



Drinking water contamination by heavy metals in different cities of Pakistan

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Abstract

The most important concern in developing countries like Pakistan is the contamination of groundwater because of the heavy metals from industrial waste which are affecting the ecosystem and public health. Some heavy metals such as Arsenic (As), Chromium (Cr), Nickel (Ni), Copper (Cu), Iron (Fe), Lead (Pb) and Zinc (Zn) are mostly reported in different cities of Pakistan and their concentrations are also to be found above the permissible levels of WHO. For domestic purposes and irrigation, groundwater is the main source in Pakistan. Its quality is getting poor because of the untreated discharge from industries. In the country, water-borne diseases are spreading quickly because of the use of unfiltered environmentally contaminated water as well as a lack of awareness of environmental laws.

Keywords: Contamination; Drinking water; Heavy metals; Pakistan.

1. Introduction

In Pakistan, resultant harmful outcomes have been recorded of industrial waste dumping in water bodies as well as on open land. Industrial development, economic growth and development have overtaken the safety of the environment, same as other developing countries. In industrial areas, the groundwater across the country has become severely contaminated which has been discharged extensively deprived of any monitoring system by industrial effluents, wastes and emissions (Samina et al., 2004). A lot of industrial wastes which remain untreated is a major problem that is continuously occurring in Pakistan. The solid waste of industry is mostly sent out into open puts down or land makes full. to do with industry effluents are normally sent out into near small stretches of water, low placed on fields, of (to do with) the town drains for waste, Some major draining sources such as small rivers, at the end of the sea of Karachi. There are many cases of attention are present as less disposal of deadly poison wastes and these are thrown on land and into water systems freely and some of these are experienced at the person and between nations level because of, in relation to the seriousness of the hazards caused to the general condition specially, the top and not deep land-water conditions (S. Khan et al., 2002). The major sources of heavy metal pollution are industrial effluents (untreated). Heavy metals are referred to those metallic chemical components that have toxic or poisonous and have relatively high density, at low concentration. Examples of heavy metals are Lead, Chromium, Cadmium, Arsenic and Mercury.

Heavy metals are present as natural components of Earth's crust. These couldn't decompose or destroyed. Up to a small extent, which enter in our bodies through breathing, up to the taking of food and drinking of water (Azeem, 2009). Till higher concentrations can be accumulated by polluted water and/or soil some heavy metals accumulate in plants and then enter into the food chain (Roy & Ghosh, 2018). As a result of human activities of anthropogenic the heavy metals naturally occur in the environment. Because of and physical processes which are going on through geographic regions, the concentrations of heavy metals are increasing in our environment. And they are migrating toward underground water and can be significantly varied. The analysis of heavy metal chemical ions in the environment is really highly important particularly in wastewaters (Murray et al., 2006). Because of toxicity, long residence time, irreversible nature accumulation in food and non-biodegradability, chain the existence of heavy metal postures a serious problem on surface soil (Markus & McBratney, 1996). Pollution of the urban soil with these heavy metals at regional global as well as the local levels has been acknowledged as a foremost concern (Qadir et al., 2008) because of human health implications (Alloway, 1990; De Kimpe & Morel, 2000). Surface and groundwater contamination taken up by plants is caused by heavy metals and in the form of gases, it is released in the atmosphere and combined permanently with soil components in the form of organic matter and clay particles which affect human health after a particular time (Krishna & Govil, 2007). In these kinds of industries, the raw materials that have been used and engineering strategies are also concerned, and industrial development has an inescapable effect on air, water and land-based pollution (Manahan, 2017). Unfortunately, it's the key to modernization, but it is leading us to variability in chemical, biological and physical, properties of the environment (Resh, 2007). Many precautionary measures should be taken to reduce industrial pollution so that it may be less harmful to the environment.

