

7 Re-screening of arsenicosis patients in three Upazillas

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Abstract

Active case search of arsenicosis patients in the form of re-screening was conducted in three UNF funded Upazillas after a period of four years. A total of 1,124 patients were identified. In Bhanga Upazilla, out of 666 patients 204 were newly diagnosed. In Muradnagar Upazilla, out of 307 patient 156 were new patients and in Sirajdikhan Upazilla, out of 151 patient only 4 were newly registered. Eighteen patients who were registered in the previous survey (2001) were found to have no characteristic sign of arsenicosis. In Sirajdikhan and Muradnagar patients were primarily poor or hard core poor. Though Bhanga registered highest number of patients, its socio-economic condition is rather better in compari-

son to other two Upazillas. Current trend of water source usage was found to be markedly influenced by the awareness raising programs as well as mitigation options. Majority of the patients fetch water from deep tube well. Though a section of patients of all socio-economic groups uses pond water but the practice was widespread among hard core poor. Melanosis in chest was found among all patients identified, and the distribution of mild type of melanosis in chest was around seventy percent. More than half of total patients' didn't have any characteristic pigmentation in back. Only 4.8% were found to have severe keratosis and all the cases were found to be present in Bhanga. On an average more than half of patients had no keratosis in either of their palm. A total of 14 cases of ulcer, 6 cases of Bowen's disease and two cancer patients were spotted during the survey. Besides this a total 13 patients were with gangrene and 12 patients were having edema. Antioxidants were the primary ingredients of all three-treatment modalities. This study found that within four years there was 47.3% increase of diagnosed new cases.

Introduction

In Bangladesh the tube well initiative was launched about 80 years back to supply the people with bacteriologically safe water. The Government of Bangladesh, with the support of international agencies, particularly UNICEF installed tube wells all over the country with an aim to provide safe water to reduce the incidence of water borne diseases. This tube well initiative to supply safe water in Bangladesh was almost a grand success, which brought 97% of its population access to safe water. But in early nineties a new problem surfaced, tube wells were found to yield water containing arsenic at levels not acceptable for consumption even by the Bangladesh standard (50 µg/l). Surveys for identification of arsenic in tube wells water showed a widespread distribution of contaminated wells throughout the country. Tube wells of various proportions in 61 out of 64 districts have been found to be Arsenic contaminated. The survey conducted by Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP) in 271 Upazillas revealed that amongst the examined tube wells (4,946,933) 29.2% were found to be arsenic contaminated. And 38,118 arsenicosis patents were identified in 255 Upazillas. Since the initial detection of arsenic contamination of tubewell water in Chamagram of Baroghoria in Chapi Nawabganj district in 1993 by Department of Public Health Engineering and patients in 1994 by Department of Occupational and Environmental Health, NIPSOM. The situation so far revealed is considered as the tip of the iceberg as survey of

all households for arsenical skin lesions covering all arsenic affected Upazillas is yet to be completed (Ahmad et al., 1998a and 2001, Ahmad, 2000; NAMIC, 2004).

The chronic low dose (>50 µg/l) exposure to arsenic through contaminated tube well water may cause the development of arsenicosis, which is characterized by characteristic skin manifestations. Besides skin manifestations, chronic arsenic toxicity may affect other organs and systems of the body which are evident from findings of various parts of the globe. These may range from respiratory problems, weakness, conjunctival congestion, diabetes mellitus, hypertension, and hepatopathy, and peripheral neuropathy, edema of lower limbs, adverse reproductive outcomes, gangrene, and cancers. In Bangladesh many of these manifestations and complications have already been reported (Ahmad et al., 1997 and 1999a, Ahmad, 2000).

To encounter the immense threat posed by arsenicosis in drinking water, both government and non-government as well as international organizations launched sporadic and orchestrated initiative. World Health Organization (WHO), one of the key role players in encountering the menace in Bangladesh, hand in hand with government and other stake-holders, undertook several decisive steps. One of their projects, United Nations Foundation (UNF) funded applied research activities started in Bhanga Upazilla (sub-district) of Faridpur district, Muradnagar Upazilla of Comilla district and Sirajdikhan Upazilla of Munshigonj district in the year 2001. At the inception UNICEF through Arsenic Unit of Directorate General of Health Services (DGHS) conducted patients screening in these Upazillas. Several types of alternative water options were installed in the project area to ensure arsenic safe water to the community and government is supplying medicine to the affected patients through its own health management mechanism (Upazilla Health Complex). WHO and UNICEF are conducting awareness raising activities in those Upazillas. WHO is also implementing applied research activities in project Upazillas for capacity building of the concerned stake-holders.

