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Inside

Anthrax outbreaks in Bangladesh: an update

Since August 2009, there have been intermittent reports of human and animal anthrax outbreaks in different parts of Bangladesh. Recently, seven outbreaks were investigated during August and September 2010, in Pabna and Sirajganj districts. *Bacillus anthracis* was provisionally detected from vesicular smears of human cutaneous anthrax cases and from a bone marrow smear of a slaughtered sick animal. Participation in slaughtering anthrax infected animals and exposure to infected meat and animal by-products was responsible for the human outbreaks. Routine vaccination of livestock should be undertaken to prevent further outbreaks of anthrax in animal and humans in Bangladesh.

One year ago the December 2009 issue of the Health and Science Bulletin reported the first human anthrax outbreaks in Bangladesh in over 25 years (1). Since then, there have been intermittent reports of anthrax outbreaks from different parts of Bangladesh. Most recently, on 18 August 2010, a suspected outbreak of cutaneous anthrax was reported in Sirajganj district. A collaborative team of epidemiologists, physicians, veterinarians and anthropologists from the Institute of Epidemiology,

icddr,b
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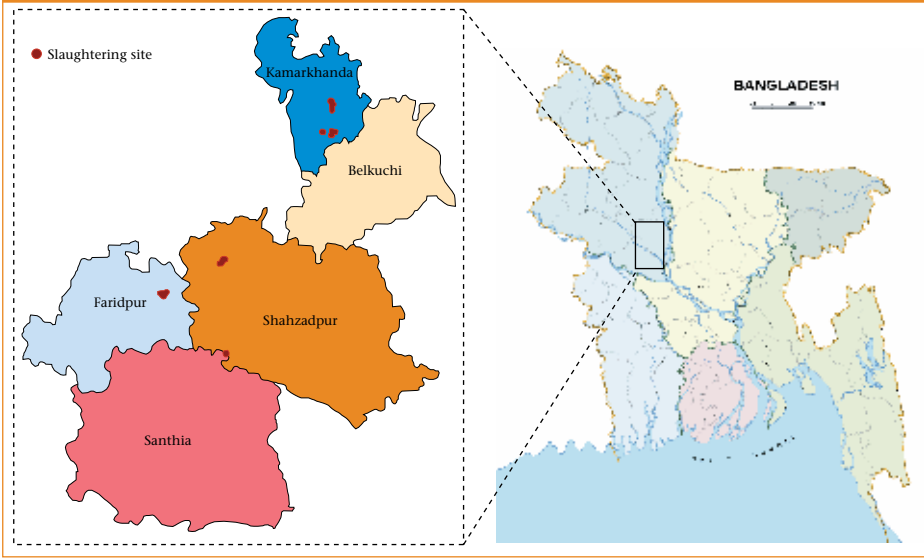
Disease Control and Research (IEDCR), the Department of Livestock (DLS) and the International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR,B) went to the outbreak area to investigate. Over the next several days, health workers and newspapers reported six more outbreaks in adjacent areas. We investigated all of these seven outbreaks spread over 11 villages of five upazillas during the period of 19-27 August (Figure 1).

Figure 1: Geographical location of anthrax outbreak areas during August-September 2010



We gathered epidemiological and clinical information about the affected animals. We defined animal illness as sudden death or convulsion of a ruminant, with or without fever, within 30 days prior to the slaughtering of a sick animal until the date of investigation. We collected bone marrow smears of three slaughtered cattle from the meat stored in a freezer.

We defined a suspected human case of cutaneous anthrax as any person who suffered from acute onset of skin lesion with papule or vesicle or skin ulceration with raised margin and central black eschar from the date of slaughtering the first sick animal in the outbreak area until three weeks after the last sick animal was slaughtered. We collected epidemiological, clinical and exposure history of the suspected human cases. We collected blood, vesicular smear and vesicular swabs in nutrient broth from cutaneous anthrax cases.

We explored social, cultural and economic factors that might have contributed to these outbreaks to understand perceptions and practices regarding sick animal slaughtering, transmission of anthrax, relationship of human illness with exposure to sick animals, and livestock vaccination coverage.

From 20-23 September, we conducted follow up investigations in all seven outbreak areas. In the first three outbreak areas we searched for suspected cases of gastrointestinal anthrax. We defined a suspected case of gastrointestinal anthrax as a person in the affected communities who ate meat or handled raw meat of cattle, goat, sheep or buffalo and developed a febrile illness associated with oral ulcer or sore throat or vomiting and/or diarrhoea from the date of slaughtering the first sick animal in the outbreak area until three weeks after the last sick animal was slaughtered. We collected blood samples from all suspected cases of gastrointestinal anthrax. We collected follow up serum from suspected cutaneous anthrax cases enrolled during the preliminary investigation who were available during the follow up investigation.

We identified 65 animal cases in these seven outbreaks (Table 1). Thirty nine (60%) animals died and 23 (35%) were slaughtered. Only three (5%) animals survived. Only four (6%) of these 65 animals had received anthrax vaccination in the previous year. Twenty-five (64%) of the animals that died were thrown in flood or river water, 10 (26%) were thrown in an open field and four (10%) were buried.

We interviewed 176 cases of cutaneous anthrax and 26 cases of suspected gastrointestinal anthrax. Among these, 11 cases met the case definitions for both cutaneous and suspected gastrointestinal anthrax (Table 2). In each outbreak area, human cases started occurring following slaughtering of anthrax infected animals (Figure 2).

