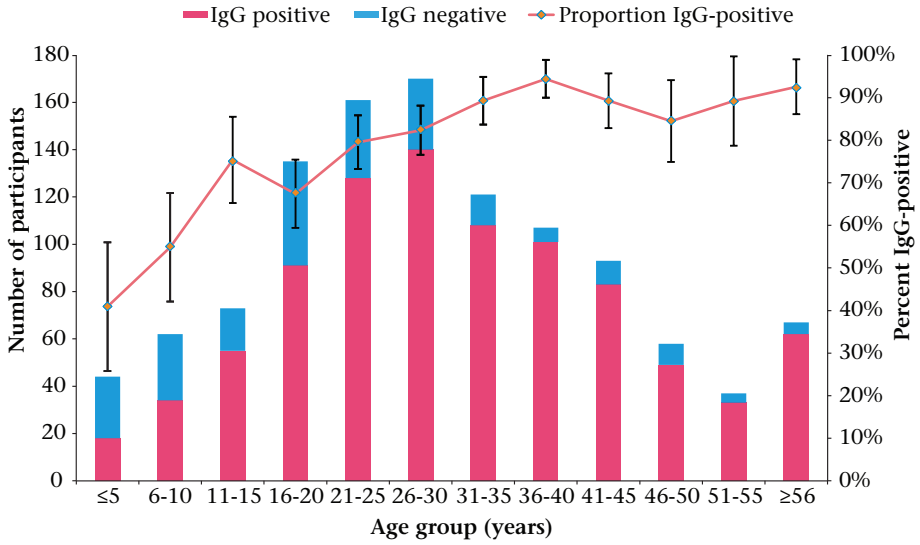
At least one person had to consent for the household to be enrolled in the study. Written informed consent was obtained from household heads and participating individuals. Assent was taken from participants aged 11 to 17 years and consent from their legal guardian was obtained. Information on demographic, socio-economic and other relevant characteristics was collected from participants using a semi-structured pre-tested questionnaire. Five ml of venous blood was collected from participants older than five years and 3 ml of venous blood was collected from those aged five years or younger. Enzyme linked immunosorbent assay (ELISA)-based serological tests were performed to identify individuals with IgM and IgG antibodies to dengue virus using DxSelect™ ELISA kit.

Among the selected 1,200 households in 12 wards of Dhaka City, 460 (38%) refused to participate in the study. A total of 1,128 individuals were enrolled from 740 households; 23 (2%) had IgM antibodies and 902 (80%) had IgG antibodies against dengue. There were no differences in seroprevalence by gender or SES (Table). IgM seroprevalence ranged from 0% (0 of 37 in 51 to 55 year age group) to 5% (2 of 42 in ≤5 years age group). IgG seroprevalence was 41% in individuals ≤5 years and 93% in those older than 56 years (Figure). The seroprevalence of IgG antibodies against dengue virus was 80% (95% confidence interval: 78% to 82%) after adjusting for clustering at the household level.

Table: Prevalence of IgM and IgG antibodies against dengue virus according to gender and socio-economic status of wards, Dhaka, Bangladesh, June-July, 2012 (N=1,128)

	IgM-positive		IgG-positive	
	n (%)	p value	n (%)	p value
Gender				
Male	11 (2.2)	0.66	397 (81)	0.31
Female	12 (1.8)		505 (79)	
Socio-economic status of wards				
High	4 (1.9)		167 (78)	
Middle	11 (2.4)	0.74	355 (79)	0.22
Low	8 (1.7)		380 (82)	

Figure: Age distribution of 1,128 participants by dengue IgG serostatus and the prevalence of dengue virus-specific IgG by age group, Dhaka, Bangladesh, June-July, 2012



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Comments

The high seroprevalence of IgG detected in this study is consistent with that seen in other dengue endemic areas such as Jamaica, Dominican Republic and Vietnam where seropositivity rates of 100%, 98% and 66%, respectively, have been observed (8-10). In this study, a relatively steady increase in IgG seropositivity by age was observed up to the 36-40 year age group, after which it was relatively stable at about 90%. This suggests that most people are exposed by 40 years of age. The sharpest increase in seropositivity for IgG occurred amongst those aged 5-15 years, suggesting that they are at higher risk of initial infection with dengue than older people. Studies conducted in other dengue endemic areas have also shown increasing antibody prevalence with age (11-13). Evidence suggests that severe manifestations of dengue occur following re-infection with a serotype different from that of the primary infection (14,15). The widespread seropositivity in the study population suggests the potential for future outbreaks of severe dengue illness if population is exposed to a different serotype. The predominant circulating dengue serotype in Dhaka at present is unknown; it is likely that there is more than one dengue serotype circulating currently given that

during the 2000 outbreak, all four serotypes of dengue virus were isolated from cases of dengue fever (16,17).

This study was subject to several limitations. First, the study team visited households during daytime hours, which may have resulted in under-representation of males and school-aged children. Second, many households refused to participate in the study and we do not know how they differed from the participating households. Finally, cross-reaction with other flaviviruses may have led to overestimation of seroprevalence estimates in this study (18).

