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***Capacity of health care providers to manage
arsenicosis in Bangladesh***

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STUDY SUPPORTED BY UNICEF, BANGLADESH

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**Final report
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Executive summary

Arsenic contamination of drinking water and consequential number of cases of 'Arsenicosis' is at present a serious public health problem in Bangladesh. It is likely that many arsenicosis cases are as yet undiagnosed. Even if the water contamination problem is resolved soon, cases of clinical arsenicosis will continue, since the clinical syndrome typically occurs many years after the first exposure. This study of different sub-groups of health care providers is intended to investigate their capacity to diagnose and manage arsenicosis cases, to provide evidence about the effects of present training and to draw recommendations for future training programmes.

Methods

A sample of health care providers was selected to reflect different sub-groups. It included doctors from tertiary, secondary and primary levels; field level government health care providers; private qualified doctors; and private unqualified practitioners.

Three teams of data collectors worked in three districts. They administered a questionnaire to the sample of government doctors, other government health care providers, and private practitioners.

Findings

Some 392 respondents were interviewed: 101 government doctors, 154 other government health care providers, 15 private qualified practitioners, and 122 unqualified practitioners. Nearly a third (30%, 116/392) were medically qualified, and 77% (302/392) were male.

Training about arsenicosis

Some 29% of respondents (112/392) had received training about arsenic: 31% (31/101) government doctors; 47% (73/154) other government health care providers; 13% (2/15) private practitioners; and 5% (6/122) unqualified practitioners.

Knowledge

- Less than half the respondents knew the problem came to light between 1990 and 1995.
- About half thought they knew how many districts were affected, more amongst those who had been trained.
- Nearly all knew it is tube wells that are mainly affected by arsenic contamination.
- Just over a third (37%, 146/392) knew the safe level of arsenic in water in Bangladesh; those with training were much more knowledgeable.
- Some 40% of those without training believed that signs of arsenic toxicity develop after only one year; among those with training, 49% said that it takes 10 years for signs of toxicity to become manifest.
- Nearly all (94%) knew the skin is affected in arsenicosis.
- Three quarters could mention at least one cardinal feature of arsenicosis, more among those who had been trained.
- Only a quarter (23%, 89/392) knew the characteristic distribution of keratosis. Those with training were more likely to know, but still only 59% could describe the distribution.

- Less than half (46%, 179/392) knew the end-stage effects of arsenicosis; those with training were much more likely to know.
- About half the interviewees (51%, 199/392) knew there is no specific treatment for arsenicosis. Those with training were not more likely to know this: among those who thought they knew, those with training were more likely to believe there is a specific treatment.
- Most (76%, 299/392) knew to advise arsenicosis patients to drink arsenic-free water.
- Half (52%, 205/392) thought that available treatments for arsenicosis are ‘somewhat effective’.

Attitudes

Assessing attitudes in a simple administered questionnaire is difficult. Nearly everyone agreed that: arsenicosis patients need support, that they all need diagnosis and management, that the population should be aware of the problem, that the present way of sinking wells should not continue, rather there should be a policy about sinking tube wells, and that the general population should not segregate arsenicosis patients. About a quarter considered that the general population should remain separate from arsenicosis patients and around a third considered arsenicosis patients should not marry; these two attitudes were less prevalent in those who had been trained.

Practice

Around a third of respondents (35%, 136/392) reported having ever seen any arsenicosis patients, and 18% (70/392) had diagnosed arsenicosis patients in the last six months. Those with training were more likely to report seeing arsenicosis patients.

Among the 136 respondents who had seen arsenicosis patients, most (75%, 102/136) said they told patients to drink arsenic free water. Of those few who mentioned treatment, nearly all said they gave vitamins.

Almost all (95%, 373/392) reported they advise the population to drink arsenic free water.

Only 29% (112/392) gave information about training their subordinates on diagnosis and management of arsenicosis. And only 23% of these (26/112) said they trained their subordinates. Those who had been trained were much more likely to train their subordinates.

Conclusions

Within the limitations of interpretation, this study shows that knowledge about arsenicosis can be improved by training. Some aspects of training need attention: for example, to avoid giving the impression of a specific treatment for arsenicosis and to focus more on early clinical manifestations of arsenicosis. Consideration needs to be given to meet the training needs of unqualified practitioners, as they are covering wide area as first line health care providers.

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Introduction

In 1993, arsenic contamination in shallow water was first detected in one of the northern districts of Bangladesh. The recent detection of high concentration levels of arsenic in water from numerous shallow and deep tube-wells in 59 out of 64 districts of the country poses serious problems for providing safe water. At present, a population 29 million are likely to be affected through arsenic contamination of 8-10 million shallow tube wells currently serving as sources of water for drinking and cooking[1]. To date, more than twelve thousand arsenicosis patients have been identified and many more remain undiagnosed. The time to develop clinically evident effects from drinking arsenic contaminated water is generally about 10 years, but early manifestations are not uncommon and manifestations of the disease in children below 10 years have been reported [1]. Clinical arsenicosis begins with hyper-pigmentation of the skin which may to death from complications including malignancies. It is very important to identify patients early before their condition becomes irreversible and to provide supportive advice and treatment to all newly diagnosed cases.

The present knowledge about management of arsenicosis is far from satisfactory. The drugs used for chelating arsenic in acute poisoning have proved to be ineffective in chronic arsenicosis. The use of arsenic free water may prevent progression of the disease[2], but it is not clear whether reversal possible. Supportive therapy with nutritional improvement may play some role in diminishing symptoms and may reverse some cases of melanosis. Recently, success in the treatment of arsenicosis with indigenous medicine 'Spirulina' has been claimed, but it is yet to be confirmed.

A recent small scale survey indicated that there are a huge number of arsenicosis patients in Bangladesh who are yet to be diagnosed and for whom appropriate treatment should be provided. Chowdhury et al concluded "After 5 years of study in Bangladesh, we feel that we have seen only the tip of the iceberg." [3] It will require a big input of financial and human resource of the Government to ensure early diagnosis and treatment of all arsenicosis cases. Well-trained health personnel and well-equipped laboratory support will be needed.

