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Arsenic in Water Contamination & Toxic Effect on Human Health: Current Scenario of India

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Abstract

The levels of Arsenic contaminations in various water sources as ground, surface, tap water etc. Arsenic presence in drinking water, groundwater and river water and produce major toxicity in India and worldwide. The major sources of arsenic contamination may be natural, household, industrial, electronic waste, Fly ash deposition, sewages discharge as well as religious activities. The incidence of high concentrations of arsenic in drinking-water has developed toxicity as a major human health problem. With newer-affected sites exposed during the past time, a significant difference has been observed in the global situation of arsenic contamination, especially in India. Due to excess amount of Arsenic is present in drinking water, ground water, river water are present and people are effected from diseases like skin cancer, neurotoxicity, depression, ulcer and majorly found are person was dead. Various analytical methods have been recommended for further examination to deliver details to recognize the amount of arsenic in water, its impact, identify the risk aspects and probable to makes recommendation for the prevention and administration of arsenic poisoning cases and study of possibility of other heavy metals. This review paper are focus that the arsenic concentration growing day by day through various level of contamination. Arsenic effect directly and indirectly in human health it need to be considering carefully arsenic pollution problem in India.

Keywords: Arsenic; Toxic; Pollution; Contamination; Water; River; Ground water

Introduction

The quick development of modern industries, water pollution has become a worldwide serious problem that major risks to the environment and human health of uncontrolled dumping of waste material [1]. Toxicological studies conducted in 1980 shows pollution of the groundwater by arsenic above the permissible limit of 0.05 mg l-1. This was first noticed in around localized compartments in a few district of West Bengal (India) [2]. Presence of Arsenic considered as one of the hazardous elements in the environment and exposure of it causes serious health issues arise like cardiovascular, neurological, hematological, renal, and respiratory problems. Groundwater Arsenic pollution in East Gang River area known as global in current research's which causes many adverse effects not used as a drinking purpose. Contamination of arsenic in soil through polluted ground water through irrigation, which is uptake by several edible parts of plants and consequently moved in other food chain. Uttar Pradesh and Bihar located in the mid and upper Gangetic belt [3]. The main source of freshwater in several parts of the global for meeting the requirements of everyday purposes including agriculture is groundwater. The dependence on groundwater mains to around one-third of the global population for drinking purposes [4].

A large part of the world experiences a major pollution in water due to involvement of various toxic and minerals and heavy metals either naturally or unorganized growth of human development [5,6]. The Arsenic is one of the most important and fatal among these metals. The high concentrations of arsenic (As) in drinking water in inorganic form affecting skin, liver, lungs and other organs damages in several parts of the world [7]. Arsenic in water is developing as an major problem in the floodplains of the Ganga- Meghna-Brahmaputra (GMB). In India, many areas from West Bengal have been revealed to be affected whereas Bihar is a developing area with high Arsenic pollution [8]. Fresher areas are assumed to be Assam, Arunachal Pradesh, Bihar, Manipur, Meghalaya, Nagaland, Uttar Pradesh and Tripura. External of India within ganga- meghna-brahmaputra side, the south part of Bangladesh are longtime are affected from Arsenic just as in West Bengal. Several reports are shown Arsenic in Nepal Terai are also contamination [9]. This higher area, there are many villages that show very high concentration of Arsenic far above the WHO mentioned safety limit of 10 µg/l (micrograms/litre). The Indian safety standard for Arsenic is 50 µg/l which is adopted by several other countries partly due to the possible perceived magnitude of the problem otherwise. A

matter of possible surprise is that density of Arsenic present in soil is not much above that present in other regions of the world [10].

Major Sources of Contamination Arsenic in India

Natural Sources

In nature extreme stages of arsenic found by geographical occurrences similar volcanic eruptions, weathering of rocks, rivers overflow, lakes and oceans due to action of water [11]. naturally found the arsenic in the soil, sediments, rocks, water, groundwater, rivers are plains and delta has been tentatively identified to the origin from the Himalayan Mountains and the Shillong Plateau Adding, numerous found in geological resources for arsenic have been further found in India, which may have contributed to this large-scale pollution as primary or secondary origins:

a) The Gondwana coal layers in the Rajmahal site in east India arsenic is found (0.02%0).

b) Bihar mica site in eastern India (arsenic found from 0.08% to 0.12%).

c) Pyrite bearing shale from the Proterozoic Vindhyan range containing in central India (0.26% arsenic).

d) Son river site gold besin in eastern India having arsenic with average concentration of B2.8%.

e) Isolated outcrops of sulfides in the eastern Himalayas containing B0.8% arsenic.

Anthropogenic Sources

There is a lack of information on pollutant role through anthropogenic sources in India. Several high-temperature procedures, such as pyro metallurgical, nonferrous metal mining and manufacture, iron and steel production, and coal ignition release arsenic to the environment. The possible involvement of arsenic from procedure industries depends on various factors:

a) the mineralogical configuration of ore

b) physiochemical properties of related major and trace metals; like arsenic

c) manufacture technology and the efficiency of gas cleaning apparatus.

