Abstract

Two adult patients from a village of district Bhilwara, Rajasthan, consulted Skin Department of R. N. T. Medical College and Hospital, Udaipur, with complaints of thickening of the palms and soles and pigmentation of skin with a nonhealing ulcer on the palm. They also had complaints of loss of appetite, abdominal pain, nausea, vomiting, and loose motion. On examination, there were multiple 2–3 mm, keratotic papules on the palms, and soles on the background of diffuse keratoderma. Two irregular nonhealing ulcers were present on the hands which on excisional biopsy revealed squamous cell carcinoma. A generalized mottled pigmentation was present over the trunk and proximal parts of extremities. The clinical presentation was suggestive of arsenicosis. There was history of similar ailment in some of the fellow villagers as well. With the help of health authorities, a survey was conducted in the village and it was found that eight more villagers were suffering from similar kind of illness. The common source of arsenic was explored and found to be increased in drinking water that was taken out through hand pump. The level of arsenic in drinking water was significantly above the WHO safe limit for arsenic.

Key Words: Arsenicosis, hyperkeratosis, keratotic papules, mottled pigmentation, squamous cell carcinoma

Introduction

Arsenicosis, as defined by the WHO, is “a chronic health condition arising from prolonged ingestion of arsenic above the safe dose for at least 6 months, usually manifested by characteristic skin lesions of melanosis and keratosis, occurring alone or in combination, with or without the involvement of internal organs”. High concentration of arsenic is present in earth crust in certain parts of our country especially West Bengal and Sub-Gangetic plains. South Rajasthan is not a known endemic region for arsenicosis. We report two cases of chronic arsenic poisoning from a nonendemic village of south Rajasthan region. A survey of their village further revealed eight more cases suffering from similar illness.

Case Reports

Case 1

A 32-year-old female, farmer by occupation, reported to the dermatology department of a tertiary teaching hospital with complaints of hyperkeratotic lesions affecting both palms and soles for the last 16 years and a nonhealing ulcer on left palm for the last 1 year. In addition, she also complained of loss of appetite, abdominal pain, and loose motion off and on. Examination revealed multiple 2–3 mm, keratotic papules on the palms, and soles on the background of diffuse palmpoplantar keratoderma. An indurated, mildly tender 2 cm × 1 cm irregular ulcer with purulent discharge and unhealthy granulation tissue was present on the base of the middle finger of the right palm [Figure 1]. There was generalized mottled pigmentation present over the trunk and proximal parts of the extremities.

Case 2

A 40-year-old male laborer unrelated to Case 1 but hailing from the same village presented with similar kind of hyperkeratotic palmpoplantar lesions for the last 15 years and a nonhealing ulcer on the dorsum of right hand [Figure 2] and generalized mottled pigmentation for last 2 years [Figure 3]. There was a history of progressive weight loss.

A presumptive diagnosis of chronic arsenic toxicity was made in both the cases. Hematologic parameter revealed microcytic anemia (hemoglobin - 8.2 g/dl)

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and 10.6 g/dl in Cases 1 and 2, respectively). Other routine investigations such as urine, chest X-ray, and biochemical laboratory tests were within normal limits. Nerve conduction velocity in both the patients showed predominantly sensory-motor axonal type polyneuropathy affecting lower limbs more than upper limbs. Excisional biopsy of ulcerative lesions in both the patients was consistent with well-differentiated squamous cell carcinoma [Figure 4]. There was epidermal hyperplasia with full thickness keratinocyte atypia in addition to irregularly-shaped nests of keratinocytes within the dermis. Ultrasonography and computed tomography scan of the abdomen were normal in both the patients.

On getting information from these patients, a survey of their village was carried out by a team that included a dermatologist and local health authorities and a detailed clinical examination of the village population that comprised of around 3000 persons was done. Eight more cases with features similar to the reported cases were detected. The clinical details of these patients are summarized in Table 1.

An attempt was made to determine the source of arsenic in these patients. Samples of drinking water were obtained from their village and analyzed for arsenic levels. The samples of drinking water brought by the patients as well as those collected from the village hand pumps showed a significantly higher level of arsenic (40 µg/L). This was 4 times the safe upper limit of arsenic in drinking water as per the WHO and USEPA guideline of 10 µg/L.

**Discussion**

Arsenic contamination of groundwater has become a new public health hazard and a threat to mankind in the last two to three decades in different parts of the world. This has caused a large number of slow deaths. The groundwater may be contaminated naturally or by
intense exploitation of groundwater, use of fertilizers, burning of coal, and leaching of metals from various textile industries.\textsuperscript{[4,5]} Arsenic in deep tubewell water is mostly present in trivalent form, whereas in oxidative condition as in surface or in ground, it gets converted into pentavalent arsenate.

Wide areas of the Ganga–Meghna–Brahmaputra plain have been worst affected areas in India. Rajasthan, despite of water scarcity is included in the nonendemic zones.\textsuperscript{[6]} Bhilwara district is perennially water scarce with deep water level. This along with large number of textile industries located nearby could account for relatively higher arsenic levels in groundwater.

Clinical symptoms of arsenicosis take many years to develop. The two most important determining factors are the total dose of arsenic consumed per day and total duration of exposure. Symptoms of chronic poisoning are vague in the beginning and include loss of weight and appetite, decreased salivation, colicky pain, and irregular bowel habits. Cutaneous lesions are a consistent finding, characterized by thick, hard, rough hyperkeratotic skin especially of the palm and sole, diffused/mottled pigmentation (raindrop appearance) on covered areas mainly of the chest, back, and limbs.\textsuperscript{[7,8]} Pigmentation generally develops earlier than keratosis that usually precedes malignancy. In a study by Fiertz,\textsuperscript{[7]} hyperkeratosis had developed about 2.5 years following the ingestion of approximately 2.2 g of arsenite. Cutaneous malignancies developed after more than 20 years of exposure. The nails may become brittle showing white bands - Aldrich–Mees’ lines. In the later stage, liver and spleen may be enlarged, ascites may develop, and peripheral neuropathy may be seen. Sensory symptoms such as numbness and tingling predominate over motor manifestations such as weakness and atrophy of distal muscles and wrist and foot drop.

Since the signs and symptoms of this condition are vague and variable, these patients can present to multiple specialists and the diagnosis of arsenic keratosis is often missed. A high index of suspicion is required especially in nonendemic areas. The distinct cutaneous manifestations such as palmpoplantar keratosis and characteristic “raindrop pigmentation”, however enable the clinician to correctly diagnose the condition, even in nonendemic areas. Perennial scarcity of water in many parts of the country coupled with increasing migration of population from the areas endemic for arsenicosis increases the number of cases of chronic arsenicosis even in nonendemic areas. The cases seen by us highlighted that the dermatologist should be aware of cutaneous manifestation of chronic arsenicosis.

\textbf{Declaration of patient consent}

The authors certify that they have obtained all appropriate patient consent forms. In the form the
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Conflicts of interest
There are no conflicts of interest.

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