Figure 2: Anthrax in human in relation with the sick animal slaughtering in Bangladesh, 2010

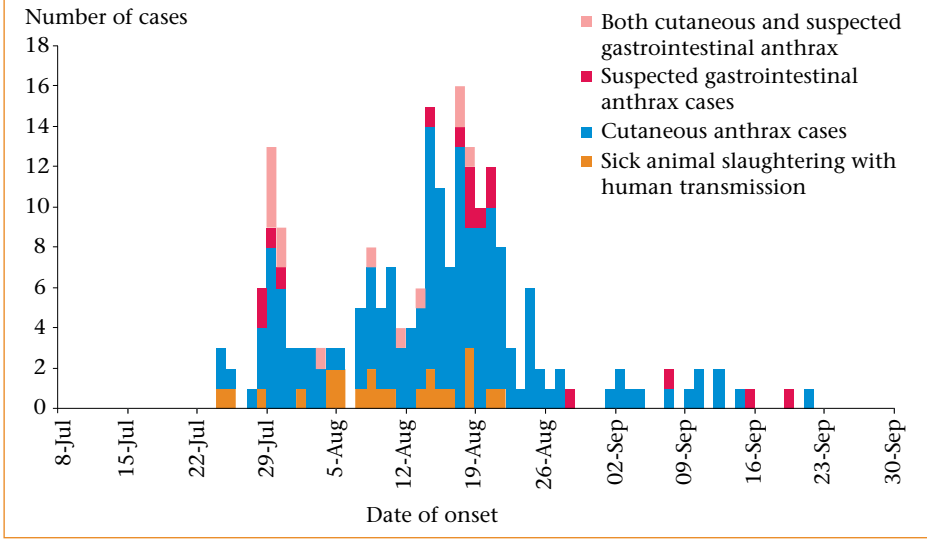


Table 1: Demographic and clinical characteristics of animal anthrax cases in Bangladesh (N=65)

Characteristics	n (%)
Age in months	
Cattle: Median (range)	36 (7-120)
Goat: Median (range)	24 (12-96)
Sheep: Median (range)	9 (9-48)
Sex: Female	42 (65)
Clinical presentations	
Fallen down	53 (82)
Fever	49 (75)
Convulsion	44 (68)
Sudden death	37 (57)
Anorexia	33 (51)
Depression	18 (28)
Respiratory distress	14 (22)
Diarrhoea	4 (6)
Muscle tremor	3 (5)
Listlessness	1 (2)
Oedema	1 (2)
Drop in milk production	1 (2)
Outcome	
Death	30 (60)
Slaughtered	25 (35)
Sick at the time of interview	3 (5)
Median (range) onset of illness to death	2 hrs (15 min-87 hours)
Median (range) onset of illness to slaughter	7 hrs (15 min-60 hours)

Eighty-eight percent of cases with cutaneous anthrax lesion either had contact with sick or dead animals, or handled raw meat or skin, or slaughtered sick animals or were present at the site of slaughtering or processing of meat. All suspected gastrointestinal anthrax cases had a history of consuming meat of a sick slaughtered animal. There was no known case of hospitalization or human mortality due to anthrax during this outbreak.

Microbiologists of IEDCR tested vesicular smears (10) and vesicular swab in nutrient broth (8) from 11 human cases. *Bacillus anthracis* was presumptively detected from all these cases by staining vesicular smear with Loeffler's Polychrome Methylene Blue and culture of vesicular swab in Nutrient agar and Blood agar media by colony morphology study, staining and microscopy. Microbiologists of the Central Disease Investigation Laboratory (CDIL) stained bone marrow smear of slaughtered sick animal with Loeffler's Polychrome Methylene Blue stain and identified rod shaped bacilli. Centers

for Disease Control (CDC), USA isolated *Bacillus anthracis* from ocular fluid of a dead goat and vesicular swab of a human case. CDC also confirmed that both human and animal were infected by the isolates of same genotype.

Table 2: Demographic and clinical characteristics of human anthrax cases in Bangladesh, 2010

Characteristics	Cutaneous anthrax in 7 outbreaks (N=176)*	Suspected gastrointestinal anthrax in first 3 outbreaks (N=26)*
Demographic characteristics		
Age: Median (range)	27 (2-90)	21 (2-50)
Age group	n (%)	n (%)
1-10 yrs	25 (14)	7 (27)
11-20 yrs	37 (21)	6 (23)
21-30 yrs	47 (27)	5 (19)
31-40 yrs	34 (19)	6 (23)
>40 yrs	33 (19)	2 (8)
Sex: Male	107 (61)	10 (38)
Clinical presentation		
Fever	115 (65)	26 (100)
Abdominal pain	18 (10)	19 (73)
Vomiting	6 (3)	14 (54)
Nausea	22 (13)	14 (54)
Diarrhoea	6 (3)	9 (35)
Oropharyngeal ulceration	4 (2)	4 (15)
Skin lesion	176 (100)	11 (42)
Papule	158 (90)	8 (31)
Vesicle	152 (87)	7 (27)
Central black eschar	130 (76)	8 (31)
Ulcer	122 (87)	8 (31)
Itchy skin	110 (63)	9 (35)
Surrounding erythema	102 (57)	4 (15)
Surrounding oedema	95 (55)	3 (12)

*Includes 11 cases of both cutaneous and suspected gastrointestinal anthrax

The anthropological investigation suggested that owners slaughtered sick cattle and goats to recover at least part of the impending financial loss in case of death of the animal. Neighbours and unlicensed veterinary service providers encouraged them to slaughter moribund animals, sell the meat and recover some money. Cattle owners mentioned that livestock anthrax vaccination coverage had reduced in the area in past few years as a result of lack of coordination between government and non-government organizations providing vaccination.

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

Supported by: Government of Bangladesh, World Health Organization and Centres for Disease Control and Prevention, Atlanta, USA

Comments

Epidemiological, clinical and laboratory findings suggest that these most recent outbreaks in humans and animals were caused by *Bacillus anthracis*. There are several environmental factors in Bangladesh that favour the presence of anthrax in nature, including high ambient temperature and relative humidity (2). As people are not aware of the hazards of improper disposal of anthrax infected dead animals, they are rarely buried. Usually an animal carcass is either thrown in the flood or river water or in the open field, which results in contamination of the grazing land with anthrax bacilli. Anthrax bacilli sporulate rapidly on exposure to air and high temperatures (>20°C) and their survival is secured (3). Although there is a routine livestock anthrax vaccination programme in Bangladesh, vaccination coverage is very low (1). As a result, more animals acquire anthrax by ingestion of spores while grazing and the cycle of infection from carcass to grazing land continues. This cycle has resulted in anthrax being enzootic among livestock in Bangladesh.