Recent water testing and passive case detection in selected villages has also indicated that there are huge number of arsenicosis patients in different parts of the country, who are yet to be screened and registered. These patients need to be diagnosed so that appropriate treatment can be initiated to reduce their mortality and morbidity. WHO has recommended that diagnosis has to be via the "organisation and systems already in place in the affected area." But the capacity of the existing health system in Bangladesh to deal with the problem of arsenicosis is very limited, and health care providers at all levels lack training and support.

The on-going health sectoral programme has included activities towards prevention and control of common communicable and non-communicable diseases. But the existing health system of Bangladesh is not well organized to address management, control and prevention of a newly emerged health problem like arsenicosis. Whatever measures are put in place now to control the problem and prevent occurrence of further cases of arsenicosis, there will be a continuing need to diagnose and treat

existing cases and those that will emerge due to present exposures. We do not know the present knowledge, attitudes and practices of health care providers at different levels about the diagnosis and management of cases of arsenicosis. This study seeks information regarding current knowledge attitude and practice of a sample of health care providers, with and without previous training, which will indicate the capacity of the health system to manage this emerging problem. The results will help the government to plan further training and support for health care providers.

Methods

Study population

The sample frame included all government health care providers working in public hospitals, health centres and at field level. There are about 10,000 doctors working in public hospitals and health centres, and around 40,000 health workers providing domiciliary and outreach services. Private health care providers were also included: private qualified doctors (who are not government employees) and private unqualified practitioners, mainly operating in the rural areas (the "village doctors"). These unqualified practitioners are the largest primary source of health care services for the majority of the population [4].

Government health care providers:

Tertiary level hospitals:

There are 13 tertiary level public hospitals in Bangladesh. One hospital was purposively selected. Of the approximate number of 120 doctors working in the hospital, about half (60) of them were supposed to work directly on the detection and management of arsenicosis cases. A one in two sample of them (30), was randomly selected.

Secondary level hospitals:

There are 52 secondary level district hospitals in the six divisions of Bangladesh. Three divisions were purposively selected on the basis of caseload and one district hospital from each division was randomly selected. There were, on average, about 20 doctors in each of the selected district hospital and half (10) of them are actively concerned in the management of cases of arsenicosis. All those 10 were included.

Primary level Upazila health complexes:

In each of the three divisions selected as above, two upazilas were randomly selected. In the Upazila Health Complex (UHC) of each of the six selected upazilas, all doctors (around 5) were included.

Field level health workers:

In each of the six upazilas selected as above there are around 100 field level health workers and 20 supervisors. A one in five sample of these workers (20 field health workers and 4 supervisors) was randomly selected.

Private health care providers:

Qualified private doctors:

Nearly all doctors providing private services in the rural areas are also government employees. However, in urban areas doctors provide specifically private services and operate from private clinics. The sample for these clinics followed that for tertiary and secondary government hospitals. Thus, the nearest private clinic to the sample tertiary hospital was included in the sample, as well as the nearest private clinics to the three district hospitals in the sample, giving a total of 4 private clinics. Depending on the number of doctors operating in these clinics, either all were interviewed, or a sample of them, when there were more than 10 doctors in a clinic who are supposed to be involved directly with arsenicosis cases.

Village doctors:

The number of village doctors is unknown as they are not registered or regulated. However, in each upazila there are at least as many village doctors as government field level health workers. The sample of village doctors followed that of the government field health workers. All the village doctors who could be identified in the villages covered by the selected field health workers and supervisors were included in the study.

Data collection

Three teams of data collectors were trained and worked in the three districts selected for the survey. They administered a questionnaire to the sample of doctors in the district hospital and private clinics, and in the 6 sample UHCs in the district, as well as to the sample of supervisory field workers and village health workers and unqualified practitioners (village doctors) in the selected upazilas. One of the teams also administered the questionnaire to a sample of doctors in the selected tertiary hospital and nearby private clinic. The time of data collection was January and February 2002.

Data management and analysis

All data were entered twice and validated, using the Epi Info validate programme, to reduce key stroke errors. Knowledge, attitudes and practice have been compared between government health workers, qualified private doctors, and unqualified practitioners, and between those who have received training about arsenic and arsenicosis and those who have not received training.

Findings

Respondents

The field teams completed the survey questionnaire with 392 respondents. Table 1 shows the occupational sub-groups of the respondents.

Table 1. Occupational sub-groups of the respondents

Sub-group	Number
Government doctors	101
Other government health care providers	154
Private qualified doctors	15
Unqualified practitioners	122

The categories in Table 1 are made up from the individual designations of the respondents¹. Nearly a third (30%, 116/392) of the respondents were medically qualified (MBBS alone or with another qualification). The mean length of service of the respondents was 16.6 years (1-58 years).

Around three-quarters (77%, 302/392) of the respondents were male. Those medically qualified were more likely to be male than those not medically qualified². Two thirds (64%) of respondents working for the government were male, compared with 97% of respondents in private practice (with or without qualification)³.

Training about arsenic

More than a quarter of the respondents (29%, 112/392) had received some training about arsenic. The proportion who reported having training varied according to occupational sub-group (Table 2).

Table 2. Training about arsenic in different professional sub-groups

Sub-group	% (number) trained
Government doctors	31% (31/101)
Other government health care providers	47% (73/154)
Private qualified doctors	13% (2/15)
Unqualified practitioners	5% (6/122)

Among the largest single group of government doctors (MO), just 19% (13/68) reported having training about arsenic. Among unqualified village doctors, 5% (6/112) reported training.

¹ Government doctors included: UHFPO, RMO, MO, MO (MCH-FP), eye specialist, junior consultant, dental surgeon, assistant professor, associate professor. Other government health care providers included: HA, FWA, HI, , FPI, SI, FWV, MA and other paramedics. Unqualified practitioners included: village doctors and homeopaths.

² 101/116 (87%) with medical qualification were male, compared with 201/276 (73%) without medical qualification. Odds Ratio 2.51 (95% CI 1.32-4.85)

³ 151/237 respondents working for government were male, compared with 151/155 in private practice. OR 0.05 (95% CI 0.01-0.14)

Respondents who were working for the government were much more likely to report having training than those in private practice⁴. Women respondents were more likely to have training, but this was because women are more likely to be working for the government.

Most (89%, 100/112) of the people reporting training about arsenic said they had been trained just once. Just a few reported two training sessions (8%, 9/112). In the great majority the training took place in 2001 (80%, 90/112), with a few in 2000 (11%, 12/112). Occasional people reported earlier training, as far back as 1997. One person even claimed to have been trained in 1991. In virtually all cases, the training was for one day (99%, 110/112).

