

**HEAVY METAL CONTAMINATION DUE TO IDOL IMMERSION IN
HUSSAINSAGAR LAKE, HYDERABAD, INDIA**

Shalini Pankanti*

V.V. College of Arts, Commerce, Science & Post Graduate Studies, Waman Naik Marg,
Jambagh, Hyderabad 500095 India

ARTICLE INFO

Article History:

Received 11th April, 2018

Received in revised form 4th

May, 2018 Accepted 23rd June, 2018

Published online 28th July, 2018

Key words:

Idol immersion, Heavy metals, Health Risk Index, phytoremediation, Desiltation.

ABSTRACT

Heavy metal contamination in water bodies is one of the major global concerns. A religious activity like idol immersion in water bodies is serious concern in India as it is main cause of heavy metal contamination. Idols of Lord Ganesha and Goddess Durgamata are worshipped every year and immersed in water bodies like ponds, lake, rivers or sea. Thousands of idols are immersed and every year the number of idols is increasing. Hussainsagar lake in Hyderabad, India is considered for present study where more than 30,000 idols are immersed this year. Very cheap and toxic paints are used to make the idols more attractive. Size of idol ranges from 1 foot to several feet (maximum height is 56 ft and weight 35 tones). Idol of average height has about 6000 kg weight which contains 36 kg of paint. There is remarkable increase in the concentration of Calcium, Magnesium, Lead and Mercury after the immersion of idols every year. Arsenic, lead and mercury are three top most dangerous heavy metals which are used in preparing paints. One gm of paint contains 10 µgm of Pb and every idol of average weight, immersed causes addition of 0.03 Gms of lead into water body. Due to this religious activity, not only surface water but also underground water is contaminated. Health risk assessment of 2% population using underground water for drinking purpose is calculated in present study. Health risk index for Live Stock and birds consuming Hussainsagar water is also calculated. Installing Eco-friendly Ganesha (painted with natural colours) can reduce this problem. Phytoremediation and desiltation can help in reducing concentration of heavy metals.

Copyright©2018 **Shalini Pankanti**. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Idol immersion (fig1) in Hussainsagar Lake (fig2) is causing serious environmental concern. Ganesh Chaturthi is celebrated as the birthday of lord Ganesha, the embodiment of auspicious beginnings and eliminator of obstacles. He is lord of success, destroyer of evil and worshipped as god of education, knowledge, wisdom and wealth. People buy the idols of lord Ganesha (size ranging from 3 inches to several feet) and install them in their houses and also in the corners of the streets. These idols are made up of plaster of Paris and painted with different colours to make it more attractive. 100 kg idol contains approximately 69 kg of plaster of paris, 10 kg of jute, 10 kg of iron, 6 kg colour and 5 kg wood (fig3). The paints used in idol making have heavy metals like lead, arsenic, mercury etc. Lead is widely used in making paints (Reuters 2009) due to wide range of benefits like low cost, reduced drying time, exceptional covering power, stabilization of formulation and attractive colours.



Fig 1

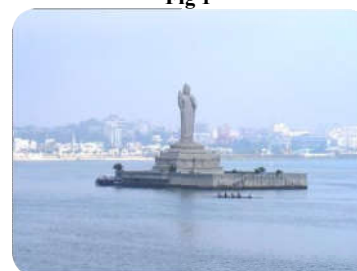


Fig 2

*Corresponding author: **Shalini Pankanti**

V.V. College of Arts, Commerce, Science & Post Graduate Studies, Waman Naik Marg, Jambagh, Hyderabad 500095 India

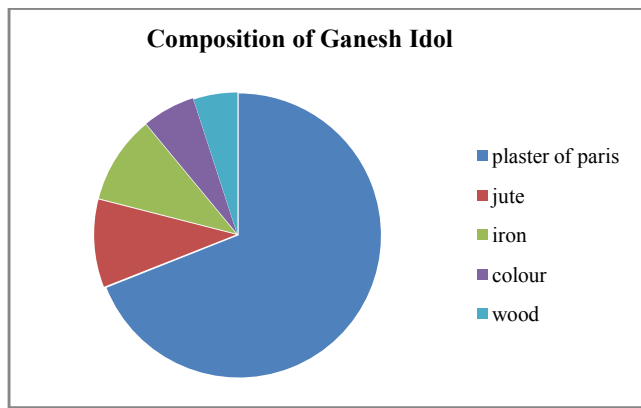


Fig 3

Due to unique combination of price and performance lead paints are used for idol painting.