These data suggest that dengue is endemic in Dhaka City and that widespread introduction of a new dengue virus serotype that is different from the current predominant circulating serotypes would pose a risk of outbreak of severe infection with dengue virus. Identification of effective dengue control activities, including vector control and source reduction appropriate for low- and middle-income country settings like Bangladesh is warranted. In addition, preparations should be made for effective case management of dengue-related complications to reduce the burden of severe disease.

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Cholera outbreak in Netrokona Municipality, 2013

A joint team from the Institute of Epidemiology,Disease Control and Research (IEDCR) and icddr,b investigated an outbreak of severe watery diarrhoea affecting residents of Netrokona municipality in northeast Bangladesh. We conducted epidemiological, laboratory, anthropological and environmental investigations to determine the cause, transmission pathways and attack rate. A total of 1,568 residents were admitted to the district hospital with severe diarrhoea between 15 August-15 October, 2013. Of 4,870 municipal residents surveyed, 154 (3%) had acute watery diarrhoea, of which 85 (55%) had severe diarrhoea, and 3 (2%) died. *Vibrio cholerae* was identified in 33 (80%) of 41 rectal swab samples collected from hospitalized patients. The municipality supplied untreated ground water intermittently for two to three hours twice daily to 1,288 (11%) of 11,415 household taps and 41 street taps; *V. cholerae* was isolated from 1 (11%) of 9 tap water samples collected. The majority of households lacked sanitary latrines and the city had no sewage system. This cholera outbreak likely resulted from contamination of water in pipelines during periods of interrupted supply. Vaccination may be a cost-effective strategy to mitigate cholera outbreaks and should be explored. Improvements in water and sanitation infrastructure are needed to prevent cholera in Netrokona. Until improvements are made, research should aim to identify environmentally sustainable water purification strategies to protect residents from cholera.

Vibrio cholerae causes three to five million cases and 120,000 deaths annually worldwide. It predominantly affects economically deprived persons (1,2). Approximately 1.1 billion people lacking access to safe water are vulnerable to cholera (3). While data on cholera burden are limited in Bangladesh, a country with a population of approximately 160 million, the annual incidence is estimated to range from 450,000 to 1 million cases (1,2). Despite the substantial burden, only a small number of cholera outbreaks have been investigated and reported during the last five years (4,5).

During 3-5 September, 2013, several national mass media organizations reported the occurrence of a severe diarrhoea outbreak that affected the residents of Netrokona municipality, the urban center of the Sadar sub-district of Netrokona District. The municipality is divided into nine wards of unequal sizes with 51 administrative units or *mahallas*. The total population of the municipality was 102,000 in 2012 according to municipal office records. On 6 September, 2013, the civil surgeon of Netrokona District confirmed the occurrence of an outbreak to the Director of the Government

of Bangladesh's Institute of Epidemiology, Disease Control and Research (IEDCR) and requested assistance to determine the cause of the outbreak and assist with control and prevention. In response, a collaborative team from IEDCR and the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) conducted an investigation during 7-9 September, 2013, and identified *V. cholerae* in rectal swab samples from affected cases. From 20-25 September, an 18-member collaborative investigation team conducted epidemiological, laboratory, anthropological and environmental investigations to determine the source of transmission and explore municipal water and sanitation infrastructure.

The team visited the Adhunik Sadar Hospital, a 100-bed secondary healthcare facility, and the civil surgeon's office and collected information from the district civil surgeon, sanitary inspector, health inspectors, and statistician; the health education officer; and the hospital's paediatric consultant, medical officers and nursing staff to generate hypotheses about sources of infection. The team conducted unstructured interviews with admitted patients and their caregivers. Hospital records were reviewed to determine if diarrhoea admission rates exceeded expected levels based on previous hospitalization rates.

A suspected cholera case was defined as acute watery diarrhoea (three or more loose stools over a 24-hour period) in a resident of Netrokona municipality with onset during the outbreak period, defined as 15 August to 15 October, 2013. A probable cholera case was defined as severe diarrhoea (e.g., resulting in admission to a healthcare facility, receipt of intravenous rehydration, or death as a result of the diarrhoeal illness) in a person meeting criteria for suspected cholera. The Adhunik Sadar Hospital registry was reviewed and a line list was made of probable cholera cases. During 7-9 and 20-25 September, 2013, persons with probable cholera were interviewed using a standardized case investigation form to collect exposure and clinical history. Given the limited diagnostic value of routine stool cultures in patients receiving antibiotic therapy (6), team medical technologists purposively collected rectal swab samples from those they interviewed who reportedly had not taken any antibiotics for their current illness episodes. Patient specimens were tested in IEDCR's laboratory and a sub-sample of specimens was sent to icddr,b for confirmatory testing using previously described methods (7-9).