Asked from where they received training, nearly all reported it was from the government (91%, 100/110). The remainder said it was from NGOs or others. As for who actually provided the training, two thirds said it was the DGHS (64%, 67/105), while a third said it was WHO, UNICEF or other groups (36%, 38/105).

The topics reported as covered in the training are shown in Table 3.

Table 3. Topics covered in reported training about arsenicosis

Topic	% (number)
Cause of the arsenic problem	86% (96)
Extent of the arsenic problem	66% (74)
Identification of arsenicosis patients	96% (107)
Treatment of arsenicosis patients	55% (62)
Other issues	5% (5)

The topics most frequently remembered by people who had received training were identification of arsenicosis patients and cause of the arsenic problem. This is not to say that the other topics were not covered, but they were less well recalled.

Trainees with a medical qualification were more likely to recall that the training included the extent of the problem⁵ and more likely to recall that it included treatment of arsenicosis patients⁶, compared with trainees without a medical qualification.

⁴ 102/237 (43%) of those in government service had received training, compared with 10/155 (7%) of those working privately. Odds Ratio 10.96 (95% CI 5.25-23.48)

⁵ 28/33 (85%) of those medically qualified recalled training about the extent of the problem, compared with 46/79 (58%) of those not medically qualified. Odds Ratio 4.02 (95% CI 1.28-13.44)

⁶ 26/33 (79%) of those with a medical qualification recalled training about treatment of arsenicosis patients, compared with 36/79 (46%) of those without. Odds Ratio 4.44 (95% CI 1.58-12.92)

Knowledge about the arsenic problem

The respondents were asked a series of questions on the arsenic problem in general and the identification and treatment of patients with clinical arsenicosis. The questions were based on the curriculum of the government training about arsenicosis.

The arsenic contamination problem

About two thirds of the respondents (65%, 255/392) were able to give a response when asked *when the arsenic problem first came to light in Bangladesh*. The proportion offering a response was the same among respondents with and without training.

There was a wide range of suggestions for the year when the problem came to light in Bangladesh. (Figure 1).

Among those with training, 41% mentioned a year between 1990 and 1995 for when the problem came to light, as did 35% of those without training. Some 41% of those with training and 53% of those without training thought the problem came to light between 1996 and 2000.

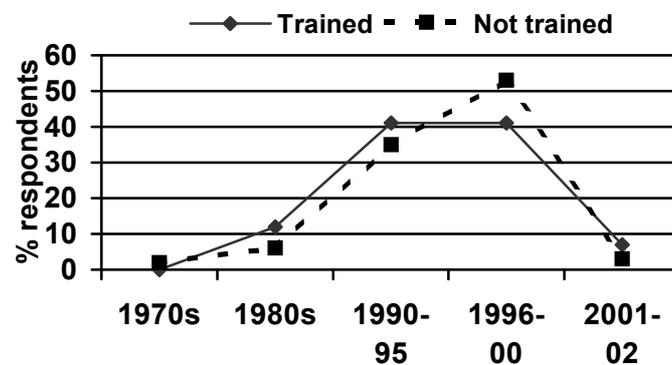


Fig 1. When did the problem of arsenic first come to light in Bangladesh?

About half (52%, 205/392) of respondents offered an answer when asked *how many districts are presently affected with arsenic contamination*. Respondents with a medical qualification were more likely to be able to respond to the question, and this was true whether or not they had received training about arsenic⁷. Respondents with training were more likely to be able to give an answer to this question⁸. The effect of training on responding to the question was evident in all the professional sub-groups (Figure 2).

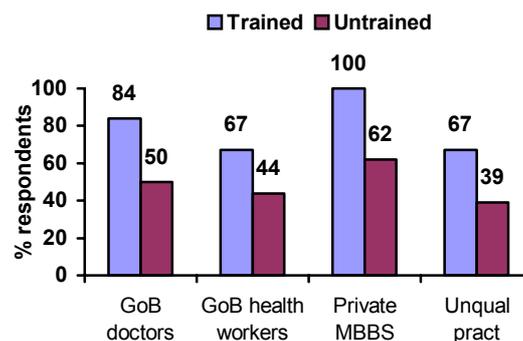


Fig 2. Training and responding to question on number of districts affected

⁷ 71/116 (61%) of those with a medical qualification responded about affected districts, compared with 134/276 (49%) of those without. After stratification by training, OR 1.74 (95% CI 1.10-2.76)

⁸ 81/112 (72%) with training could respond about number of affected districts, compared with 124/280 (44%) of those without training. Odds Ratio 3.29 (95% CI 1.98-5.48)

Among those who answered the question, the mean number of districts they thought affected was 33.69. Those with training tended to suggest a higher number of affected districts (mean 37.38) than those without training (mean 31.28), although this difference could have occurred by chance.

Nearly all the respondents (98%, 385/392) were able give an answer to a question about *which water sources are contaminated with arsenic*. And virtually all those who answered the question knew that arsenic contamination affects tube wells (99%, 382/385). Some 3% (11/385) thought that dug wells are affected, but less than 1% thought that river water, ponds or rainwater are affected.

Only half (49%, 193/392) the respondents were able to respond when asked about the *maximum safe level for arsenic in water in Bangladesh*. Respondents with a medical qualification were more likely to respond to the question than those without a medical qualification⁹. Those who had received training were much more likely to give a response to this question than those who had not received training¹⁰. The effect of training was evident in all sub-groups (Figure 3).

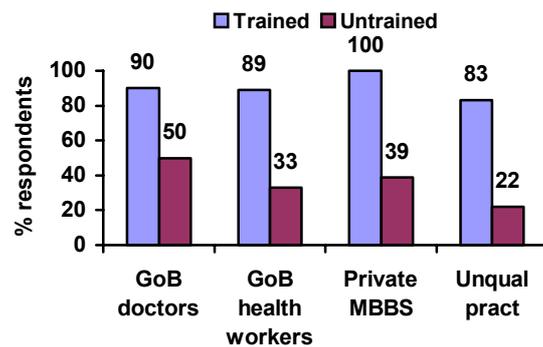


Fig 3. Training and responding to question on maximum safe level of arsenic in water

Three quarters (76%, 146/193) of those who gave some response about the safe level of arsenic in water in Bangladesh gave the correct answer (0.05mg/l). Some (11%, 22/193) gave the answer of 0.5mg/l instead.

