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Inside . . .

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Emergence of a unique, multi-drug resistant strain of *Vibrio cholerae* O1 in Bangladesh

Effective antimicrobial treatment of severe dehydrating diarrhoea due to *Vibrio cholerae* reduces stool volume and shortens the duration of illness. We report the emergence of a new strain of *V. cholerae* O1 resistant to tetracycline, trimethoprim-sulfamethoxazole, furazolidone, and erythromycin.

Cholera due to *Vibrio cholerae* O1 is the leading cause of severe dehydrating diarrhoea with distinct seasonality in Bangladesh (1). Early institution of rehydration therapy using appropriate intravenous fluid(s) is life saving for such patients. However, therapy with an effective antimicrobial agent significantly shortens the duration of diarrhoea. Shorter diarrhoea duration shortens duration of hospitalization, reduces the volume of rehydration fluid, and shortens the duration of faecal excretion of *V. cholerae* reducing the transmission of infection to other family members and nosocomial infections at clinic settings (2). Tetracycline (or the long-acting tetracycline, doxycycline) has long been the antibiotic of choice in treating severe cholera in Bangladesh except for young children and pregnant women (1,2). Furazolidone, erythromycin, trimethoprim-sulfamethoxazole (TMP-SMX), and chloramphenicol are the other effective alternative antimicrobials used in treating severe cholera caused by susceptible strains of *V. cholerae* (3).

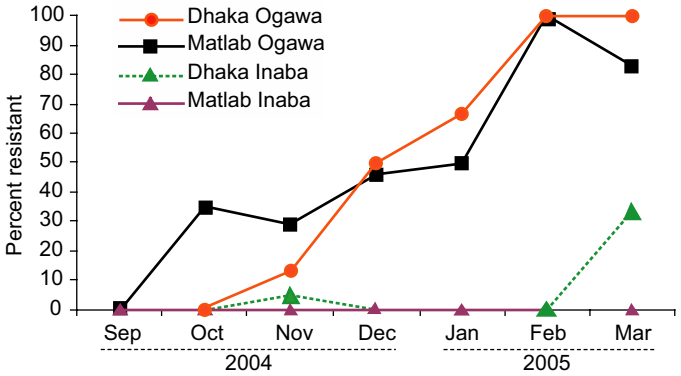
In the Matlab diarrhoea treatment hospital of ICDDR,B, all patients presenting with diarrhoea from among the approximately 200,000 population under active demographic surveillance have their stool cultured for *V. cholerae* and other enteric pathogens. At the Dhaka

hospital of ICDDR,B (popularly known as The Cholera Hospital) a 2% systematic sample of all patients attending the hospital with diarrhoea have their stool cultured for *V. cholerae* and other enteric pathogens.

In October 2004, six strains of *V. cholerae* O1 that were resistant to trimethoprim-sulfamethoxazole, tetracycline, furazolidone, and erythromycin were isolated from patients attending the Matlab hospital. Over the following five months strains with this same antimicrobial resistance pattern were repeatedly isolated from both the Matlab and Dhaka hospital (Figure 1). In March 2005 five of the 11 (45%) *V. cholerae* isolates from the Matlab hospital and 43 of the 54 (79%) isolates from the Dhaka hospital had this same multi-drug resistance pattern. In addition, strains with this same multi-drug resistance profile have been recently isolated from ICDDRB surveillance sites in Mathbaria and Bakerganj (Figure 2),

These strains of *V. cholerae* possessing the broad resistance were uniformly

Figure 1: Percent of V. cholerae *O1 isolates resistant to trimethoprim-sulfamethoxazole, tetracycline, furazolidone, and erythromycin by month in Dhaka and Matlab*



susceptible to chloramphenicol and ciprofloxacin *in vitro*, as determined by the disc diffusion method. However, clinicians noted less of a clinical response from ciprofloxacin than would have been expected from the findings of studies done some years ago (4,5). The minimum inhibitory concentration of the current strain ranged from 0.38 - 0.5 microgram of ciprofloxacin/ml, compared to a mean of 0.0125 against *V. cholerae* strains in 1994-5 (4).

Figure 2: Locations in Bangladesh where V. cholerae *O1 resistant to trimethoprim-sulfamethoxazole, tetracycline, furazolidone, and erythromycin by month in Dhaka and Matlab*

Reported by: Clinical Science Division and the Laboratory Science Division, ICDDR,B: Centre for Health and Population Research.

