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# Socioeconomic Condition and Health Status of Chronic Arsenicosis Patients in Jessore, Bangladesh

**Sabia Sultana[1], Quazi Zahangir Hossain[2] and Reshma Pervin[3]**

[1]Department of Anatomy, Ad-din Sakina Medical College, Jessore, Bangladesh
[2]Environmental Science Discipline, Khulna University, Khulna, Bangladesh
[3]Department of Public Health, Northern University Khulna Campus, Khulna, Bangladesh

Correspondence should be addressed to Sabia Sultana, sabia_23_s@yahoo.com

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**Abstract** A descriptive type of cross sectional study was conducted in Sharshaupazila under Jessore district on socioeconomic condition and health status of chronic arsenicosis patients from July to October, 2011. The prevalence of arsenicosis due to arsenic contamination of ground water may emerge in the form of epidemic and chronic arsenic exposure through drinking water is one of the major environmental hazards in Bangladesh. The main source of drinking water is shallow tube well (64%) among which 21% tube well has been red marked i.e., contaminated with arsenic poisoning. About 59.8% respondents have belonged to income deficit group and their monthly income decreased significantly. The chronic effect due to arsenic poisoning is about 32% and the men (69.33%) were more susceptible to arsenicosis. Among the affected patients identified problems were melanosis (94%), keratosis (33%), leucomelanosis (38%), respiratory problem (49%), loss of sensation (45%), bowen's (21.33%), oedema (9.33%), chronic nonhealing ulcer (6.33%), lung cancer (2%), and gangrene (0.66%). About 32.94% people consulted with homeopath for their treatment and only 22.35% people consulted with government health physician. To be aware of arsenicosis the health education must be improved within the community and the financial support; relevant training could be effective to reduce the arsenic poisoning.
**Keywords** *Arsenicosis, Health Status and Socioeconomic Condition*

## 1. Introduction

Groundwater contamination by arsenic is one of the largest problems in Bangladesh; millions of people are being affected by the arsenic in recent past. Huge numbers of tube-well were installed to protect the people from waterborne diseases, but water of the tube-well not properly tasted about the contamination of arsenic. People who have long term exposure to arsenic contaminated water more than 500mg/liter may ultimately die from cancer caused by arsenic. Statistic shows that arsenic contaminant cause chronic causality like as lung, bladder and skin cancer. Statistic also shows that one in every ten people may fall in chronic diseases because of long term exposure of arsenic [1]. In Bangladesh source of drinking water is one of the largest exposure way to inorganic arsenic to human body [2]. People of Bangladesh are facing largest poisoning of arsenic in recent history, and millions

of people are drinking water with high level of arsenic which is above the permissible limit. Health catastrophe has gradually unfolding creating threat to the people of Bangladesh [3]. Arsenic also creating problem to child and maternal health, which cause spontaneous abortion and still birth [4]. In Bangladesh more than 60 districts are affected with arsenic by ground water contamination. Which cause future generation at great risk of arsenic contamination and statistic show that about 38430 identified patient existing in Bangladesh (BAMWSP, 2004). But the actual magnitude of the problem and upcoming future burdens very difficult to scale up and therefore this study us just an endeavor towards touching the tip of the iceberg in capturing the entire scenario in a single frame. There are two million cases of skin lesions in the country caused from drinking arsenic contaminated water and 3,000 people is dying every year in Bangladesh by arsenic-related illness. Disease resulted from chronic arsenic exposure is commonly known as arsenicosis. Early symptoms of arsenicosis include various skin lesions (cancers) that develop over an incubation period of 5-10 years of continuous exposure. After 10-20 years of prolonged exposure, afflicted persons often develop arsenic-related cancers. Although no specific treatment of arsenicosis has yet proved to be effective, patients experiencing arsenic poisoning tend to seek treatment from health professionals. Use of antioxidant multivitamins (vitamins A, C and E), various skin lotions and drinking arsenic free water have been shown to be beneficial in some extent for the people who are in the initial stages of arsenicosis. Eating selenium rich foods, such as fresh fruits, vegetables, eggs and milk also help to reduce the effects of arsenicosis symptoms. Arsenic patients who are in the advance stages may require surgical interventions if they suffer from gangrene and arsenic related cancers. WHO (1993) [5] listed the symptoms of arsenicosis roughly in successive order as changes of skin color (either hyper-pigmentation or de-pigmentation), skin and internal cancers, peripheral vascular disorders and neurological disorders. The liver and lung may also become affected. Arsenic poisoning also affects the productivity of the sufferers, and its debilitating nature may disrupt their family harmony. Although arsenic contamination of ground water was first identified in 1993, even now many of the people, who are drinking this contaminated water, are not aware of this fact and its consequences.