Considering all 392 respondents, just over a third (37%, 146/392) knew the correct answer about the safe level of arsenic in water. Those with a medical qualification were more likely to know the correct answer¹¹. Those with training were much more likely to know the correct answer, compared with those without training¹². The effect of training was apparent in all the professional sub-groups (Figure 4).

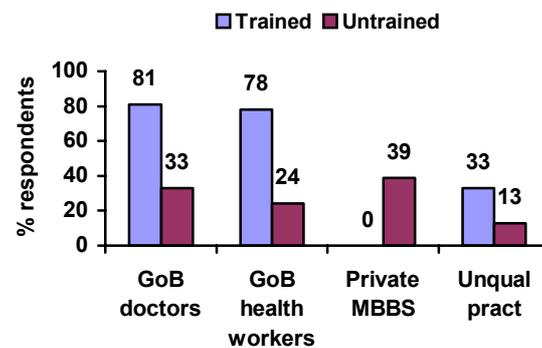


Fig 4. Training and correct knowledge of maximum safe level of arsenic in water

⁹ 70/116 (60%) of those with medical qualification responded on safe level of arsenic in water, compared with 123/276 (45%) of those without. Odds Ratio 1.89 (95% CI 1.18-3.03)

¹⁰ 100/112 (89%) of those with training responded to the question on safe level of arsenic in water, compared with 93/280 (33%) of those without training. Odds Ratio 16.76 (95% CI 8.39-34.13)

¹¹ 53/116 (46%) of medically qualified knew the correct answer on safe level of arsenic, compared with 93/276 (34%) not medically qualified. Odds Ratio 1.66 (95% CI 1.06-2.65)

¹² 84/112 (75%) of those with training knew the correct response for safe level of arsenic, compared with 62/280 (22%) of those without training. Odds Ratio 10.55 (95% CI 6.10-18.32)

Clinical features of arsenicosis

Two thirds (66%, 259/392) of respondents were able to give an answer about *how long it takes for arsenic toxicity to become manifest*. Qualified doctors were more likely to be able to respond¹³. Those with training were more likely to be able to respond¹⁴, and the effect of training was seen across all the occupational sub-groups (Figure 5).

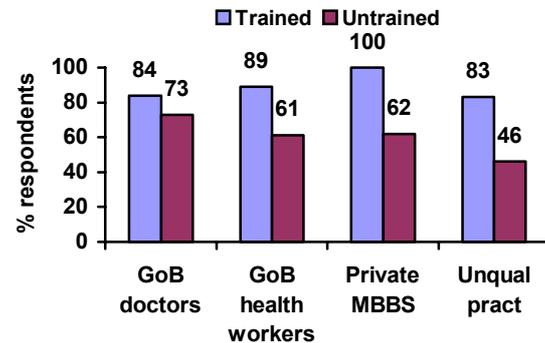


Fig 5. Training and responding to question on time for arsenic toxicity to manifest

It is commonly stated that it takes, on average, 10 years for clinical

arsenicosis to develop, but this can vary and signs may develop after shorter periods. Therefore there is no one 'correct' answer to this question. The numbers of years suggested by those with and without training are shown in Figure 6. It is clear that those without training tend to think signs of toxicity develop earlier, with 40% saying that signs of toxicity develop after only one year, which is an important misconception. Among those with training, almost half (49%) said that it takes 10 years for signs of toxicity to become manifest.

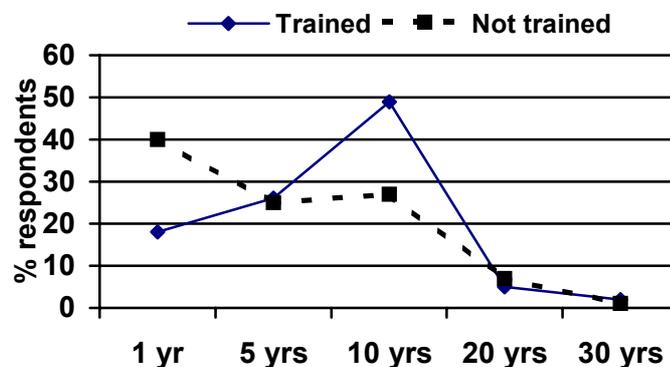


Fig 6. How long does it take for arsenic toxicity to become manifest?

Almost all the interviewees (390/392) were able to mention at least one *part of the body affected in arsenicosis*. Although respondents could mention several body parts affected (out of a choice of five), few mentioned any part other than the skin, which was mentioned by 94% (368/392). Respondents with training were more likely to mention the skin, compared with those without training¹⁵.

Three quarters of respondents (75%, 294/392) were able to mention one or more of the cardinal symptoms and signs of clinical arsenicosis. Of those who could mention any symptoms, 31% (90) mentioned just one, 52% (154) mentioned two or three, and

¹³ 87/116 (75%) of those qualified could respond about time before toxicity is manifest, compared with 172/276 (62%) without. Odds Ratio 1.81 (95% CI 1.08-3.05)

¹⁴ 98/112 (88%) of those with training could respond about time before toxicity is manifest, compared with 161/280 (58%) of those without training. Odds Ratio 5.17 (95% CI 2.71-10.04)

¹⁵ 111/112 (99%) of those with training mentioned the skin affected in arsenicosis, compared with 257/280 (92%) of those without training. Odds Ratio 9.93 (95% CI 1.38-203.45)

17% (50) mentioned five. Respondents with training about arsenicosis were more likely to mention at least one cardinal symptom or sign of arsenicosis, compared with those without training¹⁶. The effect of training was apparent in all the sub-groups (Figure 7).

Only half the interviewees (50%, 197/392) were able to give an answer when asked about the *characteristic distribution of keratosis in arsenicosis*. Those with training were more likely to be able to give a response than those without training¹⁷. But even among those with training, only two thirds (66%) could give an answer to this question.

