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Heavy metal concentrations distribution in coastal sediments of Nellore, Andhra Pradesh, India

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Abstract
The present examination manages the measurement of aggregated poisonous substantial metals in sediment of Nelaturu and Krishnapatnam of Nellore coast. The examination was performed at two diverse mechanical and port exercises testing areas alongside the progression of Nellore. The diverse substantial metals contemplated were As, Pb, Ac, Cd, Hg, Fe, Mn, Cu, and Zn. The consequences of the present investigation demonstrate that the focus level of lethal overwhelming metals was more than passable levels when contrasted with IS 10500; WHO Standards. The outcome is an unmistakable sign of expanding poisonous overwhelming metals contamination levels of the residue of the Nellore coast, which is making a negative ecological effect on the natural existence of the beach front territory. The outcomes accentuate the requirement for standard logical observing of various contaminations antagonistically influencing the earth and to reframe the contamination control systems as of now in presence.

Keywords: Coastal pollution, heavy metals, nellore coast sediments

1. Introduction

Sea-going bodies particularly waterways are one of the most significant regular assets on earth. They give natural surroundings to different oceanic living beings and help in saving biodiversity. Substantial metals can store in silt for brief periods. Physico-substance attributes of water conditions contrast season to season. A littler measure of these lethal substantial metals will reappear the overlying water body and take-up by the oceanic biota. Amphibian water bodies get silt from different focuses and diffused sources which saved at the base of the stream and goes about as the two transporters and potential wellsprings of metal aggregation in the oceanic natural pecking order by the procedure of bio-amplification [1]. At long last, human wellbeing is unfavorably influenced by up taking of these by the fishes and water. In this way, it is important to explore the present status of overwhelming metals in residue of the seaside territories. Numerous exercises, for example, land use/land spread change [2] sewage ooze, mine waste, modern waste, squander water [3] climatic poisons, pesticides, and compost applications are the fundamental exercises controlling the progression of stream and benefactors of overwhelming metals released into waterways, lakes, estuaries, and marines [4-6]. Other than these transfer squanders, streams likewise convey huge amounts of strong squanders, including a huge number of creature remains and several human cadavers are dumped into the dynamic channel of the waterways and waterways consistently lately. These days, the condition is being exacerbated because of the release of poisonous metal contaminants everywhere scale from enterprises. The previously mentioned elements influence the profitability of the waterway biological system and use for water system of harvests [7] and furthermore influence other life-emotionally supportive networks in different manners. It is sad for us, other than lessening the wellsprings of toxins, our intercessions in waterway environment are expanding step by step, which is making huge weight on the stream frameworks.

Amassing of overwhelming metals in the dregs of the amphibian condition which are presented to modern waste and mining is a typical wonder in creating nations [8]. Such seaside and waterway residue have become sinks for overwhelming metals, much the same as wetlands. The silt once in a while go about as bearers and hotspots for the overwhelming metals in the earth [9]. The investigation of overwhelming metals in waterfront silt is significant in light of the fact that residue fill in as living space for some sea-going benthic living beings. Shockingly more often than not, the beach front zones are observed without giving any consideration to the residue which are in steady communication with the ocean. Studies have indicated that beach front and riverine conditions have been seriously debased with overwhelming metals because of noteworthy and present day mining and mechanical activities [10]. Overwhelming metals in residue enter through various pathways, either from the point or non-point sources [11]. Instances of point sources could be the releases of modern waste, for example, metal mine losses through funnels or depletes, into amphibian water bodies. Non-point sources, for example, residue loaded spillover from unearthed lands and leachate from landfills likewise add to the degrees of overwhelming metals typically released into water assets. The destiny of substantial metals in an amphibian situation is influenced by procedures, for example, precipitation, sorption, and disintegration [12]. These procedures are likewise influenced by variables, for example, pH, temperature, break down oxygen fixation and the unsettling influence of the water [13-14]. At higher pH, overwhelming metals encourage and get adsorbed onto silt surfaces. Metals are additionally discharged all the more effectively into the water at lower pH and higher temperatures. At the point when the disintegrated oxygen focus is low, i.e., under 7 mg/L, overwhelming metals particularly those bound to natural issue silt are discharged into the overlying water and the other way around [15] shows that physical disturbance of water releases metals more rapidly into the water than biological disturbance. The study of heavy metals in sediments can serve as a guide in predicting the extent of pollution of the overlying water under different environmental conditions.

2. Materials and Methods

The present study conducted during the month of April 2019 by the Department of Marine Biology, Vikrama Simhapuri University, Nellore, and Andhra Pradesh, India.