Funded by: ICDDR,B: Centre for Health and Population Research

Comment

This is the first time that ICDDR,B has isolated a *V. cholerae* O1 resistant to trimethoprim-sulfamethoxazole, tetracycline, furazolidone, and erythromycin. The emergence of this broad resistance to commonly used antibiotics against *V. cholerae* had several immediate consequences. Cholera patients had longer duration of hospitalization in the ICDDR,B hospital. These longer hospitalizations increased crowding, necessitated expansion of the hospital in temporary tents, required recruitment of additional health workers, purchase of addition supplies and increased treatment costs.

Based on the results of previously published controlled clinical trials, the Dhaka hospital changed the routine treatment regimen for severe cholera to a single 1-gram dose of ciprofloxacin for adults and patients with a body weight of ≥30 kg, and a single, 20 mg/kg dose for children older than 2 years (4,5).

For pregnant and lactating women, no antimicrobial therapy was administered. Even though the strain remains susceptible to ciprofloxacin in disc diffusion tests, the 100 fold increase in the minimum inhibitory concentrations since it was studied in 1995, and the clinical impression of ineffectiveness suggests that ciprofloxacin therapy is sub-optimal.

The strain remains sensitive to chloramphenicol. Randomized controlled clinical trials conducted in Dhaka 40 years ago demonstrated that patients with severe *V. cholerae* treated with chloramphenicol had a shorter duration of diarrhoea and reduced stool volume (6,7). Effective regimens included for patients with a body weight ≥25 kg 500 mg chloramphenicol orally every 6 hours for 3 days and for patients <25 kg 12.5 mg/kg every 6 hours for 3 days.

Efforts to prevent cholera should focus on reducing sewage contamination of water and food. Initiation of oral rehydration solution right from the onset of diarrhoea remains the life saving cornerstone of therapy. We will continue to report the antimicrobial resistance patterns of *V. cholerae* in future issues of the Health and Science Bulletin.

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An intervention to improve quality of care in first-level government health facilities

Integrated management of childhood illness (IMCI) includes activities to improve skills of health workers and community practices related to child health and strengthen health system supports. Twenty first-level outpatient facilities in the Matlab upazila (sub-district) of Bangladesh were randomized to either IMCI or comparison. At baseline few of the sick children seeking care at these facilities were fully assessed or correctly treated. Two years after implementation the mean index of correct treatment for a sick child was 54 in the IMCI facilities compared to only 9 in the comparison facilities. Utilization of the IMCI facilities increased from a 0.6 visits/child/year at baseline to 1.9 visits/child/year. The IMCI strategy resulted in improvements in the quality of care for sick children in government health and family welfare facilities and increased utilization.

In 1998, the Government of Bangladesh adopted integrated management of childhood illness (IMCI) as a key child health strategy to reduce child deaths and improve child health and development. The IMCI strategy was designed to include coordinated activities within three components: 1) improving health worker skills; 2) improving community practices related to child health and development; and 3) strengthening health system supports for child health activities (1). A pilot IMCI intervention and evaluation is being carried out through active collaboration between the Government of Bangladesh, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), and the World Health Organization. Details of the programme development and early results from the programme have been reported (2,3). This article presents a brief summary of the first two years.

The intervention is being implemented in areas of Matlab upazilla (sub-district) not covered by child and reproductive health services provided by the ICDDR,B. The total population of the study area is about 350,000. The sampling frame included twenty of the 24 first-level outpatient facilities in the study area and their catchment areas. The remaining 4 units were excluded because substantial portions of their catchment populations received child health services from ICDDR,B facilities and not from the government facilities. Random allocation was based on clusters where the 20 facility/catchment area units were first paired in terms of facility type, geographical distribution, baseline mortality levels and catchment population size.

The IMCI interventions and delivery strategies were developed through extensive consultations and strong collaboration with programme managers, policy makers, government officials, and researchers. In comparison areas, usual programmes and normal schedules for supervisory visits were maintained.