In accumulation, arsenic may be released to the hydrologic scheme from cement manufacture, burning of wastes, and chemical industries in India. High arsenic concentrations are informed in the mining areas of Rajasthan, in western India, specifically around the mining areas of Khetri Copper Complex and Zawar mines in Udaipur districts and Jhunjhunu districts, respectively. In the Bihar region, there are various open pit mines from where sulfide-bearing copper and lead ores are mined. Containing arsenic in trace amounts, which, if organized, may significantly polluted the groundwater sources. In accumulation, India is the third biggest solid coal manufacturer in the world; the coal mining area protected some 855 km2, and the total quantity of coal mines is 572 in 2004. The coal mines are also a potential source of arsenic discharge, and the average amount of arsenic concentration in Indian coal ranges up to 0.15– 40mg kg_1. India produces over 100 million tons of coal fly ashes and the major part is dumped in the close vicinity of the plant sites. Concern has been raised due to leaching of arsenic during coal washing, combustion, and ash. Fertilizers and various pesticides, insecticides, herbicides, and fungicides often contain high concentration of arsenic and their widespread use is known to cause considerable groundwater contamination especially in the agricultural states of India, as documented in Punjab, Andhra Pradesh, Haryana, Karnataka, Tamil Nadu, West Bengal, and Uttar Pradesh (UP) [12].

Power Generation Plants

A huge non-point source of arsenic pollution is coal-fired power generation, which can polluted water sources over aerial deposition of mercury emitted from boiler flues. The industry also generates large amounts of ash which itself contains heavy metals, including Major Arsenic [13].

Mineral Extraction

Mineral process actions can also products significant arsenic pollution, both from direct extraction processes (which typically entail size reduction - greatly increasing the surface area for mass transfer - and generate effluents) as well as through leaching from ore and tailings stockpiles [14].

Electronic Waste

Electronic goods production Companies must be legally ensured to mention the disposal procedure of their product in their user guidebook. As E-wastes are the identified major source of arsenic, dangerous chemicals and carcinogens, certainly diseases related to skin, respiratory, intestinal, immune, and endocrine and nervous systems including cancers can be prevented by proper administration and discarding of E-waste. With a view to bond the digital divide, there is exponential development in the use of Electrical and electronic equipment (EEE) and so there is disturbing effect on environment and human health when the ICT wastes are not disposed of scientifically [15].

Yamuna River

The Yamuna River and the nearby area has high spiritual importance. It is extremely unhealthy and calling for a right cure. The arsenic pollution in the Yamuna River originates from domestic, industrial, electronic waste and agricultural activities apart from a totally mishandled solid waste collection and discarding. Mass bathing in the Yamuna River, open defecation and discarding of dead animals also add to the difficult. The managing for the collection and discarding of the city's waste is neither effective nor scientific. The several efforts of the

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government have not improved the condition for many reasons and technical faults. The public is similarly answerable, for mainly because of ignorance, indiscipline and an unhygienic culture. The several plans for the regulator of Yamuna River's arsenic contamination are grouped into defensive and proactive methods. The defensive policies contain scientific collection, treatment and discarding of all the arsenic contaminated wastewaters creating in Mathura, industrial wastewater's organization within the industrial campuses, development in the existing agricultural practices through controlled use of chemical fertilizers, insecticides and pesticides, better solid waste organization strategies, construction of public services at major Ghats including alternatives for disposal of holy materials, and development of recreation parks and embankments, or retaining walls (serving as barrier between the town and the river).

Along the river banks as part of the foolproof pollution control strategy to prevent the flow of arsenic contaminated wastewater into the Yamuna river, legislative measures including the adoption of scientifically evolved effluent standards, and corruption free management of funds and a sincerely strict qualified supervision of constructional works. The pro-active strategies include creation of awareness and duty amongst the Indian masses and unconcerned public, maintaining enough flow in Yamuna specially during the lean periods, enforcement of the Yamuna river's self-purifying abilities through artificial and in-stream aeration, scientific exploitation of the river's waste assimilative capacity and creation of an artificial lake for storing the flood waters and later its release into the Yamuna river during the dry flow periods. Apart from adopting the various control strategies outlined in this paper, there is a sincere need to punish the polluters and defaulters through a system of fines with adequate bonus to the fine collectors to keep them duty bound and honest. Creation of public awareness on the suggested lines and keeping away from persons not qualified in environmental technology will also expedite the Yamuna River cleaning [16]. In dehli region are found Yamuna River are majorly found in arsenic in the Yamuna water and near area of Yamuna groundwater.in Allahabad region have many Ghats are contaminated arsenic in Yamuna river and Yamuna river are merged with ganga river and contamination water of Yamuna & ganga are majorly contaminated. It is very serious problem in our country. Many people are collected the holy water of sanagm (Ganga & Yamuna) but they are unknown about this holy water are contaminated with high concentration arsenic is found.

