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Incidence and prevalence of chronic cutaneous arsenicosis: A study in Homna upazilla health complex, Homna, Cumilla, Bangladesh

MJ Abedin[1], GM Matiur Rahman[2], Hoq AJMS[3], Sultana F[4]

[1-3] Assistant Professor, Department of Dermatology and Venereology, Cumilla Medical College Hospital, Cumilla, Bangladesh
[4] Emergency Medical Officer (EMO), Mymensingh Medical College Hospital, Mymensingh, Bangladesh

Abstract
Introduction: In Bangladesh a large number of people have been exposed to naturally occurring inorganic arsenic through their drinking water. Characteristic skin lesions, keratosis and pigmentary alteration, and the water arsenic level confirmed the arsenic exposure. Homna upazilla of Cumilla district of Bangladesh is one of the arsenic contaminated area in Bangladesh. Till now we have not enough data regarding the prevalence of chronic cutaneous arsenicosis in this locality.
Aim of the study: The aim of this study was to assess the incidence and prevalence of chronic cutaneous Arsenicosis in patients with skin diseases attended in the OPD of Homna Upazilla Health Complex, Homna, Cumilla Bangladesh.
Methods: This was a cross sectional study conducted in the OPD of Homna Upazilla Health Complex, Homna, Bangladesh during the period from January 2015 to December 2015. In total 7653 patients with several types of skin diseases and disorders attended in the Out Patients Department (OPD) of Homna Upazilla Health Complex, Homna, cumilla Bangladesh was selected study population. The data were analyzed by Epi info version 7, Microsoft Excel and SPSS version 20.
Result: In final outcome analysis we found, among all the total study population only 383 participants were with arsenicosis which was 5% (5.0046%). Besides this 49.76% were with several infective skin diseases and 45.24% were with non-infective skin diseases.
Conclusion: The arsenic concentration in the drinking water samples indicates presence of arsenic exposure of the study population through drinking water. To gain the clear concepts about chronic cutaneous Arsenicosis. We would like to recommend for conducting more studies in several places with larger sample sizes.

Keywords: chronic cutaneous arsenicosis, keratosis, melanosis, pigmentation

1. Introduction

Chronic arsenic toxicity in humans due to prolonged exposure is known as arsenicosis. There occurred a massive arsenic toxicity caused by consumption of arsenic-contaminated tube well water in Bangladesh and West Bengal of India. World Health Organization (WHO) has defined arsenicosis as a chronic health condition arising from prolonged ingestion of arsenic above the safe dose for at least six months, usually manifested by characteristic skin lesions of melanosis and keratosis occurring alone or in combination with or without the involvement of internal organ [1]. Chronic arsenic intoxication from drinking water contaminated from geological sources has caused a devastating health crisis in Bangladesh [2]. A similar situation can be observed not only in Bangladesh, but also in some other parts of the world. By the year 2000, investigators estimated that between 35 and 77 million of the 125 million inhabitants were exposed to high inorganic arsenic levels through drinking water retrieved from tubewells [3]. With some other reason, arsenic contaminated drinking water is the most common cause of arsenic poisoning in Bangladesh even in the world. Day by day the number of patients with chronic cutaneous Arsenicosis is increasing. In a study they claimed, more than 30 countries have reported arsenic contaminated water [4]. The prevalence of arsenicosis in Asia is higher than any other part of the world. It has involved more than 150 million people in the world, of which 45 million are living in Asia. Chronic cutaneous Arsenicosis poisoning may result in dermatologic manifestations, peripheral vascular diseases, hypertension, diabetes, and neuropathy [4]. The World Health Organization has recommended concentration of arsenic in drinking water 10 µg/L as an allowable range for human consumption [6]. The permissible level of arsenic in water is 50 ppb (Parts per billion) in Bangladesh according to experts. Reports suggest arsenic contamination in water from more than 30 countries in the world. The high concentrations of arsenic in groundwater are reported from large areas of India, Bangladesh, Taiwan and Northern China. Some Asian countries affected are Lao PDR, Cambodia, Myanmar, Pakistan, Nepal, Thailand and Vietnam. Significant arsenic contamination of groundwater are also reported from Hungary, Mexico, USA, Chile and Argentina [7]. Major affected regions of South-East Asia are the basin of the Ganga-Brahmaputra-Meghna Rivers and the Mekong Delta [8]. In a study they said, in India, West Bengal and neighboring Bangladesh constitute the most extensively contaminated region in the world [9]. The skin effects of arsenicosis are pigmentation changes (melanosis), especially on the trunk and extremities and thickening of the outer horny layer of skin (keratosis). Pigmentation and keratosis caused by arsenic are quite distinctive and are the hallmark

