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Chapter 15

Review of heavy metals contamination in groundwater in India and their effects on human health

Revisión de la contaminación por metales pesados en las aguas subterráneas en la India y su impacto en la salud humana

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ABSTRACT

Heavy metal is present in various states of India in industrial, agricultural work, wastewater, and natural water. Water is getting highly polluted for some years and it is having a bad effect on people. It can cause various types of disorders and can result in excessive damage. It causes genetic disorders, neurotoxic disorders, kidneys, skin, and cancer. Toxic heavy metals are regularly released into the aquatic environment in India as industries continue to grow. This is a major issue of contamination of groundwater through heavy metals over time. Water is a very useful source for all, which is essential for all aspects of survival and for human health. Groundwater is the level of contamination of heavy metals in water, such as As, Cu, Cd, Ir, Pb, Zn, As, Cr, and Ni. This review study addresses the presence of heavy metals in groundwater in India and their health effects on human life.

KEYWORDS: Groundwater, heavy metals contamination, human health effects, and India.

RESUMEN

El metal pesado está presente en trabajos industriales, agrícolas, aguas residuales y agua natural en varios estados de la India. El agua se está contaminando mucho desde hace unos años y está teniendo un efecto negativo en la gente. Puede causar una variedad de trastornos y dar como resultado un daño excesivo. Provoca trastornos genéticos, neurotóxicos, renales, cutáneos y cáncer. A medida que las industrias continúan desarrollándose, los metales pesados tóxicos se liberan regularmente al medio ambiente acuático. Este es un problema importante de contaminación de las aguas subterráneas a través de metales pesados a lo largo del tiempo. El agua es una fuente muy útil para todos, esencial para todos los aspectos de la supervivencia y la

salud humana. El agua subterránea es el nivel de contaminación de metales pesados en el agua, como As, Cu, Cd, Ir, Pb, Zn, As, Cr y Ni. Este estudio de revisión aborda la presencia de metales pesados en las aguas subterráneas de la India y sus efectos sobre la salud en la vida humana.

PALABRAS CLAVE: Agua subterránea, contaminación por metales pesados, impacto en la salud humana e India.

INTRODUCTION

Heavy metals designate a group of elements found in the natural system in minimal concentrations and when present in sufficient quantities and are toxic to living organisms. The behavior of trace metals in groundwater is complicated and is related to the source of the group water and the biogeochemical process under elementary conditions (WHO. 1993). Some metals are essential for the normal functioning of the human body, while others are not essential (Shivashankaran, M. A. 1997). Most metals are important for the growth, development, and health of living organisms (Duan, A., & Kofi, D. 1993). However, the quantity and quality of groundwater change due to human intervention (Gehrels, H. (ed.). 2001). Endangering the suitability of the groundwater system as a source of drinking water and degrading nature conservation areas. Assessing the impacts on the aquifer system and predicting the magnitude of future changes is therefore a major scientific challenge (Tang, Z., et al., 2005). Groundwater is used for industrial purposes, agricultural, and domestic, in most parts of the world. Human activities such as agriculture and households release a large number of pollutants into the aquatic environment. In India, ponds, rivers, and groundwater are used for domestic and agricultural purposes (Kamble, P. N., et al., 2011). The main sources of water are precipitation, surface water with rivers, lakes, groundwater with wells, boreholes, etc. In recent years, growth in the industry, technology, population, and water consumption has increased pressure on our land and water resources. Locally, groundwater quality has deteriorated. Municipal and industrial waste, chemical fertilizers, herbicides, and pesticides entered the ground, and some aquifers have infiltrated and demolished the quality of the groundwater. Other pollution problems are sewer losses and the defective effect of the septic pit and land holes. In some coastal areas, the intensive pumps of fresh groundwater have ensured that the salt has invaded the water in freshwater draga. As the urbanization process continues, the problems with water pollution have become increasingly clear and led to serious ecological and environmental problems. Industrial production without sufficient attention to environmental effects has increased water and atmospheric pollution and has led to the breaking of the soil and large-scale global effects such as acid rain, global warming, and the exhaustion of the ozone. All metabolic and physiological activities and life processes of aquatic organisms are generally influenced by water temperature (Shah, D. G., & Patel, P. S., 2011). Groundwater supply sources are largely dependent on rainfall and the resulting water infiltration into the ground. Another important factor is the quality of the soil. Heavy metals play an important role in the normal functioning of the human body. The imbalance of one of the heavy elements will disrupt the normal functioning of the human being. Heavy metals are added to the water system from both natural and artificial sources (Jameel, A. A., et al., 2012). Heavy