To estimate attack rates of suspected and probable cholera, a stratified cluster survey was conducted in the municipality from 10-30 November, 2013. *Mahallas* from which ≥20 diarrhoea patients were admitted to Adhunik Sadar Hospital during the outbreak period were defined as cluster communities and those from which <20 patients with diarrhoea were admitted to the hospital were defined as non-cluster *mahallas*; these were the primary sampling units. Next, 12 primary sampling units were randomly selected from each stratum. In each selected *mahalla*, the field research team first visited the

local city corporation office, identified the boundary and center point of the selected *mahalla* and starting from that point proceeded in a randomly selected direction to visit every other household until they contacted 50 households. In each selected household, trained data collectors sought verbal informed consent and then collected demographic information and determined if any household members met the suspected or probable case definitions. The team administered a pretested, structured questionnaire to collect information on history of illness, demographic characteristics and potential exposure from household members with suspected or probable cholera.

Unstructured interviews were conducted with the Netrokona mayor, executive and assistant engineers of the Department of Public Health Engineering, water superintendent of Netrokona municipality, five pump maintenance managers, the district sanitary inspector, and health workers. Three group discussions were conducted with residents of the municipality to collect information regarding local water supply and sanitation. We visited the *mahallas* with clusters of cases to investigate the water distribution system and sanitation infrastructure and collect water samples from different sources including household and public drinking water taps, household (shallow) and pump station (deep) tube wells, and the main source pumping station. All collected samples were transported to Dhaka within 24 hours of collection in cool boxes at 4°C and tested in icddr,b's Environmental Microbiology Laboratory for total coliforms, faecal coliforms, faecal streptococci, *V. cholerae* subtypes, and *Salmonella*, *Shigella* and *Pseudomonas* spp.

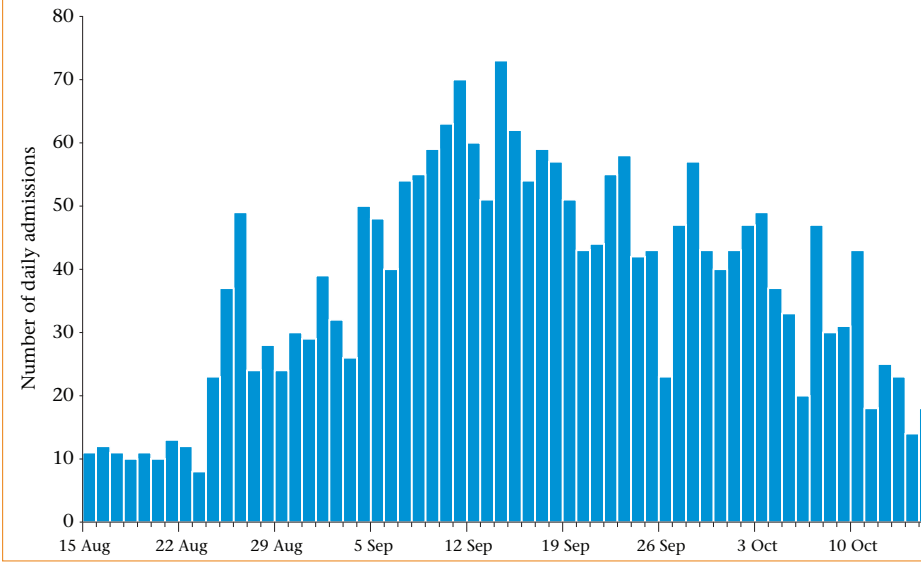
Group discussions were conducted in several *mahallas* affected by cholera with affected and unaffected residents, local healthcare providers, municipal workers, and representatives of Department of Public Health Engineering to understand their perceptions regarding possible causes of the outbreak. In addition, the anthropological team visited surveyed households in which deaths from suspected cholera occurred and conducted in depth interviews to describe the illness preceding death in more detail.

Quantitative data were analyzed to generate descriptive statistics. The total number of suspected cases, probable cases, and deaths thought to be due to cholera was divided by the total population surveyed to calculate the incidence of suspected cases, incidence of probable cases, and mortality due to cholera during the outbreak period. Qualitative data were reviewed to identify common themes, which were manually coded and summarized.

A total of 2,318 patients with acute watery diarrhoea were admitted in the Adhunik Sadar Hospital during the outbreak period (Figure 1). The median age was 25 (inter-quartile range [IQR]: 12-38) years, 64% were males, and 1,568 (68%) lived within the municipality. Among the 1,568 probable cases,

5 (0.3%) died. Of 165 probable cases admitted to the Adhunik Sadar Hospital during 7-9 and 20-25 September, 2013, the majority were admitted within 24 hours of onset of symptoms. *V. cholerae* was cultured from rectal swabs collected from 33 (80%) of 41 sampled patients.

Figure 1: Number of daily admissions to Adhunik Sadar Hospital for acute watery diarrhoea, Netrokona Municipality, 15 August-15 October, 2013 (N=2,318)



Among the 4,870 residents in 1,252 households surveyed, 154 (3%) had acute watery diarrhoea during the outbreak period. The median age was 22 (IQR:10-38) years and 83 (54%) were males. Eighty-five (55%) persons met criteria for probable cholera cases, 60 (39%) were admitted to a hospital, 78 (51%) were given intravenous fluids, and 3 (2%) died.