signs of chronic arsenic exposure [10]. A series of causes are associated with arsenicosis. Arsenicosis may also cause weakness, anaemia, conjunctival congestion, chronic lung disease, peripheral neuropathy, encephalopathy, bronchitis, noncirrhotic portal hypertension (NCPH), portal hypertension, peripheral vascular disease, renal and endocrinal dysfunction [11]. Now a days, scholars from several places of the world raises their voices on the association of arsenicosis with cancer. The International Agency for Research on Cancer has classified arsenic in drinking water as a ''Group I'' human carcinogen [12]. According to many scientific report, the number of patients with arsenicosis is increasing day by day in several regions in the world. Different studies conducted in Taiwan, India and Argentina shows that malnutrition increases the risk of arsenic-induced diseases in humans [11]. So the clear knowledge about arsenicosis is now very important to us. The aim of this study was to assess the incidence and prevalence of chronic cutaneous Arsenicosis in OPD of Homna Health Complex, Homna, Bangladesh.

2. Objectives

a. **General objective:** To assess the incidence and prevalence of chronic cutaneous Arsenicosis in patients with skin diseases attended Homna Upazilla Health Complex, Homna, Bangladesh.
b. **Specific Objectives:** To assess the factors associated with chronic cutaneous Arsenicosis in Homna Upazilla, Bangladesh.

3. Methodology & Materials

It was a cross sectional study and was conducted in the OPD of Homna Upazilla Health Complex, Homna, Bangladesh during the period from January 2015 to December 2015. In total 7653 patients with several types of skin diseases and disorders attended the Outdoor Patients Department (OPD) of Homna Upazilla Health Complex; Homna, Bangladesh was the study population. In the selection process primarily among all the patients attended the Outdoor Patients Department (OPD) of Homna Upazilla Health Complex, Homna, Bangladesh, only those patients with several types of skin diseases and disorders with possibilities of arsenicosis were separated. This was 7659 in number. During study period because of poor documentation and irregularities primarily selected 6 participants among those 7659 were rejected. So the rest 7653 patients were finally selected as the total study population. All the skin lesions of the patients were examined and proper laboratory diagnosis was performed. The age range of the participants was 21 to 70 years. Written informed consent from the participants of subjects was taken before using the pro-forma and doing clinical examination and also before water collection. Water samples from most patient concentrated area of Homna Upazilla were collected and tested in a public health engineering dept. reputed laboratory. The tube well water for testing was collected randomly from crowded patient's area. According to the inclusion criteria only adult patient with skin diseases and with possibilities of chronic cutaneous Arsenicosis were included. On the other hand, Patients with arsenicosis for less than six months and the participants with uncompleted data were excluded from the study. For data collection and statistical analysis Microsoft Excel, Epi info version 7 as well as SPSS version 20 was used.