2.1 Study Area: The Nellore district has a 169 km of the coastal line with habitation of fishermen community along the east coast of India. The Nellore coastal region is suitable for the brackish water aquaculture farming, recently gradually increased some industrial activities. The present sampling sites of Nelaturu and Krishnapatnam coastal areas have thermal power industries and also shipping activities from this coastal region (Fig.1).

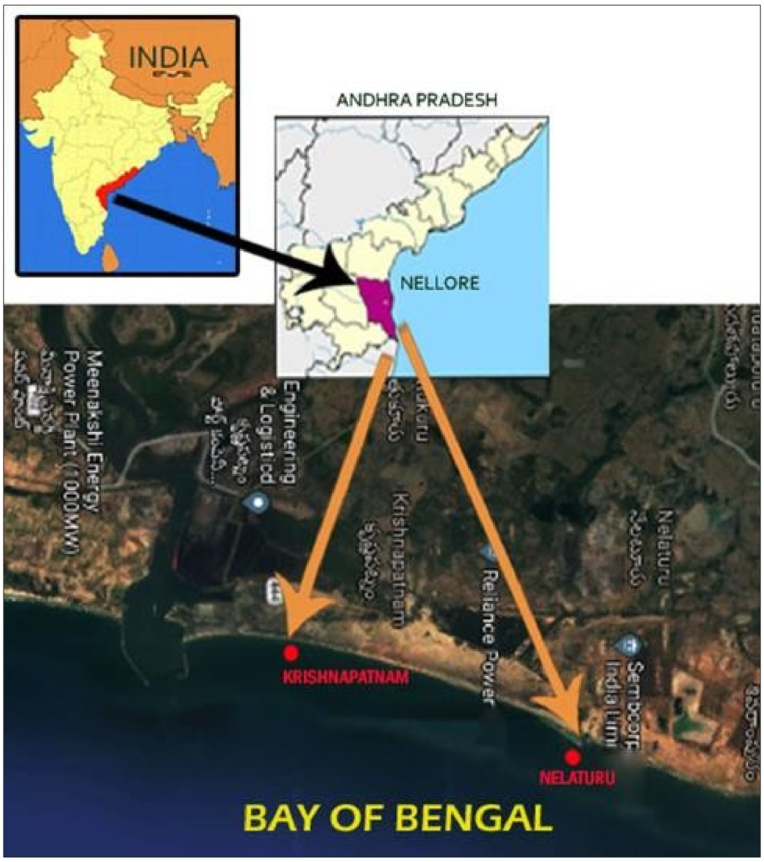

Fig 1: Map showing the study areas of Nelaturu and Krishnapatnam coastal regions of Nellore coast of Andhra Pradesh in India

2.2 Sample collection: The coastal Sediment soil samples were collected by following the quality sample assortment protocol and tips given in Indian Standards strategies IS 3025 part-1 and APHA twenty-second edition. The special precautions were taken throughout the sampling of sediment soils within the elite places of study areas. The stations were picked to subjectively assume control over the recently arranged testing maps (Fig. 1). Prior to the gathering of the examples, the example holders square measure doused night long in a couple of water fortis and washed with two fold Refined water and dried during a spotless space. The residue tests were gathered from 5 to 10 cm profundity of the ocean or the bank of the running waterfront water channel. The residue tests were gathered in pre-cleaned compartments for copy mensuration as 500 gm. for every circumstance with the assistance of the grab sampler.

2.3 Sample preparation for analysis: The digestion procedure for water samples was carried out by total digestion method in which 2 gm. of residue test was warmed with 20ml of the tri-corrosive blend (HNO3, H2SO4, and HClO4) to the extent of 5:1:1 in a Teflon estimating receptacle at 80°C for 4–5 h. Right when the residue completely processed and leaves a straightforward arrangement, the example was cooled to room temperature and from that point onward, it was separated through what man No. 42 channel paper into a pre-cleaned 100-ml volumetric cup. The synthetics used as a piece of the examination were procured from E. Merck, Mumbai, India, of scientific evaluation and china's were totally cleaned with 10% HNO3 lastly cleaned with water before the usage.

2.4 Heavy metals analysis: by Atomic Absorption Spectroscopy- AAS is most widely using an analytical technique for the determination of trace and heavy metals up to parts per billion levels. AAS is a very useful technique to determine trace levels of multi-elements in single aspiration. AA-6800 AAS coupled with GFA-EX7 graphite furnace atomizer and ASC-6100 auto sampler from Shimadzu (Koyoto, Japan) was used for heavy metal analysis. A high-density graphite tube was used for atomization. Normal single hollow cathode lamps were used for irradiation followed by APHA [16].