Pigments used in paints are

- Lead sulphide-black
- Lead chromate-yellow
- Lead molybdate-reddish orange
- Lead carbonate-white
- Lead antimonite-naple yellow
- Mercury sulphide-red.

A joint survey by west Bengal pollution control Board and Indian Toxicology research Institute found that each gram of color used for painting the idol has high quantity of lead ranging from 6 to 10 micrograms.

After worshipping for 10 days, on 10th day a large procession of thousands of people starts from place of installation and Ganesha is taken to immersion site by beating the drums and smearing gulal (vermillion) in air. Vermillion is a red colored powder made of cinnabar (mercuric sulphide). Procession lasts for more than twelve hours causing lot of sound pollution and air pollution. Then idol is immersed in water body like a pond, lake, river or sea. Similarly goddess Durga Mata, protector of all evils, deity of power is worshipped for 10 days during Navaratri. After 10 days, the idols of Durga Mata are immersed in water bodies as a mark of respect to deity's and their power. In Hyderabad, Hussainsagar Lake and Saroornagar Lake are the places for idol immersion.

Details of Hussainsagar Lake

Year of construction	1562
Basin area	240 km ²
Direct catchment area	67 km ²
Shore line length	14 km
Maximum water area	5.7 km ²
Capacity	27.1 million m ³
Average depth	5.2 m
Depth variable	1 to 12 m
Storage volume	28.6x10 ⁶ m ³

Hussainsagar Lake was built in 1575 by Sultan Ibrahim kutb shah for only Rs 2.5 lakhs (\$5092). The Hussainsagar catchment area is drained by 5 nalas covering separate water sheds and total catchment area to about 240 sq km. covering Kukkatpally, Dullapally, Bowenpally, Yusufguda and Khairatabad water sheds. The lake is fed by 4 streams Kukkatpally, picket and Bowenpally, Banjara, Balkapur, domestic sewage and industrial effluents. The catchment area has major industrial areas like Kukkatpally, Balanagar, Sanathnagar and Jeedimetla. The length of the lake is 3.2 km, width 2.8 km, maximum depth is 12.5m with a surface area of

440 ha. The purpose of constructing this lake was to supply drinking water to the twin cities Hyderabad and secunderabad. Since 1930 this lake water is not used for drinking purpose.

The water is getting polluted due to continuous discharge of untreated domestic sewage and toxic industrial chemicals for several years. Since 1980's immersion of Ganesh idols has led to further pollution (Reddy and Kumar 2001). This year more than 30,000 Ganesh idols have been immersed which resulted reduction of depth of Hussain Sagar. Ganesh idol takes about 15 days to dissolve. Due to Plaster of Paris (pop) and paints, turbidity of water increases.

MATERIALS AND METHODS

Water samples were collected from four different sites in Hussainsagar lake two days before immersion and 10 days after immersion. These samples were analysed as per the standard methods (APHA 1995) to find total dissolved solids and metal concentrations shown in table (1). All the reagents used were of Analar grade. Arsenic, lead, mercury concentrations were determined by Atomic Absorption Spectrometer (Perkin Elmer model 700). Pollution Index is calculated using formula PI = Concentration of metal in sample/tolerable limits (Nistida et al. 1982).

Risk to human health by consumption of metal contaminated water is assessed by calculating

HRI (health risk index) as follows

$$HRI = DIM/RfD \text{ (Khan et al. 2009)}$$

Where DIM is daily intake of metals and RfD is reference oral dose (0.35mg/kg/day for lead, 0.001 mg/Kg/day for mercury), (DEFRA 1999). DIM is calculated as

$$DIM = C_{metal} \times C_{factor} \times D_{water} \text{ intake/body average weight (Khan et al. 2009).}$$

Where C_{metal} is concentration of metal in water, C factor is conversion factor taken as 1, D_{water} intake is daily consumption of water which is taken as 2 litres. Body average weight is taken as 65 Kg. DIM and HRI are found for lead and mercury for Hussainsagar water before immersion, after immersion and water samples of 10 bore wells (underground water) near Hussainsagar lake. Table (2).

Table 1 Concentrations of metal in Hussainsagar lake before and after idol immersion.