4. Result

Among total study people 54% were male and 46% ware female. So the male female ratio was 1.17:1 and male were dominating. During the first tenure (6 months) in total 7659 patients were attended the OPD of the health complex. After deducting 6 irregular patients finally we found 7653 patients who were the total study population of this study. Most of the study participants were among 41-50 years' age group which was 37.66%. This trend was followed by 28.68% from 31-40 years' age group, 14.62% from 21-30 years' age group, 11.03% from 51-60 years' age group and 8.01% from 61-70 years' age group. Among total study people 3808 were with several infective skin diseases. The patients with infective as well as non-infective (Mixed) skin disease were also included in this group. On the other hand, in non-infective patients group there were the patients with non-infective skin disease only and they were also free from arsenicosis. However, in this study we found the highest number of patients in infective skin disease group with scabies which was 17.26%. This trend was followed by 14.74 with tinea infections, 7.62% with pyoderma, 3.95% with Pityriasis versicolor, 1.66% with candidiasis. Other patients were with herpes zoster (1.16%), chicken pox (0.27%), herpes simplex (0.46%), warts (1.45%), hansen's disease (0.17%), TB skin (0.18%) and STD (0.84%).Besides these in our study, we found in total 3462 patients with only non-infective skin diseases. Among them the highest 1632 (17.26%) patients were fond with eczema only. This trend was followed by chronic bullous diseases in 5.75%, urticaria in 4.87%, acne vulgaris in 4.13%, vitiligo in 0.59%, melasma in 0.74%, psoriasis in 0.74%, lichen planus in 0.44%, alopecia in 0.59%, drug eruptions in 0.29%, collagen disease in 0.29%, photosensitivity in 0.15%, ichthyosis in 0.15% and naevoid disorders in 0.15% patients.In final outcome analysis we found, among all the total study population only 383 participants were with arsenicosis which was 5% (5.0046%). Besides this 49.76% were with several infective skin diseases and 45.24% were with non-infective skin diseases.

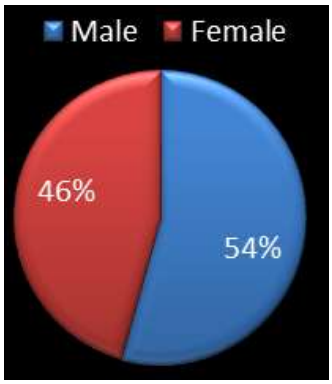

Fig 1: Gender distribution of the participants (N=7653)

Table 2: Age distribution of participants (N=7653)

Age Group	n	%
21-30	1119	14.62
31-40	2195	28.68
41-50	2882	37.66
51-60	844	11.03
61-70	613	8.01
Total	7653	100

Table 2: Distribution of infective skin diseases among the participants (N=3808)

Diseases	n	%
Scabies	1321	17.26
Tinea infection	1128	14.74
Pityriasis versicolor	302	3.95
Candidiasis	127	1.66
Pyoderma	583	7.62
Herpes zoster	89	1.16
Chicken pox	21	0.27
Herpes simplex	35	0.46
Warts	111	1.45
Hansen's disease	13	0.17
TB skin	14	0.18
STD	64	0.84
Total	3808	49.76

Table 3: Distribution of non-infective skin diseases among the participants (N=3462)

Diseases	n	%
Eczema	1632	17.26
Chronic bullous diseases	576	5.75
Urticaria	487	4.87
Acne vulgaris	385	4.13
Vitiligo	72	0.59
Melasma	71	0.74
Psoriasis	69	0.74
Lichen planus	51	0.44
Alopecia	39	0.59
Photosensitivity	18	0.15
Drug eruptions	17	0.29
Collagen disease	16	0.29
Ichthyosis	15	0.15
Naevoid disorders	14	0.15
Total	3462	36.14

Table 4: Final outcome (N=7653)

Diseases of patients	n	%
Infective skin disease	3808	49.76
Non-infective skin disease	3462	45.24
Arsenicosis	383	5.00