## 2. Materials and Methods

The study area is situated near about 35 km south-west from Jessore district and it was selected because of the study area is in a great risk of arsenic problem and more than 65% tube well of the area is red marked or highly arsenic concentrated. Study period was July to October, 2011. The chronic arsenicosis patients with the age range from 30- 69 years of old were including in this study. The people aged below 30 years and mentally retarded were excluded. Stratified random sampling was used as sampling procedure. Both qualitative and quantitative information has been collected by using semi-structure self-develop questionnaire. Information from 107 respondents was collected through interview. The sample size for data collection from each stratum was obtained from the following equation (Kothari, C.R., 2001):

$$n = \frac{z^2 pqN}{e^2(N-1) + z^2 pq} \qquad (3.1)$$

Where n = sample size; $z^2$ = the value of the standard variant at a given confidence level; p = sample proportion; q = 1-p; e = acceptance error; N = population size for the strata.

For the study, as the sample proportion would represent 25% of the population, thus the value for the equation is: p = 25% of the population, i.e. 0.25; q = 0.75; z = 1.96 [for 95% confidence level the value of z is 1.96]; e = 0.08 [since the estimate should be within 10% of the true value];

Therefore,

$$n = \frac{1.96^2 \times 0.25 \times 0.75 \times 2142}{0.08^2 (2142-1) + 1.96^2 \times 0.25 \times 0.75} = 107$$

Data collection tool was semi structured questionnaire. Data management and analysis was followed a sequential order. Secondary information such as statistical data, reports, has been collected from various government and nongovernment organizations. Demographic information such as household data was collected from Bangladesh Bureau of Statistics, Jessore. Social information from Upazila Parishad Office, Sharsha.

## 3. Results and Discussion

### 3.1. Socioeconomic Condition

Arsenic contamination is one of the most threatening health issues in Bangladesh, particularly in study area. Arsenic contamination causes health hazard and putting continuous pressure on sociology-economic conditions of the people. It is affecting the people in the study area not only physically but also economically, environmentally and socially. As a whole the area is under insecure condition both environmentally, economically and socially. To explain the socioeconomic condition of the study area the following socioeconomic criteria are considered.

***Table 1:*** *Socio-Demographic Characteristic of Respondent*

| Indicators | Percentage (%) |
|---|---|
| **Age distribution (in years)** | |
| <20 | 20.91 |
| 21-30 | 15.82 |
| 31-40 | 40.75 |
| 41-50 | 19.71 |
| 51-60 | 12.91 |
| 60+ | 6.34 |
| Mean Age (in years) | 29.91 |
| **Educational attainment** | |
| Ever Been to school | 78.4 |
| **Number of HH** | **376** |
| **Gender Distribution** | |
| Female | 58.82 |
| Male | 41.18 |
| **House type** | |
| Earthen structure | 95.30% |
| Semi brick structure | 2.80% |
| Brick structure | 1.90% |
| **Highest level of education** | |
| Primary | 44.2 |
| Secondary | 52.7 |
| Higher secondary and above | 3.1 |
| **Number of HH** | **376** |

The analysis of the age group of the study area showed that, age group of 31-40 years is mainly engaged in income activities (40.75%), followed by 41-50 years (19.71%), 51-60 years of age groups are engaged (12.91%). These three age groups mainly constitute the main work force in the study area (73.37%). Although it does not show any significant relationship with their livelihood but only indicate that, the livelihood of middle aged category (31-40 years age) is more affected by arsenicosis. The total respondents of the study area were categorized into two groups according to

their sex. In general, there were more female than male respondents. Among them 58.82 % patient were female and 41.18% patients were male. The nature of house indicates the social status of the community people. People in the study areas generally use available local materials for construction of house. Depending on the wall materials the housing of the study area can be classified into three categories and these are earthen (materials of housing are mud, straw, bamboo, golpata) semi-brick (materials of housing are tin, asbestos, brick) and bricked. In this case most of the people have earthen structure house (95.30%), small percentage of the people use semi-bricked (2.80%) and brick structure house (1.90%).

### 3.2. Sources of Drinking Water

Source of drinking water is another important indicator of the socioeconomic condition for the people in the study area. The study showed the majority of the respondents obtained their drinking water from shallow tube-wells (64%) with nearly 29% using deep tube-wells, pond sand filter (2.5%), and traditional well (5%) respectively. The study results are similar with the results of Faruque et al. more than half (54%) regularly consumed well water with an as concentration ≥ 50 µg/L- above the acceptable government standard in Bangladesh due to lack of knowledge [6].

