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Review article

Soil and water pollution an update on the status of selected Indian states and cities

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ABSTRACT

Pollution is now the main problem for man and his survival. Waste, which can originate from any source, whether mining, industrial, biological or household, is now on the priority list of all countries? The treatment and disposal of waste is a source of local and central government concern. The methods used to dispose of waste create a new problem for society. Dumping solid waste and burying it underground pollutes the soil and handling liquid waste on the ground or in water both causes pollution. Therefore, the pollution caused by the continuous disposal of wastes underground and in the water is not only harmful to the environment, but also has a negative impact on the health of living organisms. This review aims to highlight the status of several Indian states and cities that are suffering from soil and water pollution. The review will attempt to shows oil and water standards, heavy metal status, seasonal changes in soil and water pollution, contaminated agricultural crops, pollution pathways, uses and threat to living organisms.

Key words: Pollution, Soil pollution, Water pollution, Heavy metals.

INTRODUCTION

The environment that supports the existence of living things is called the environment; it includes air, water and soil. The foundation of existence is the environment which is being destroyed day by day due to various factors and one of them is pollution. Concern about growing pollution is now global, and India is also on this list[1]. The major cities of India are facing the problem of soil, water and air pollution and the above fact needs no citation. Overall, the main factors that increase pollution in both categories are industrialization and urbanization. Waste from industry and mining depletes groundwater and air, as well as household and medical waste. The adverse health effects from pollution contaminated soil and water are quite complex to understand, especially when both essential part of lithosphere and hydrosphere are considered. Soil contamination has been shown to cause contamination of food sources which then go into containers and create various health problems regardless of gender, age and race. Vegetables, fruits or grains grown on contaminated soil release a variety of pollutants in to the receptor system resulting in a variety of visceral toxins. Likewise, contaminated water follows the same path and can cause health risks [2,3,4]. Toxicity produced by these sources can be immediate or long-lasting. Numerous investigations have demonstrated that heavy metals and other pollutants in soil, air and water are carcinogenic to progeny [5,6,7].

Status of pollution in the state of Chhattisgarh

The state of Chhattisgarh is located almost in the center of India. The state has been blessed with good natural resources both organic and metallic. Due to the availability of minerals, various industries based on mining, metallurgy and manufacturing operates in the state. Students, professors and researchers from different Indian and foreign universities have gathered, studied and tried to uncover

the facts related to land and water degradation in Chhattisgarh. Starting with Raipur district, analysis of ground water source was evaluated to assess heavy metal levels. Sampling was done from the Arang block of Raipur district [8]. The analysis was performed using a spectrophotometer and water samples were taken from ponds, wells and bore holes. According to the analysis results above, the detected chromium exceeds the World Health Organization standard. WHO standards. The level of excess calcium concentration was overestimated in the peak samples.

In another study, an estimate of heavy metals was made on road dust in Bhilai city. Bhilai town, Chhattisgarh is known for having steel mill for more than 5 decades. Ironworks is necessary for the growth and development of the counter as well as that of the parent state, but with each type of development comes environmental degradation. Sampling was evaluated from Bhilai steel mill area and Bhilai town. Dust sample analysis was performed by atomic fluorescence spectroscopy for arsenic and mercury. For the determination of cobalt, chromium, lead, zinc, nickel and manganese, inductive pair plasma mass spectrometry was performed. The study concluded with the remark that there was an increase in zinc, manganese, lead, copper, chromium, arsenic, cobalt and mercury in roadside dust. The above study stated and a unique observation that road dust is more contaminated with heavy metals than soil samples. Analysis of road side dust and comparison with the ground clearly concluded that although vehicle emissions and industrial emissions pollute the air, the ground is also polluted. This study demonstrates that the sources, spread and impacts of pollution are diverse and quite complex [9].

Another study reports on ground water quality of Bhilai and Drug Industrial Park. Water sampling was evaluated from Durg and Bhilai industrial zones within a radius of 10 kilometers. The sampled water source was manually pumped. The pH analysis of the water samples howls that the results are within the allowable range according to the ISI 10500-91 standard, the conductivity value exceeds the allowable threshold, indicating that the water is contaminated with metals, the total alkalinity in the water exceeds the permissible limit, the function. The calcium content of exceeded the ISI 10500-91threshold, and the lead content in the water also exceeded the allowable limit. The above study concludes with the statement that the water in Durg Industrial Park and Bhilai is not safe for human consumption [10].