On the part of all industries, there is widespread reluctance in developing countries as it requires expensive methods for the treatment of pollutants of industrial wastes. For every human as well as animal or in natural streams diverse industries had been built in Pakistan our

water bodies are receiving which ends up in the unexpected discharge of untreated effluents which can be being used by down-motion clients (Caso, 2010). Specifically, near the larger cities in Pakistan such as Faisalabad, the cities located near the rivers, partially are also used for agriculture and then throw their wastes directly into the rivers (Ghafoor et al., 1994). From various industries, the effluents are discharged and are a potential threat to underground water contamination and the changeable properties are also present. With each industry, the wastewater treatment plants must be established and that is a recommendation. In the surrounding area for inhabitants of the estate, it must be undertaken for the environment with respect to the potential threat of industrial effluents, social awareness program and efficient environmental laws (Rehman et al., 2008; Tariq et al., 2006).

In this review article, the contamination of drinking water in different cities of Pakistan has been viewed and water contamination sources also discussed. The impacts of unhygienic water also seen on the people living in different cities of Pakistan. This study is very helpful to control the lethal diseases emerging from contaminated water which may affect the lives of Pakistani people.

2. Health impacts due to heavy metals

Metals reach people and the environment through environmental booths and the pathways, and human health and the effect of heavy metals on the environment depend upon the movement of each steel (R. Khan et al., 2005). In Pakistan, by the variety of research pollution popularity by heavy Metals is taken as a major concern. The pollution created by heavy metals in veggies, soil, particulate matter, water and sediments are the main concern of researches (Pillay et al., 2003).

2.1. Arsenic (As)

The compounds (inorganic) of arsenic are carcinogenic to human beings and are labeled as organization 1, it stays a sizeable human fitness challenge, it is poisonous and by using international enterprise for research on cancer organic compounds like mono and di-methyl arsenic acids are probably cancer-causing for human health and are categorized with institution 2b (Field & Withers, 2012). Arsenic increases several hazards for developing some of the cancers mostly involved lung, bladder, kidney, colon, pores, skin and liver cancer (Çöl et al., 1999; Morales et al., 2000). The arsenic solid sum was found high in best and land-water in Pakistan for the most part in 2 nation divisions, which is, Sindh and Punjab resources of water (3%, 16%) as it has unclean, ailing level of things, which is exceeding up to 50g/l. This is independently exhibited in Sindh as well as in Punjab while 20% of Punjab and 36% of Sindh water assets are made unclean, infected by As over 10g/l (Ahmad et al., 2004; Saqib et al., 2013). As there is less availability of facilities for investigation of low concentrations, the developing nations in which arsenicosis is greater, are nevertheless the usage of the previous guideline value (50µg/l), but in keeping with WHO, in advanced countries, the allowable concentration of As in drinking water is 10µg/l (Edition, 2011).

2.2. Cadmium (Cd)

From a toxicity point of view Cadmium (Cd) is an element of great concern. Due to its exposure, the health of living things can be affected in chronic or acute forms. Naturally, it is found in the crust of the earth as well as in the water of the ocean. It is cancer-causing to human health. ARC (International Agency for Research on Cancer) is classified as Group 1. Positive relations of Cd and its compounds have been observed in cancer-causing in kidneys and lungs [19]. Some samples of groundwater are collected from different areas of Pakistan, the perceived concentration of Cd fluctuated from 0.001 - 0.21 mg/L (Lone et al., 2003; Manzoor et al., 2006). The major notable assessment for 0.21 mg/L were collected from tube well water coming from Hayatabad Industries Estate, (KPK) territory with standard of 0.02 mg/L (Manzoor et al., 2006). Various investigations demonstrated the far-reaching Cd conveyance in squander water tests gathered from different locales of Pakistan. The most noteworthy grouping of 5.35mg/L Cd in squander water announced from Korangi region, Karachi (Amin et al., 2014), exceeded the reasonable furthest reaches of 0.10 mg/L as NEQS-PAK set this amount for sewage water (Waseem et al., 2014).