Between November 2001 and April 2004, 35 health workers managing

children in both first- and referral-level facilities in the intervention areas were trained in the Bangladesh adaptation of the IMCI case management guidelines using the standard eleven-day course curriculum recommended by WHO (4,5), as well as a three-day training on how to counsel mothers on breastfeeding (6). As part of the training, the health worker was expected to receive a "follow-up after training" visit carried out by teams of specially-prepared supervisors, including referral facility doctors. Visits included the observation of case management with immediate feedback, as well as systematic discussions of barriers to full implementation of the IMCI case management guidelines at the health facility level (7).

The Government of Bangladesh routinely provides essential drugs needed for child health care in both intervention and comparison facilities. Anticipating higher utilization, the government of Bangladesh and ICDDR,B study team worked together to make available additional drugs in the intervention facilities through a combination of direct purchase and the establishment of a facility-level drug tracking and reporting system. IMCI job-aids such as weighing scales, a timer for use in determining respiratory rates, thermometers, chart booklets, and locally-adapted cards for use in counselling mothers were provided to all IMCI facilities. The routine recording forms used in IMCI facilities were modified to reinforce correct health worker performance after IMCI training.

The referral system and services were strengthened through the development and distribution of specific guidelines on when, how and where to refer, the provision of a structured referral form for the transfer of patient information from first- to referral level, and an orientation of first- and referral-level health workers on the use of these tools.

IMCI facilities are supervised jointly by Government of Bangladesh and ICDDR,B staff, with a target of one monthly visit to each facility. Visit activities are guided by a supervisory checklist, and include the review of completed case recording forms to assess correct treatment (especially for severe cases unlikely to be observed during the visit), observations of sick child case management with immediate feedback, checking the status of drugs and supplies, and supportive interaction with health workers to identify unanticipated barriers to IMCI implementation.

A baseline survey was carried out in the study health facilities between August and October, 2000. Observations of case management were used to calculate indices, ranging from 0-100, for both assessment and treatment/counselling. These indices have been found to be valid and reliable measures of quality of care (8). The health facility survey was repeated in all 20 facilities between August and October 2003.

At baseline, the quality of the assessment of the child's illness, when

measured against IMCI standards, was very low in all health facilities (Table 1). None of the children were checked for danger signs. Very few were checked for the presence of cough, diarrhoea, fever or other problems. Providers made very little effort to explain the child's condition and counsel the caretaker on treatment and management of the illness. Consequently, only about one in ten caretakers of children who were prescribed ORS and/or an oral antibiotic knew how to administer the treatment. The overall index of assessment had a mean score of 23 out of a maximum of 100.

Table 1. Proportions of children and caregivers for whom specific case management tasks were performed by providers in first-level health facilities in Matlab thana, Bangladesh, 2000 (weighted estimates)

Indicator	No. of children or No. of caretakers eligible for task	% (n) or mean for whom task was performed
Assessment of the sick child		
Child checked for three danger signs[a]	284	0 (0)
Child checked for the presence of cough, diarrhoea and fever	284	14.7 (43)
Child's weight checked against a growth chart	284	0 (0)
Child under 2 years of age assessed for feeding practices[a]	153	0 (0)
Child checked for other problems	114	11.9 (15)
Child with very low weight assessed for feeding problems[a]	47	1.3 (1)
Index of integrated assessment (mean) (range 0–100)[a]	284	23.0[b]
Classification of the sick child		
Child was correctly classified	274	19.9 (56)
Child with very low weight was correctly classified[a]	49	1.8 (1)
Treatment of the sick child		
Child with pneumonia treated correctly	64	12.5 (8)
Child with dehydration treated correctly	0	0 (0)
Child with anaemia treated correctly	43	0 (0)
Child needing an oral antibiotic was prescribed the drug correctly	110	11.1 (12)
Child not needing antibiotics left the facility without antibiotic	164	38.8 (68)
Child received first dose of treatment at the facility[a]	97	0 (0)
Child needing referral was referred	8	45.4 (4)
Advice and counselling given to caregiver of sick child		
Caregiver of sick child is advised to give extra fluids and continue feeding[a]	268	5.3(12)
Child prescribed oral medication: caregiver was advised on how to administer the treatment	184	9.0 (13)
Sick children whose caretaker is advised on circumstances indicating need to return immediately to health care facility[a]	274	0.6 (1)
Child with very low weight whose caregiver received correct counselling[a]	47	2.1 (1)
Caregiver of child prescribed oral rehydration solution, and/or an oral antibiotic knows how to give the treatment	188	9.4 (16)

[a]IMCI-specific indicator.