Netrokona Municipality had five pump houses that supplied water intermittently two times daily to 1,288 (11%) of the 11,415 households and to 41 street taps supplying water across the municipal area during the outbreak period (Figure 2). The municipal pump houses supplied approximately one-third of the total estimated water flow requirement for the municipality. Fifty-eight percent of community survey respondents reported drinking water exclusively from tube wells and 42% reported drinking municipal water supplied to households and/or street taps. In group discussions, 7 (58%) of 12 participants reported drinking pond or river water during summer and winter because of scarce water supply; 19 (13%) respondents from surveyed households reported drinking pond or river water during the outbreak period because of the shortage of municipal water supply

Figure 2: A street tap supplying municipal water to the public free of cost, Netrokona Municipality, September, 2013

and drying up of tube wells. *V. cholerae* was detected in 1 (11%) of nine water samples collected from household or street taps supplied with municipal water but in none of the samples collected from household or pump station tube wells (Table). All collected samples from household and street taps supplied by the municipality had detectable faecal coliforms, 5 (56%) had detectable faecal *Streptococci*, and 2 (22%) had detectable *Pseudomonas* spp. Three (50%) samples from household tube wells had detectable faecal coliforms, 3 (50%) had detectable faecal *Streptococci*, 1 (17%) had detectable *Pseudomonas* spp. Three (50%) samples from public pump stations had detectable total coliforms, 1 (17%) had detectable faecal coliforms, 1 (17%) had detectable faecal *Streptococci*, and 3 (50%) had detectable *Pseudomonas* spp. No samples from any source had detectable enteric pathogens (e.g., *Salmonella* or *Shigella* spp.).

All group discussants mentioned that the sanitation infrastructure of Netrokona municipality was poor given the absence of septic tank or sewerage systems in the city and the lack of sanitary latrine facilities in the majority of households. Participants mentioned that wastewater from households was frequently discharged into adjacent ditches or into the river adjacent to the municipality. Adhunik Sadar Hospital did not have a sewage system; hospital waste was dumped without any prior treatment into the adjacent river. This river served as a drinking water source for community residents during periods of water shortage.

All interviewed physicians expressed concern regarding the Adhunik Sadar Hospital's outbreak management capacity, including the limited number of doctors and nurses, which made it difficult to manage patients and follow infection control measures. They expressed the need to improve surge capacity by deploying additional staff and conducting frequent refresher training on management guidelines for acute watery diarrhoea. Several

physicians also reported a shortage of necessary antibiotics and rice-based oral rehydration salts.

Table: ***Bacteriological test results of water samples collected from various sources from communities affected by diarrhoea outbreak, Netrokona Municipality, Bangladesh, 15 August-15 October, 2013***

Points of water collection	Number of samples exceeding the maximum allowable limits[1], (Range of organisms)					
	Total coliforms	Faecal coli-forms	*Vibrio cholerae*	Faecal *Strepto-cocci*	*Salmo-nella/ Shigella* Spp	*Pseu-domonas* Spp
Municipality supplied household/street taps (N=9)	9 (14-261,000)	9 (3-31,000)	1 (1)	5 (0-1,045)	0 (0)	2 (0-1)
Household tube wells (N=6)	3 (0-14)	3 (0-7)	0 (0)	3 (0-570)	0 (0)	1 (0-1)
Public pump station tube wells (N=6)	3 (0-4)	1 (0-1)	0 (0)	1 (0-1)	0 (0)	3 (0-1)

[1]Maximum allowable limit by World Health Organization's Guideline is 0 CFU/100 ml for the following organisms: Total coliforms, faecal coliforms, faecal *streptococci*, *Vibrio cholerae*, *Salmonella* spp., *Shigella* spp., *Pseudomonas* spp.

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Comments

Onset of acute watery diarrhoea affecting 3% of municipal residents during a two-month period, widespread occurrence of cases who shared a common water supply system, and detection of cholera organisms in the majority of rectal swab samples collected from affected patients suggests this outbreak was due to cholera. The detection of coliforms and faecal *Streptococci* in all municipal water samples, the detection of *V. cholerae* in one sample from a tap supplied by municipal water, the intermittent supply of municipal water, and the absence of enteric pathogens in samples from source pumps suggest contamination of water in the pipelines as the most likely source of this outbreak. Similar outbreaks have been reported

from urban communities with untreated piped water in the context of intermittent water supply (4,10,11).

The growing disparity between demand and investment in water supply and sanitation infrastructure can lead to water quality risks and ingress of polluted groundwater into pipelines (12). Raising community awareness of water quality risks and the necessity of improving overall hygiene and sanitation practices, exploring options for vaccination against cholera, and developing contingency plans for future cholera outbreaks are warranted. Steps should be taken to strengthen waste management at the Netrokona District hospital. In addition, it is likely that the hospital's waste management practices are not unique to this hospital and that hospitals throughout Bangladesh should also strengthen their waste management practices.

Control and prevention of future cholera outbreaks in Netrokona will require integrated efforts to improve the water supply and sanitation infrastructure. Until water supply and sanitation infrastructure are improved and water safety plans are adopted, collaborative multi-disciplinary research efforts to explore and evaluate new approaches for providing microbiologically safe drinking water in municipalities with intermittent water supply should be a priority.