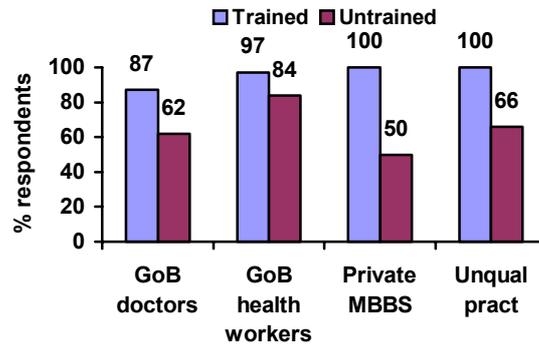


Fig 7. Training and mentioning at least one cardinal feature of arsenicosis

Only a quarter of respondents (23%, 89/392) gave the correct answer about the characteristic distribution (symmetrical over the palms or soles). Those with training were much more likely to know the correct distribution than those without training¹⁸. Nevertheless, only 59% of those with training could describe the distribution correctly. The effect of training was

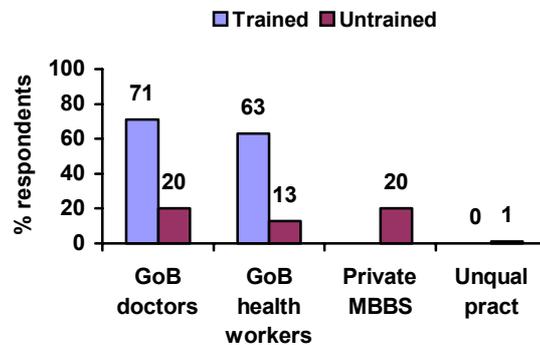


Fig 8. Training and knowledge of the distribution of keratosis in arsenicosis

seen in those in government service (Figure 8). The lack of knowledge in this area is particularly evident among those groups not working in the government health services, and among them it was not better in those with training (Figure 8).

Most interviewees (86%, 338/392) could give an answer about the *end-stage effects of arsenicosis*. Those with training were more likely to be able to respond than those without training¹⁹. Correct responses were categorised as those which mentioned gangrene or cancer. Among all the respondents, less than half (46%, 179/392) gave a correct response about end-stage effects of arsenicosis. Those with training were much more likely to give a correct response²⁰.

¹⁶ 105/112 (94%) of those with training knew at least one cardinal feature of arsenicosis, compared with 189/280 (68%) of those without training. Odds Ratio 7.22 (95% CI 3.07-17.84)

¹⁷ 74/112 (66%) of those with training could respond about distribution of keratosis, compared with 123/280 (44%) of those without training. Odds Ratio 2.49 (95% CI 1.53-4.05)

¹⁸ 66/112 (59%) of those with training knew the correct distribution of keratosis, compared with 23/280 (8%) of those without training. Odds Ratio 16.03 (8.71-29.73)

¹⁹ 109/112 (97%) of those with training gave an answer about end-stage effects, compared with 229/280 (82%) of those without training. Odds Ratio 8.09 (95% CI 2.34-33.61)

²⁰ 94/112 (84%) of those with training knew the correct end-stage effects, compared with 85/280 (30%) of those without training. Odds Ratio 11.98 (95% CI 6.56-22.11)

The effect of training on increasing knowledge of the end-stage features of arsenicosis was apparent across all sub-groups of health care providers (Figure 9). There is a marked effect of training, particularly in the government doctors and other workers in government health services.

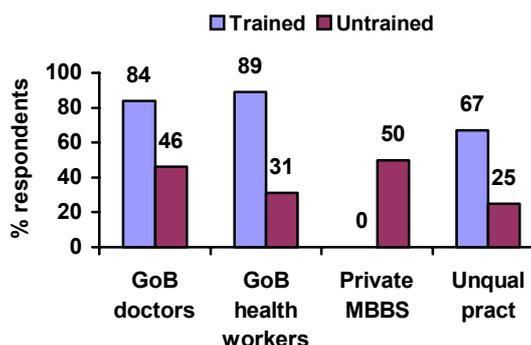


Fig 9. Training and knowledge of the end-stage features of arsenicosis

Treatment of arsenicosis

Most respondents (84%, 328/392) were able to give an answer to the question about *whether there is any specific treatment for arsenicosis*. Those with training were more likely to be able to give an answer than those without training²¹.

There is no specific treatment available for arsenicosis. About half the interviewees (51%, 199/392) responded with this correct answer. Medically qualified respondents were more likely to give the correct answer about specific treatment for arsenicosis²². However, considering all interviewees, those with training were *not* found to be more prompt to give the correct answer about specific treatment for arsenicosis²³. Among people who gave any answer, those with training were more found to believe *that there is a specific treatment for arsenicosis*, compared with those without training²⁴.

This negative effect of training – strengthening the belief that there is a specific treatment for arsenicosis – is particularly apparent among government health service providers who are not medically qualified (Figure 10). In this group, more than half those who had been trained (56%) knew there is no specific treatment for arsenicosis, but only 38% of those who had been trained believed this. Perhaps discussion about different treatment options during training gave a false impression about these treatments being specific.

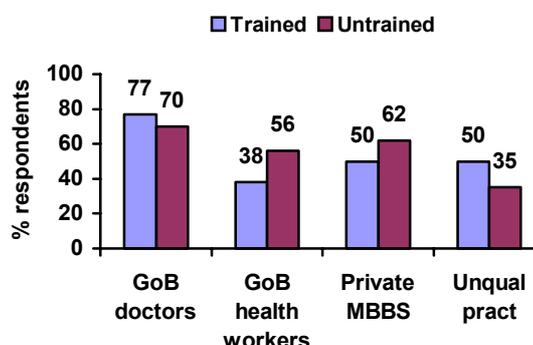


Fig 10. Training and knowledge there is no specific treatment for arsenicosis

²¹ 108/112 (96%) of those with training could respond about whether there is a specific treatment for arsenicosis, compared with 220/280 (79%) of those without. Odds Ratio 7.36 (95% CI 2.46-24.74)

²² 82/116 (71%) of those with a medical qualification knew there is no specific treatment for arsenicosis, compared with 117/276 (42%) without. Odds Ratio 3.28 (95% CI 2.00-5.39)

²³ 56/112 (50%) of those with training, among all respondents, knew there is no specific treatment for arsenicosis, compared with 143/273 (51%) of those without. Odds Ratio 0.96 (95% CI 0.60-1.53)

²⁴ 52/108 (48%) of those with training, who gave any response, believed there is a specific treatment, compared with 77/220 (35%) of those without training. Odds Ratio 1.72 (95% CI 1.05-2.84)

Less than half the interviewees (40%, 156/392) were able to mention any medicines given to arsenicosis patients. Those with a medical qualification were more likely to be able to mention any medicines, compared with those without a medical qualification²⁵. Those with training were much more likely to be able to mention a medicine used for arsenicosis, compared with those without training²⁶. The marked effect of training was evident in all sub-groups (Figure 11).