metals in water refer to heavy, dense metallic elements that are found in trace amounts but are very toxic and tend to build up, which is why they are commonly referred to as trace metals. The main anthropogenic sources of heavy metals are industrial wastes from mining sites, metal manufacturing and refining plants, as well as domestic and street runoff. Many of these trace metals are highly toxic to humans, such as Mn, Ni, As, Sn. Cd, Pb, As, and Hg. Their presence in surface and groundwater at concentrations above the background is undesirable. Some heavy metals such as Mn, Ni, As, Sn, Cd, Pb, As, Hg, etc. have been identified as harmful to the aquatic ecosystem and human health (Jameel, A. A., et al., 2012). Humans have evolved in the presence of metals and are adapted to varying levels of essential and non-essential metals. Metals from dietary intake and environmental exposure eventually reach their target organs (brain, liver, and kidneys). The fate of the metal inside the body is determined by its ability to alter these systems. Excess metals in the body are excreted through urine and feces or accumulated in various tissues. At higher concentrations, metals become toxic. The most important environmental problem today is groundwater pollution (Vodela J. K., et al., 2001).

Sources of Heavy Metal Pollution

Table: 1 Sources of heavy metals in the environment (Central Water Commission. 2019).

Pollutant	Major sources
Lead	Automobile emissions, lead smelters, burning of coal and oil, lead arsenate pesticides, smoking, mining, and plumbing.
Mercury	Mining and refining of mercury, organic mercurial's used in pesticides, laboratories using mercury.
Copper	The iron and steel industry, fertilizer industry, burning of wood, discharge of mine tailings, disposal of fly ash, and disposal of municipal and industrial wastes are the sources of copper in the atmosphere.
Zinc	Zinc refineries, galvanizing processes, brass manufacture, metal plating, plumbing.
Chromium	Chemical industry, and Metallurgical processes using chromate compounds, cement, and asbestos units.
Cadmium	Cadmium producing industries, electroplating, welding. Byproducts from the refining of Pb, Zn, and Cu, fertilizer industry, pesticide manufacturers, cadmium–nickel batteries, and nuclear fission plants.
Arsenic	Arsenic containing fungicides, pesticides, and herbicides, metal smelters, byproducts of mining activities, chemical wastes.
Iron	Cast Iron, Wrought Iron, steel, alloys, construction, transportation, machine manufacturing.
Nickel	Metallurgical industries using nickel, combustion of fuels containing nickel additives, burning of coal and oil, electroplating units using nickel salts incineration of nickel-containing substances.

The main sources of heavy metal pollution are the mining, milling, electroplating, and surface finishing industries which discharge a variety of toxic metals such as Cr, Cu, Cd, Ni, Co, Zn, and Pb into the environment.

The concentration of these heavy metals in river water and sediments has increased rapidly in recent decades. As a result, the concentrations of toxic metals in cereals and vegetables grown on contaminated soils have increased alarmingly. This poses a serious threat to humans and the environment due to its toxicity, non-biodegradability, and bioaccumulation (Central Water Commission. 2019, Bahadir, T., et al., 2007, Pérez-Marín, 2008, & Reddad , Z., et al., 2003).

The following list displays the several human activities that are done which heavy metals get into the water & environment.

