

# Chapter 5

## Arsenic and Cancer

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### ABSTRACT

*In the entire world, about 200 million people are exposed to arsenic poisoning in groundwater. In Bihar, India, about 50 million people are drinking arsenic contaminated water. Humans are exposed to elevated levels of inorganic arsenic mainly through the consumption of arsenic contaminated groundwater as drinking water and food crops are irrigated with high-arsenic water resources. This has caused various health-related problems in the population like skin diseases, anemia, bronchitis, gastrointestinal problems, hormonal imbalance and cancer. According to recent study, cancer risk is associated with daily consumption of 2 litres of water with inorganic arsenic 50 µg/L has been estimated to be 1/100 denotes that elevated blood arsenic levels in population can lead to cause various diseases including cancer. Skin and several types of internal cancers, including, bladder, kidney, liver, gall bladder, lung, uterus, and prostate, have been found associated with arsenic ingestion. This hospital-based study also correlates the cause of cancer due to arsenic contamination.*

### INTRODUCTION

#### Arsenic Global Scenario

Arsenic has caused various health related issues in the population worldwide. It is a naturally occurring metalloid present in air and water. Groundwater is the major source of human exposure. About 105 countries in the world have been identified where a population of > 200 million is estimated to be exposed to arsenic poisoning (IARC, 2004; WHO, 2008; Smith et al., 2000; Straif et al., 2009; Murcott, 2012; and Naujokas et al., 2013). However, arsenic concentration has been highest in La Pampa of Argentina as 5280 µg/l, the highest ever reported, 4730 µg/l in Bangladesh, 3590 µg/l in Taiwan, 3700 µg/l in South 24 Parganas of India, 2100 µg/l in Antofagasta o Chile, 1100 µg/l in Brazil respectively (Smedley et al., 2005; Chakraborti et al., 2015; Chiou et al., 2001; Chakraborti et al., 2009; Borgono

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et al., 1977; Armita and Segovia, 2008). Arsenic exposure causing black foot disease was for the first time coined in 1961 when there were serious health related issues in the population of southwest coast of Taiwan (Blackwell et al. 1961). In Chile, 90% population were exposed to arsenic by drinking high arsenic contaminated water in 1960's and 1970's (Byrne et al., 2010).

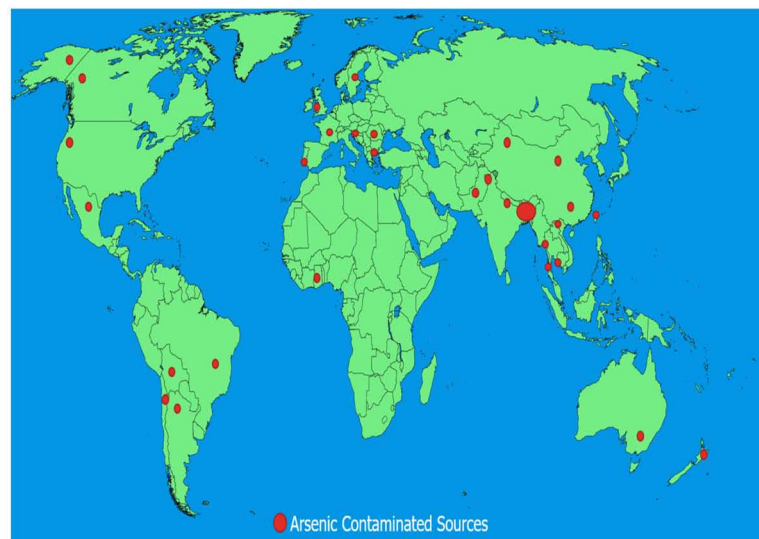
In Asia, after Bangladesh, India is second largest country affected from the arsenic poisoning. The most exposed populations of the countries are concentrated in Bangladesh, Cambodia, India, Nepal and Vietnam along with countries in Latin and North America, such as Argentina, Bolivia, Chile and Mexico and the USA (Figure 1). Various epidemiological studies in Taiwan, Bangladesh, Chile, India, Argentina and the USA demonstrated links between the arsenic exposure exceeding 10 µg/L in drinking water and increased all-cause mortality, linked not only to increased risk of lung, bladder and skin cancers, but also cardiovascular, neurological and respiratory diseases, and skin lesions (Ahsan et al., 2006; Argos et al., 2010; Argos et al., 2011; Argos et al., 2012; Chen et al., 2010; Chen and Ahsan, 2004; Haque et al., 2003; James et al., 2015; Wasserman et al., 2014; Yuan et al., 2010).

## **MAIN FOCUS**

### **Arsenic Indian Scenario**

In the Indian peninsular region, arsenic has caused severe health hazards in the population inhabiting Ganga- Meghna- Brahmaputra basin. Bangladesh and India are the most arsenic effected countries in this region. In India, West Bengal, Bihar, Uttar Pradesh and Assam are the most affected states. In the recent studies, it has been found that the Himalayan originated river plains are mostly affected from arsenic poisoning in the ground water in the Asian subcontinent. The entire Ganga- Meghna Bramhaputra (GMB) plains has high arsenic concentrations more than 10 µg/L in groundwater (Guillot and Charlet, 2007). Population residing in these plains are exposed to arsenic poisoning which has led to

*Figure 1. Showing Arsenic exposed population worldwide*



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