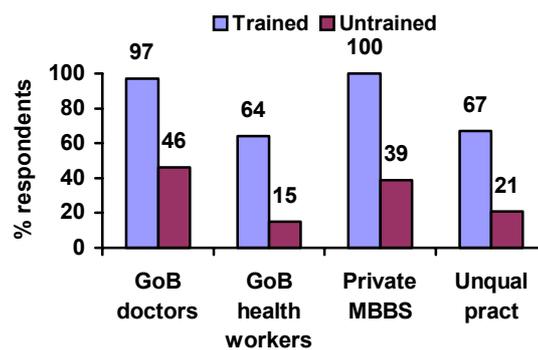


Fig 11. Training and knowledge of any medicine used for arsenicosis patients

Most of those who could mention at least one medicine mentioned vitamins alone (80%, 125/156), a few mentioned vitamins and some other medicine (7%, 11/156), and a few mentioned some other medicine without vitamins (13%, 20/156).

Most of the interviewees (83%, 324/392) could mention some advice that should be given to arsenicosis patients. Those with training were more likely to be able to mention some advice, compared with those without training²⁷.

Of the 324 people who mentioned any advice, almost all of them (92%, 299) mentioned advising the patients to drink 'safe' (not arsenic contaminated) water. Also, some (10%, 33) mentioned telling the patient to seek help from a doctor as necessary.

More than three quarters of respondents (79%, 311/392) expressed an opinion about the effectiveness of present treatments for arsenicosis. Those with training were more likely to have an opinion than those without training²⁸. Among those 311 respondents with an opinion about effectiveness of medicines, two thirds (66%, 205) considered that available treatments are "somewhat effective". The opinions about effectiveness were not different between those with and without training (Figure 12).

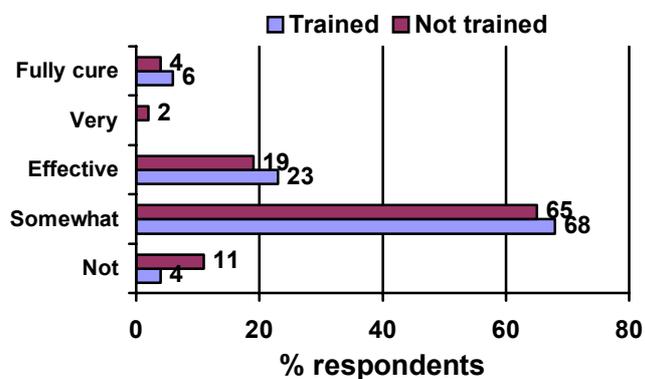


Fig 12. Training and opinion about effectiveness of treatments for arsenicosis

²⁵ 69/116 (60%) of those with a medical qualification could mention a medicine used for arsenicosis patients, compared with 87/276 (32%) without. Odds Ratio 3.19 (95% CI 1.98-5.15)

²⁶ 83/112 (74%) of those with training could mention a medicine used for arsenicosis patients, compared with 72/280 (26%) of those without training. Odds Ratio 8.12 (95% CI 4.76-13.89)

²⁷ 108/112 (96%) of those with training could mention advice to give to arsenicosis patients, compared with 216/280 (77%) of those without training. Odds Ratio 8.00 (95% CI 2.68-26.82)

²⁸ 111/112 (99%) of those with training expressed an opinion about effectiveness of treatments, compared with 200/280 (71%) without training. Odds Ratio 44.40 (95% CI 6.48-885.63)

Attitudes about the arsenic problem

It is generally difficult to assess attitudes in a short questionnaire, and respondents may tend to give answers that are what they perceive the interviewer wants to hear. While recognising this difficulty, the questionnaire nevertheless included a section about attitudes.

Virtually everyone (99%, 389/392) expressed an opinion in response to the question “*What do you think about the present arsenicosis situation in Bangladesh?*” Among those expressing an opinion, most (86%, 335/389) said the situation was very dangerous. Respondents with a medical qualification were less likely to say that the situation was “very dangerous”, compared with those without a medical qualification²⁹. The proportion considering the situation very dangerous varied in different sub-groups of service providers (Table 4).

Table 4. Proportions considering arsenicosis in Bangladesh “very dangerous”

Sub-group	% (number)
Government doctors	75% (76/101)
Other government health care providers	93% (142/153)
Private qualified doctors	67% (10/15)
Unqualified practitioners	88% (107/122)

In this case, there was no difference in perception about the arsenicosis situation between respondents with and without training about arsenic.

The responses to a range of other questions about attitudes related to arsenicosis, in overall and trained and untrained respondents, are shown in Table 5.

Table 5. Attitudes about arsenic and arsenicosis and training

Question	% (n) responded	Overall % (n) ‘Yes’	Trained % (n) ‘Yes’	Untrained % (n) ‘Yes’
Do you think arsenicosis patients need support?	99 (390)	99 (385)	99 (111)	99 (274)
Do you think all arsenicosis patients need diagnosis and management?	99 (389)	100 (388)	100 (112)	100 (276)
Do you think the population should be aware of the problem?	99 (389)	100 (388)	100 (112)	100 (276)
Do you think the present method of sinking tube wells should be continued?	92 (360)	14 (52)	7 (8)	18 (44)
Do you think there should be a policy about sinking tube wells?	97 (382)	98 (374)	97 (109)	98 (265)
Do you think ordinary people should remain separate from arsenicosis patients?	98 (383)	25 (96)	13 (14)	30 (82)
Can patients with arsenicosis get married?	93 (363)	71 (258)	84 (92)	66 (166)

There are a few differences between trained and untrained respondents:

- Respondents with training are less likely to think that the present method of sinking tube wells should be continued³⁰

²⁹ 75/101 (74%) of respondents with a medical degree thought the arsenicosis situation was “very dangerous”, compared with 245/270 (91%) without. Odds Ratio 0.29 (95% CI 0.15-0.57)

³⁰ 8/109 (7%) of those with training consider the same methods of sinking tube wells should continue, compared with 44/251 (18%) of those without training. Odds Ratio 0.37 (95% CI 0.15-0.87)

- Respondents with training are less likely to think ordinary people should remain separate from arsenicosis patients³¹
- Respondents with training are more likely to say that patients with arsenicosis can get married³²

Practice about arsenic and arsenicosis

The survey interviewees were asked several questions about the number of patients with arsenicosis they had seen and how they had managed them. The number of people responding to questions in this section was relatively low as it depended on their having experience in diagnosing and managing clinical arsenicosis.

