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## Heavy Metals Concentration of Different Pond Waters of Berhampur City, Odisha during Religious Activities

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### Abstract:

*In many religions and mythological narrations about the genesis of world, water symbolizes the state of creation or even basic source for all living beings. The rivers and ponds are worshiped right from the time any person takes birth to its death, the entire rituals and ceremonies are associated with these water bodies. People of Odisha are observing many festivals and religious activities for array of god and goddess during whole year. Out of many, Maa Gajalaxmi pooja is being observed by different people irrespective of their cast, creed and etc. for wealth and health of their family members. Religious activities during all Thursday's of Margasira generated a huge quantity of waste materials and these are immersed into water bodies, as per deep rooted sentiment of the people. During worship different materials are offered and used for mental satisfaction and sanctity of festival. The psychology of people is that to immerse all worship materials into water bodies, thou, these are already offered. These worshiped waste materials includes many colouring materials, sindoor, abhira and etc which are contains many heavy metals. Basing on the above facts, the present study was designed to assess different kinds of heavy metals viz. Pb, Cd, Hg, Ni, Cr, Zn, Cu, Co, As and Fe. The experimental findings indicated that most of heavy metals concentrations were higher than standard values of WHO and BIS in the pond water of Berhampur city. The study revealed that there is increase in heavy metals contamination after immersion of worshiped materials into water bodies that may magnify in their concentration at different trophic levels, which finally reach the human through food chain. Higher heavy metals concentration in water also decreased the quality of water standard and disturbing the aquatic ecosystems. Heavy metal related colouring materials should be restricted which are using in religious occasions and create awareness among the people and society to use natural materials.*

**Keywords:** Religious activities, Water bodies, Heavy metals, Water quality, Waste water, Colouring material

### 1. Introduction

Water is a unique and wonderful liquid, without it, life as we know is impossible. Water the 'Elixir of life' is under stress and facing a lot of treat due to loading of different kinds of pollutant on it. The degree of solvent power of water is highest among all liquid and is constantly threatened to get polluted easily. Heavy metals are used in different aspect of life for sustenance and maintenance i.e. domestic, food processing, religious and other activities. From above multidimensional processes and activities heavy metals are released directly and indirectly and ultimately mixed with water and become polluted. The requirement of water in all form of living system starting from microorganism to human being is a serious problem today because all water resources have been reached to a point of crisis due to unplanned urbanization and industrialization (Singh S.P, Pathak D{13} 2002). During religious activities people are used different kinds of colour related materials (rangoli) which contains various kinds of heavy metals such as mercury, zinc oxides, chromium, lead, copper, iron and etc. Two heavy metals i.e. lead and chromium get added in the water bodies through use of sindoor. On account of the immersion, material like clay, bamboo, grass, wood, colouring materials, painted cloth, flowers, incense sticks, dhoop, amphora, ash and etc. are mixed with water and released heavy metal related pollutants. Heavy metal related pollutants, together with other debris, they combine to form a harmful cocktail in the water bodies. Lakes and ponds are more complex and fragile ecosystem in comparison to running water bodies as they lack self-cleaning ability (Mehta {10} 2013). Prapurna and Shasikanta,{11} (2002) reported that various heavy metal ions present in the lake water of Hussan Sagar and are hindering the beneficial uses of the lake waters. Immersion of worshiped materials with colours are dissolve slowly and leading to significant alteration in the water quality (Dhote S, Varghese B {5} 2001). In fact, low levels of some metals like Cu, Fe, Zn, Coand etc. are act as catalysis for enzymes activities but excess have severe consequence of health (Dixit and Tiwari, {6} 2008).Heavy metal pollution is a major problem to environment like ponds, lakes and rivers because toxicity, persistent and tendency to accumulate and cause stress in different trophic levels with biomagnifications (Lohar {8}2000).The lentic water bodiesare polluted by immersion of worshiped materials caused heavy metal toxicity a common phenomenon in all over India. Occurrences of heavy metals in the aquatic system and its impact on flora, fauna and human being has created a serious problem as a whole in general and city areas in particular. As per above views and concerns, present work has taken up to study the heavy metal concentration in different ponds of Berhampur city

before and after immersion of worshiped materials into pond waters and compared with standard value of WHO {14}(1993) and BIS {3} (1991).