2.3. Lead (Pb)

Lead (Pb) is mostly present in children and adults can be the reason for a colossal series of wellness inconveniences, beginning from slight consequences for ingestion and information of seizures, trance like state, renal disappointment and destruction (Papanikolaou et al., 2005) as per worldwide organization for examines on tumor evaluation, Pb inorganic mixtures are probably cancer-causing to social order, lead mixes which exist naturally are not classifiable because of their cancer-causing in society (Boffetta, 2006). The renditions inside the Pb fixation at a couple of components might be because of guests load, block furnaces and utilization of leaded fuel (Faiz et al., 2009). These days, the consideration of Pb inside the city air of Islamabad diminished in most recent years in light of the utilization of Pb-free fuel, in spite of the way that the Pb content keeps on being at an intemperate level, beginning from 0.002 to 4.7 µg/m³ (Manzoor et al., 2006; Shah et al., 2004).

2.4. Nickel (Ni)

Nickel is roughly dispensed in the environment and can be seen through individuals, blossoms and soil; the amount of Nickel in the soil is about the possibility of four-eight-ppm (Field & Withers, 2012; Peter & Viraraghavan, 2005). With regards to overall boss for contemplates on most growths appraisal, Ni mixes are the reason of cancer to individuals and are sorted as foundation 1. Mixtures of Ni, metal as well as mixes reason growths of the lung, empty space of nasal cavity and paranasal sinuses (Field & Withers, 2012). Inside cutting edge assessment, the consideration of Ni in particulate be checked ended up revealed inside the scope of zero.001-zero.15µg/m³ and the best of its substance move toward becoming specified in the urban condition of Islamabad (Shah & Shaheen, 2007).

2.5. Copper (Cu)

Copper(Cu) constantly found in the liver of living things, that show as the primary people for the introduction of copper through diet (Kabata-Pendias, 2011; Uauy et al., 1998). Cu can cause an infection like reduction inside the chemicals like, lysyl oxidase, dopamine oxidase, superoxide oxidase cytochrome oxidase and various distinctive oxidases which reduces sub-atomic oxygen.

2.6. Chromium (Cr)

Chromium (Cr) is a pivotal detail specifically in metallurgical/metallic or shade undertaking. Every one of its oxidation printed material (+3 and +6) in the compound are utilized by and large in shades, metal finishing and wood additives (Trumbo et al., 2001). The harmful type of Cr having oxidation state +6 as (Cr⁺⁶), and then it causes for most growths of the lung and positive affiliations have moreover found between exposure to Cr⁺⁶ mixes as for most diseases of the nostril and nasal sinuses. Iarc sorted Cr⁺⁶ mixes for gathering 1 as they're cancer-causing to people (Field & Withers, 2012).

2.7. Iron (Fe)

Iron is a necessary component of the human body for digestion that goes about an impetus and it is found in more noteworthy sum than some other follow detail. Press (Fe) works as a part of various proteins, comprising catalysts and hemoglobin. The Rda for every male and woman is 8mg per day and in the middle of the road higher admission arrange for grown-ups is forty-five mg per day of iron, which depends on digestive tract wretchedness as a negative effect (Kabata-Pendias, 2011).

2.8. Zinc (Zn)

Zinc(Zn) is indispensable micronutrient it also uses as a catalyst for reactions in leisure activity, in addition to protein shape it also controls quality articulation (Kabata-Pendias, 2011). In spite of the way that results of Zinc lack has analyzed for various years anyway this is harmful while use in surpass physiological requirements (Solomons & Ruz, 1998). These horrible outcomes related to endless utilization of additional Zn envelop intense gastrointestinal outcomes and migraines, debilitated safe component, variations in lipoprotein as well as the level of cholesterol, reduced copper notoriety (Meyers et al., 2006).

3. Conclusion

Drinking water contamination is a big problem all over the world. Anthropogenic activities are the reason for water pollution due to releasing toxic metals into the environment. Many lethal issues have been also observed in Pakistan by using contaminated drinking water for domestic purposes. The river and underground water are also used for crop cultivation purposes in Pakistan that is much contaminated from different industrial waste. The crops absorb such toxic and carcinogen substances from contaminated water, on eating these crops by humans as well as animals causing different health diseases in Pakistan. Many precautionary measures should be taken to reduce industrial pollution so that it may be less harmful to the environment. The environment protection laws and principles should be followed by government and non-government industries before the discharge of their waste into the environment.

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