[b]Means and ranges are provided for the composite indices.

Note: Percentages are weighted estimates whereas the numbers (n) are actual, and therefore will not exactly correspond

Figures 1 and 2 present the mean scores of the indices for correct assessment and correct management of children in the 10 IMCI and 10 comparison facilities, at baseline and in the follow-up survey conducted approximately 18 months after the introduction of IMCI in the intervention areas (maximum scores possible: 100). Sick children visiting the IMCI facilities received significantly better care than children visiting comparison facilities as reflected in both the clinical assessments and management of their presenting illnesses. The quality of care in comparison facilities did not improve over this period.

Figure 1: Index of correct assessment in ten IMCI (only nine at baseline) and ten comparison facilities

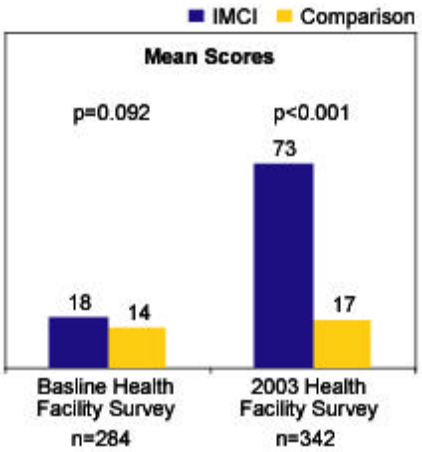
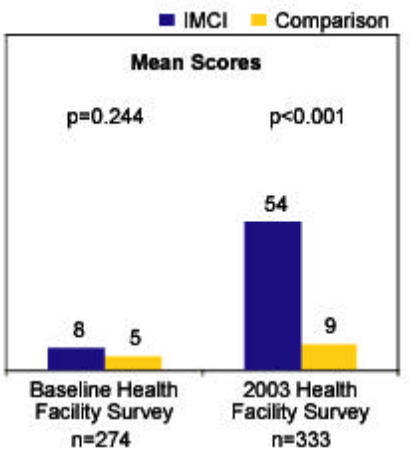


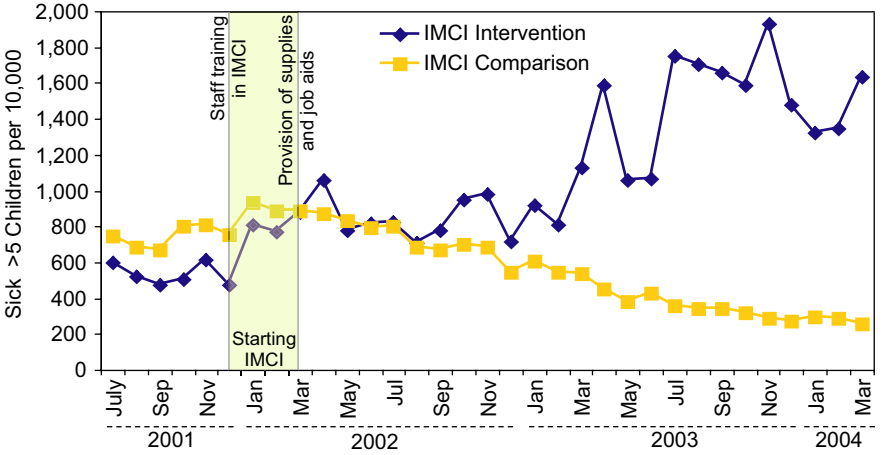
Figure 2: Index of correct treatment and counseling assessment in ten IMCI (only nine at baseline) and ten comparison facilities



Attendance for child health care at IMCI facilities increased dramatically after the introduction of IMCI, while attendance at comparison facilities declined (Figure 3). Utilization increased from 0.6 sick-child visits/child/year in the last half of 2001 to 1.9 sick-child visits/child/year 21 months after IMCI implementation.

Facility utilization data show a fourfold increase in the number of severe cases seeking care from IMCI facilities, from 37 children in the first quarter of 2002 to 126 in the 2nd quarter of 2003. However, only 94 of the 126 severe cases accepted referral. Although the referral rate from first- to referral-level facilities has also increased, rates of compliance with the recommended referral are low.