At the inception (2001) of UNF funded community based arsenic mitigation project, Bangladesh Rural Advancement Committee (BRAC), Grameen Shikha and Dhaka Community Hospital (DCH) conducted patient screening, awareness raising and installation of safe water options in Bhanga, Muradnagar and Sirajdikhan Upazillas respectively (BRAC, 2001; DCH, 2001). DGHS is conducting patient identification and management through Upazilla Health Complex. After four years of project input it has become necessary to assess

status of arsenicosis patients. Therefore, re-screening of arsenicosis cases in the UNF funded Upazillas was felt necessary particularly for identifying the impact of the project on the health of the population in terms of emergence of new patients, complications and reduction of previous manifestations.

The main objective of re-screening is to follow-up previously identified patients, compare the state of complication if any, enlist the new patients in the government MIS system (time incidence of patients) and compare updated information with old one. Thus drawing a conclusive statement on trends of the disease.

Materials and Methods

Study area: This re-screening study was conducted in Bhanga Upazilla of Faridpur District, Muradnagar Upazilla of Comilla District and Sirajdikhan Upazilla of Munshigonj District (Figure 1, 2, and 3). Bhanga is about 70 km southwest, Muradnagar is about 110 km southeast and Sirajdikhan is about 30 km south from Dhaka.

Duration of study: The study was conducted during July to December 2005.

Development of questionnaire: Color coded questionnaires/forms were prepared to collect data. The green color form was used by the interviewer and was kept with patients as referral form. The orange color form was used by doctors for confirmation of cases. It was kept at Upazilla Health Complex.

Interviewers: Government Health and Family Welfare field staffs were involved for data collection. All the staff received one day orientation training based on a training manual prepared by the authors. Video clip on diagnosis and management of arsenicosis patients were collected and used for training of interviewers. After the training the field staffs were asked for diagnosis of arsenicosis patients using WHO algorithm. During field testing the interviewers were asked to do specific type of examination. Draw-backs of individual interviewer were discussed after field testing. Micro-planning was done involving all interviewers and their supervisors for house to house visit.

Field Survey: In house to house survey in three Upazillas, the trained interviewers went out to the field to examine individuals for the skin manifestations of arsenicosis. "WHO algorithm for arsenicosis case detection" was used as case detection tool. Each interviewer was allotted 10 working days to complete house to house searching of arsenicosis case. The interviewers with the help of local volunteers had undertaken a blanket survey in all the households and the houses having arsenicosis/suspected patients were marked "As +" by a chalk. Each patient was then interviewed for socio-demographic information, obtain water-fetching history pertaining to arsenicosis in the designated 'Green Referral Form' and the suspected patient with the filled in green form was instructed to report to the health complex arsenic clinic. Once the suspected patient attended the arsenic clinic of the health complex, trained Medical Officer and the experts were responsible for confirmation and exclusion of suspected and probable cases. The findings of the clinic physician and the records of the green form were

Upazilla Profile (Bhanga)



Figure 1: Arsenicosis patient map of Bhanga Upazilla (total patients: 666)

Area: 216.3 sq km

Administrative divisions: one municipality, 12 union parishads and 227 villages

Population: 230,300 (male 50.2%, female 49.8%)

Religion: Muslim 90.4%, hindu 9.5%, others 0.1%

Literacy: Average literacy 25.7% (male 33.2%, female 18.1%)

Health centers: Upazilla Health Complex 1, union health centre 3, family planning centre 8, satellite clinic 2, community clinic 27

Upazilla Profile (Muradnagar)



Figure 2: Arsenic patient map of Muradnagar Upazilla (total patients: 307)

Area: 339 sq km

Administrative divisions: 21 union parishads, 154 mouzas 301 villages

Population: 417,204 (male 50.5%, female 49.5%)

Religion: Muslim 90.6%, hindu 9.39% and others 0.01%

Literacy: Average literacy 30.6% (male 38.0%, female 23.2%)

Health centers: Upazilla Health Complex 1, satellite clinic 5 and family planning centre 9

Upazilla Profile (Sirajdikhan)



Figure 3: Arsenic patient map of Sirajdikhan Upazilla (total patients: 151)

Area: 180.19 sq km

Administrative divisions: 14 union parishads, 124 mouzas and 177 villages

Population: 229,085 (male 51%, female 49%)

Religion: Muslim 85%, hindu 10%, christian 4.99% and buddhist 0.01%

Literacy: Average literacy 33.7% (male 38.7%, female 28.8%)

Health centers: Upazilla Health Complex 1, sub-health centre 6, family planning centre 11, and veterinary hospital 1

further entered into a 'Orange Form'. The doctor himself filled up the form and signed before data entry in the computer.