A similar type of study determining the physicochemical parameters of groundwater in Bhilai town observed and concluded with the same results that ground water in Bhilai town was not suitable for drinking. Status of water of Bhilai town has deteriorated due to high levels of domestic and industrial waste water [11].

However, another study was done to approach status of water of the Kharun River. Kharun River flows through Durg and Raipur district. River water sampling done at different points within a distance of 25 km. Water in the Kharun river has been recorded be both contaminated and polluted. Variation is observed due to seasons. The river is more polluted in summer than in any other season. In my opinion, the cause of the rivers' pollution is the discharge of industrial wastewater and domestic waste [12].

A study was done to evaluate heavy metals in vegetables and fruits obtained from Jagdalpur market, Chhattisgarh [13,14]. Leaching is a process by which pollutants and other macro- or micro-molecules enter the soil depending on the season. The analysis of cultures for heavy metals is the best way to represent contamination and its exposure to humans. Sampling of vegetables and fruits was carried out at the local market of Jagdalpur by local vendors, who mainly grow them in nearby villages. Evaluation of heavy metals cadmium, copper, iron and cobalt was performed by atomic absorption spectroscopy. The results obtained from atomic absorption spectroscopy were compared with the limits set forth in the Food adulteration Prevention Act of India 1954. The following observations and studies show that locally grown vegetables and fruits are contaminated with heavy metals in decreasing order of cadmium, iron, and zinc, copper and lead.

Therefore, the consumption of cultivated fruits and vegetables at Jagdalpur and surrounding areas leads to a high risk of heavy metal poisoning. As above, a related type of study was performed and published inthe same year, a vegetable and soil sample from Jagdalpur city was analyzed for heavy metal pollution. In the above works, a clear conclusion can be drawn between the heavy metal content in the soil and the vegetables grown in it. Vegetables and soil were collected from the same site in March. Sample analysis was performed using the same atomic absorption spectroscopy method. The heavy metals observed in the sample in descending order are cadmium, iron, copper and lead. The conclusion of the study also indicates that vegetables are contaminated with heavy metals and are likely to cause related toxicity.

A water quality assessment was performed for the Hasdeo River, which flows through the town of Korba [15]. The city of Korba is known for its coal-fired power plant that produces both electricity and pollution. Water sampling was done at the Manikpur coal mine and NTPC fly ash site. The heavy metal physio chemical analysis was performed on the obtained samples. Water quality research has concluded that the water in the Hasdeo river is not suitable for human use although it can be used for agriculture. In the same manner as above, status of water of the towns of Bacheli and Kirandul located in

the South Baster Dantewada region was assessed [16]. The above-mentioned place of the state of Chhattisgarh is famous for its iron ore reserves. Water samples were taken from bore holes. The results of the above work show that iron content in water increases after the monsoon and regular monitoring of water samples.

Fruit and vegetable pollution in the Himalayas

As mentioned earlier, pollution is a growing concern, adding to research that the Himalayas are also affected by the same [17]. The study underwent in the Tarai region of the Kumaun Himalaya. Sampling is done for both the soil and the vegetables grown on it. Samples were collected in May and June. The heavy metal testis performed using atomic absorption spectroscopy. The results shown for the above study clearly indicate that the soil and vegetables are both contaminated. Heavy metals from the soil transfer to vegetables and the absorption of heavy metals is greater in children.

Soil pollution in Jharkhand state

A heavy metal assessment was performed on vegetables from Ranchi city, Jharkhand. In the study mentioned above (ICP-OES), inductively coupled plasma optical emission spectrometry technique was used [18]. The above study performed on vegetables from the local market in Ranchi town. It indicates the transfer of metals from soil to plants and further in humans. Estimates of cadmium, copper, cobalt, chromium, lead, nickel and arsenic were performed. The town of Ranchi is home to many small-scale industries and their waste water is used by tribal farmers without treatment, damaging the soil, the quality of the vegetables and most importantly the health of the consumers. The health risk was estimated as Health Risk Index (HRI) and its value was greater than 1, concluding that there is a significant health risk to the consumption of this vegetable, by gender and group year old. It is suggested that detailed and periodic analytical assessments of the soil and crop composition should be conducted to estimate current and future health risks. Farm land in Singhbhum was surveyed for heavy metals, the study areas bearing the site with the copper mining area [19]. Agriculture and mining are done locally nearby. In the above study, the analysis of heavy metals in soil was performed by inductive plasma mass spectrometry. The study site is the Singhbhum copper mining area of Jharkhand. Metal concentrations are estimated to be moderate to high in an area close to abundant and ongoing mining are the factors that cause high concentrations of metals in soil are natural and man-made. This study proposes periodic estimation of heavy metals in soil to assess its impact on humans.