1. Natural resources

In nature, the extreme stages of heavy metals are found through the physical condition of resistance to rocks, volcanic eruptions, and leaching in rivers, lakes, and aquifers due to water hammers (Bagul, V. R., et al., 2015). The earth's layer is produced by volcanoes and evaporation. Various heavy metals are found in natural water. Mining around the world the metal leads to direct and indirect waste in the water (Honglei, L., et al., 2008).

2. Anthropogenic sources

Minor quantities of heavy metals are released while mining and wild producing bulky amounts of metal, and ores in open fires. With the industrial uprising, metals were mined from natural sources and treated in the industries from where heavy metals conceded into the water. Likewise, traces of heavy metals get into the environment over the release of waste - both domestic, agricultural, and from auto drains (Armah F. A., et al., 2014).

3. Mining activities

Heavy metals are found in the physical background of the earth and therefore are found in natural water sources. An example of the contamination of mining operations by heavy rain or liquid water can leach heavy metals from the physical background. Such procedures are enhanced when this physical property is disrupted by commercial actions such as mining. These processes represent mine waste giving water to water and can lead to uses such as acid mine drainage (Sankhla, M. S., et al., 2016). Mineral Extraction Mineral extraction processes can also generate larger heavy metal contaminants, both through removal processes (which of course involve size reduction - significantly accumulating external mass range transfer - and produce waste through the leaching of ore and tailings accumulations (Sankhla, M. S., et al., 2016).

4. Electronic waste

Industrial electronic properties companies are legitimately guaranteed the procedures offered by their product in their user manual. Recognized important toxicity produced by electronic waste and by the main source of heavy metals, dangerous connections, and carcinogenic agents, diseases connected to intestinal snc,

immune, skin, breathing and endocrine, and tumors they contain. To the estimate of the Association, the digital distribution, there is an exponential growth in the use of the electrical and electronic devices, therefore there is a disturbing effect on people and the environment when IT waste is not systematically thrown away (Sankhla, M. S., et al., et al. 2016).

5. Sanitary Landfills

The metal contents and average concentrations of sanitary-landfill leachates are Cu (5 ppm), Zn (50 ppm), Pb (0.3 ppm), and Hg (60 ppb) (Central Water Commission. 2019).

6. Agricultural Runoff

The metal content of agricultural runoff originates in sediments and soils saturated by animal and plant residues, fertilizers, specific herbicides and fungicides, and the use of sewage and sludge as plant nutrients (Central Water Commission. 2019).

7. Waste water from domestic wastewater

Household wastewater contains large amounts of traces of metals from metabolic waste products, corrosion of water pipes - copper (Cu), lead (Pb), zinc (Zn), and cadmium (Cd) and household products, such as detergents - iron (Fe), manganese (Mn), chromium (Cr), nickel (Ni), cobalt (Co), zinc (Zn) and arsenic (As). Wastewater treatment usually removes less than 50% of the metal content of the tributary, leaving the effluent with a significant metal load. Sludge released during wastewater treatment is also rich in metals. Domestic wastewater and domestic and industrial sludge landfills are the main man-made sources of cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), and mercury (Hg) pollution (Central Waters Commission. 2019).

8. Stormwater Runoff

Stormwater runoff from urbanized areas is a significant source of metal pollution in the receiving water streams. The metal composition of urban runoff water is dependent on many factors, such as city planning, traffic, road construction, land use, and the physical characteristics and climatology of the watershed (Central Water Commission. 2019).

9. Industrial Wastes and Discharges

In general, the concentration of heavy metals in industrial effluents is much higher than the permissible limits prescribed in aqueous solutions, which makes it urgent to treat effluents containing metals before their discharge into the aquatic environment. Metals and their concentrations in industrial wastes depend specifically on the profile of each industry (Central Water Commission. 2019).

Name of the States/Districts from where chemical constituents in groundwater beyond BIS Norms have been reported

Table: 2 Heavy metal-contaminated sites in India (MEFCC & CGWB).