3. Results

The concentrations of heavy metals in sediments collected from two different locations in Nellore coast are given in Table 1.

Table 1: Heavy metals in the coastal sediments soils of (Nelaturu, Krishnapatnam) Nellore (mg/lt) Mean ± SD (n=6) in Andhra Pradesh, comparison with WHO and IS: 10500 standards

S. No.	Name of the Metal	Nelaturu Coast	Krishnapatnam Coast	IS 10500 Standards	W.H.O Standards
1	Arsenic (As)	0.69±0.08	0.69±0.09	0.01	0.01
2	Lead (Pb)	86.04±0.15	2.28±0.08	0.01	0.01
3	Cadmium (Cd)	N.D	N.D	0.003	0.003
4	Mercury (Hg)	N.D	N.D	0.001	0.001
5	Iron (Fe)	4442.18±206.26	2852.99±187.45	0.3	0.2
6	Manganese (Mn)	150.61±13.17	73.88±14.84	0.1	0.5
7	Copper (Cu)	1.55±0.15	2.53±0.19	0.05	2.0
8	Zinc (Zn)	N.D	N.D	5.0	3.0

N.D= Not Detected

4. Discussion

In the present study, the ranges of the heavy metals were present in the coastal water of Nelaturu, Krishnapatnam coastal regions of Nellore coast in the present study obtained from AAS analysis as discussed below. Although there was no clear definition of what a heavy metal density is in most cases taken to be the defining factor. Heavy metals are hence generally defined as those having a specific density of more than 5 g/cm3. Heavy metals are among the most common environmental pollutants, and their occurrence in water and biota indicate the presence of natural or anthropogenic sources. Although adverse health effects of heavy metals have been known for a long time, discharge of heavy metals continues and is even increasing in some areas are particularly in less developed countries.

The main threat by heavy metals to human health is associated with exposure to lead, cadmium, and mercury. These toxic metals accumulation and distribution in soil, sediments, and aquatic environment are increasing at an alarming rate thereby affecting aquatic life [17-18]. A number of metals are normally present in relatively low to high concentrations, usually more than a few mg/L, in conventional irrigation water and are called trace elements. Heavy metals are a special group of trace elements which have been shown to create obviously health threat when taken up by small to larger plants and animals.

Arsenic (As) concentrations were observed 0.69 mg/L in the sediment of Nelaturu coast, 0.69 mg/L in Krishnapatnam coast. The maximum concentrations were observed in both study areas. The permissible limit for Arsenic as per IS: 10500 is 0.01 mg/L and maximum guideline value as per the WHO is 0.01 mg/L. However, the observed concentration levels of Arsenic in the study area were observed as excess than acceptable limits given by the IS: 10500 and WHO guidelines. Long-lasting introduction to arsenic in drinking water can cause malignant growth in the skin, lungs, bladder, and kidney. It can likewise cause other skin changes, for example, thickening and pigmentation [19].

Lead (Pb) concentrations were observed 86.04 mg/L in the sediment of Nelaturu, 2.28 mg/L in Krishnapatnam coast. The maximum concentrations were observed in both study areas. The permissible limit for Lead is as per IS: 10500 is 0.01 mg/L. Lead is a highly toxic metal substance, exposure to which can produce a wide range of adverse health effects in both adults and children. Every year, industries producing about 2.5 million tons of lead throughout the world that used for making batteries. In adults, lead can increase blood pressure and cause infertility problems, nerve disorders, muscle & joint pain, irritability, and memory or concentration problems come [20-21].

Cadmium (Cd) were not observed in both study areas. The permissible limit for Cadmium is as per IS: 10500 is 0.003 mg/L. cadmium is widely distributed in the earth's crust and is principally used in many industries and in agriculture, according to USPH standards. Higher values of Cd in wastewater effluent samples suggest a high level of pollution due to dyes paints and pigments manufacturing industries [22]. Cadmium targets the liver, placenta, kidneys, lungs, brain, and bones. Consumption of food or drinking water with very high cadmium levels severely irritates the stomach, leading to vomiting and diarrhea and sometimes causes death [23].