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Prevalence of sputum smear-positive Tuberculosis in Kamalapur, urban Dhaka, Bangladesh

The recent report of the World Health Organization on global burden of tuberculosis (TB) revealed that Bangladesh ranked the sixth highest among 212 countries. Since there is scarcity of data on TB disease burden from urban areas in Bangladesh, we aimed to determine the prevalence of sputum smear-positive TB in Kamalapur, an urban area in Bangladesh. TB surveillance was established in Kamalapur in 2004 and data were collected in 2004 and were linked to icddr,b's existing health and demographic surveillance system. Trained interviewers visited all households once every three months and interviewed all individuals aged ≥15 years to identify those with suspected pulmonary TB (i.e., those with cough for >21 days). Sputum specimens from suspected cases were collected and examined for acid-fast bacilli. The prevalence of cough >21 days was 1.8%. The population-based prevalence of smear-positive TB was 97/100,000 (95% confidence interval [CI] 57-137) among people aged ≥15 years; it was more than four times higher among males (187/100,000, 95% CI 97-277) than females (42/100,000, 95% CI 9-75). More recent TB disease burden data from urban areas are not available. This study revealed that the burden of smear-positive TB in this urban population was high and warrants appropriate measures to control TB in Bangladesh. The higher prevalence of cough >21 days and sputum smear-positive TB among males needs further exploration.

Tuberculosis (TB) is a major cause of morbidity and mortality globally with an estimated 8.6 million incident cases in 2012 (1). Currently, Bangladesh ranks sixth among the 22 highest-burden countries, with an estimated annual incidence of all forms of TB of 350,000 cases (220/100,000 population) in all ages (1). A nationwide TB prevalence survey conducted during 2007-2009 revealed that the overall prevalence of new smear-positive TB in persons aged ≥15 years was 79.4/100,000 (95% confidence interval [CI]: 47.1-133.8) and that TB prevalence was higher among males and higher in rural than in urban areas (2).

In urban areas, migration rates are frequently high, which can lead to delayed and interrupted treatment, facilitating spread of TB and increasing the risk of developing multidrug resistant (MDR) TB (3). A substantial proportion of patients who live in urban areas seek and receive TB therapy in the private sector (4,5). The Bangladesh National Tuberculosis Control Programme (NTP) is frequently not notified about such cases, leading to underreporting

of TB cases, which may in turn impact the reach and effectiveness of directly observed therapy short course (DOTS), which is recommended by the World Health Organization (WHO) and NTP. Because of the high TB burden in Bangladesh, the large number of Bangladeshis who live in urban areas, the poor conditions in urban settings that can facilitate the spread of TB and the development of MDR TB, and a lack of data on TB in urban settings in Bangladesh, we conducted a population-based study to estimate the prevalence of TB in Kamalapur, an urban area in Dhaka, Bangladesh.

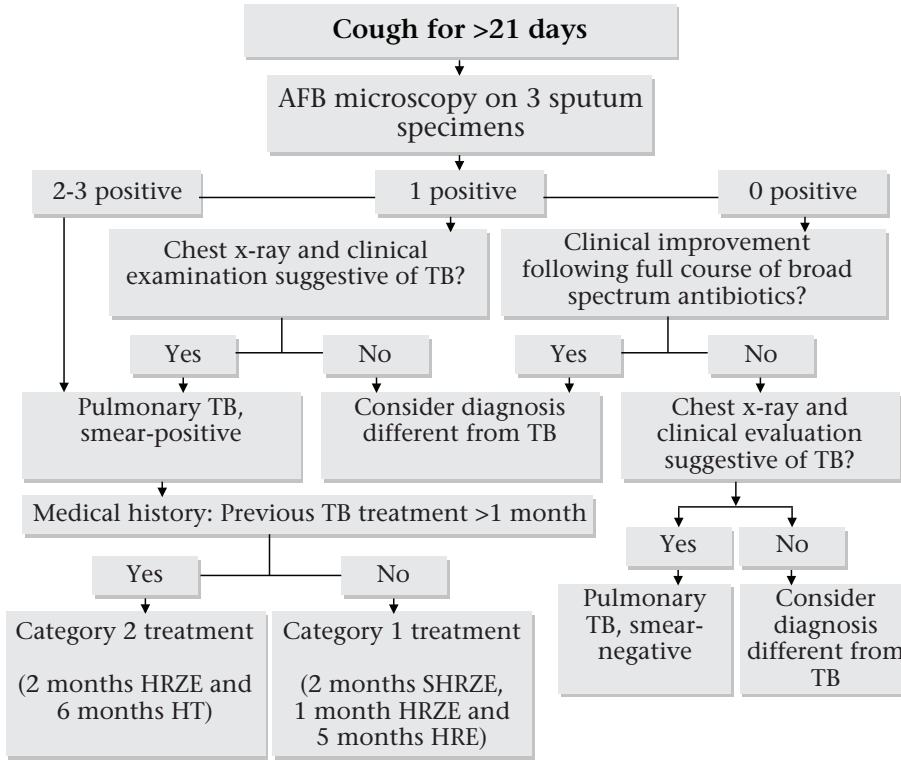
Kamalapur is situated in the south-eastern part of Dhaka City where an urban Health and Demographic Surveillance System (HDSS) has been maintained since 2000. Kamalapur is a densely populated, low-income community with a mixed population living in slum and non-slum areas. In 2004, the Kamalapur HDSS area included a total population of 123,705 in 26,429 households with a mean family size of 4.6 persons. During that year, a TB surveillance system was set up for persons aged ≥15 years in the Kamalapur HDSS area. We limited our study to persons aged ≥15 years old because of the difficulties obtaining sputum specimens from and diagnosing TB in children.