Around a third of the interviewees (35%, 136/392) had *ever seen any arsenicosis patients*. Respondents with a medical qualification were more likely to have seen any arsenicosis patients, compared with those without a medical qualification³³. Respondents with training were more likely to report they had seen arsenicosis patients, compared with those without training³⁴.

The proportion of respondents reporting seeing arsenicosis patients varied by different sub-groups, and within each sub-group it was higher in those with training (Figure 13). It could be that after training respondents are more likely to recognise arsenicosis patients (or realise they have seen them in the past), or that those more likely to see arsenicosis patients are targeted for training.

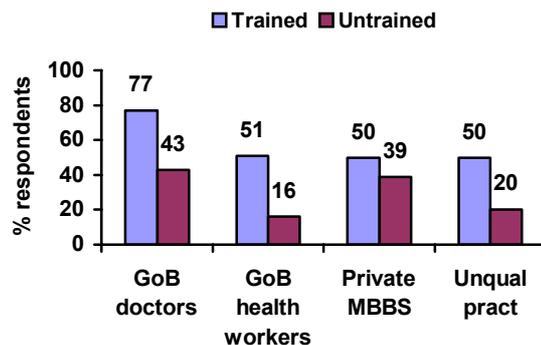


Fig 13. Training and having ever seen arsenicosis patients

The mean *number of reported arsenicosis patients seen* (by the 136 people who saw any) was 33.97, median 3.00. Excluding two people who said they saw 1000 and 2000 patients, the mean number seen was 12.09.

When asked about patients they had *diagnosed with arsenicosis in the last six months*, just 18% (70/392) respondents reported they had diagnosed any arsenicosis patients in this period. Medically qualified respondents were more likely to report diagnosing any arsenicosis cases in the last months³⁵.

³¹ 14/112 (13%) of those with training think ordinary people are separate from arsenicosis patients, compared with 82/271 (30%) of those without training. Odds Ratio 0.33 (95% CI 0.17-0.64)

³² 92/110 (84%) of those with training think arsenicosis patients can get married, compared with 166/253 (66%) of those without training. Odds Ratio 2.68 (95% CI 1.46-4.96)

³³ 60/116 (52%) of those with a medical qualification had ever seen an arsenicosis patient, compared with 76/276 (28%) of those without. Odds Ratio 2.82 (95% CI 1.75-4.56)

³⁴ 65/112 (58%) of those with training had ever seen an arsenicosis patient, compared with 71/280 (25%) of those without training. Odds Ratio 4.07 (95% CI 2.49-6.67)

³⁵ 36/116 (31%) of those with a medical qualification had diagnosed a case of arsenicosis in the last six months, compared with 34/276 (12%) of those without. Odds Ratio 3.20 (95% CI 1.81-5.68)

Trained respondents were more likely to have diagnosed a case of arsenicosis in the last six months, compared with non-trained respondents³⁶. The association between training and recently diagnosing cases of arsenicosis was present across all occupational sub-groups (Figure 14). Again, this could either reflect targeting of training or the effect of training on raising awareness about diagnostic features of arsenicosis.

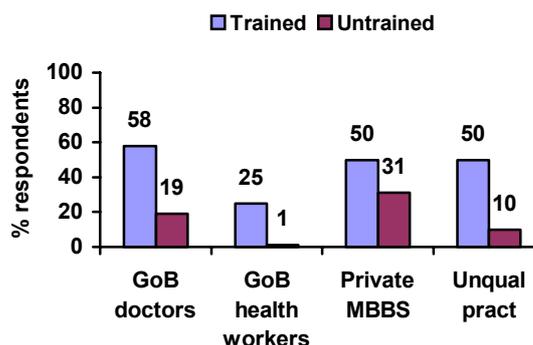


Fig 14. Training and diagnosis of arsenicosis in last six months

Among those who reported diagnosing any cases of arsenicosis in the last six months, the mean number of cases diagnosed was 30.70, median 2.00. Excluding one person who claimed to have diagnosed 1500 cases, the mean number was 9.41.

Of the 136 people who had ever seen a case of arsenicosis, 117 answered a question on the *advice they gave patients about drinking arsenic free water*. Most of these (87%, 102/117) said they told the patient to drink arsenic free water. No effect of training was apparent (but the numbers are small).

Almost everyone (99%, 388/392) responded to a question about the *advice they give to the population on drinking arsenic free water*. And almost all (96%, 373/388) reported they advise the population to drink arsenic free water.

Only 58 people answered a question about what *medicines they gave to arsenicosis cases*. Of these, nearly all (97%, 56/58) said they gave vitamins, either alone or occasionally with some other medicines.

Less than a third of interviewees (29%, 112/392) responded to a question about *training their subordinates on diagnosis and management of arsenicosis*. It is likely that many of the others did not have subordinates. Of those who answered the question, less than a quarter (23%, 26/112) said they trained their subordinates about arsenicosis. Respondents, who had training, were much more likely to say they had trained their subordinates, compared with those who had not been trained.³⁷

³⁶ 40/112 (36%) of trained respondents diagnosed a case of arsenicosis in the last six months, compared with 30/280 (11%) of non-trained respondents. Odds Ratio 4.63 (95% CI 2.59-8.29)

³⁷ 25/44 (57%) of those with training said they trained their subordinates, compared with 1/68 (2%) of those without training. Odds Ratio 88.16 (95% CI 11.18-1893.52)

Discussion

Level of knowledge

The testing of knowledge about arsenic and arsenicosis produced useful information. For most questions, more people in the trained group than in the untrained were prepared to try to give an answer, and they usually gave a more accurate answer.