Most of the recent cases were not detected through the routine reporting system. This indicates under-diagnosis and under-reporting of anthrax in Bangladesh. Additionally, the recent wave of outbreaks was apparently more widespread compared to previous reported anthrax outbreaks. The increase in the number of outbreaks and suspected cases reported in these latest outbreaks might have been due to raised awareness among health workers, physicians and the general public, because of the unprecedented media attention on this issue.

Our investigations suggest that the decision to slaughter a sick animal is influenced by economic considerations on the part of the animal owners, as well as the neighbors, and other villagers who purchase the meat. Cattle owners slaughter moribund animals to minimize financial loss as a result of death of the animal, while people living in pervasive poverty in rural Bangladesh, and being unaware of the risks associated with slaughtering, handling or eating meat of sick animal, purchase the relatively inexpensive infected meat. Such strong economic stimulation in favour of slaughtering sick animals suggests that a prevention strategy that only encourages people not to slaughter sick animals and to bury anthrax infected dead animals deep in the ground is unlikely to be successful. Improving routine vaccination coverage of livestock has been effective in other contexts (2,4), and should be undertaken as the principal strategy to prevent anthrax outbreaks in Bangladesh.

References

1. ICDDR,B. Cutaneous anthrax outbreaks in two districts of northwestern Bangladesh. *Health Sci Bul,* 2009:7(4);2-8.
2. World Health Organization. Anthrax in humans and animals. 4th ed. Geneva: World Health Organization, 2008.
3. Christie AB. Infectious Diseases: Epidemiology and Clinical Practice, 4th ed. Edinburgh: Churchill Livingstone, 1987.
4. Joklik WK, Willet HP, Amos DB, Wilfert CM. Zinsser Microbiology. 20th. Norwalk: Appleton & Lange, 1992. 618 p.

Academic detailing: A strategy to disseminate health information to non-formal providers in Bangladesh

Academic detailing is a strategy to improve health care services through one-to-one outreach visits to health care providers to disseminate information on specific health topics. This strategy uses a trusted source to convey correct information and stimulate positive behavior change. This study assessed the feasibility of using academic detailing to improve the health care services of non-formal providers when counseling patients with sexually transmitted infections. We trained medical representatives of private pharmaceutical companies to disseminate counseling guidelines on sexually transmitted infections to non-formal providers. We collected data through in-depth interviews with 12 medical representatives and 23 non-formal providers. We found the medical representatives disseminated the guidelines in one-to one visits and that the non-formal providers understood the counseling guideline messages. The study suggests that academic detailing could be used to improve the knowledge and skills of non-formal providers on other health topics, particularly those that can be linked to specific pharmaceutical products.

In Bangladesh 95% of all health care providers are non-formal providers[1] (1). Evidence from low income countries suggests that their services are limited by inadequate knowledge and poor clinical practices. Many patients do not receive the correct dose of medicine, or they receive unnecessary or even harmful treatment (2,3). In Bangladesh, only half of the non-formal providers who treat clients with sexually transmitted infections treat partners

[1]Non-formal providers in Bangladesh have a range of training and competencies: some with limited training and other with certificates/degrees. They include traditional medicine doctors/herbalists (Kabiraj), religious healers (Pir/Fakir), village doctors and pharmacists.

as well as clients. Just over half of non-formal providers (54%) advise their clients to use condoms during sex (4,5). A number of avenues for improving the services of health care providers have been explored, including social marketing and improved training (6). However, considering the large number of non-formal providers in Bangladesh, comprehensive training is difficult. One approach, known as academic detailing, that could be adopted on a large scale is one-to-one outreach visits to health care providers to disseminate information on specific health topics (7-9). Academic detailing is the use of a trusted source to convey correct information and stimulate behaviour change (9,10). Most studies on the effectiveness of academic detailing have been conducted in high-income countries, focusing on changing providers' prescriptions practices and their promotion of preventive information (11). We conducted a study to assess the feasibility of using academic detailing, carried out by medical representatives from selected pharmaceutical companies, to improve the health care services of non-formal providers when counselling patients with sexually transmitted infections (12).

Data for this study was extracted from a national project entitled *'Prevention of HIV/AIDS among Young People in Bangladesh'* that was implemented during January 2007 to February 2009 in Rajshahi City Corporation and Modhupur Upazila (sub-district) of Tangail district. The intervention consisted of two components: 1) developing counselling guidelines for sexually transmitted infections and 2) training medical representatives to disseminate the information in the counselling guidelines to non-formal health care providers. The guidelines contained key messages related to sexually transmitted infections using the '4Cs': counselling, condoms, contact tracing, and compliance with treatment. Under each of the key messages, an explanation was provided through sub-messages (Box 1).

Box 1: Key messages and sub-messages of the counseling guidelines

Counseling for prevention of sexually transmitted infections

- If you are unmarried, abstain from sex
- Avoid multiple sexual partners
- Use condoms to prevent sexually transmitted infections

Counseling for condoms, importance for prevention of sexually transmitted infections

- Condoms are the only way to prevent sexually transmitted infections, including HIV, during sex
- Use condoms correctly
- Use condoms every time you have sex

Counseling for completion of treatment for sexually transmitted infections

- Complete all medicine prescribed for treatment of sexually transmitted infections
- Abstain from sex or use a condom while taking medication

Counseling for partner's treatment

- Help your partner/spouse to get treatment

We consulted the Bangladesh Index of Medical Specialities to identify local

pharmaceutical companies that produce the five drugs recommended for the treatment of sexually transmitted infections in the national guidelines (13). Of these five, two pharmaceutical companies, Acme Laboratories Ltd. and Aristopharma Ltd., covered large areas of the country and were willing to participate. No financial incentive was provided, but their logo was included on the printed counselling guidelines. We trained all the medical representatives of these companies, who were already working in our two study sites. We focused the training on both content of the 4C's and on delivery of the messages through practical demonstration sessions.