***Table 2:*** *Source of Drinking Water*

| Source of Drinking Water | Percent (%) of Respondent |
|---|---|
| Shallow Tube –well | 64 |
| Deep tube –well | 29 |
| Dug well | 5 |
| Pons sand filter | 2 |

### 3.3. Location of Drinking Water Source of Respondents

The supply of water has always been a problem in Bangladesh. In the rural area, the source of drinking water is a great concern. The presence of arsenic in the underground water is another problem which is being intensified day by day. In the study area about 38.82% drinking water source were inside their houses and the rest of the households 61.18% collect drinking water outside their house. Out of this 61.18% source of water was more than that of 500 meter of the house. The distribution of the respondents based on the location of drinking water source is shown in the figure 1.

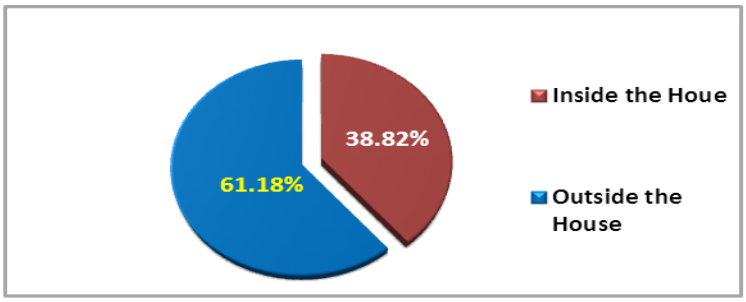


***Figure 1:*** *Distribution of the Drinking Water Sources in the Study Area*

### 3.4. Perception about Arsenic Poisoning

The study was found that, the majority (73.15%) of the respondent had no basic knowledge about arsenic poisoning. Only 26.48% people had little knowledge about arsenic poisoning and 18.2%, 8.65% people had little and medium knowledge, respectively about arsenic poisoning.

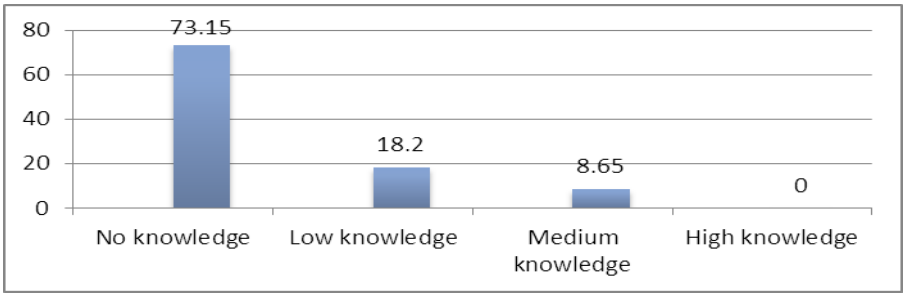


***Figure 2:*** *The Distribution of Respondents Based on Knowledge of Arsenicosis*

### 3.5. Household Income and Arsenicosis Prevalence

The study was found that household income has negative relation to prevalence of arsenicosis problem in the study area. It was found who have higher income is more aware about arsenicosis problem. The study showed that the maximum number of arsenicosis patients (71%) belonged to low income group and 29% belong to middle class income group but none was found in high income group and all these patients were from rural areas of the country. Majority of all these patients was related with the traditional occupation of the country like cultivation (53%) in addition to lower level of educational background (81.5%). People who have low income, low educational background and individual who have been suffering from malnutrition are main exposure side of arsenicosis [7]. Health status of severe arsenicosis patients and loopholes of existing medical facilities in the study area.

### 3.6. Categorizations of the Arsenicosis Patients

Five category of arsenicosis pained had observed in the study area that's: leucomelanosis (initial stage), melanosis (1st stage), keratosis (2nd stage), hyperkeratosis, and skin cancer (3rd stage). In the study area highest 48.24% respondents were in initial stage (leucomelanosis), 21.18% were melanosis, 11.78% were keratosis, 3.5% were hyperkeratosis stages and 12.95% were not affected by arsenocosis.

***Table 3:*** *Category of Diseases*

| Category of Diseases | Percent (%) of Patient |
|---|---|
| Leucomelanosis (initial stage) | 48.24 |
| Melanosis (1st stage) | 21.18 |
| Keratosis (2nd stage) | 11.78 |
| Hyperkeratosis | 5.5 |
| Skin cancer (3rd stage) | 10.9 |

This study correlates with the study of Guo et al. indicated that the prevalence of skin lesions like leucomelanosis and melanosis were highest prevalence in region of drank water from tube wells with higher concentration of inorganic [8].