## 2. Materials and Methods

Berhampur is a municipal cooperation located on the eastern coastline of Ganjam District of Odisha state, India. The population of the city is 355,823 as of the 2011 census of India, making it the third most populous urban city in Odisha State. Berhampur city is situating at  $19^{\circ} 20'$  N latitude  $84^{\circ} 50'$  longitudes. Its average elevation above mean sea level is 24.0 M. The city has good number of ponds and lakes. The economic stratification parameters show that 36 % of the population of the city of Berhampur is below the poverty line, 45 % economically weaker section zone and the balance 19 % belong to high and middle income in-come groups. There are many temples in Berhampur city. The people of Berhampur celebrate many festivals. Out of many, Manabasa Gurubar is (worshipping goddess Maa Gajalaxmi for wealth and prosperity of family in month of Margasira) one of them. During the pooja a huge amount of ritual material produced as waste were immersed in the pond and lakes. Present investigation was conducted on different pond waters which are highly affected by immersion of waste material produced from Margasira Gurubar (Thursday) during in the month of November and December. In this experiment, 11 pond waters were taken for analysis of physico-chemical parameters which are present in the different areas of the city. The site-wise eleven ponds of Berhampur city are named as follows: Site No.-01: Harida khandi; site No.-02- Raja Sahi Chaka,Aska Road; site No.-03- Ramlingeswar Tank; site No.-04 - Gate Bazar Market; site No.-05- Payal Talkies; site No.- 06-Sunaribandho; site No.-07-Gosaninuagoan; site No.- 08- Lanjipalli; site No.-09- Ankuli Jail road; site No.-10- Kmapalli and site No.-11- Khodasingha. The religious activities duration is about one month (i.e. four Thursday of Maragasira month).The water samples for heavy metal analysis were collected before and 10 days after completion of religious activities from selected sites, in triplicate, in clean polythene bottles. Heavy metals viz.Pb, Cd, Hg, Ni, Cr, Zn, Cu, Co, As and Fe were determined using the standard procedure followed by APHA {1} (2005).

## 3. Results and Discussions

The concentrations of heavy metals in pond water of different sites were estimated after immersion of worshiped materials during religious activities of all Thursday's of Margasira (normally from mid-October to mid-November). The results obtained were depicted in form of graphs viz. 01, 02, 03, 04, 05, 06, 07, 08, 09, 10 and 11 for heavy metals Pb, Cd, Ni, Cu, Zn, Fe, Cr, AS, Hg and Co respectively. The heavy metal concentrations of pond waters in different sites under study were increased after immersion of religious waste materials. Among all heavy metals, lead concentration was noticed maximum at site-5 followed by site-3, site-4, site-2, site-10, site-7, site-8, site-1, site-9, sita11 and site-6. Other heavy metal like Cd, Ni, Cu, Zn, Fe and Cr were exhibited more or less similar trend as it was found in Pb. Whereas, heavy metal viz. As, Hg and Cowere shown maximum values at site-4, however, their minimum values of concentrations were at site-1,site-10 and site-9 respectively. Other sites of pond water were noticed intermediate values.

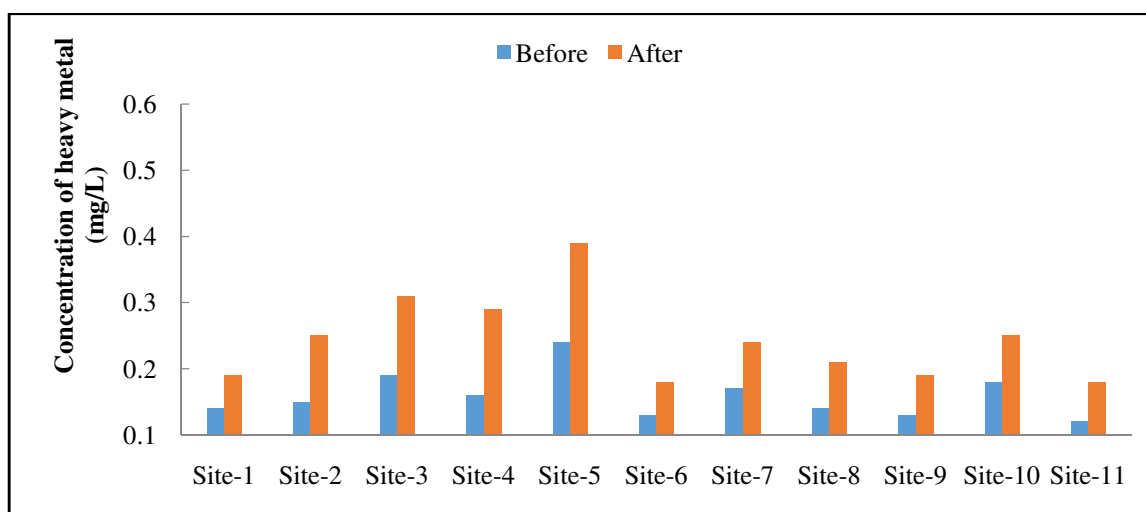


Figure 1: Concentration of Lead in different sites pond water of Berhampur city



Figure 2: Concentration of Cadmium in different sites pond water of Berhampur city