S. No.	State/UT	Arsenic (above 0.05 mg/l)	Iron (above 1.0mg/l)	Lead (above 0.01 mg/l)	Cadmium (above 0.003 mg/l)	Chromium (above 0.05 mg/l)
1	Andhra Pradesh		Vishakhapatnam , Krishna, Guntur, Nellore, Kurnool, Chittoor, Cuddapah			
2	Telangana		Nizamabad, Ranga Reddy, Nalgonda, Karimnagar, Medak, Hyderabad, Adilabad, Mahabubnagar	Rangareddy, Nalgonda	Rangareddy	Rangareddy
3	Assam	Sivsagar, Jorhat, Golaghat, Sonitpur, Lakhimpur, Dhemaji, Hailakandi, arimganj, Cachar, Barpeta, Bongaigaon, Goalpara, Dhubri, Nalbari, Nagaon, Morigaon, Darrang&Baksha	Kokrajhar, Lakhimpur, Nalbari, Sibsagar, Darrang, Hailakandi, KarbiAnglong, Dhemaji, Dhubri, Goalpara, Jorhat, Kamrup, Golaghat, Karimganj, Cachar, Morigaon, Nagaon, Sonitpur			
4	Bihar	Vaishali, Begusarai, Samastipur, Katihar, Lakhisarai, Bhojpur, Purnea, Darbhanga, Kishanganj, Bhagalpur, Saran, Khagaria, Buxar, Patna, Munger	West Champaran, Samastipur, Aurangabad, Kishanganj, Saharsa, Muzaffarpur, Siwan, East Champaran, Buxar, Nawada, Gopalganj, Bhojpur, Supaul, Madhepura, Lakhiserai, Rohtas, Khagaria, Begusarai, Katihar			
5	Chhattisgarh	Rajnandgaon	Kanker, Bastar, Koriya, Dantewada	Korba	Korba	Korba
6	Delhi			West and South-west	Southwest	Northwest, South, New

				districts, Along Najafgarh drain in North		Delhi, East
7	Goa		North Goa, South Goa			
8	Gujarat		Kachchh, Ahmedabad, Mehesana, Banaskantha, Narmada, Bhavnagar			
9	Haryana	Ambala, Fatehabad, Karnal, Sonepat, Bhiwani, Hissar, Panipat, Yamunanagar, Faridabad, Jhajjar, Rohtak, Jind, Sirsa	Ambala, Fatehabad, Karnal, Sonipat, Bhiwani, Hissar, Panipat, Yamunanagar, Mahendargarh, Faridabad, Jhajjar, Rohtak, Jind, Sirsa, Gurgaon, Kaithal, Kurukshetra	Ambala, Fatehabad, Karnal, Sonipat, Bhiwani, Hissar, Panipat, Mahendargarh, Faridabad, Jhajjar, Rohtak, Jind, Sirsa, Gurgaon, Kaithal, Rewari, Panchkula	Jind, Bhiwani, Rohtak, Gurgaon, Kaithal, Jhajjar, Rewari,	Fatehabad
10	Jammu & Kashmir		Srinagar, Kathua, Baramulla, Pulwama, Budgam, Kupwara	Jammu (Gangyal), Bari Brahma, Kathua	Kathua	
11	Jharkhand	Sahebganj	West Singhbhum, Ranchi, Chatra, Giridih, East Singhbhum, Deoghar	Jamshedpur		
12	Karnataka	Raichur and Yadgir district	Bellary, Tumkur, Kodagu, Uttar Kannada, Mysore, Bagalkot, Chikmagalur,			