In the field, academic detailing on the counselling guidelines took place over a period of two weeks. Immediately afterwards we conducted semi-structured in-depth interviews with both the medical representatives and the non-formal providers whom they visited. We then manually analysed the data by transcribing the field notes and doing content analysis based on the study objectives.

We interviewed 12 medical representatives who had a mean age of 31 years. Eleven had a master's degree in science and one had a bachelor degree. The average length of time of working as a medical representative was 4 years. We selected 23 out of 180 non-formal providers (12%) who received the counselling guidelines from medical representatives, had a high volume of clients with sexually transmitted infections, and were willing to give time for an interview. The mean age of the non-formal providers was 42 years. Almost half (11 out of 23) of the non-formal providers had at least bachelor's degree and the rest held a higher secondary certificate or a lower degree. Most of the non-formal providers (18 out of 23) had another certificate or diploma degree that was related to their present profession. Some non-formal providers (7 out of 23) had undergone related training on sexually transmitted infections from non-governmental organizations. On average, the non-formal providers had been working in their current locations for the past 18 years. All non-formal providers reported to have treated patients with sexually transmitted infections who were from 15-30 years old and were mostly male.

Each medical representative disseminated the counselling guidelines to an average of 15 non-formal providers. However, they required several visits to disseminate the guidelines in detail.

> *"Since we want to distribute the guidelines using the method of academic detailing, just handing over the guideline is not enough. We should take time to explain the guideline messages … so we need several visits to disseminate the guidelines".*

The number of visits required depended on several factors related to the academic detailing process. First, if a medical representative's relationship with a non-formal provider was positive, approaching them and sharing

this information was easier. Secondly, if the non-formal provider had the ability and enthusiasm to learn about counselling for sexually transmitted infections, then more knowledge could be shared.

The medical representatives discussed their participation in the intervention as *"samajik daitto"* or social responsibility. They reported that they had taken on this additional job responsibility not only because they were asked to by their employer, but because it fulfilled their personal sense of social responsibility. For example, one medical representative said:

> *"Being a conscious person of our society (shomajer shocheton bekti), it is our social responsibility to do something for our young people…to save them from the deadly disease AIDS".*

The medical representatives also recommended providing more information on condom use in the guidelines, as some non-formal providers wanted to know the correct way to use them. Even though medical representatives had some knowledge regarding correct condom use, they felt that providing an appropriate leaflet would be the easiest way to disseminate information to both non-formal providers and their clients.

We found that the content of the guidelines was understandable by the non-formal providers. There were four specific issues that we asked non-formal providers to explain during the interview: 1) importance of the counselling guidelines, 2) encouraging youth to use condoms, 3) reasons for all youths to receive respectful services, and 4) referring young people to youth-friendly health services. We assessed their responses according to the national guidelines (13) and found that they explained most of the messages elaborately and accurately.

The non-formal providers were aware of the importance of counselling related to sexually transmitted infections. They felt that counselling was a way to make youth aware of their vulnerability to sexually transmitted infections and HIV and that the messages could help protect them and other youths. Most of them thought that encouraging youth to use condoms was a good idea as young people are curious about sex because it is something new for them and they want to try it out. However, as they are often too young to make correct decisions, they need counselling. One village doctor in Rajshahi said:

> *"Youths should be encouraged to use condoms, because youths are vulnerable to risky behaviour. They feel excited, but do not know what it is, and they want to know…they want to experiment."*

Although the non-formal providers were generally positive about the sexually transmitted infections counselling messages, three out of 23 had negative reactions about condom use. These were religiously conservative non-formal providers, who were worried that these messages might encourage youth to have more sex.

Reported by: Health Systems and Economics Unit, Health Systems and Infectious Diseases Division, ICDDR,B

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Comments

The medical representatives demonstrated that with limited training they understood the counselling guidelines' messages and could disseminate the guidelines to non-formal providers using academic detailing. The non-formal providers' understanding of the counselling guideline messages was evident through their ability to discuss the guidelines' messages in their own words. This is likely because medical representatives are a well received source of information for non-formal providers who are motivated to learn new information (9,14). As shown in another recent study, the majority of non-formal providers in Bangladesh learn about sexually transmitted infection services from the medical literature provided by medical representatives (5). The negative reactions from a few non-formal providers were related to specific content, which is sensitive in many countries, including Bangladesh, rather than to the dissemination strategy itself. However, from comments received from both medical representatives and non-formal providers, the guidelines could be improved to strengthen the academic detailing approach. For example, there could be more comprehensive information on correct condom use.

The study demonstrated that the private sector may be willing to participate in public sector programs of this kind. The inclusion of their logo on the guidelines, and the collaboration with ICDDR,B, were factors that likely encouraged their active participation. The medical representatives were allowed time to attend the initial training, and time during their normal product promotion to conduct the academic detailing related to counselling for sexually transmitted infections. The medical representatives reported that they were personally motivated to participate through their individual sense of social responsibility.

Given the reach of private sector pharmaceutical companies in Bangladesh, this is a promising approach to improving health services through a public-private partnership. This approach has the potential for improving the knowledge and skills of non-formal providers on other health topics, particularly those that can be linked to specific pharmaceutical products.

References

1. Bangladesh Health Watch. Bangladesh health watch report 2009 : how healthy is health sector governance? Dhaka : University Press Limited, 2010. 96 p.

2. Brugha R, Zwi A. Improving the quality of private sector delivery of public

health services: challenges and strategies. *Health Policy Plan* 1998;13:107-20.