Soil pollution in Madhya Pradesh state

The sampling area for the next study was Mandideep, Madhya Pradesh. Mandideep is known for its automotive, pharmaceutical, leather and food industries. The analysis of heavy metals in the soil was performed by atomic absorption spectroscopy and sampling was performed in the dry and rainy seasons. Soil is analyzed for cadmium, chromium, copper, lead, iron, zinc and nickel. Leads to the conclusion that industries have a negative impact on the land. Increased heavy metal content in soil, or in other words causes soil pollution and degradation. Heavy metals in the soil of Mandideep in the dry season were higher than in the rainy season. The study looked at the fact that due to water pollution during the rainy season, heavy metals deep into the soil and reach water bodies, leading to water pollution. However, another study was performed to evaluate heavy metals in Mandideep Industrial Park, Madhya Pradesh. The study was performed to evaluate lead, zinc, chromium, copper, nickel, arsenic and cadmium using the ICP-OES instrument. The results if the study stated the fact that heavy metal concentrations are high and support the fact that the soil of the test area was contaminated in any of the ten samples. Research once again proves that industrial waste pollutes land and water [20,21].

Pollution in Odisha state

Like the states and cities mentioned above, Odisha and its cities also suffer from pollution problems due to industrialization and civilization. To prove the above statement, a study is summarized and evaluated below. Soil sampling was performed from Regali block of Sambalpur district, Odisha. Sampling was done before and after the monsoon. Determination of heavy metal content was done by atomic absorption spectroscopy. The results contradict the fact that metals, specifically chromium, nickel and cadmium, are present in high concentrations at the sampling site. Concentrations were high as compared to controls and within safe soil limit [22].

CONCLUSION

The article highlights the alarming state of soil and water pollution in various regions of India, with a particular emphasis on Chhattisgarh, the Himalayas, Jharkhand, Madhya Pradesh, and Odisha. The adverse effects of pollution on the environment and human health are well-documented, as industrialization and urbanization continue to exacerbate the problem. Heavy metal contamination in soil and water sources poses serious health risks to communities, and the presence of pollutants in vegetables and fruits further aggravates the issue. Urgent and comprehensive measures are needed to address pollution and protect the environment and human health.

REFERENCES

1. Kelishadi R, 2012. Editorial, Environmental Pollution: Health Effects and Operational Implications for Pollutants Removal. J Environ Public Health. Pages - 1-2. Doi : 10.1155/2012/341637.

2. Loux NT, Su YS, Hassan SM, et al, 2011. Issues in assessing environmental exposures to manufactured nanomaterials. Int J Environ Res Public Health. 8(9):3 Pages - 3562-3578. Doi: 10.3390/ijerph8093562

3. Abbasi T, Abbasi SA, 2011. Water quality indices based on bioassessment: the biotic indices. J Water Health. 9(2), Pages - 330-348. Doi: 10.2166/wh.2011.133.

4. Kelishadi R, Mirghaffari N, Poursafa P, et al, 2009. Lifestyle and environmental factors associated with inflammation, oxidative stress and insulin resistance in children. Atherosclerosis. 203(1): Pages - 311-319. Doi: 10.1016/j.atherosclerosis.2008.06.022.

5. Kelishadi R, Poursafa P, 2010. Air pollution and non-respiratory health hazards for children. Arch Med Sci. 6(4): Pages - 483-495. Doi: 10.5114/aoms.2010.14458.

6. Kargarfard M, Poursafa P, Rezanejad S, et al, 2011. Effects of exercise in polluted air on the aerobic power, serum lactate level and cell blood count of active individuals. Int J Prev Med. 2(3): Pages - 145-150. PMID: 21811656; PMCID: PMC3143527.

7. Coogan PF, White LF, Jerrett M, et al, 2010. Air pollution and incidence of hypertension and diabetes mellitus in black women living in Los Angeles. Circulation. 125(6): Pages - 767-772. Doi: 10.1161/CIRCULATIONAHA.111.052753.