			Bijapur, Kolar, Gulburga, Shimoga, Dakshina Kannada, Bangalore, Udupi, Koppal, Belgaum, Haveri, Raichur, Davanagere, Hassan, Bidar, Chitradurga			
13	Kerala		Kasaragod, Thrissur, Alappuzha, Kannur, Wayanad, Quilon, Idukki, Kollam, Palakkad, Thiruvananthapuram, Pathanamthitta, Kozhikode, Malappuram, Ernakulam, Kottayam	Ernakulam , Kollam Chromium: Kollam		Kollam
14	Madhya Pradesh		Panna, Sagar, East Nimar, Sidhi, Balaghat, Neemuch, Satna, Jhabua, Damoh, Guna, Chhindwara, Sehore, Raisen, Khandwa, Barwani, Narsinghpur, Rajgarh, Umaria, Seoni, Daria, Chhatarpur, Gwalior, Betul, Ratlam, Shahdol, Mandsaur, Ujjain, Dewas, Katni, Hoshangabad, Jabalpur, Dhar, Bhind, Shajapur, Indore, Rewa, Mandla, Vidisha, Tikamgarh, Shivpuri, Bhopal, Dindori	Vidisha, Balaghat, Dewas, Gwalior, Raisen, Shajapur, Barwani, Dhar, Rajgarh, Shivpuri, Damoh, Dindori, Satna, Gwalior, Datia,		
15	Maharash tra		Thane, Yavatmal, Ahmednagar, Buldana, Gadchiroli, Nandurbad, Parbhani, Wardha, Amravati, Chandrapur, Jalna, Nashik, Ratanagiri, Washim, Beed, Dhule, Kolhapur, Osmanabad,	Pune, Sangli, Wardha, Buldana, Dhule, Gadchiroli, Jalna, Kolhapur,		

			Satara, Latur	Washim, Yavatmal, Ahmed Nagar, Akola, Aurangabad, Beed, Latur, Nagpur, Nanded, Osamabad, Parbhani		
16	Manipur	Bishnupur, Thoubal	Bishnupur, Thoubal			
17	Meghalaya		East Khasi Hills, Jaintia Hills, East Garo Hills,			
18	Orissa		Balasore, Deogarh, Jharsuguda, Keonjhar, Rayagada, Koraput, Sonpur, Bargarh, J. Singhapur, Kalahandi, Kendrapara, Mayurbhanj, Sambalpur, Bhadrak, Jajpur, Kandmahal, Khurda, Nayagarh, Sundergarh, Puri, Cuttack			Sukinda valley in Sukinda block of Jajpur District
19	Punjab	Mansa, Amritsar, Kapur thapa, Gurdaspur, Ropar, Hoshiarpur	Bhathinda, Fatehgarh Sahid, Gurdaspur, Rupnagar, Faridkot, Mansa, Sangrur, Firozpur, Hoshiarpur	Amritsar, Muktsar, Ferozepur, Bathinda, Gurdaspur, Ropar	Tarantaran, Fatehgarh Sahib, Nawanshahr, Sangrur, Ludhiana, Patiala, Sasnagar, Ropar	Amritsar, Kapurthala, Sangrur, Bathinda, Mansa, Sasnagar, Gurdaspur, Ropar, Tarantaran, Barnala
20	Rajasthan		Ajmer, Barmer, Bikaner, Dausa, Ganganagar, Jaipur, Jhunjhunu, Nagaur, Sikar,	JhunjhunuDist (Khetri Copper		

			Udaipur, Alwar, Bharatpur, Bundi, Dhaulpur, Hanumangarh, jaisalmer, Jodhpur, Pali, Sawai Madhopur, Banswara, Bhilwara, Chittaurgarh, Dungarpur, Jalore, Karauli, Pratapgarh, Sirohi, Baran, Churu, Jhalawar, kota, Rajsamand, Tonk	Deposit), Pali, Jaipur (Sambhar Lake, Sanganer)		
21	Tamil Nadu		Namakkal, Salem	Dindigul, Tiruvallur, Kancheepuram Cadmium : Tiruvallur Chromium: Cuddalore, Dindigul, Erode, Kanchipuram, Tiruvallu	Tiruvallur	Chromium: Cuddalore, Dindigul, Erode, Kanchipuram, Tiruvallu
22	Tripura		Dhalai, North Tripura, South Tripura, West Tripura,			