### 3.7. Treatment Received from the Govt. Health Institution

Different types of treatment are available in the study area. The study represents that most of the patients (69.23%) received vitamins for arsenicosis treatment. Among rest of the patients, 7.65% patient got ointment for treatment and about 23.12% patient did not get any treatment for arsenicosis disease. The distribution of the respondents based on the treatment they received in the study area is shown in the following figure 3.

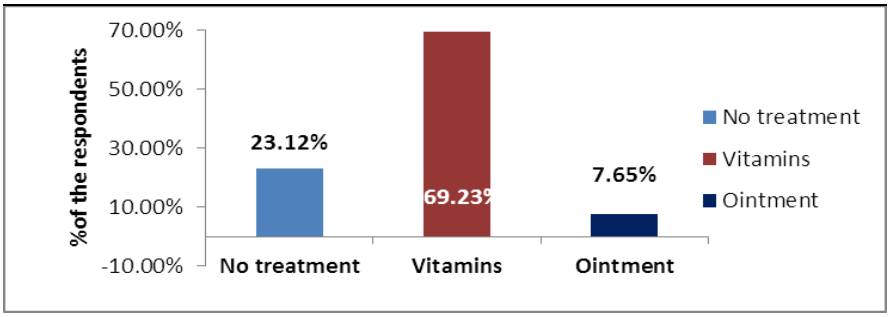


***Figure 3:*** *The Distribution of Respondents Based on Medical Facilities*

### 3.8. Frequency of Treatment Received by the Patients

The study represents the times of receiving treatment of the respondents during last one year from the different medical facilities available in the study area. Most of the patients (49.61%) got treatment yearly for arsenicosis disease. Among rest of the respondents, 28.35% patients half yearly got treatment due to arsenicosis and about 15.68% and 6.36% patients got treatment quarterly, monthly respectively. The distribution of frequency of treatment received by the patients in the study area is shown in the following figure 4.

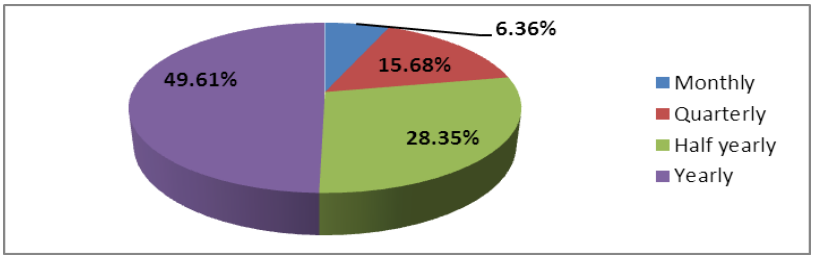


***Figure 4****: The Distribution of Respondents Based on Frequency of Treatment*

### 3.9. Types of Support People Want to Cope With the Impact of Arsenicosis

Different types of support people want to cope with the impact. The study represents the types of recommendations of the respondents to get more improved treatment for arsenicosis disease. Most of the patients (45.58%) recommended free treatment and medicine can be provided regularly to get treatment. Among rest of the patients 20.80%, 14.65%, 6.85% and 12.12% patients recommended that more medical center should be established, loan can be provided, more arsenic safe water options can be established, regular physician visit should be established respectively.