Quality of data: A quality control check in randomly selected households were made by the authors and liaison with Upazilla health manager. Frequent supervisory visits and close monitoring were ensured to harvest authentic and reliable survey.

Data management: The information was then entered into the computer database supplied to the health complex. The program for data collection was developed based on the MS Access software. The physician and staff of the health complex who had undergone training at NIPSOM were entrusted with the responsibility of entering collected information in the database. Thana Health & Family Planning Officer (TH&FPO) and central resource person strictly supervised the input of data into the software program. From the access query the data were converted into Excel Spreadsheet. After necessary screening the data were analyzed and the report prepared. However, all the data collected from the field were finally stored in the office of director MIS under Directorate General of Health Services, Government of Bangladesh.

Validation: Newly identified patients and asymptomatic patients in current survey were validated. We used the same questionnaire that we used during re-screening for patients and referred cases. All field staff were called up in a coordination meeting at Upazilla Health Complex. The authors were present in the meeting and explained the purpose and importance of validation. The field supervisors and interviewers discussed the draw-backs and difficulties they faced during re-screening activities. The chief investigator noted the identified problems and took action to overcome it. During validation period the field workers were supplied the list of identified patients. The interviewers conducted house to house survey for spotting left over arsenicosis patients and to evaluate the referral system. They also confirmed the reported cases according to a specific checklist. Thus number of missing, cured, migrated and newly identified cases was registered. Frequent supervisory visit and close monitoring were ensured for authenticity and reliability of survey.

Results

A total of 1,124 patients of arsenicosis were identified in three Upazillas of which 364 cases were newly diagnosed (Bhanga- 204 cases; Muradnagar- 156 cases; Sirajdikhan- 4 cases; Table 1). There was 47.3% increase in the number of newly diagnosed patients within four years. The percentage of newly detected cases was not uniform in all the Upazillas. Almost all the cases (96.5%) received some treatment but not regular and the recovery rate was very poor (1.6%).

Table 2 shows the age and sex distribution of the patients. The mean age of the patients of Bhanga, Muradnagar and Sirajdikhan Upazillas was 40.5 ± 11.3 years, 36.2 ± 13.8 years and 35.5 ± 12.5 years respectively. The highest number of patients was in between the age 30-39 years. Males were more affected in Sirajdikhan (62.9%).

Table 1: Number of new and old cases with treatment regimen and recovery of skin lesions

Upazilla	Patient status		Information about treatment		Recovery from sickness	
	Previously diagnosed	Newly diagnosed	Received treatment	No treatment	Recovered	Not recovered
Bhanga	462	204	650	16	12	654
	69.3%	30.6%	97.6%	2.4%	1.8%	98.1%
Muradnagar	151	156	291	16	3	304
	49.1%	50.8%	94.7	5.2%	0.8%	99.1%
Sirajdikhan	147	4	144	7	3	148
	97.3%	2.6%	95.3%	4.6%	1.9%	98.0%
Total	760	364	1085	39	18	1,106

Table 2: Distribution of patients by age and sex

Age group (year)	Bhanga		Muradnagar		Sirajdikhan		Total
	Male	Female	Male	Female	Male	Female	
< 20	3	8	13	16	11	9	60
	27.3%	72.7%	44.8%	55.2 %	55.0%	45.0 %	5.3%
20 -29	42	55	46	37	12	10	202
	43.3%	56.7%	55.4%	44.6%	54.5%	45.5%	18.0%
30 -39	133	100	50	40	39	14	376
	57.1%	42.9%	55.6%	44.4%	73.6%	26.4%	33.5%
40 -49	113	79	32	22	22	13	281
	58.9%	41.1%	59.3%	40.7%	62.9%	37.1%	25.0%
50 -59	45	54	12	15	9	8	143
	45.5%	54.5%	44.4%	55.6%	52.9%	47.1%	12.7%
> 60	9	25	7	17	2	2	62
	26.5%	73.5 %	29.2%	70.8%	50%	50.0 %	5.5%
Total	345	321	160	147	95	56	1,124
	51.8%	48.2%	52.1 %	47.9%	62.9%	37.1%	100%