23	Uttar Pradesh	Bahraich, Basti, Gonda, Meerut, Rai Bareilly, Shajahanpur, Unnao, Balia, Bijnor, Gorakhpur, Mirzapur, Sant kabir Nagar, Siddharthnagar, Balrampur, Chandauli, Lakhimpur Kheri, Muradabad, Sant Ravidas Nagar, Bareilly, Ghazipur,	Azamgarh, Etawah, Hardoi, Kanpur Nagar, Siddharthnagar, Ballia, Fatehapur, Kanpur Dehat, Lakhimpur, Unnao, Balrampur, Gazipur, Lalitpur, Ganda, Mau	Muzzafar nagar, Allahabad, Ghaziabad, Raebareli, Kanpur, Mathura, Bhadohi, Moradabad, Jaunpur, Sonbhadra	Varanasi city, Unnao	KashiVidyapeeth, Varanasi, Kanpur, Unnao
24	Uttarakhand					
25	West Bengal	Howrah, Bardhaman, Murshidabad, S- 24 Parganas, Hooghly, Nadia, N - 24 Parganas, Malda	Bankura, Dakhindinajpur, Howrah, Murshidabad, S-24 Parganas, Midnapur, Bardhaman, E. Midnapur, Hugali, N-24 Parganas, Uttardinajpur, Birbhum, Jalpaiguri, Nadia, West Midnapur, Kolkatta	Nadia, Malda, N-24 Pargana, Kolkata, S-24 Pragana, Murshidabad	N-24 Praganas, S-24 Prganas	N-24 Praganas, Murshidabad
26	Andaman & Nicobar		Andaman			
27	Himachal Pradesh					
	Total no of districts	86 districts in 10 states	297 districts in 24 states	113 districts in 15 states		

Sources: Ministry of Environment, Forests & Climate Change, Govt of India and Central Ground Water Board (CGWB) Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation Government of India.

Heavy metals and their effects

The most important heavy metals from the point of view of

Table: 3 Permissible limits of heavy metals in drinking water (Kumar, M., & Puri, A. 2012, & Paul, D. 2017).

Heavy metal	Permissible limit WHO	Permissible limit ISI	Permissible limit CPCB	Permissible limit ICMR
Lead (mg/l)	0.05	0.10	No relaxation	0.05
Mercury (mg/l)	0.001	0.001	No relaxation	0.001
Copper (mg/l)	1.0	0.05	1.5	1.5
Zinc (mg/l)	5.0	5.0	15.0	0.10
Chromium (mg/l)	0.1	0.05	No relaxation	--
Cadmium (mg/l)	0.005	0.01	No relaxation	0.01
Arsenic (mg/l)	0.05	0.05	No relaxation	0.05
Iron (mg/l)	0.1	0.3	1.0	1.0

WHO: World Health Organization, ISI: Indian Standard Institution, ICMR: Indian Council of Medical Research, CPCB: Central Pollution Control Board.

Water pollution is Zn, As, Cu, Pb, Cd, Hg, Ni, and Cr. Some of these metals (e.g. Cu, Fe, Ni, and Zn) are required as nutrients in trace amounts for life processes in plants and microorganisms but become toxic at higher concentrations (Table 3). Other such as Pb, Cr, and Cd has no known biological function, but are toxic elements (Dudka, S., & Adriano, D. C. 1997, Sa'idi, M. 2010, Wuana, R. A., & Okieimen, F. E. 2011, & Ghannam, H. E., et al., 2015). These heavy metals are not readily degradable and accumulate in the animal as well as human bodies to a very high toxic amount leading to undesirable effects beyond a certain limit (Adakole, J. A., & Abolude, D. S. 2012, Singare, P. U., et al., 2012, & Pandey, G., & Madhuri, S. 2014). The fatal diseases such as eyelid edema, nephritis, renal tumor, extensive lesions in the kidneys, anuria, nasal mucous membranes, pharynx congestion, increased blood pressure, cardiovascular diseases, osteoporosis, cancer, headache, and malfunctions of different systems of the body caused by heavy metals have been reported by several authors (Florea, A. M., & Büsselberg, D. 2006, Jaishankar, M., et al., 2014, Solenkova, N. V., et al., 2014, & Vaishaly, A. G., et. al., 2015). They are also known to interfere with the synthesis and metabolism of the hormones (Sharma, B., et al., 2014).