Figure 3: Sick under-5 utilization of 1st level facilities in IMCI intervention and comparison areas, Matlab



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Comment

These findings indicate that the current quality of care offered to sick children in these first-level facilities is very poor. Sick children are incompletely assessed, and their illnesses are erroneously or incompletely classified. The majority of children do not receive appropriate treatment. The introduction of IMCI is associated with improvements in the quality of child health care in first-level facilities, and a more than threefold increase in utilization of first-level facilities for the care of sick children.

One important strength of this study is that the delivery of health care is being done by the government. Thus the findings are generalizable to other similar government facilities receiving similar support. We further note that all aspects of implementation reflect an agreement between the study team and the Government of Bangladesh to ensure that the set of interventions and delivery strategies being evaluated fall within the policies and resources envisioned for a nationwide scale up of IMCI.

The experience of this project to date suggests that full implementation of the IMCI strategy, with interventions directed to improving health worker skills, health system support for child health care, and family and community

practices, is feasible and can lead to changes in care-seeking practices and increases in the utilization of public health facilities. Achieving and expanding on this success, however, requires full and active collaboration among multidisciplinary teams of scientists and health decision makers and a willingness to improve key elements of the health system. In the context of this study, supervisory staff were trained and supported to provide more frequent supervision and to incorporate activities into each visit that targeted quality of care. The standard information system forms used by the Government of Bangladesh were modified to further reinforce correct health worker performance. Essential drugs and equipment needed to provide quality health care to children are being provided and maintained. Levels of intervention coverage are high, if not universal, and sustained over the study period. The result has been improved health care for all children. The study team continues to work closely with the government of Bangladesh to incorporate lessons and experiences from the IMCI study into nation-wide implementation of IMCI. Tools and methods developed and implemented in Matlab form an integral part of the IMCI intervention already implemented in 48 upazillas in Bangladesh by the Government of Bangladesh.

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National Coverage Survey of childhood diarrhoea management practices in Bangladesh

We conducted a nationally representative cross-sectional cluster survey of households in Bangladesh to evaluate management practices for childhood diarrhoea. A total of 7,247 children with diarrhoea within the preceding 2 weeks were enrolled. Among children who sought care outside of the home 92% visited private providers, a minority of whom were licensed physicians. Over 70% of residents of Dhaka and Chittagong used oral rehydration solution, but fewer than 50% of rural residents did. Expenditures were fairly evenly distributed among income groups and well within the projected cost of ORS plus zinc treatment for diarrhoeal illness.

Diarrhoea is a leading cause of childhood death, killing nearly 2 million children under age 5 every year(1). The majority of these deaths can be prevented by the timely use of oral rehydration solution (ORS) and continued feeding, but these are practiced by less than one-third of children in South Asia and sub-Saharan Africa (2). Beside ORS, zinc is one of the most effective measures to reduce under-five mortality due to diarrhoea (3). The 'Scaling up Zinc for Young Children' (SUZY) project will, for the first time, provide zinc treatment for diarrhoea on a large scale to the entire under-five population of Bangladesh. Prior to launching the intervention, this national survey of childhood diarrhoea management practices was undertaken to evaluate household management practices, utilization of health services, illness expenditures, and disparities in relation to gender, income status and geography. It will then be possible to monitor changes in practices that coincide with the scaling up of zinc in Bangladesh.

The survey was a nationally representative cross-sectional cluster survey. The population of Bangladesh was sub-grouped under three strata: city corporations, district municipalities, and rural. The two largest cities in Bangladesh, Dhaka and Chittagong, were purposively selected as the city corporations. Using a proportionate probability random sampling procedure one district in each of the six divisions of Bangladesh was selected. Sixty rural clusters and 20 clusters from municipal wards were randomly selected per

district. Within each city corporation 20 slum and 20 non-slum clusters were selected using probability proportionate sampling. Thus, a total of 560 clusters were identified. Using the modified WHO-EPI cluster survey procedure (4), between November 2003 and June 2004 households in each cluster were approached until 15 households with a case of diarrhoea (history of a diarrhoeal illness in the past two weeks of at least 48 hours duration) in children 6 to 59 months of age were identified. In any household with a case of childhood diarrhoea, a 15 minute interview was completed. Socioeconomic status was estimated by determination of a household asset score (5). For any household all asset scores were summed and then sub-grouped into quartiles.