The socio-economic condition of the patients is shown in Figure 4. In Sirajdikhan 46.4% diagnosed cases were hard core poor and 26.5% were poor and only 7.3% were reasonably well to do. Muradnagar's patients were primarily poor (49%) and 18.6% were hard core poor. Though Bhanga contributed to highest number of patients its socio-economic condition was rather better in comparison to other two Upazillas.

Table 3 illustrates the current trend of water source usage by the patients. Deep tube well was the source of water of 82.1% patients in Bhanga, 19.9% in Muradnagar and 82.8% in Sirajdikhan. Shallow tube well was still used by

65.5% patients in Muradnagar. Filter and rain water harvesting were mostly used in Muradnagar. Pond water and dug well were found to be less popular in all three Upazillas as an alternative water option.

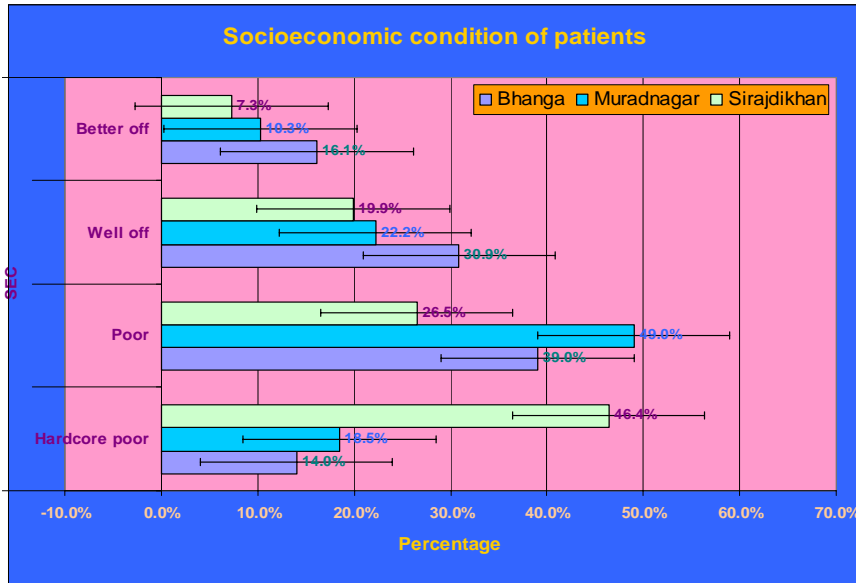


Figure 4: Distribution of the patients by socio-economic condition

Table 3: Distribution of the patients by current water sources

Current water source	Upazilla wise use of water source			Socio-economic condition			
	Bhanga	Muradnagar	Sirajdikhan	Hard core poor	Poor	Well off	Better off
Tube well							
Deep	547 82.1%	61 19.9%	125 82.8%	131 60.9%	291 64.5%	208 66.7%	103 40.5%
Shallow	111 16.7%	201 65.5%	5 3.3%	62 28.8%	135 29.2%	86 27.6%	34 23.3%
Dug well	3 0.5%	1 0.3%	7 4.6%	7 3.3%	0 0%	4 1.3%	0 0%
Filter	5 0.8%	14 9.3%	0 0%	3 1.4%	2 0.4%	8 2.6%	6 4.1%
Pond	0 0%	16 5.2%	14 6.3%	9 4.2%	15 3.3%	5 1.6%	1 0.7%
Rain water harvesting	0 0%	14 4.6%	0 0%	3 1.4%	8 1.8%	1 0.3%	2 1.4%
Total	666	307	151	215	451	312	146

In Bhanga 622 out of 666 patients used water from arsenic contaminated water source (Table 4). In Muradnagar 87.0% and in Sirajdikhan 98.0% of the arsenicosis patients confirmed about the contamination of their previous water source. Regarding arsenic contamination of current water source, whatever were the sources 83.3%, 42.3% and 96.7% of water source used by the patients were arsenic safe in Bhanga, Muradnagar and Sirajdikhan respectively. In Muradnagar there were a large number of tube wells, of which the arsenic contamination levels were yet to be measured or the patients had no idea of its concentration.