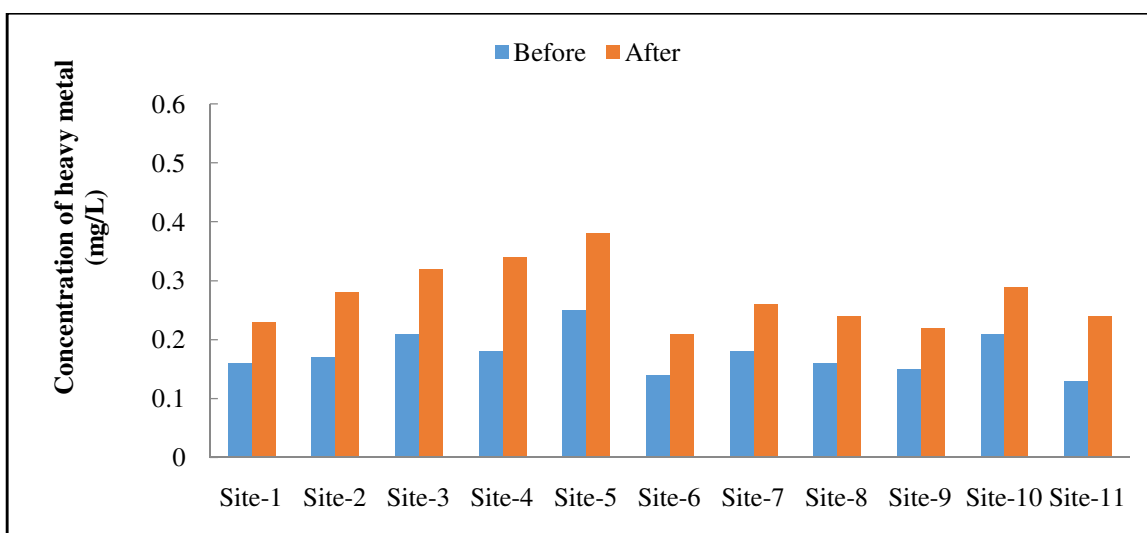


Figure 3: Concentration of Nickel in different sites pond water of Berhampur city

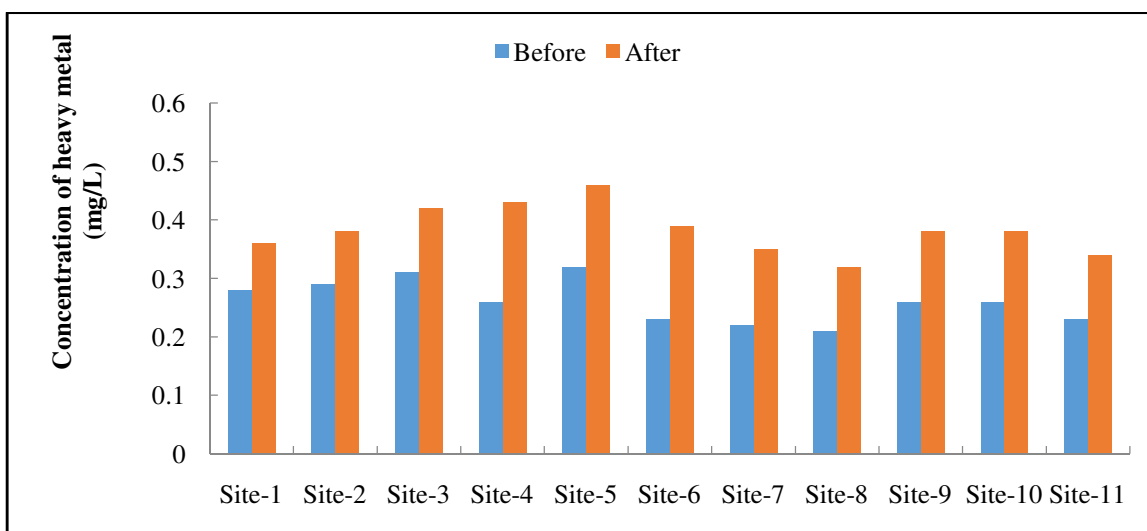


Figure 4: Concentration of Copper in different sites pond water of Berhampur city