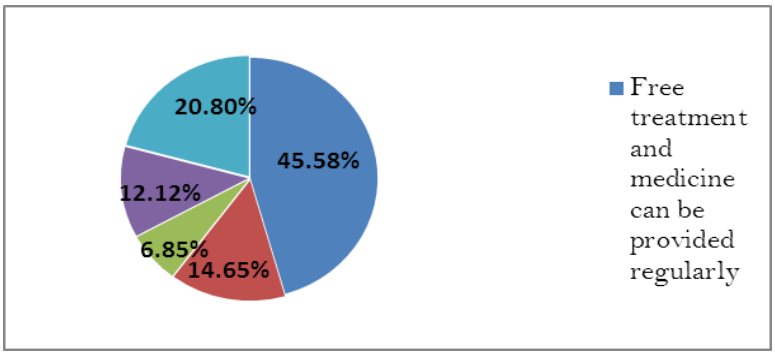


***Figure 5:*** *Different Types of Support People Want in the Study Area*

Rahman et al., found a significant dose response relationship between arsenic exposure and diabetes mellitus among those suffering from keratoses in Dhaka, Bangladesh [6]. Deep tube-well is one of the other best alternatives for drinking water. According to record of British geological survey [12] out of 280 tube-wells only 2 are contaminated by arsenic above the limit. According to the study majority of arsenic patient are low income group and next is middle class (29%) group. Majority (53%) people of the patient engaged with cultivation in addition lower level of education background. So need to emphasis on supply on arsenic free drinking water and balance diet to the people by means of easy access to better nutrition facility. (Ratnaike R.N., 2003). The study results is similar with the results of Faruque et al. more than half (54%) regularly consumed well water with an as concentration ≥ 50 µg/L- above the acceptable government standard in Bangladesh due to lack of knowledge [13]. In West Bengal study also reveals that as safety level is not same in all the areas. This study correlates with the study of Guo et al. indicated that the prevalence of skin lesions like leucomelanosis and melanosis were highest prevalence in region of drank water from tube wells with higher concentration of inorganic arsenic [8].

This study reflects in the West Bengal study by Ahsan et al. reported that 21.6% of participants in the study had skin lesions of such as melanosis or blackspots [14]. These issues based on various studies are discussed below. Arsenic is not only a physical but also a social phenomenon [15]. Besides arsenic toxicity and arsenicosis diseases, arsenic poisoning creates extensive social implications for its victims and their families in affected areas. A number of socio-economic problems like social uncertainty, social; injustice, social isolation and problematic family issues are reported due to arsenicosis [14, 15]. Poor are the main victim of arsenicosis [14, 16, 17, 18], who have not easy access to alternative drinking water source and basic health facilities because of less income status. Long term arsenicosis problem could cause social problem and amplify the social problems [16]. Arsenic diseases have positive relation with income and poverty. Most of the arsenicosis patient could not take any treatment because of financial constraints. One of the study found that about 20-70% of the patients do not go for any treatment because of financial constraints in Bangladesh. The lack of treatment lessens the working efficiency of the poor and cause loss of job, barrier to aces new job and social rejection. Arsenic free water collection to family also matter of diminish the household income [15]. Social conflicts over contaminated water destroy the social harmony and network relationships [15, 18]. Arsenicosis victim wrongly treated and isolated from social and family relation, this creates social discrimination and hampers the social mobilization. Children of the arsenicosis patient being isolated from social and religious function, moreover they are not allowed to take baths in the village ponds [15] some unaffected people act like that the patient should stay in their home or leave their village in elsewhere [19]. There is lack of information to the rural people of Bangladesh about aresenicosis [15, 19, 20]. As a result some people think that the disease is an act of devil /impure air or the work of evil sprite. For this believe about 30-80% patients of arsenicosis patient do not take any treatment in Bangladesh [16].

## 4. Conclusion

In rural areas of Bangladesh, access to water is generally more problematic, more differentiated and less secure due to presence of arsenic in the drinking water source. For human consumption, water should be both safe and wholesome. Without ample safe drinking water, communities cannot be staying healthy. So, it is very urgent to ensure the enormous supply of safe water sources for the arsenic-prone areas. The current situation is that arsenic contamination is increasing in both severity and extent in the study area. Poor people are the most vulnerable to the effect of chronic arsenic diseases because of their lack of capacity to install arsenic free source of drinking water. In view of the increasing burden of arsenicosis- especially among the poor-the whole effort of arsenic mitigation should be considered as an essential part of the National Poverty Alleviation Strategy of Bangladesh. The present study will be helpful for the other researchers for doing research in arsenic related research in the study area and other organization.

The World Health Organization describes arsenic contamination problem as one of the world's primary environmental changes. Most of the population in the study area is continues to drink arsenic-laced water. Knowledge about the health hazards of arsenic contamination, availability of alternative arsenic free drinking water source abets them to face this devastating environmental challenge. To reduce the cumulative intake of arsenic by the population as a whole as rapidly as possibly the arsenic mitigation should be installed in the region. The short term and long term mitigation programs are

- The arsenic related problem should be declared a public health emergency to facilitate the rapid allocation of funding and prompt expansion of intervention
- Creation of awareness by health education
- All cases of arsenicosis should be identified; more research in the study area should be implemented
- An immediate interim source of arsenic-free water should be identified and the implementation of a long term solution should begin
- Chemicals to be used daily to remove arsenic from water
- Surface water should be used through filtration and chlorination
- Patients' progress should be monitored regularly by the health worker
- Rain water through rain water harvesting
- Surface water (pond/river) through pond sand filter

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