3. Chabikuli N, Schneider H, Blaauw D, Zwi AB, Brugha R. Quality and equity of private sector care for sexually transmitted diseases in South Africa. *Health Policy Plan*, 2002;17:40-6.
4. Ahmed SM, Hossain MA. Knowledge and practice of unqualified and semi-qualified allopathic providers in rural Bangladesh: implications for the HRH problem. *Health Policy*, 2007;84:332-43.
5. National AIDS/STD Programme. STI knowledge and practices of unlicensed private practitioners in Bangladesh. Dhaka: National AIDS/ STD Programme, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of Bangladesh, 2009, 24 p. (Prevention of HIV/AIDS among young people in Bangladesh).
6. Peters DH, Mirchandani GG, Hansen PM. Strategies for engaging the private sector in sexual and reproductive health: how effective are they? *Health Policy Plan*, 2004;19:i15-i21.
7. Eltayeb IB, Awad AI, Mohamed-Salih MS, Daffa-Alla MA, Ahmed MB, Ogail MA, *et al*. Changing the prescribing patterns of sexually transmitted infections in the White Nile Region of Sudan. *Sex Transm Infect*, 2005; 81:426-7.
8. Larson K, Levy J, Rome MG, Matte TD, Silver LD, Frieden TR. Public health detailing: a strategy to improve the delivery of clinical preventive services in New York City. *Public Health Rep*, 2006;121:228-34.
9. Siegel D, Lopez J, Meier J, Goldstein MK, Lee S, Brazill BJ, *et al*. Academic Detailing to Improve Antihypertensive Prescribing Patterns. *Am J Hypertens*, 2003;16:508-11.
10. Simon SR, Majumdar SR, Prosser LA, Salem-Schatz S, Warner C, Kleinman K, *et al*. Group versus individual academic detailing to improve the use of antihypertensive medications in primary care: a cluster-randomized controlled trial. *Am J Med*, 2005;118:521-8.
11. Grol R. Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet*, 2003;362:1225-30.
12. ICDDR,B: Practices of Medical Representatives in Bangladesh (unpublished document).
13. Rahman M, Ara R, McCormick D. Sack JC, Richards HG, Mitra D. National guidelines for management of sexually transmitted infections. Dhaka: National AIDS/STD Programme, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of Bangladesh, 2006. 129 p.
14. Collier J, Iheanacho I. The pharmaceutical industry as an informant. *Lancet*, 2002;360:1405-9.

Nationwide tuberculosis prevalence survey in Bangladesh, 2007-2009

A multi-institutional collaborative team conducted the national tuberculosis prevalence survey during 2007-2009 to determine the prevalence of new smear-positive tuberculosis in Bangladesh. Fieldworkers implemented a multi-stage cluster survey and identified 52,098 eligible persons ≥15 years from 40 clusters (20 urban and 20 rural). The study team confirmed a total of 33 new smear-positive tuberculosis cases. The overall adjusted prevalence was 79.4 per 100,000 persons ≥15 years. Tuberculosis was higher among males and rural residents. The prevalence was highest among persons aged 55-64 years, lowest in 15-24 years and was highest among the lowest SES quintile. The prevalence was significantly lower than the previous nationwide survey in Bangladesh in 1987-88. Intensive tuberculosis control activities should be continued and increased emphasis should be given to older people, rural populations and lower socioeconomic groups.

Tuberculosis is a major cause of morbidity and mortality globally with an estimated 9.4 million incident cases and 11.1 million prevalent cases. In 2008 there were 1.3 million deaths from tuberculosis in HIV negative persons and 0.52 million deaths in HIV positive persons (1-2). There is limited current systematically collected epidemiologic data from Bangladesh. Two previous national tuberculosis prevalence surveys were conducted in Bangladesh in 1964-66 and in 1987-88. The 1964-66 survey estimated a prevalence of 318/100,000 persons ≥15 years, while the 1987-88 survey reported a much higher prevalence of 870/100,000 persons ≥15 years (3,4). For both surveys, a sputum sample was collected from all targeted individuals who reported that they had a cough that lasted for at least one month. Both the national surveys were conducted before the Government of Bangladesh implemented Directly Observed Treatment Short-course (DOTS) therapy for tuberculosis.

Bangladesh has achieved commendable success in tuberculosis control activities with country-wide coverage of DOTS, a >70% case detection rate and a >90% treatment success rate (5). However, these rates are calculated based on the 1964-66 and 1987-88 prevalence surveys and infection rates (3,4). The uncertainty of the accuracy of the previously reported prevalence estimates, in addition to rapid population growth, and the expansion of government, non-government organizations and the private sector in tuberculosis control activities, called for a review of the national tuberculosis burden. A new assessment was undertaken by ICDDR,B in collaboration with the National Tuberculosis Control Programme, BRAC, Damien Foundation, the World Health Organization, Netherlands Tuberculosis Foundation (KNCV) and other partners. The study objective was to determine the prevalence of

new smear-positive tuberculosis in Bangladesh and its distribution among different sub groups of the population. We report here the preliminary results from the survey.

The national tuberculosis prevalence survey was conducted from October 2007 to March 2009. This was a cross sectional community-based multistage cluster survey in 40 clusters (20 urban and 20 rural) (Figure 1). Socio-demographical data were collected from the participants. In contrast to the earlier surveys, which only collected sputum samples from persons who reported a chronic cough, in the present evaluation two sputum samples were collected from all persons aged ≥15 years irrespective of presence of symptoms. Sputum samples were examined under fluorescence microscopy and those that were positive were re-examined by Ziehl Neelsen microscopy. To clarify a diagnosis, the assessment team collected additional sputum samples or arranged for a chest X-ray. The case definition of a smear-positive tuberculosis patient was any person with either two positive samples with Ziehl Neelsen microscopy, or one positive sample with Ziehl Neelsen microscopy and a chest X-ray suggestive of tuberculosis (6).