5. Discussion

In our study we found the prevalence of chronic cutaneous Arsenicosis is 5% among study population attended the Upazilla Health Complex of Homna of Bangladesh. It was similar to one[13] of the studies conducted in Bangladesh. The findings of the study were about similar to the findings of GuhaMazumdar DN *et al.* [14] a study of West Bengal. In some of the studies reported higher prevalence of arsenicosis than the present study or ours' [15, 16]. The causes of different findings in prevalence rate might be due to difference in the arsenic level in drinking water, genetic factors, geographic factors, and nutritional status of the study population and drinking water practices [17]. In the present study, we found, 95% cases were diagnosed as non-arsenic cases. Most of these conditions constitute differential diagnosis of non-cancerous arsenicosis skin lesions were measured according to World Health Organization (WHO). It is therefore important to identify whether a skin lesion is a confirmed manifestation of arsenicosis or it is a lesion, which only appears like arsenicosis, but belongs to a different condition [18]. In the locality of the study place maximum concentration of arsenic in water samples was 97µg/L, minimum concentration was 32 µg/L and the mean concentration was 68.68 µg/L (SD 17.67) which is above the WHO recommended level of 10 µg/L. The permissible level of arsenic in water is 50 ppb (Parts per billion) in Bangladesh according to experts [19]. Concentration of arsenic in drinking water is determined by both source of water and treatment of water before drinking [20]. However, no relevant study was found on treatment of drinking water and past drinking water practices in arsenic endemic area. The arsenic concentration of water samples found in the present study was similar to another study, the variations observed with other studies [20]. The difference observed in groundwater concentration of arsenic in the present study and other studies as well as drinking water practices (source, filtration) might be possible cause of different prevalence of arsenicosis observed in the present study [20]. Therefore, further studies are required to find out the factors influencing occurrence of arsenicosis in the study area. Age of the patients was also a considerable factor in our study. In our study among total study population highest number of patients were foundfrom 41-50 years age group which was 37.66% (n=2882) followed by 28.68% (n=2195) from 31-40 years' age group, 14.62% (n=1119) from 21-30 years' age group, 11.03% (n=844) from 51-60 years' age group and 8.01% (n=613) from 61-70 years' age group. The prevalence of arsenicosis was higher in the older/ middle age group (41-50 years' age group), while, in West Bengal, the prevalence of arsenicosis was high both in the middle age- and older age-groups, and, in Bangladesh, the proportion of arsenicosis was high in early and middle age-groups [22]. In our study, we found in total 3462 patients with only non-infective skin diseases. Among them the highest 1632 (17.26%) patients were found with eczema only. This trend was followed by chronic bullous diseases in 5.75%, urticaria in 4.87%, acne vulgaris in 4.13%, vitiligo in 0.59%, melasma in 0.74%, psoriasis in 0.74%, lichen planus in 0.44%, alopecia in 0.59%, drug eruptions in 0.29%, collagen disease in 0.29%, photosensitivity in 0.15%, ichthyosis in 0.15% and naevoid disorders in 0.15% patients. On the other hand, in many preceding studies in West Bengal [23] and Bangladesh [24], the current study discovered that manifestations in skin, such as melanosis and keratosis, were common among the arsenicosis patients. Melanosis was usually present on the chest or trunk, while keratosis on the palms and soles and leukomelanosis on the thighs. Regarding the extent of severity of arsenicosis, most cases were found at the mild and moderate stages [25], while in Bangladesh, severe arsenicosis was slightly higher compared to that in Nepal. In Bangladesh, complications, such as non-pitting pedal oedema, gangrene, and cancer, has been reported in different studies [25] but, in Nepal, no such complications have yet been reported.

Limitations of the study

This was a single centered study in a small area with a small sized sample. So the findings of this cross-sectional study may not reflect the exact scenario of the whole country.

6. Conclusion and Recommendations

In this study the prevalence of chronic cutaneous Arsenicosis was found 5% among total study population attended in the OPD of Homna Upazilla Health Complex of Bangladesh. These findings were similar to some other studies conducted elsewhere in the world, although in

various studies reported higher prevalence rate of arsenicosis. The arsenic concentration in the drinking water samples indicates presence of arsenic exposure of the study population through drinking water. To gain more clear concepts about chronic cutaneous Arsenicosis we would like to recommend for conducting more studies in several places with larger sample sizes.

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