Parameter	Units	Values (before immersion)	Values (after immersion)	Permissible limits	Pollution index before immersion	Pollution index after immersion
Total dissolved solids	Mg/l	732	946	600	1.22	1.57
Calcium	Mg/l	240	344	75	3.2	4.58
Magnesium	Mg/l	56	96	30	1.86	3.2
Arsenic as As	Mg/l	<0.02	<0.02	.05	---	---
Lead as Pb	Mg/l	<0.02	0.06	.1	2.0	6.0
Mercury as Hg	Mg/l	BDL	0.018	.001	0.1	18

Table 2 Concentrations of metal in underground water from bore well near Hussainsagar lake.

Units	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Tds Mg/l	910	1873	1896	3629	855	655	825	2081	16731	1939
Ca Mg/l	91	209	218	420	97	48	111	88	432	215
Mg Mg/l	90	71	69	160	30.2	48.2	29.6	188	684	91.6
As Mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pb Mg/l	BDL	BDL	0.022	0.026	BDL	BDL	BDL	0.028	0.026	0.022
Hg Mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

B1 to B10 are the samples collected from Borewells near Hussainsagar lake.

Table 3 Comparison of Health Risk Index before and after idol immersion

Water sample	DDI (lead)	HRI (lead)	DDI (mercury)	HRI (mercury)
Before immersion	0.0006	0.0175	Nil	Nil
After immersion	0.0018	0.051	0.00055	0.5538
B 3	0.00067	0.019	Nil	Nil
B 4	0.0008	0.02285	Nil	Nil
B 8	0.00086	0.0246	Nil	Nil
B 9	0.0008	0.02285	Nil	Nil
B 10	0.00067	0.019	Nil	Nil

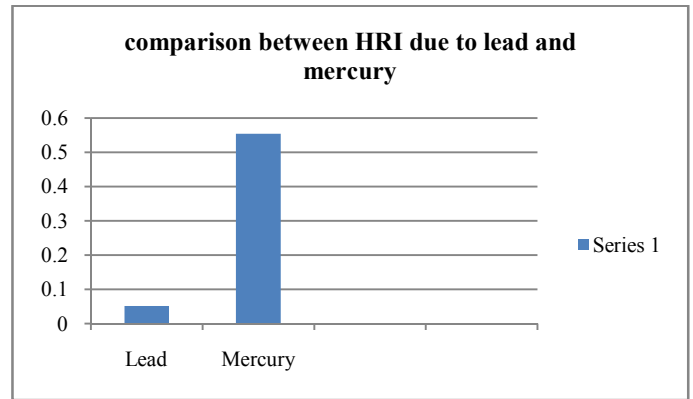


Fig 7

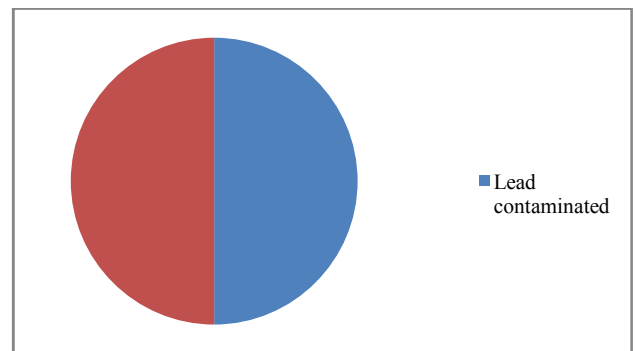


Fig 8 Lead contamination in underground water

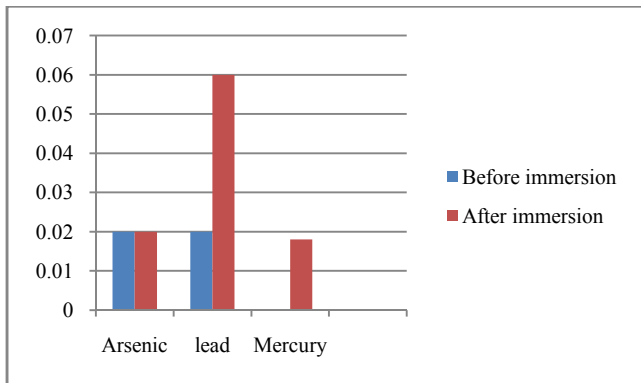


Fig 4 Comparison of concentrations of heavy metals before and after immersion of idols