The survey included 52,098 persons ≥ 15 years. Their mean age was 35.5 years. The mean size of the clusters was 1,302 participants. The survey identified 33 new sputum smear-positive pulmonary tuberculosis cases. The mean age of the detected cases was 47.2 years. The overall crude prevalence of new smear-positive tuberculosis was 63.3 per 100,000 (95% CI: 43.6-88.9) and after adjusting for age, sex, residence, socioeconomic status the prevalence was 79.4 per 100,000 (95% CI: 47.1-133.8) among persons ≥15 years. The adjusted prevalence of smear positive tuberculosis was higher in rural (86.0 per 100,000, 95% CI: 47.9-154.3) than urban areas (51.1 per 100,000, 95% CI: 27.7-94.1) and among males (121.7 per 100,000, 95% CI: 69.6-212.8) than females (40.3 per 100,000, 95% CI: 13.4-121.4). The prevalence rates generally increased with age. The prevalence was much higher among the lowest socioeconomic quintile (Table 1).

Reported by: Child Health Unit, Public Health Sciences Division, ICDDR,B

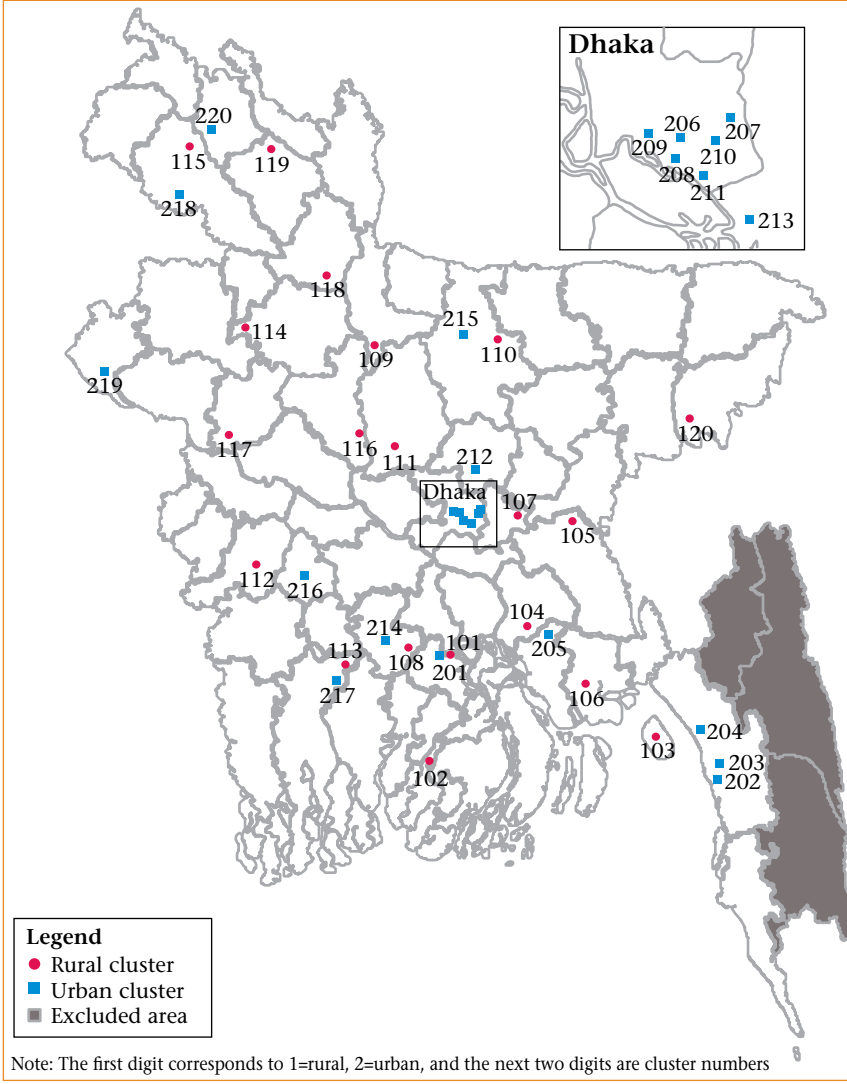
Supported by: USAID/Dhaka and World Health Organization

Comments

This survey is the first nation-wide representative survey to determine the prevalence of smear-positive tuberculosis since the introduction of the DOTS programme in Bangladesh in 1993. The survey found a significantly lower prevalence of sputum positive tuberculosis as compared to previous surveys (3,4), but tuberculosis still causes a substantial burden of disease.

The present survey did not pre-screen participants for symptoms of TB. Screening by symptoms can potentially miss between 20% and 50% of the tuberculosis cases due to low sensitivity of various screening algorithm (7,8). In this study, all eligible individuals were asked to provide two sputum

Figure 1: Map of Bangladesh showing distribution of the study cluster sites, 2007-2009



Note: The first digit corresponds to 1=rural, 2=urban, and the next two digits are cluster numbers

samples for smear microscopy. As no one was excluded from examination, this provided the best estimate for smear positivity.

The prevalence was higher among the rural population compared to urban areas. Over the last several years, media initiatives, which are more commonly viewed by the urban population, advocated seeking appropriate care for symptoms of tuberculosis. This health education may have contributed to lower prevalence in the urban population.