Table 4: Distribution of the patients by arsenic contamination of previous and current water source

<i>Upazilla</i>	<i>Contaminated water</i>		<i>Current non-contaminated water</i>	<i>Unknown</i>	
	<i>Previous source</i>	<i>Current source</i>		<i>Previous source</i>	<i>Current source</i>
Bhanga	622	111	555	44	0
	93.4%	16.7%	83.3%	6.6%	0%
Muradnagar	267	133	130	40	44
	87.0%	43.3%	42.3%	13%	14.3%
Sirajdikhan	148	5	146	3	0
	98.0%	3.3%	96.7%	2%	0%
Total	1,037	249	831	87	44
	92.3%	22.1%	73.9%	7.7%	3.9%

Melanosis (mild to moderate degree) in chest was a common clinical manifestation whereas melanosis in back and diffuse melanosis were seen in some patients (Table 5). Diffuse melanosis was not found in any patient in Sirajdikhan. Only a few patients in Muradnagar and Sirajdikhan had leuko-melanosis whereas in Bhanga a large number of patients suffered from leukomelanosis.

On average 617 patients (54.9%) had no keratosis in palm and 624 patients (55.5%) had no keratosis in sole. Mild to moderate degree of keratosis were found in palm and sole in Bhanga and Muradnagar. Only mild form of keratosis in palm and sole were seen in patients of Sirajdikhan.

Majority were with either mild (58.8%) or moderate (37.7%) form. Only 3.5% were with severe disease manifestations. No patient was isolated in its severe form in Sirajdikhan. Eighteen old patients (1.6%) were found to have no visible sign of arsenicosis, these were the previously diagnosed patients in convalescence. Among them 12 were from Bhanga and three each from Muradnagar and Sirajdikhan.

Table 5: Distribution of patients by melanosis, leukomelanosis and keratosis

<i>Clinical manifestations</i>	<i>Nil</i>	<i>Mild</i>	<i>Moderate</i>	<i>Severe</i>
<i>Melanosis in chest</i>				
Bhanga	0	472	182	12
Muradnagar	0	212	91	4
Sirajdikhan	0	136	14	1
<i>Melanosis in back</i>				
Bhanga	389	83	182	12
Muradnagar	157	94	56	0
Sirajdikhan	8	133	10	0
<i>Diffuse melanosis</i>				
Bhanga	416	65	175	10
Muradnagar	227	64	16	0
Sirajdikhan	151	0	0	0
<i>Leukomelanosis</i>				
Bhanga	397	91	168	10
Muradnagar	297	8	2	0
Sirajdikhan	150	1	0	0
<i>Keratosis in palm</i>				
Bhanga	436	93	105	32
Muradnagar	157	84	65	1
Sirajdikhan	24	119	8	0
<i>Keratosis in sole</i>				
Bhanga	441	92	102	31
Muradnagar	160	83	62	2
Sirajdikhan	23	118	10	0

Table 6 shows the distribution of the patients by development of ulcer, cancer, gangrene, and edema on exposure of arsenic in drinking water. A total of 14 cases of ulcer were identified of which 7 were from Bhanga, 5 from Muradnagar and 2 from Sirajdikhan. In Muradnagar, no cancer patient was identified while 2 cancer cases (1 each from Bhanga and Sirajdikhan) were identified during the re-screening activity. Out of total 13 gangrene cases notified 2 were from Muradnagar, another 2 were from Sirajdikhan and 9 were from Bhanga. Twelve cases developed non-petting leg edema among them 1 in Sirajdikhan, 4 in Muradnagar and 7 in Bhanga. We identified a total of 6 Bowen's disease cases of which 5 were from Bhanga and 1 from Sirajdikhan.

Patients received antioxidants with topical salicylate ointment or other drugs including spirulina and selenium. In Bhanga and Muradnagar majority of patients were treated with antioxidant only (Bhanga 436, Muradnagar 152)

Table 6: Distribution of the patients by complication of arsenicosis

<i>Upazilla</i>	<i>Complications</i>				<i>Total</i>
	<i>Ulcer</i>	<i>Cancer</i>	<i>Gangrene</i>	<i>Edema</i>	
Bhanga	7 1.1%	1 0.2%	9 1.4%	7 1.1%	24 3.6%
Muradnagar	5 1.6%	0 0%	2 0.7%	4 1.3%	11 3.6%
Sirajdikhan	2 1.3%	1 0.7%	2 1.3%	1 0.7%	6 3.9%
Total	14 1.2%	2 0.2%	13 1.2%	12 1.1%	41 3.7%

but in Sirajdikhan majority were treated with the combination of antioxidants and others (Table 7).