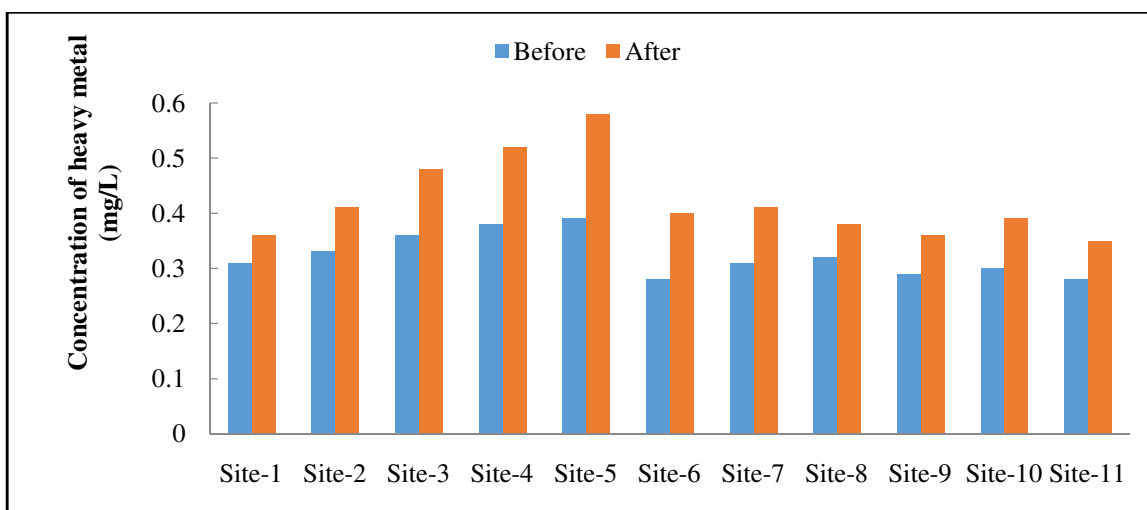


Figure 5: Concentration of Zinc in different sites pond water of Berhampur city

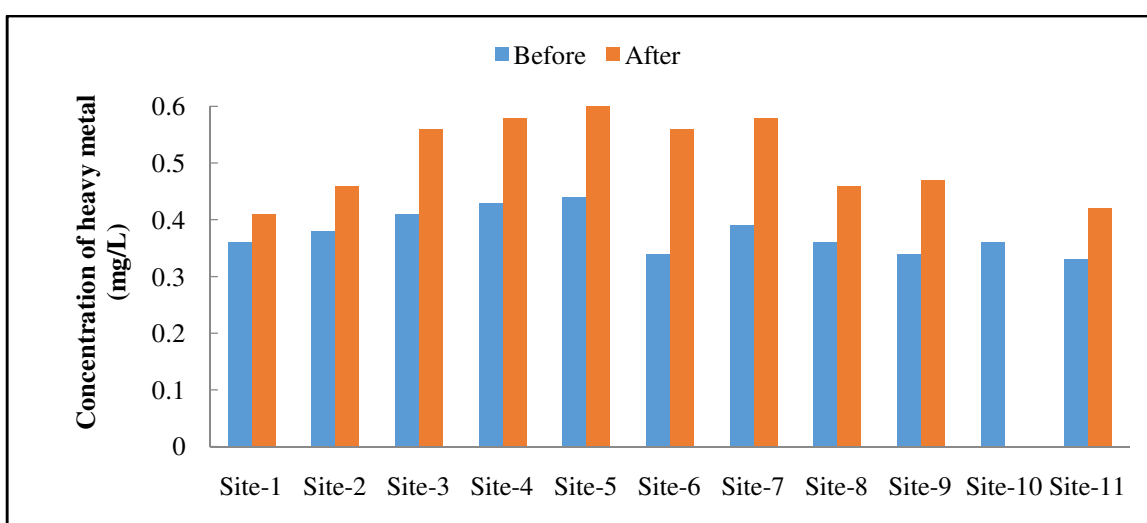


Figure 6: Concentration of Iron in different sites pond water of Berhampur city



Figure 7: Concentration of Cr in different sites pond water of Berhampur city

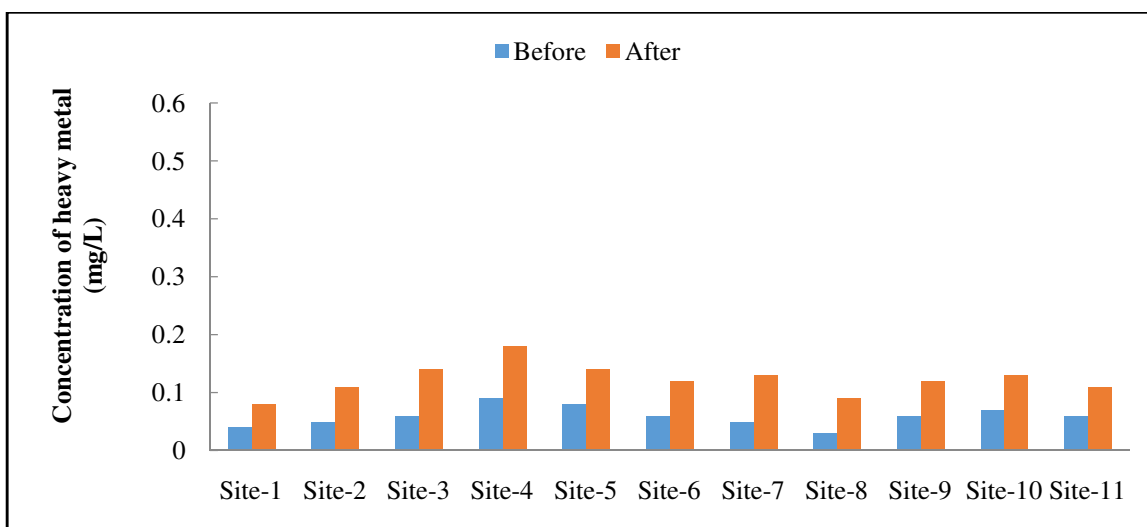


Figure 8: Concentration of Arsenic in different sites pond water of Berhampur city



Figure 9: Concentration of Hg in different sites pond water of Berhampur city



Figure 10: Concentration of Cobalt in different sites pond water of Berhampur city

From the above results, it is noticed that Payal talkies pond (site-5) was more polluted with heavy metals like Pb, Cd, Ni, Cu, Zn, Fe and Cr may be due to road site location and input of more religious waste materials. However, in case of heavy metal namely As, Hg and Co were found to be highest in Gate Bazar Market pond waters (site-4) might be due to immersion and damping of religious and

market waste materials. The lowest, intermediate and highest concentrations of heavy metals in pond waters were varied from site to site may be due to the degree of loading of religious waste materials and other waste products generated by anthropogenic activities. Almost all sites of pond waters under investigation were noticed higher values of heavy metals in compared with standard values of WHO {14}(1993) and BIS {3} (1991).

Heavy metals are accumulates in the environment mostly through the anthropogenic activities and its natural weathering processes. The immersion of religious waste materials into water bodies is now a serious problem due to addition of heavy metals. Das K.K, Panigrahi T {4} (2012) reported that heavy metals concentrations are increased in the river water after immersion of various religious related matters. The