Knowledge about when the arsenic problem began and how many districts are affected was not particularly good, even after training. But nearly everyone knew that arsenic contamination affects specifically tube wells, whether they had received training or not. This seems to be common knowledge, probably because it has received considerable publicity. Thus it is not a particularly important area to stress in training. On the other hand, knowledge about the safe level of arsenic in water was very poor in the untrained group and very much better in the trained group. In this cross-sectional study we cannot definitely attribute the difference between the groups to training, but it was found in each sub-group of health care providers with and without a medical qualification, which seems likely to be related to the training they received.

Knowledge about clinical features of arsenicosis was patchy. It is of concern that four out of ten people in the untrained group believed that arsenic toxicity is manifest within one year. This aspect of knowledge was better in the trained group, but still one in five believed that the lag period to arsenic toxicity is only a year. Most people could mention at least one cardinal feature of arsenicosis, and this knowledge was quite common even in those without training. On the other hand, few people were able to describe the characteristic distribution of keratosis in arsenicosis; this knowledge was better in the trained group but even among them some 30-40% could not give the correct distribution. Lack of this knowledge would make diagnosis of cases of clinical arsenicosis less likely. The difference between trained and untrained groups in knowledge about the end-stage features of arsenicosis was marked, and most of the trained group had accurate knowledge. While this suggests a benefit of training, knowledge of end-stage features is not useful for diagnosing arsenicosis at an early stage when some form of intervention is still potentially useful.

Knowledge about treatment options for arsenicosis is an important issue for practice. It is of concern that more people in the trained group think there is a specific treatment for arsenicosis. It may be that discussion of treatment options is interpreted as meaning the treatments are specific. This could lead to a false sense of optimism about the likely success of treatment regimes, and perhaps less emphasis on preventing the development of arsenicosis, particularly by provision of safe water. The training programme modules need to be reviewed to make this aspect clearer.

Attitudes

Attitudes are difficult to assess in such a cross-sectional study using questionnaire. The questions in the section about attitudes produced predictable responses. Nearly everyone responded in the same way to these questions and some of them could be described as 'leading questions.' The responses given to these questions may not be a very good reflection of the underlying attitudes of the doctors and other health care providers interviewed.

Practice

It is interesting that people who had been trained were more likely to report seeing cases of arsenicosis. This could reflect increased awareness and better diagnosis of cases, some of which may have been missed by the non-trained workers. But it could also reflect targeting of the training to those people most likely to be seeing arsenicosis cases, by virtue of the type of work they undertake. While we cannot be sure which of these explanations is the case, we did select the sample of doctors only from those whose work would mean they were likely to come across arsenicosis cases, and the whole sample was drawn from service providers who were equally eligible for receive training.

Training

In the study sample nearly a third of the government doctors and nearly half of the other government health care providers had received training about arsenic and arsenicosis. We have to be somewhat cautious when generalizing from this study to indicate the overall proportion of government health care providers who have received training about arsenicosis. The sample was not drawn to include those most likely to have received training, although among doctors those more likely to be involved in managing cases of arsenicosis were sampled. However, it is possible that regional variations in level of training could be reflected in the proportion of respondents who had been trained.

The main thrust of the analysis is comparison between those people with and without training. We have to be cautious in concluding that differences between trained and untrained people are due to the training. Training was not randomly allocated and we do not know the knowledge of each individual before and after training. It is possible that people who were more knowledgeable in the first place were selected to have training, although there is no particular reason to believe this is the case. It is probable that the differences between the trained and untrained groups in this study reflect the effects of the training.

The findings suggest that most aspects of the training programme apparently worked well. Training was associated with better knowledge about the safe level of arsenic in water, useful knowledge when considering prevention efforts. Training was also associated with better knowledge about clinical features of arsenicosis. However, knowledge of the end-stage features (markedly better in the trained group) is not useful for early intervention efforts. The training programme should perhaps place

more emphasis on hands-on experience of early cases of arsenicosis, when diagnosis may give more chance of intervening to prevent progression. As mentioned above, the apparent association of training and the misconception that there is a specific treatment for arsenicosis suggests that this aspect of the curriculum needs revision.

Implications of the findings

The government training programme about arsenic and arsenicosis for health care providers is useful and should continue to cover all government health care providers across the country. So far it seems that, at the time of the survey in early 2002, about a third of doctors and nearly half of other government health care providers have received training.

Some aspects of the curriculum should be revised. In particular the module about management of arsenicosis should not give the impression that there are specific treatments available for the condition. More emphasis should be placed on the early manifestations of clinical arsenicosis, rather than on end-stage effects, in order to increase the likelihood of diagnosis of cases at an earlier stage, when progression might be halted by provision of arsenic free water.

The training programmes available are for government health service providers and few private providers included in the sample had received training. Some of them may have received the training in relation to concomitant or previous government service. Most first line health care in Bangladesh is provided by private practitioners, and especially by unqualified practitioners such as village doctors. Therefore there is a clear need to provide some training about arsenicosis for these practitioners, since early cases of arsenicosis may well present to them and be missed. How to provide training to this group is a difficult question, but it needs urgent consideration.

References

1. Smith AH et al. Contamination of drinking-water by arsenic in Bangladesh: a public health emergency. *Bulletin of the World Health Organization*, 2000; 78(9): 1093-1103.
2. *The Bangladesh arsenic mitigation water supply project: addressing a massive public health crisis*. The World Bank Group, October 1999 (Internet communication, 13 December 1999, available at <http://wbln1018.worldbank.org/sar/sa.nsf>).
3. *Arsenic Mitigation in Bangladesh. Media brief, UNICEF, Bangladesh, updated version*, January 2000.
4. *Executive summary of the main report of phase 1, ground water studies of arsenic contamination in Bangladesh*. British Geological Survey and Mott Macdonald (UK). 1999. (Internet communication, 15 December 1999, available at <http://www.damient-consul.co.jp/english/arsenic/article/>
5. Mandal BK et al. Impact of safe water for drinking and cooking on five arsenic-affected families for 2 years in West Bengal India. *Sci. Total Environment*, 1998; 218(2-3): 185-201
6. Chowdhry UK et al. Ground water arsenic contamination in Bangladesh and West Bengal, India. *Environ Health Perspect*, 2000; 108(5): 393-7
7. Ministry of Health and Family Welfare and CIETcanada. *Bangladesh health and population sector programme: second service delivery survey*, 2000. MOHFW: Dhaka, 2001