Table 7: Treatment options and severity of arsenicosis

<i>Upazilla</i>	<i>Treatment</i>	<i>Severity of arsenicosis</i>				<i>Total</i>
		<i>No symptom</i>	<i>Mild</i>	<i>Moderate</i>	<i>Severe</i>	
Bhanga	Antioxidants	6	286	142	2	436
	Antioxidants + ointment	6	39	166	3	214
	Antioxidants + others	0	0	0	0	0
	No medication	0	10	6	0	16
Muradnagar	Antioxidants	2	117	33	0	152
	Antioxidants + ointment	1	62	45	1	109
	Antioxidants + others	0	0	16	0	16
	No medication	0	16	0	0	16
Sirajdikhan	Selenium	0	12	1	1	14
	Antioxidants	1	4	0	0	5
	Antioxidants + ointment	0	2	0	0	2
	Antioxidants + others	2	129	6	0	137
	No medication	0	7	0	0	7
Total		18	684	415	7	1,124

In Muradnagar, 16 patients were identified who apparently exhibited mild form of arsenicosis reported to receive no medication for arsenicosis. In

Sirajdikhan also few of the patients were not treated at all. Majority of patients exhibited mild form arsenicosis and were given with antioxidant in conjunction with other necessary remedy.

Validation of re-screening: Diagnosed cases of re-screening program were reconfirmed during validation. No wrong diagnosed arsenicosis patients were found. Among 12 already cured/asymptomatic cases it was reconfirmed that all of them took antioxidants according to the prescription of physicians. During validation it was reported that one patient died in the month of August, 2006. The cause of death was not clear. Another patient reported to develop squamous cell carcinoma on left arm few months after the re-screening activity. A total of 17 new patients (8 males and 9 females) were identified during the validation activities. Regarding the clinical manifestation all of them had melanosis, 15 had both melanosis and keratosis, 7 had melanosis, keratosis and leukomelanosis.

Discussion

This study aimed at following up the already identified patients as well as to add up new entries to the existing patients list; thus to facilitate assessment of time incidence and prevalence of arsenicosis and observe trend of disease pattern, treatment compliance and other pertinent issues.

Total numbers of 364 new arsenicosis patients were identified during re-screening survey. Additional 17 patients were identified in validation phase. House to house mop-up campaign was conducted during validation activity. Three arsenic experts thoroughly examined all the previously identified cases and re-confirmed the diagnosis. Confirmation of diagnosis was done in three step screening procedure. The authors could reject none of the diagnosed cases during validation phase i.e. none of the cases were wrongly diagnosed during re-screening survey. This indicates efficiency of health workers and effectiveness of WHO algorithm for arsenicosis case detection. This report is consistent to the evaluation report of Ahmad et al., (1999) on use of WHO-algorithm for arsenicosis case detection. The present re-screening finding clearly shows that arsenic contamination in tube well water was a serious public health problem in Bhanga, Muradnagar and Sirajdikhan. In 2001, 93.4%, 87.0% and 98.0% of tube well water of respective Upazillas had $>50 \mu\text{g/l}$ arsenic in water. During re-screening survey it was found that 16.7%, 43.3% and 3.3% water sources of Bhanga, Muradnagar and Sirajdikhan were till arsenic contaminated and the people were still drinking

water from these sources. The total identified arsenicosis patients in these three Upazillas indicate clear increase (47.3%) of cases from 2001 to 2005. Additional 17 patients were identified in Bhanga during validation of re-screening findings. One of them developed squamous cell carcinoma. This is a serious public health concern for the Government of Bangladesh. Hassan et al., (2005) stated that arsenic patients in Bangladesh faced an absence of effective medicine and in some cases very little choice in water that they drink, which may lead them to a grave situation in future.

All reported patients were categorized into three groups' namely mild, moderate and severe forms. Some of the old patients were found to have no existing symptoms or very negligible remnant of initial symptoms was categorized into a new group. These patients were probably in the course of convalescence. Overall 18 old patients who were registered in previous surveys were found to have no visible characteristic sign of arsenicosis, these were the previously diagnosed patients in convalescence. Such cases were 1.6% of total patients.