35 metals are worrying for us due to the residential or professional exposure, from which there are 23 heavy metals: antimony, arsenic, bismuth, cadmium, cerium, cobalt, copper, gallium, iron, lead, manganese, mercury, nickel, platinum, Platino, Platinum Silver, Tellurium, Tallio, Stagno, Uranium, Vanadium and Zinc (Mosby, C. V., et al., 1996). These heavy metals are often found in the environment and in the diet. In small quantities, they are required to maintain good health, but in greater quantities, they can become toxic or dangerous. The toxicity of heavy metals can reduce energy levels and damage the functioning of the brain, lungs, kidneys, liver, blood composition, and other important organs. Long-term exposure can lead to progressively progressive physical, muscular, and neurological degenerative processes that mimic diseases such as multiple sclerosis, Parkinson's disease, Alzheimer's disease, and muscular dystrophy. Long-term repeated exposure to certain metals and their compounds can even cause cancer (Järup, L. 2003). Toxicity levels of some

heavy metals can be just above naturally occurring background levels in the environment. Therefore, a thorough knowledge of heavy metals is very important in order to be able to take appropriate countermeasures against their excessive exposure (Ferner, D. J. 2001).

Table 4: Heavy metals uses and health effects on human

Heavy metals	Health effects	References
Ni	Chills and sweating, shortness of breath, coughing, muscle pains, fatigue, and gastrointestinal discomfort.	(Central Water Commission. 2019).
Fe	Biomolecules, cells, tissues, and the whole organism.	(Central Water Commission. 2019).
Zn	Damage to nervous system, dermatitis	(Singh, R., et al., 2011, & Fahimirad, S., et al., 2017).
As	Internal cancer, skin lesions, and death	(Fergusson, J. E. 1989, Anawar, H. M., et al., 2002, Cappuyns, V., et al., 2002).
Cd	Cancer, lung insufficiency, disturbances in the cardiovascular system, liver and kidney damage	(Mashitah, M. D., et al., 2008, Cruz, 2004, Malkoc, E., et al., 2005, Elliott, H. A., & Huang, C. P. 1981, Yin, J., & Blanch, H. W. 1989, Sharma, Y. C. 1995, & Arıca, M. Y., et al., 2003).
Cu	Normocytic, hypochromic anemia, leukopenia, and osteoporosis; copper deficiency	(Aksu, Z., et al., 1998, & ATSDR. 2004).
Cr	Ulcer, skin irritation, liver and kidney damage	(ATSDR. 2004, Landis, W. G. & Yo, M. 2003, Kumar, P. A., et al., 2007, & Fiol, N., et al., 2008).
Pb	Spontaneous abortion, nervous system damage, kidney and brain damage	(Tunali, S., et al., 2006, & ATSDR. 2007).
Hg	Memory problems, increased heart rate, tremors, kidney, and brain damage	(ATSDR. 2007, Abia, A. A., & Igwe, J. C. 2005, & Igwe, J., & Abia, A. A. 2006).

CONCLUSION

At present, India is continuously moving toward the development of the country. The development of the country of India can be mainly defined by its industries and mines sectors. Various types of heavy metals, some of them potentially highly toxic, are rapidly polluting groundwater by entering the groundwater through various routes through the leaching process. Groundwater is being polluted by major heavy metals through increasingly industrial areas, population growth, quarry residues, metal wastes, leaded gasoline, paint, etc. Consumption of contaminated water has led to problems in health, kidney, liver, and nerve problems; DNA, skin, etc. are being caused by the consumption of contaminated water. Releasing polluted industrial water sources and controlling them for anthropogenic tax protection is a major need and it is suggested that awareness should be spread among the people about the toxicity of drinking groundwater.

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