Table 1: Estimated number of sputum positive tuberculosis cases and prevalence in Bangladesh, 2007-2009 by age, sex, area of residence (per 100,000)

Characteristics	Number of tuberculosis cases detected	Prevalence per 100,000	
		Crude prevalence (95% CI)	Adjusted prevalence (95% CI)
All	33	63.3 (43.6-88.9)	79.4 (47.1-133.8)
Residence			
Rural	20	76.8 (46.9-118.6)	86.0 (47.9-154.3)
Urban	13	49.9 (26.6-85.3)	51.1 (27.7-94.1)
Sex			
Male	24	99.2 (63.5-147.8)	121.7 (69.6-212.8)
Female	9	32.3 (14.8-61.3)	40.3 (13.4-121.4)
Age in years			
15-24	5	32.7 (10.7-76.4)	43.0 (16.2-115.0)
25-34	3	24.1 (4.9-70.4)	46.4 (10.0-215.0)
35-44	6	58.9 (21.6-128.1)	82.0 (36.0-187.2)
45-54	6	36.0 (32.4-192.0)	99.0 (39.0-254.3)
55-64	7	171.0 (69.0-354.0)	201.0 (96.3-418.3)
65+	6	182.2 (67.0-397.0)	150.0 (53.5-418.3)
Asset quintiles			
1st (lowest)	12	134.5 (69.0-233.1)	137.9 (81.3-233.8)
2nd	8	81.9 (35.3-161.3)	79.6 (34.4-184.3)
3rd	7	66.2 (26.6-136.3)	69.8 (23.3-209.0)
4th	4	35.2 (9.6-90.0)	51.4 (9.1-289.9)
5th (Highest)	2	17.6 (2.1-63.4)	13.9 (3.7-51.8)

The tuberculosis control programme in Bangladesh has achieved good coverage of case detection and treatment success rate for the last several years. The present findings of a higher proportion of smear-positives among older age groups, who are at higher risk of reactivation of latent tuberculosis that was acquired many years earlier, suggests that the tuberculosis control programme in the country may have interrupted substantial tuberculosis transmission among younger residents of Bangladesh.

In this survey the prevalence of tuberculosis among males was three times higher compared to females, and was observed more among socially disadvantaged populations. The findings are consistent with routine case findings and with sporadic surveys (9-11).

Comparing the results with the previous surveys, the prevalence of tuberculosis has declined sufficiently enough to conclude that Bangladesh

has met some of the Millennium Development Goal targets for tuberculosis. This suggests that the DOTS implementation has been effective. Regular surveys of tuberculosis prevalence can provide useful monitoring of the tuberculosis prevalence and provide valuable information for targeting activities. While progress has been remarkable, tuberculosis remains a major health problem in the country, so intense tuberculosis control activities should be continued with increased emphasis directed to older people, rural populations and lower socioeconomic groups.

References

1. World Health Organization. Global tuberculosis control: a short update to the 2009 report. WHO/HTM/TB/2009.426. Geneva: World Health Organization, 2009
2. World Health Organization. Global Tuberculosis Control 2009: Epidemiology, Strategy, Financing. Global Tuberculosis Control, WHO/HTM/TB/2009.411. Geneva: World Health Organization, 2009
3. Bangladesh. Ministry of Health and Family Welfare. The report of tuberculosis survey of Bangladesh. Dhaka: National Tuberculosis control and research project. Ministry of Health and Family Welfare. 1973.
4. Bangladesh. Ministry of Health and Family Welfare. Report on the national prevalence. Survey on tuberculosis in Bangladesh, 1987-88. Dhaka: Director General Health Services, Ministry of Health and Family Welfare, 1989.
5. Bangladesh. Ministry of Health and Family Welfare. Tuberculosis Control in Bangladesh, Annual Report 2008. Dhaka: National Tuberculosis Control Programme, Directorate General of Health Services. 2008.
6. Bangladesh. Ministry of Health and Family Welfare. National TB guidelines 2009, 4th ed, Dhaka: Director General of Health Services, Ministry of Health and Family Welfare, 2009.
7. Gothi GD, Narayan R, Nair SS, Chakraborty AK, Srikantaramu N. Estimation of prevalence of bacillary tuberculosis on the basis of chest X-ray and/or symptomatic screening. *Indian J Med Res*, 1976;64:1150-9.
8. Datta M, Radhamani MP, Sadacharam K, Selvaraj R, Rao DL, Rao RS, *et al*. Survey for tuberculosis in a tribal population in North Arcot district. *Int J Tuberc Lung Dis* 2001:5:240-9.
9. Chowdhury AM, Chowdhury S, Islam MN, Islam A, Vaughan JP. Control of tuberculosis by community health workers in Bangladesh. Lancet 1997;350:169-72.
10. Salim MAH, Declercq E, Van DA, Saki KA. Gender differences in tuberculosis: a prevalence survey done in Bangladesh. *Int J Tuberc Lung Dis* 2004;8:952-7.
11. Zaman K, Yunus M, Arifeen SE, Baqui AH, Sack DA, Hossain S, *et al*. Prevalence of sputum smear-positive tuberculosis in a rural area in Bangladesh. *Epidemiol Infect* 2006;134:1052-9.

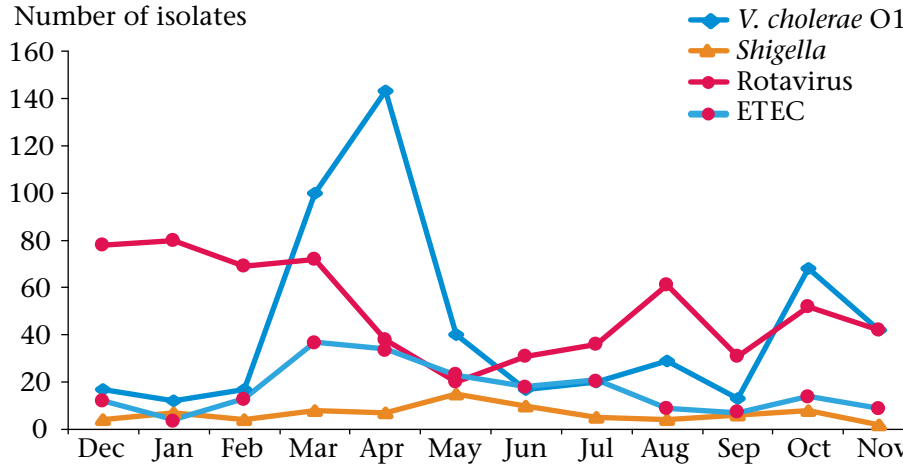
Surveillance updates

With each issue of HSB, updates of surveillance data described in earlier issues are provided. These updated tables and figures represent the most recent observation period available at the time of publication. We hope these updates will be helpful to health professionals who are interested in current patterns of disease and drug resistance in Bangladesh.