Trained female field workers visited all households in the surveillance area once every three months during 2004 to identify suspected pulmonary TB, defined as cough of >21 days duration in a person ≥15 years at the time of interview. On each visit, field workers enquired if any member in a surveyed household aged ≥15 years had a cough for >21 days. Written consent was obtained from persons with suspected TB and a structured questionnaire was administered which collected detailed history of illnesses (including Bacille Calmette Guerin [BCG] vaccination and/or prior treatment for TB), current signs and symptoms of active TB (e.g., cough, haemoptysis, fever, chest pain), contact with TB patients, and socio-demographic data.

We used the algorithm for the diagnosis and treatment of pulmonary TB that is recommended by NTP (Figure) (6). Field workers referred all suspected pulmonary TB cases to the Population Services Training Centre (PSTC), a partner nongovernmental organization located in Kamalapur, for sputum testing for acid-fast bacilli (AFB). During two consecutive days, two spot and one morning sputum specimen were collected in routine sputum cups from each person with suspected pulmonary TB. All specimens were examined in PSTC laboratories for AFB via standard microscopy (7). If only one of three sputum samples was smear-positive, a chest x-ray was performed to confirm the diagnosis of smear-positive pulmonary TB.

A confirmed case of smear-positive pulmonary TB was defined as symptoms of cough for >21 days in a person ≥15 years who had at least two sputum specimens positive for AFB or one sputum specimen AFB-positive plus radiologic abnormalities or clinical examination findings consistent with pulmonary TB (8). TB patients under treatment who did not have symptoms of cough >21 days during the interviewing period were not included in this study.

Figure: National Tuberculosis Programme algorithm for diagnosis and treatment of pulmonary tuberculosis (6)



Notes: H: isoniazid; R: rifampicin; Z: pyrazinamide; E: ethambutol; T: thiacetazone; S: streptomycin.

A total of 42,247 persons aged ≥15 years in the Kamalapur HDSS area was covered by home visits. Of these, 23,473 (55.6%) were found at home and interviewed; a greater percentage of females than males were interviewed (69.5% vs. 41.7%, p=.001). The overall prevalence of cough >21 days was 1.8%, it was higher among males than females (3% vs. 1%, P <0.0001) and it increased with increasing age category (p-value for linear trend: <0.001) (Table 1).

Overall, 5.2% of persons tested had confirmed smear-positive pulmonary TB; a greater proportion of males than females had confirmed smear-positive pulmonary TB (6.2% vs. 4%), but this finding was not statistically significant (p=0.5) (Table 2). The overall population-based prevalence of smear positive TB was 97/100,000 (95% CI: 57-137/100,000) per population

aged ≥15 years; the prevalence was higher among males (187/100,000, 95% CI: 97- 277/100,000) than females (42/100,000, 95% CI: 9-75/100,000).

Table 1: Distribution of persons with cough >21 days by age and gender, Kamlapur, Bangladesh, 2004

Age (years)	Gender				Total	
	Male		Female			
	N	Cough >21 days n (%)	N	Cough >21 days n (%)	N	Cough >21 days n (%)
15-24	2,764	34 (1.2)	4,994	47 (0.9)	7,758	81 (1)**
25-34	2,124	67 (3.2)	4,400	39 (0.9)	6,524	106 (1.6)
35-44	1,838	70 (3.8)	2,687	33 (1.2)	4,525	103 (2.3)
≥45	2,182	99 (4.5)	2,484	33 (1.3)	4,666	132 (2.8)
All	8,908	270 (3)*	14,565	152 (1)*	23,473	422 (1.8)

P-value: <0.0001 (male compared to female)
**$\chi 2$ test for linear trend: 59.99, P <0.0001

Table 2: Distribution of persons with confirmed smear-positive pulmonary TB by age and gender, Kamlapur, Bangladesh, 2004*

Age (years)	Gender				Total	
	Male		Female			
	Tested N	Sputum AFB-positive n (%)	Tested N	Sputum AFB-positive n (%)	Tested N	Sputum AFB-positive n (%)
15-24	31	1 (3.2)	35	3 (8.6)	66	4 (6.1)
25-34	58	5 (8.6)	33	1 (3)	91	6 (6.6)
35-44	53	4 (7.5)	29	1 (3.4)	82	5 (6.1)
≥45	85	4 (4.7)	28	0 (0)	113	4 (3.5)
All	227	14 (6.2)	125	5 (4)	352	19 (5.4)

P-value: .5 AFB: Acid-fast bacilli
*Defined as sputum positive for AFB by microscopy in a person ≥15 years with cough >21 days