A total of 7,247 children with diarrhoea in the preceding two weeks were identified and enrolled in the survey. In each location diarrhoea was reported more frequently in males than females (Table 1). The likelihood of a prevalent diarrhoeal illness was lowest among urban non-slum households and the occurrence of prolonged diarrhoea was greatest within urban slum households, affecting one-quarter of the children identified (Table 1). Children from households in different locations typically visited different types of health care providers (Table 2). Among those seeking care outside the home in urban, non-slum households, licensed allopaths (MBBS) were the most commonly utilized provider (34.4% of cases), while only 6.8% of rural children were seen by a licensed provider. The dominant providers in urban slums were drug sellers (42.5%) and in rural households it was unlicensed allopaths (village doctors, quacks) (40.9%). Among those who sought care outside the home, over 90% visited private sector providers. NGO services are widespread in Bangladesh, but fewer than 1% of children with diarrhoea visited an NGO provider.

Table 1: Summary description of children enrolled and diarrhoeal illness characteristics by location of child's household

Characteristic	Rural 240 clusters n=4057	Municipality 120 clusters n=1983	City Corporation Slum 40 clusters n=647	City Corporation Non-Slum 40 clusters n=640
Mean age in months (SD)	27.1 (14.4)	26.9 (14.9)	27.8 (14.6)	27.2 (14.8)
% male	51.9	53.6	53.9	56.1
% female	48.1	46.4	46.1	43.9
Diarrhoeal illness				
% bloody	10.6	4.0	8.2	8.4
% >7 days duration	18.1	18.7	24.8	18.3
Overall prevalence	0.24	0.21	0.21	0.15

Table 2: Caretakers' health provider seeking behaviours by location of household.

	Districts		City Corporations	
	Rural %	Urban %	Slum %	Non-slum %
Provider				
Licensed allopath (MBBS)	6.8	22.8	14.2	34.4
Unlicensed allopath	30.9	12.5	18.0	12.5
Drug seller	9.6	14.4	24.5	17.3
Homeopath	10.6	10.4	4.3	3.8
Other	2.2	1.6	0.7	0.6
None	39.9	38.3	38.4	31.4
Sector*				
Private	93.7	85.5	93.7	87.4
Public	6.0	13.5	6.0	11.7
NGO	0.3	1.0	0.3	0.9

*among those who sought help from a provider

Outside of the city corporation the care received by male and female children was similar (Table 3). However, in non-slum, city corporation households males were more likely to see any provider (74.1% vs 64.1%, p<0.01) and, more likely to see a licensed allopath (45.1% vs 35.3%, p<0.01) (Table 3). In this same population greater direct cost expenditures were made on males (median expenditure 36 vs 27 taka, p<0.05).

Table 3: Childhood diarrhoea provider utilization and diarrhoea management practices by gender and location or household

Practice	Rural		Municipality		City Corporation			
					Slum		Non-slum	
	Male	Female	Male	Female	Male	Female	Male	Female
Any provider seen, %	61.0	58.8	61.3	61.7	64.2	58.7	74.1	64.1**
Licensed provider seen, %	7.1	6.1	23.8	20.8*	16.1	11.4	45.1	35.3**
Received ORS, %	48.8	48.5	58.9	58.3	70.7	71.8	80.8	82.9
Received ORS or other rehydration fluids, %	59.2	59.5	66.8	66.0	78.2	78.5	85.2	87.2
Received antibiotics, %	35.9	30.7***	39.7	37.3	40.2	34.6	58.2	46.3**
Median expenditure on medications (Taka)	25.0	23.0	28.0	25.0	20.0	18.0	36.0	27.0

Male/Female comparisons by location of household: * p<0.05 ** p<0.01 ***p<0.001

Households within the upper asset quartile households were significantly more likely (p<0.01 or <0.001) to utilize the services of a provider, including licensed doctors, and to have received ORS or an antibiotic (Table 4). Over 50% of urban households administered ORS, regardless of asset score.

Table 4: Childhood diarrhoea provider utilization and diarrhoea management practices by asset quartile (1 lowest, 4 highest) and location of child's household.