Mercury (Hg) was not observed in both study areas. The maximum acceptable limit for Mercury as per IS: 10500is 0.001 mg/L permissible value and values are within the permissible limits given by IS: 10500 and WHO guidelines. There are three forms of mercury and among these the most toxic one is the organic form, viz., methyl mercury. Methyl mercury is a microbiologically transformed form of inorganic mercury when it reaches aquatic environments, water bodies or in soils. Inorganic and organic mercury is toxic to the human body in different ways, affecting different organs in different ways it may primarily expose to mercury via food, where fish is the major source of methyl mercury exposure by bio-magnification. Mercury has no necessary function in any living organism and is considered as a non-essential metal, and is among the most toxic elements to man and many higher animals[24].

Iron concentrations were observed 4442.18 mg/L in the sediment of Nelaturu coast and observed 2852.99 mg/L in Krishnapatnam coast. The maximum acceptable limit for iron as per IS: 10500 is 0.3 mg/L and no guideline value was given by the WHO for Iron content. However, the observed concentration levels of Iron found more than the permissible limits given by IS: 10500 and WHO guidelines CPCB [25].

Manganese (Mn) concentrations were observed 150.61 mg/L in the sediment of Nelaturu coast and 73.88mg/L in Krishnapatnam coast. The maximum acceptable limit for Manganese as per IS: 10500 is 0.1 mg/L and permissible value 0.3 mg/L and provisional guideline value as per the WHO is 0.4 mg/L. The observed manganese values were more than the permissible limits given by IS: 10500 and WHO guidelines CPCB [25].

Copper (Cu) concentrations were observed 1.55 mg/L in the sediment of Nelaturu coast, and 2.53 mg/L in Krishnapatnam coast. It is more than the permissible limits in both study areas given by IS: 10500 and WHO guidelines. Copper is one of the essential metals to life despite being as inherently toxic as non-essential heavy metal exemplified by lead and mercury. Plants and animals rapidly accumulate it. It is toxic at minute low concentration in water and is known to cause brain damage in mammals. The natural inputs of copper to the marine aquatic environment are from erosion of mineralized rocks or maybe from the industries. Anthropogenic inputs of copper are from industries and paints. It also forms complexes with organic molecules. Mollusks have a tremendous capacity to accumulate copper from contaminated waters CPCB [25].

Zinc (Zn) were not observed in the sediment of both Nelaturu and Krishnapatnam coast. It is within the permissible limits at Nelaturu given by IS: 10500 and WHO guidelines. Zinc is an essential nutrient for the human body and has importance for health also it acts as a catalytic or structural component in many enzymes that are involved in energy metabolism also. Indications of zinc poisonous quality are moderate reflexes, tremors, deadening of furthest points, paleness, metabolic issue, teratogenicity impacts and expanded mortality in people CPCB [25].

In the present coastal sediment soil study the heavy metals of Arsenic, Lead, Iron, Manganese, Copper have observed maximum levels and Cadmium, Mercury and Zinc concentrations in the seawater have been observed in BDL<1.0 mg/L. Increased toxic heavy metal concentrations in the water lead to the Bioaccumulation factor in the aquatic food chain and it showed the transfer of metals especially arsenic, lead, cadmium, mercury are warning signal for fish consumption by humans towards food safety[25-26].

5. Conclusions

The environmental parameters of sediment soils of aquatic environment can be affected by the toxicity of the metal either by influencing the physiology of organisms or by altering the chemical form of the metal in soil and water by bioaccumulation. The increased ambient heavy metal concentration will result in accumulation in the tissues of aquatic organisms. It is an inherent danger of higher bioaccumulation of toxins in the edible species that may result in severe health hazards to the consumers especially human. It was evident that the present study on heavy metals in the sediment soils of the Nellore coast suggested adopting effective heavy metal removal technologies to control the toxic metal contamination in coastal water. Further bioaccumulation study to be needed for better understanding the metal toxicity in the coastal and marine environment.