concentration of Mg, Cr, Cd, Pb, and as has increased significantly in the river water ten days after the idol immersion (Kulshrestha S.K, Goerge M P {7} 1988). Manik and Manik, {9} (2005) observed and suggested that level of heavy metals has been increased all the way after idol immersion into water bodies, thus, it is clearly evident that immersion of religious matter has negative impact in the water bodies. Cadmium derives its toxicological properties from its chemical similarity to Zn an essential micronutrient for plant, animal, and human beings. Heavy metal at lower concentration is highly essential for function of living cell as catalyst but its above critical concentration is harmful. The heavy metals are known to be persistent and gradually accumulate and magnify through the process of bioaccumulation and biomagnifications, while they move up in the food chain (Bajpai A, Pani S {2} 2003). The heavy metals especially Mn, Pb and Hg excess in water cause skin disease (Reddy and Kumar, {12} 2001).

#### 4. Conclusion

In a nutshell, it is concluded that immersion of worshiped waste materials into pond water during religious activities boost the heavy metals concentration and its secondary pollutants, which generated an undercurrent hydrodynamic flux and environment become toxic. The heavy metals and associated organic derivatives reached to human beings through different trophic levels and caused diseases starting from brain to anus through alimentary canal due to its multidimensional properties in an aquatic medium. Hence, heavy metal related colouring and associated materials are banned, awareness should be created among the people and society about the harmful effect of heavy metals and used eco-friendly and biodegradable natural material in religious activities.

#### 5. Acknowledgment

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