Practice	Rural Asset Quartile				Municipality				City Corporation			
	1	2	3	4	1	2	3	4	1	2	3	4
Any provider seen, %	54.6	58.9	63.4	62.5***	55.7	60.3	61.2	69.4***	59.8	65.6	67.7	69.3**
Licensed provider seen, %	5.2	5.9	5.6	10.4***	14.3	19.6	20.3	36.9***	21.2	20.6	33.2	34.3***
Received ORS, %	45.2	47.4	48.0	54.3***	52.7	56.3	58.6	66.2***	72.8	72.4	75.9	84.5**
Received ORS or other rehydration fluids, %	54.8	62.1	60.6	60.8***	64.7	60.6	68.5	72.9***	77.2	82.0	83.4	88.5**
Received antibiotic, %	29.6	26.5	34.1	42.3***	31.5	36.1	38.6	48.0***	35.2	42.6	47.3	55.5***
Median expenditure on medications (Taka)	23.0	20.0	24.0	26.0	20.0	23.0	25.0	38.0***	18.0	24.0	27.0	35.0***

Asset quartile comparisons by location of household: * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Within the city corporations, even the poorest households exceeded 70% ORS coverage for a childhood diarrhoea episode. With the exception of the highest quartile, ORS coverage was less than 50% for all rural children. Household illness expenditures were relatively uniform across all asset quartiles, with the exception of the wealthiest urban, 4th quartile, and poorest, 1st quartile, city corporation households. Antibiotics were frequently prescribed.

Reported by: Health Systems and Infectious Disease Division, ICDDR,B

Supported by: Bill & Melinda Gates Foundation.

Comment

Throughout Bangladesh health seeking practices for childhood diarrhoea are dominated by the private sector; unlicensed providers, whether village "quacks", drug sellers or homeopaths, continue to be the preferred source of care. This suggests that unlicensed private providers will have an important role in distributing zinc therapy to the population at risk.

NGO and government providers combined provided care to fewer than 15% of patients who visited a care provider. Private providers are easily accessed and are available at all hours of the day, in contrast to government or NGO clinics that tend to operate in daytime hours only. Possible alternative explanations for the less than 1% utilization of NGO clinics could be the selection of rural survey sites where NGOs are not providing health services (NGOs are found in all urban sites) or a

misclassification of NGO clinics among caretakers not appreciating the distinction from private sources of care.

There is considerable variation within South and Southeast Asia in the type of provider utilized for a childhood diarrhoeal illness. This survey also found significant variation by where the child lived. Unlicensed providers were visited in over 90% of rural and over 75% of inner-city slum cases. Bangladesh urban caretakers utilize unlicensed care providers more commonly than caretakers in other Asian countries (6-8). As in India, about one-third of caretakers chose self-management of a childhood diarrhoeal illness. Given the high use of ORS and the fact that the surveys cover the full illness spectrum, this may be appropriate. In Bangladesh, seeking help from a provider is primarily driven by a caretaker's expectation that their child requires a drug treatment. If not prescribed a treatment, the visit is considered to have been a waste of time. The treatment prescribed is most commonly an antibiotic, but also includes antidiarrhoeals, antihistamines and vitamins.

The diarrhoea prevalence figures reported were calculated by dividing the number of cases of diarrhoea identified by the number of under-five children screened in each cluster. These were then summed to provide an overall estimate of prevalence in rural and urban sites. This method of calculation may not necessarily reflect the true prevalence of diarrhoea in children under five years of age. Cluster sampling methods tend to overestimate the actual prevalence of diarrhea (9). The explanation for the high proportion of children with persistent diarrhoea is largely explained by the fact the longer the duration of a diarrhoeal episode the more likely it will be identified in cross-sectional surveys. Nonetheless, this approach reflects diarrhoea occurrence and the practices associated with them.

The finding that a relatively high proportion of children received ORS is consistent with the 2004 Bangladesh Demographic and Health Survey (2004 BDHS) report (10). In the BDHS report 77% of urban and 65% of rural children were treated with ORS. As zinc is increasingly promoted, it will be extremely important to monitor for any drop-off in ORS utilization.