Ganga River

The Ganga river is the major in land river of India draining a catchment of about 8,61,404 Km2 and covers a long area about 2,525 Km from Gangotri to Bay of Bengal. Ganga river has various branches like Ramganga, Kali, Yamuna and Gomati around the central stretch from Haridwar to Varanasi. Amongst these branches Ramganga, Kali and Yamuna are loaded with huge quantity of heavy metals having major arsenic contaminants found in the water. There are numerous major cities such as Haridwar, Farrukhabad, Kannauj, Kanpur, Allahabad and Varanasi are situated close to the river side in the middle stretch and their waste waters directly discard into the river. According to CPCB's (2013) report from these cities about 2,723 million litres per day (MLD) of domestic sewage is discard into the holy river. The monitoring of river Ganga in between Rishikesh to Varanasi designated that the central stretch of river Ganga from Kannauj to Kanpur and Varanasi are the most contaminated area [17, 18].

Although the physical presence of river water is commonly good in quality previously it reaches the Ghatiya Ghat, Farrukhabad to Menhadi ghat (Kannauj) the water quality of river frequently decreases due to discard of around 500 MLD toxic wastes from domestic sewage and Kali and Ramganga rivers. Industrial wastes with organic and inorganic chemical constituents change the physical appearance of river water [19]. Heavy metals is a combined term, which relates to the collection of metals and metalloids with an atomic density larger than 4 g/ cm3, or 5 times or further, bigger than water [20]. Heavy-metal contamination is not a modern problem arising out of industrialization e it began when humans started processing ores [21, 22]. Since then the use of metals and their impacts on the environment have accelerated, with a major increase during the 19th and 20th centuries [23]. Generally, most of the heavy metals enter the in river from different sources, it be can be either natural by erosion and weathering and or anthropogenic [20, 24]. The Ganga river water is not suitable for drinking purpose and its basic requirement to be treating to reduce the pollutions specific heavy metals. Heavy metals extraction is a serious problem as well as very costly. Heavy metals in water causes many serious

Biochemical problems in human health [25].

Toxic Health Effect on Human

Arsenic toxicity also presents a disorder, which is related to, and often confused with Guillain-Barre syndrome, an anti-immune syndrome that happens when the body's immune system falsely attacks part of the PNS, resulting in nerve inflammation that causes muscle weakness. Arsenic is one of the most important heavy metals causing disquiet from both ecological and individual health stand points. The property of Arsenic is metallic, and is obviously toxic and carcinogenic, and is widely available in the form of oxides or sulfides or as a salt of iron, sodium, calcium, copper, etc. Twentieth most abundant element are found in nature its arsenic on earth and its inorganic forms such as arsenite and arsenate complexes are lethal to the environment and existing creatures. Encounter of arsenic in human natural means, industrial source, or from unintended sources. Deliberate consumption of arsenic in case of suicidal attempts or accidental consumption by children may also result in cases of acute poisoning.

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Arsenic is a proto plastic poison since it affects primarily the sulphydryl group of cells causing malfunctioning of cell respiration, cell enzymes and mitosis [14]. Human health effect of arsenic toxicity occurs due to ingestion of as having powders or solutions accidentally, suicide, homicide, or ingestion of polluted food or drinking water. Arsenic has been resulted to be related with hypertension and serious influences on the cardiovascular system, and even hepatic harmful in the excessive amount taken [26, 27]. An exploitive result release on spermatogenesis and gonadotrophin and testosterone in human [28]. There is association among arsenic exposure and diabetes mellitus (type II) [29]. Chronic arsenic harmful effects on skin like: hyperkeratosis, hyperpigmentation and hypopigmentation; periorbital swelling; the frequency of impulsive abortion and if high quantity was taken arsenic are damage to the nervous system [30]. Arsenic are recognized as causes of developmental neurotoxicity. The major impact of arsenic is on the peoples who were directly in exposure of industries, water [31].

Discussion

These Review paper studies show that India many regions ground water and river water are contaminated with the high amount of arsenic pollutants. Their quantities are far above the permissible levels according to national guidelines of drinking water and WHO, USEPA standards. India two main holy river (Ganga, Yamuna) are major contamination with arsenic pollution Ganga river water quality is not fit for daily use purpose such as drinking, bathing and Aquatic Environment. The Arsenic Toxic of waste in contained in water, Ground water, River make them a big risk to human health. Signs of acute & chronic toxicity of arsenic. Severe nausea and vomiting, colicky stomach pain, and diarrhea. Vessel injury leads to general vasodilation, transudation of plasma, and vasagenice tremor. Drowsiness and misunderstanding are frequently seen along with the growth of a psychosis related with paranoid delusions, illusions, and hallucination. Finally, annexations, coma, and death, usually due to shock, may ensue.

Conclusion

The present review work has been done considering the increasing pollution of arsenic in water bodies. Contamination between water bodies is a major worldwide problem. The toxicologist has frequently detected the arsenic concentration in many water bodies. Human health is directly affected by the intake of polluted water, fish, etc. Earlier studies have shown exceeded arsenic limit which shows that drinking water is not suitable for intake whereas somewhere it is below the permissible limit. Which contaminates water, sediment and aquatic life such as fish major human health. There is a need to maintain control on disposal of industrial waste in water bodies and to bio-monitor the arsenic in the water. It is recommended that awareness should be spread among the people regarding the hazards on consumption of polluted water.

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