Reported by: Centre for Child and Adolescent Health, icddr,b in collaboration with the National Tuberculosis Control Programme, Ministry of Health and Family Welfare, Government of Bangladesh, and BRAC

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Comments

This study found a high burden of pulmonary TB among persons aged ≥15 years in an urban area of Dhaka. The population-based rate of new smear-positive TB of 97 per 100,000 persons ≥15 years was higher than the overall rate observed in the 2007-2009 national TB prevalence survey (2). This may be due sampling variations as the national prevalence survey included clusters from both low- and high income areas and/or because the current survey was limited to a predominantly low-income urban setting. However, the findings in this report are in agreement with a regional survey conducted in 2001 in Matlab, a rural area of Bangladesh, where the prevalence was reported to be 95/100,000 per adults aged ≥15 years (9). The finding that men were three times more likely than women to have cough >21 days and that the population-based rate of smear-positive TB was more than four times higher among males than females is consistent with previous reports from Bangladesh and other countries and could reflect occupational risks (crowded working environment or working in industries) behavioural factors (e.g., smoking, differences in access to and/or use of health care services) or immunological factors (10-13).

This study has at least two limitations. First, the survey was conducted in Kamalapur, so findings are not representative of Bangladesh and may not be representative of other urban settings in Bangladesh. Second, this survey was conducted 10 years ago, so comparison of findings with the national TB prevalence survey in 2007-09 may not be appropriate.

The high burden of TB found in Kamalapur among the urban population warrants appropriate measures to control TB in Bangladesh. TB poses a high economic burden for families and NTP in Bangladesh considers case detection rate in urban areas a high priority. The higher prevalence of cough >21 days and population-based rate of confirmed pulmonary TB among males than females needs further exploration. Appropriate strategies for prevention (e.g., education and behaviour modification), targeted diagnosis and treatment are needed to strengthen TB control activities in Bangladesh. It will be important to monitor the change in urban TB situations regularly to provide information and timely interventions to control and prevent TB transmission.

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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 2013-May 2014

Antimicrobial agents	*Shigella* N=70	*V. cholerae* O1 N=302
Mecillinam	85.5	Not tested
Ampicillin	58.6	Not tested
TMP-SMX	36.2	0.7
Ciprofloxacin	42.0	100.0
Tetracycline	Not tested	2.0
Azithromycin	74.3	99.7
Ceftrioxone	100.0	Not tested

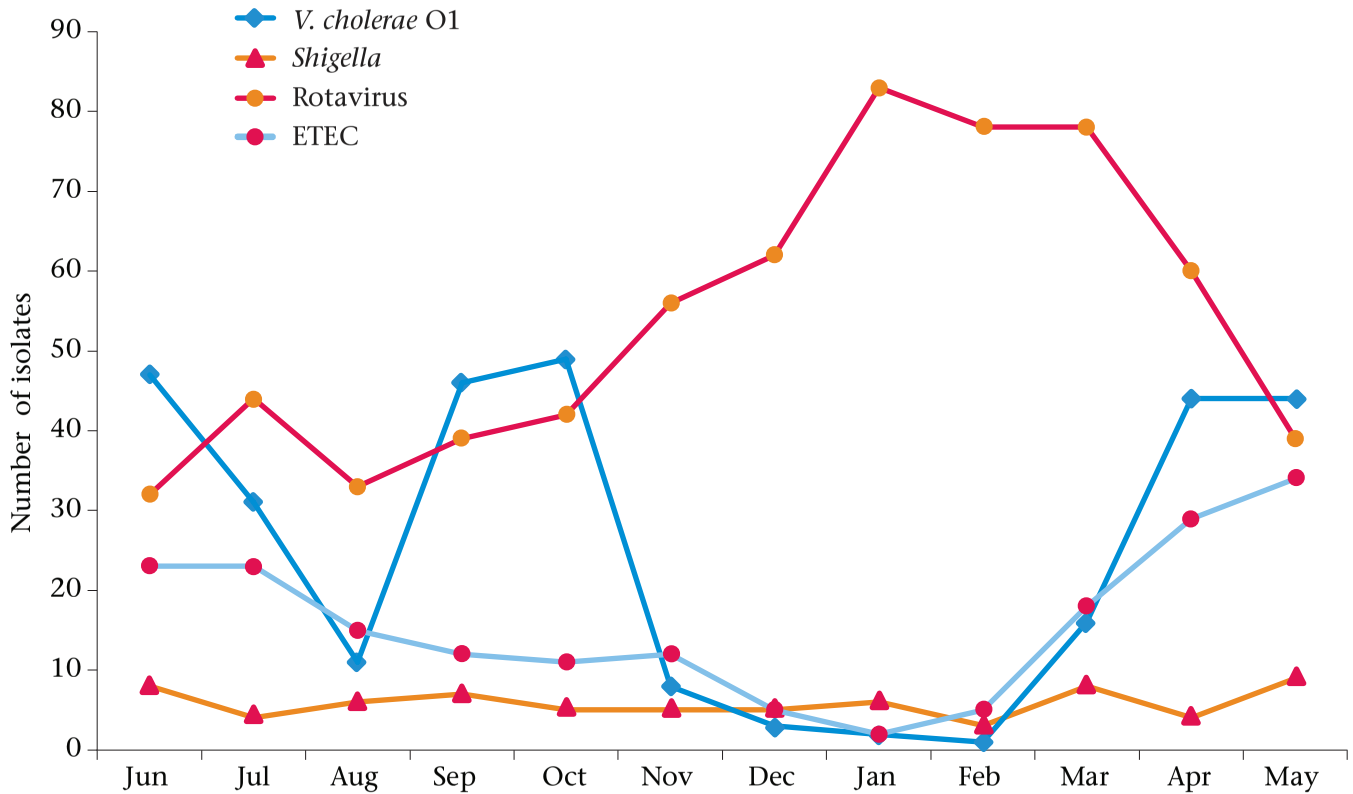
Source: Hospital Surveillance, Dhaka Hospital, icddr,b