Selective diarrhoea management bias in favour of males has been well documented in Bangladesh and elsewhere in South Asia (11-14). The magnitude in recent years has diminished or all together diasappered (10,15,16). For example the 2004 BDHS reported no gender disparities in ORS coverage, use of other rehydration fluids, or having seen a licensed provider (10). In this survey we did identify gender disparities favouring males in diarrhoea treatment practices, but only in selected sub-populations. This is particularly the case among the wealthier, non-slum, city corporation households in Dhaka and Chittagong. This is possibly explained by the greater

amount of discretionary money available to spend on a diarrhoeal illness. As seen in table 4, there is little difference among the remaining wealth quartiles in the total amount spent and it may well represent the most a household can afford.

Because of the funding available to initiate a national zinc diarrhoea treatment scale up, we had an unusual opportunity to conduct a large, representative survey detailing childhood diarrhoea management practices in Bangladesh. Several encouraging trends were identified, including the high proportion of children receiving ORS or other rehydration fluids and the closing gap in gender disparities. This survey will be repeated in 2006/2007, thus permitting an assessment of the impact of the zinc scale up.

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Surveillance updates

With each issue of the HSB, updates of surveillance data described in earlier issues will be provided. These updated tables and figures will 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.

Proportion of diarrhoeal pathogens susceptible to antimicrobial drugs: May 2004-April 2005

Antimicrobial agent	*Shigella* (n=110)	*V. cholerae* O1 (n=714)	*V. cholerae* O139 (n=2)
Nalidixic acid	38.2	NT	NT
Mecillinam	100.0	NT	NT
Ampicillin	63.6	NT	NT
TMP-SMX	35.5	0.8	50.0
Ciprofloxacin	99.0	100.0	100.0
Tetracycline	NT	72.8	100.0
Erythromycin	NT	75.9	100.0
Furazolidone	NT	0.4	50.0

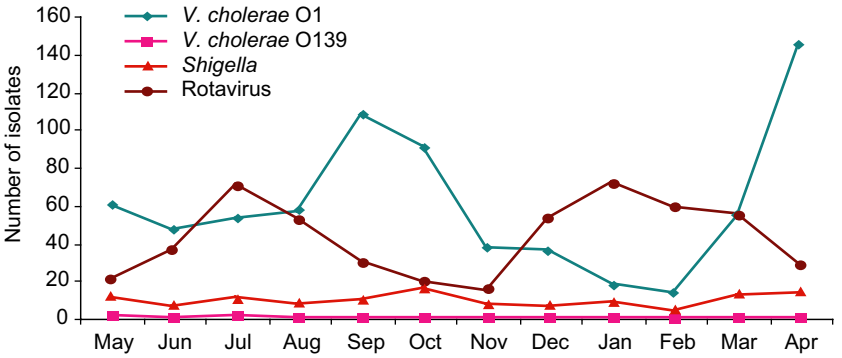
NT=Not Tested

Antimicrobial resistance patterns of 28 M. tuberculosis *isolates*: *September 2003-February 2005*

Drugs	Resistance type		Total (n=28)
	Primary (n=26)	Acquired* (n=2)	
Streptomycin	13 (50.0)	2 (100.0)	15 (53.6)
Isoniazid (INH)	2 (7.7)	2 (100.0)	4 (14.3)
Ethambutal	1 (3.8)	1 (50.0)	2 (7.1)
Rifampicin	1 (3.8)	0 (0.0)	1 (3.6)
MDR (INH+Rifampicin)	1 (3.8)	0 (0.0)	1 (3.6)
Any drug	13 (50.0)	2 (100.0)	15 (53.6)

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

Monthly isolation of* V. cholerae *O1,* V. cholerae *O139,* Shigella *and Rotavirus: May, 2004-April, 2005*



*2% of patients admitted to ICDDR,B have stool culture performed for surveillance

Antimicrobial susceptibility of N. gonorrhoeae *isolated during January-March 2005 (n=18)*

Antimicrobial agent	Susceptible (%)	Reduced susceptibility (%)	Resistant (%)
Azithromycin	100.0	0.0	0.0
Ceftriaxone	100.0	0.0	0.0
Ciprofloxacin	22.2	0.0	77.8
Penicillin	33.3	11.1	55.6
Spectinomycin	100.0	0.0	0.0
Tetracycline	22.2	5.6	72.2
Cefixime	100.0	0.0	0.0

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Photo: A surveillance staff is measuring mid-arm circumference of a child (Courtesy of Dr MASalam)

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