6. References

1. Theofanis ZU, Astrid S, Lidia G, Calmano WG. Contaminants in sediments: remobilization and demobilization. Sci. Total Environ. 2001;266:195-202.
2. Singh SK, Srivastava K, Gupta M, Thakur K, Mukherjee S. Appraisal of land use/land cover of mangrove forest ecosystem using support vector machine. Environ Earth Sci. 2014; 71:2245-2255.
3. Gautam SK, Sharma D, Tripathi JK, Singh SK, Ahirwar S. A study of the effectiveness of sewage treatment plants in Delhi region. Applied Water Sciences. 2013; 3:57-65.
4. Adaikpoh E, Nwaijei G, Ogala J. Heavy metal concentration in coal and sediment from River kulu in Enugu, coal city of Nigeria. Journal of Applied Sciences Environmental management. 2005;9:5-8.
5. Singh SK, Singh Prafull, Gautam SK. Appraisal of urban lake water quality through numerical index, multivariate statistics and earth observation data sets. Int J Environ Sci. Technol. 2016;13:445-456.
6. Singh H, Singh D, Singh SK, Shukla DN. Assessment of river water quality and ecological diversity through multivariate statistical techniques, and earth observation dataset of rivers Ghaghara and Gandak, India. Int J River Basin Manag, 1-14. doi:10.1080/15715124.2017.1300159.
7. Bharose R, Singh SK, Srivastava PK. Heavy metals pollution in soil-water-vegetation continuum irrigated with ground water and untreated sewage 1. Bull Environ Sci. Res. 2013;2:1-8.
8. Islam MS, Ahmed MK, Raknuzzaman M, Habibullah-Al-Mamun M, Islam MK. Heavy metal pollution in surface water and sediment: a preliminary assessment of an urban river in a developing country. Ecological Indicators. 2015;48:282-291.
9. Haiyan L, Anbang S, Mingyi L, Xiaoran Z. Effect of pH, temperature, dissolved oxygen, and flow rate of overlying water on heavy metals release from storm sewer sediments, 2013.
10. Miller JR, Hudson-Edwards KA, Lechler PI, Preston D, Macklin MG. Heavy metal contamination of water soil and produce within riverine communities of the Rio Pilcomayo Basin. The Science of the Total Environment. 2004;320:189-209.
11. Shazili MNA, Yunus K, Ahmad AS, Avdullah N, Abd Rashid MK. Heavy metal pollution in the Malaysian aquatic environment. Aquatic Ecosystem Health &Management. 2006;9(2):137-145.
12. Abdel-Ghani NT, Elchaghaby GA. Influence of operating conditions on the removal of Cu, Zn, Cd and Pb ions from wastewater by adsorption. International journal of Environmental Science and Technology. 2007; 4:451-456.
13. Atkinson CA, Jolley DF, Simpson SL. Effect of overlying water pH, dissolved oxygen, salinity and sediment disturbances on metal release and sequestration from contaminated marine sediments. Chemosphere. 2007;69(9):1428-1437.
14. Simpson SL, Angel BM, Jolley DF. Metal equilibration in laboratory-contaminated (spiked) sediments usedfor

the development of whole-sediment toxicity tests. Chemosphere. 2004; 54(5):597-609.
15. Haiyan L, Anbang S, Mingyi L, Xiaoran Z. Effect of pH,temperature, dissolved oxygen, and flow rate of overlying water on heavy metals release from storm sewer sediments. Journal of Chemistry, 2013,104316.
16. APHA. Standard methods for examination of water and waste water. 22nd Edition. American Public Health Association, Washington DC, 2012.
17. Mohiuddin KM, Zakir HM, Otomo K, Sharmin S *et al*. Geochemical distribution of trace metal pollutants in water and sediments of downstream of an urban river. Int. J Environ. Sci. Tech. 2010;7(1):17-28.
18. Okafor EC, Opuene K. Preliminary assessment of trace metals and polycyclic aromatic hydrocarbons in the sediments. Int. J Environ. Sci. Tech. 2007;4(2):233-40.
19. Ferner DJ. Toxicity and Heavy Metals. eMed. J. 2001; 2(5):01.
20. Gopinathan KM, Amma SR. Bioaccumulation of toxicheavy metals in the edible soft tissues of green mussel (*Perna viridis* L.) of Mahe region. Project report submitted to the Department of Science, Technology and Environment (DSTE), Government of Pondicherry, 2008, 1-32.
21. Salem HM, Eweida A, Azza F. Heavy metals in drinking water and their environmental impact on human health, Center for Environmental Hazards Mitigation, 2000, 542-556.
22. Tiwana NS, Jerath N, Singh G, Ravleen M. (Eds.) Heavy metal pollution in Punjab rivers, in Newsletter Environmental Information System (ENVIS), Punjab State Council for Science and Technology, India. 2005; 3(1):3-7.
23. Sindhu PS. Environ. Chem., New Age International (P) Ltd., New Delhi, 2002, 75-243, 1stEdition.
24. Jarup L. Hazards of heavy metal contamination. British Med. Bull. 2003;68:167-82.
25. CPCB. Impact of Coal Mine Waste water Discharge on surroundings with reference to heavy metals. Central Pollution Control Board Bhopal, 2011.
26. Utete B, Nhiwatiwa T, Barson M, Mabika N. Heavy metal bioaccumulation in edible fish species from an industrially polluted river and human health risk assessment. International Journal of Water Sciences. 2013;2(4):1-8.