Skin lesion was higher among men than women, which is consistent with the result of Rahman et al., (2006) in Matlab Upazilla of Bangladesh. Several other studies have shown similar result (Watanabe et al., 2001; Sinha et al., 2003). Although higher susceptibility among women were also reported (Ahmad et. al. 1999b). Rahman et al., (2006) reported the highest prevalence of skin lesion among the age group between 25-54 years with a peak at 35-44 years. This finding is consistent with our re-screening survey finding. Majority of the patients of re-screening were in between the age 30-50 years in all Upazillas.

This study reveals that the highest number of patients of Bhanga Upazilla belongs to comparatively better off socio-economic condition in comparison to Muradnagar and Sirajdikhan Upazilla. Most of the patients of Bhanga belong under paurashava and in paurashava people live in better off socio-economic condition. Survey of Rahman et al., (2006) in Matlab Upazilla reported on similar findings.

Current trend of water source usage found to be markedly influenced by the awareness raising programs as well as mitigation options. Most of the patients admitted that they have used arsenic contaminated water in the past, of course some didn't know about the arsenic contamination profile of their previous water source. Majority of the population have shifted their drinking water source to deep tube well or some other safe water source. This finding is relevant to the study report of Rahman et al., (2006) that arsenic exposure

seems to have decreased after 1997 showing an increased awareness and a start of shift to drinking water with less arsenic.

In this re-screening survey a total numbers of 683, 307 and 151 patients have been identified in Bhanga, Muradnagar, and Sirajdikhan respectively that correspondence to a prevalence 3.18/1000, 0.73/1000 and 0.64/1000 in respective Upazillas.

Melanosis in chest was found among all identified patients, 73% of them had mild melanosis and 1.5 % had severe chest melanosis. More than half of total patients don't have any characteristic pigmentation in back. Very few patients were found to have severe wide spread melanosis dispersed all over the body particularly beyond chest and back. All such cases were found in Bhanga only. Chest melanosis is the index sign of arsenicosis. As substantial number of patients were in earlier stage higher percentage of patients presented with melanosis only in chest. Presence of keratosis characteristically in palm and sole appears usually following melanosis. Sequential organization of characteristic lesion might provide an estimation of duration of exposure and disease onset as well. About five percent (4.8%) cases were found to have severe keratosis and all of them were from Bhanga. Beyond diagnostic criteria and characteristic skin lesion of arsenicosis; features of complications were also surveyed. A total of 14 cases of chronic skin ulcer, 6 Bowen's disease and 13 gangrene were notified during re-screening survey. Out of them 7 cases of chronic ulcer, 5 Bowen's diseases and 9 gangrene were reported from Bhanga. This finding is consistent with 4 and 5 times higher prevalence rate of arsenicosis in Bhanga than Muradnagar and Sirajdikhan respectively. Cancer is thought to be a major cause of mortality among arsenicosis patients. Two cancer cases one each was located at Bhanga and Sirajdikhan.

Treatment was almost identical in all three upazillas. Most of the patients took antioxidants for 6 months (Talukder, 1999). Few patients were treated with alcohol extract of spirulina plus zinc (Misbahuddin et. al., 2006). Khandker et al., (2006) stated according to an observation study among 250 arsenicosis patients in Bhanga that, combination of drinking arsenic safe water and use of antioxidants have positive impact on improvement of arsenicosis. Salicylic acid ointment was given for treatment of keratolytic skin lesions (Islam et al., see chapter 8). Other studies show that antioxidants were effective in the treatment of arsenicosis (Ahmad et al, 1998b; Bangladesh Arsenic Control Society, 2003).

This re-screening survey reveals that till 43.3% of the patients are drinking arsenic contaminated water. The lowest increase of prevalence was found in Sirajdikhan. Only 3.3% people of this Upazilla are till drinking arsenic contaminated water.

A small number of patients reported to have no treatment options. Majority of this group of patients were mild form arsenicosis. Reason may be that these patients do not feel sick. Do not take the health problem seriously and therefore do not go to health complex for medicine. However, this study indicates a definitive increase of prevalence of arsenicosis cases in the surveyed Upazillas. The highest increase of prevalence was found in Muradnagar, which is directly correlated with drinking water source.

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