Proportion of diarrhoeal pathogens susceptible to antimicrobial drugs: December 2009-November 2010

Antimicrobial agents	*Shigella* (n=80)	*V. cholerae* O1 (n=518)
Nalidixic acid	20.0	Not tested
Mecillinam	67.9	Not tested
Ampicillin	53.8	Not tested
TMP-SMX	28.8	1.2
Ciprofloxacin	50.0	99.8
Tetracycline	Not tested	62.9
Erythromycin	Not tested	0.2
Furazolidine	Not tested	Not tested

Monthly isolation of* V. cholerae *O1*, Shigella, *Rotavirus and ETEC
December 2009-November 2010



Antimicrobial resistance patterns of 110 M. tuberculosis *isolates: November 2009-October 2010*

Drugs	Resistance type		Total n=110 (%)
	Primary n=97 (%)	Acquired* n=13 (%)	
Streptomycin	12 (12.4)	1 (7.7)	13 (11.8)
Isoniazid (INH)	5 (5.2)	1 (7.7)	6 (5.5)
Ethambutal	0 (0.0)	0 (0.0)	0 (0.0)
Rifampicin	1 (1.0)	0 (0.0)	1 (0.9)
MDR (INH+Rifampicin)	0 (0.0)	0 (0.0)	0 (0.0)
Any drugs	15 (15.5)	1 (7.7)	16 (14.5)

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

Antimicrobial susceptibility pattern of S. pneumoniae *among children <5 years during October-December 2010*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	2	2 (100.0)	0 (0.0)	0 (0.0)
Cotrimoxazole	2	0 (0.0)	0 (0.0)	2 (100.0)
Chloramphenicol	1	1 (100.0)	0 (0.0)	0 (0.0)
Ceftriaxone	2	2 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	2	2 (100.0)	0 (0.0)	0 (0.0)
Gentamicin	2	0 (0.0)	0 (0.0)	2 (100.0)
Oxacillin	2	2 (100.0)	0 (0.0)	0 (0.0)

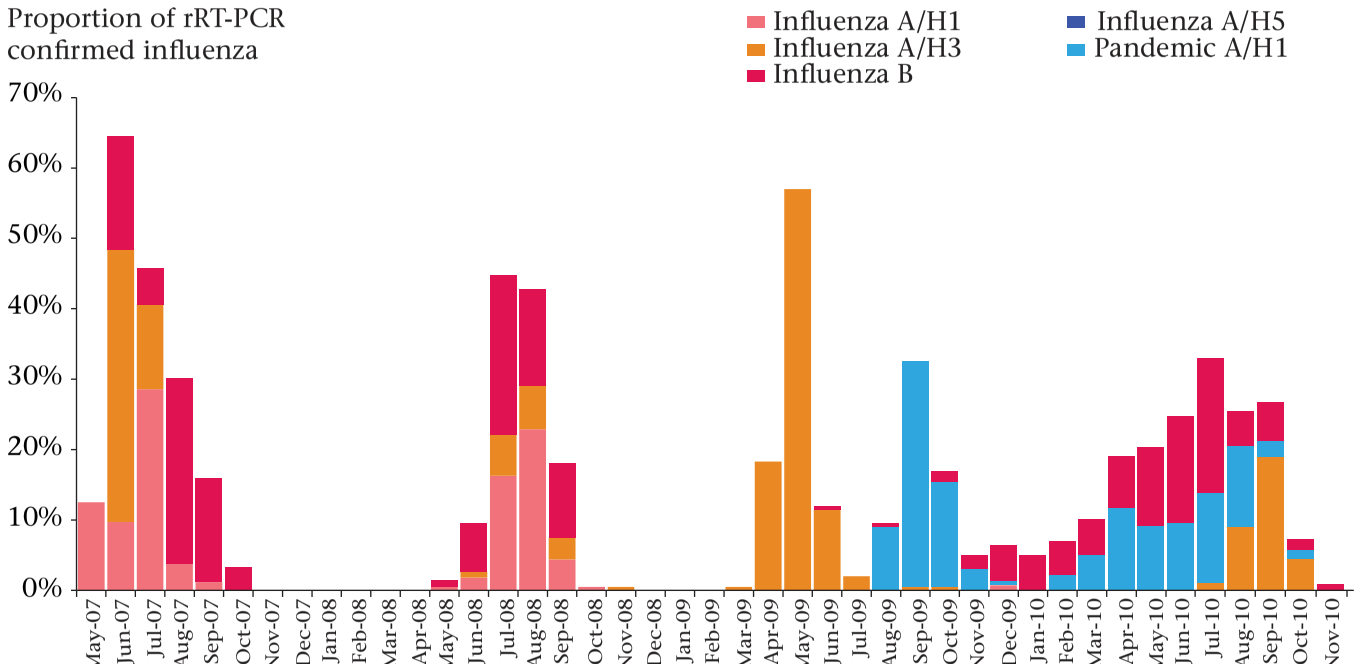
Source: ICDDR,B's urban surveillance in Kamalapur (Dhaka).

Antimicrobial susceptibility pattern of S. typhi *among children <5 years during October-December 2010*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicilin	23	14 (61.0)	0 (0.0)	9 (39.0)
Cotrimoxazole	23	13 (57.0)	0 (0.0)	10 (43.0)
Chloramphenicol	23	13 (57.0)	0 (0.0)	10 (43.0)
Ceftriaxone	23	23 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	23	1 (4.0)	22 (96.0)	0 (0.0)
Nalidixic Acid	23	1 (4.0)	0 (0.0)	22 (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 May 2007 and November 2010



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)

Skin lesion of a cutaneous anthrax patient

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