Antimicrobial susceptibility pattern of* S. typhi *among children <5 years during April-June 2014

Antimicrobial agent	Total tested (N)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicillin	43	41 (95)	0 (0)	2 (5)
Cotrimoxazole	43	42 (98)	0 (0)	1 (2)
Chloramphenicol	43	42 (98)	0 (0)	1 (2)
Ceftriaxone	42	42 (100)	0 (0)	0 (0)
Ciprofloxacin	43	1 (2)	40 (93)	2 (5)
Nalidixic Acid	43	4 (9)	0 (0)	39 (91)

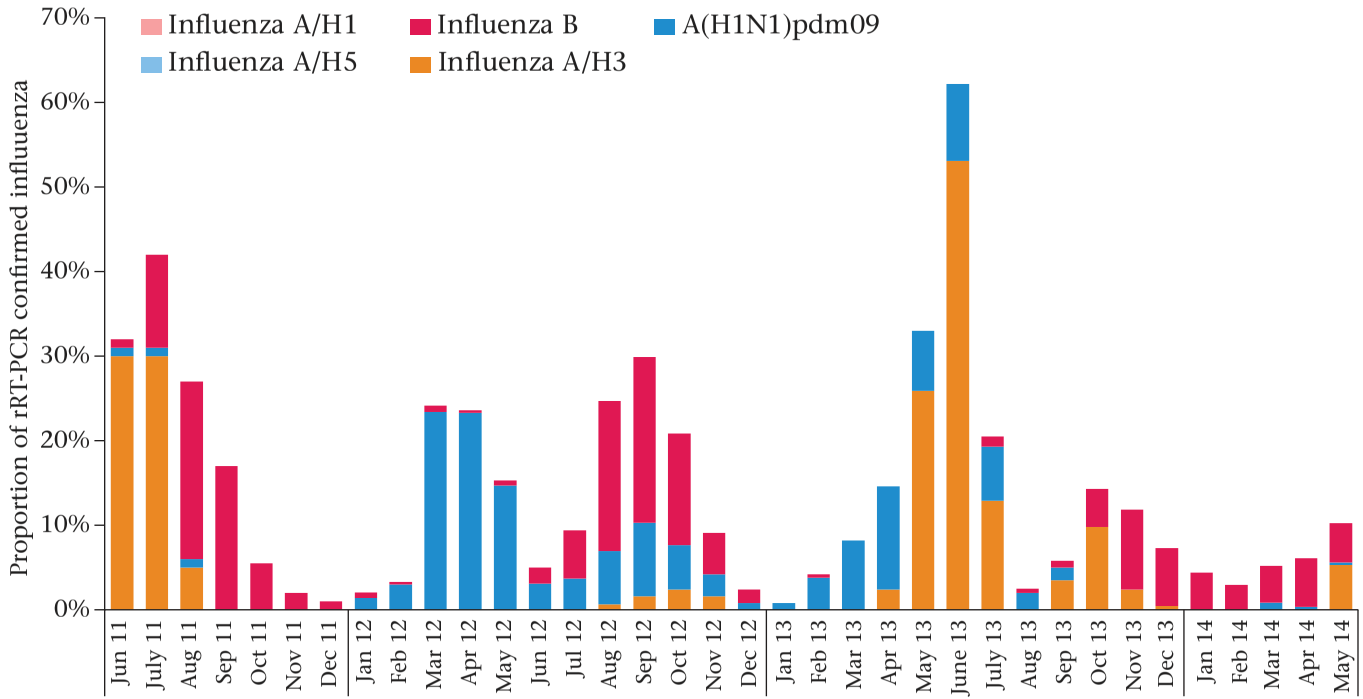
Source: Kamalapur Urban Surveillance, icddr,b

Monthly isolation of V. cholerae *O1,* Shigella*, Rotavirus and ETEC: June 2013-May 2014*



Source: Hospital Surveillance, Dhaka Hospital, icddr,b

Proportion of laboratory-confirmed influenza among hospitalized severe acute respiratory illness (SARI) and outpatient influenza like illness (ILI) cases between June 2011 and May 2014



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), Sher-e-Bangla Medical College Hospital (Barisal), Chittagong Medical College Hospital' and Dinajpur Medical College Hospital* (*since April 2014)

Collection of blood sample for dengue serological survey

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