8. Enehizena, O.O. Emokpae, M.A. Toxic Metal Concentrations in Drinking Water and Possible Effect on Sex Hormones among Men in Sabongida-Ora, Edo State, Nigeria. Medicines 2022 (9) 4. Page – 1- 12. Doi: 10.3390/medicines9010004A.

9. Roy S, Gupta SK, Prakash J, Habib G, Kumar P. A global perspective of the current state of heavy metal contamination in road dust. Environ Sci Pollut Res Int.; 29 (22):33230-33251. Doi: 10.1007/s11356-022-18583-7.

10. Choudhary S, Ramteke S, Rajhans K, et al. (2016) Assessment of Groundwater Quality in Central India. Journal of Water Resource and Protection, 8(1) 12-19. Doi: 10.4236/jwarp.2016.81002.

11. Jena V, Dixit S, Gupta S, et al, 2012. Physico-chemical parameter assessment of ground water in different sites of Bhilai city, Chhattisgarh. j.chemosphere .5(4): Pages - 506-509. Doi:10.1016/j.chemosphere.2012.03.064.

12. Mise SR, Mujawar S, 2017. Evaluation of water quality of Kharun River stretch near the Raipur city. Int Res J Eng Technol. 4(9): Pages - 1071-1078. Doi: 10.13140/RG.2.2.29028.83842.

13. Salhotra P, Verma R, 2017. Determination of heavy metals contamination in some vegetable and fruit samples from markets of Jagdalpur, Chhattisgarh state. Indian J Innov Sci Res Tech. 2(5): Pages - 372-375. Doi: 10.9790/5736-100502110113.

14. Rao PS, Thomas T, Hasan A, et al, 2017. Determination of heavy metals contamination in soil and vegetable samples from Jagdalpur, Chhattisgarh state, India. Int J CurrMicrobiol App Sci. 6(8): Pages - 2909-2914. Doi: 10.20546/ijcmas. 2017.606.348.

15. Mandadhi Rajendra, P. K., Balan, A. P., Selvaraj, J, et al, 2022. Formulation and optimization of hydroxyurea loaded nanostructured lipid carriers using design of experiment for the effective treatment of ovarian cancer. Int J App Pharm, 14(05): Pages 137-143. Doi: 10.22159/ijap.2022v14i5.45464

16. Jufri, M., Namirah, J., & Suryadi, H, et al, (2022). Formulation and stability study of black cumin (Nigella sativa L.) seed oil emulsion using sucrose palmitate as emulsifier. Int J App Pharm, 14(05): Pages 113-118. Doi: 10.22159/ijap.2022v14i5.44945

17. S. K. Vishwakarma, S. K. Padhye, and V. Jena, et al. (2016). The water quality of the Hasdeo River in Korba District, Chhattisgarh, India, j.envpol 2(16), Page - 440-447. Doi: 10.1016/j.envpol.2016.02.046.

18. S. K., Mishra, P., & Tiwari, R. K. (2016). Assessment of groundwater quality in and around Bailadila iron ore mining area, Dantewada district, Chhattisgarh, India. Environmental Monitoring and Assessment, 188(1), 1-15.Doi: 1 0.1007/s10661-016-5477-y.

19. Tewari G, Pande C, 2013. Health risk assessment of heavy metals in seasonal vegetables from northeast Himalaya. Afr J Agric Res. 8(23): Pages - 3019-3024. Doi: 10.5897/AJAR2013.6955.

20. Ghosh R, Xalxo R, Ghosh M, et al, 2013. Estimation of Heavy metals in vegetables from different market sites of tribal based Ranchi city through ICP-OES and to Assess Health Risk. Curr World Environ. 8(3): Pages 435-444. Doi: 10.12944/CWE.8.3.13.

21. Giri S, Singh AK, Mahato MK, et al, 2013. Metal contamination in agricultural soil in the copper mining area of Singhbhum Sher zone of India. J Earth Syst Sci.; 126 (49): Pages - 1-13. Doi: DOI 10.1007/s12040-017-0833-z.

22. Rathor G, Chopra N, Adhikari T, et al, 2017. Heavy metal contamination in soil surrounding Mandideep industrial area, Madhya Pradesh. Asian J Soil Sci 12(1): Pages - 30-36. Doi: 10.15740/HAS/AJSS/12.1/30-36.