Units: Concentration in mg/Litre

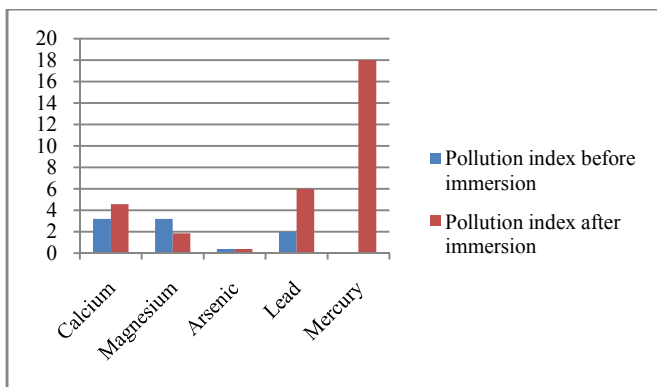


Fig 5 Pollution index of the metals before and after immersion of idols

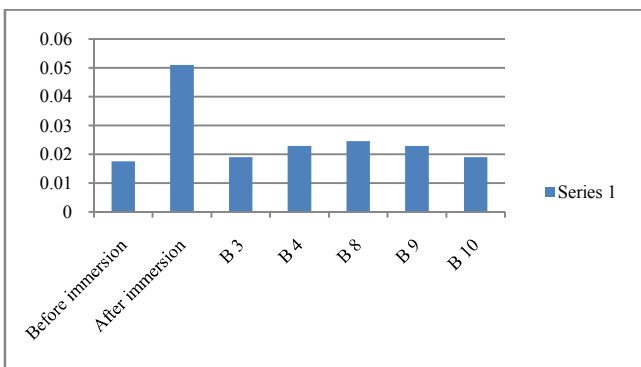


Fig 6 Concentration of Lead in water samples

Units: Concentration of Lead in mg/Litre

RESULTS AND DISCUSSIONS

Immersion of idols in Hussainsagar lake has a strong impact on water quality. The present investigations reveal that water is contaminated with heavy metals due to idol immersions. Lot of work has been done on idol immersion and metal contamination (Dhote et.al 2001, Mukerjee 2003, Vyas et.al 2007). Present study shows that there is detectable amount of lead in underground samples near this lake which indicates that idol immersion has not only polluted surface water but also underground water. Variation in concentration of metal is shown in fig 4 and fig 6. The pollution indices of the metal are compared before and after idol immersion are shown in fig 5. Though concentration of mercury after immersion is 0.018mg/litre, its pollution index is 18 which is highest among all metals shown here (fig 7) because of its very small permissible level. HRI values for lead range from 0.0175 to 0.051 which is three fold due to idol immersion. HRI of mercury is causing highest concern. (Health is at risk if HRI greater than 0.2). There is no threat due to arsenic as it is below detectable levels in most of the samples. 50% of the underground water samples are contaminated with Lead fig 8 which could be due to percolation of contaminated Hussainsagar lake water underground.

Lead and mercury after reaching human body undergo bioaccumulation and biomagnifications. Heavy metals entering human body directly through contaminated water or indirectly through food chain can cause many health problems (Jarup 2003). Excessive accumulation of these metals creates problems like cardiovascular, kidney, nervous and bone diseases. The acidic medium in the stomach converts metal into stable form and enables it to combine with body's biomolecules such as proteins and enzymes to form strong chemical bond. The hydrogen atoms are replaced by poisoning

heavy metal and enzyme. Therefore functioning of enzyme is inhibited.

CONCLUSION

Heavy metals like lead mercury and arsenic in paints are not easily assimilated in aquatic environment and this leads to contamination of lakes affecting various fish and prawn species. The metals enter into the food chain and cause bio accumulation and bio magnification which could be fatal for human beings, live stock, birds etc. The Hussain Sagar Lake can be prevented from such heavy metal contamination by stopping this religious activity.

Public awareness programs should be conducted for stopping such kind of pollution. Instead of harmful chemical paints, eco friendly natural colours should be used to make the idols attractive. Desiltation and Phytoremediation can also help in reducing the metal concentrations in the lake.

Acknowledgments

The author gratefully acknowledges support from the UGC, New Delhi for granting a minor research project. (MRP – 3171/09) (MRP –UGC/SERO).

References

1. APHA (1995), Standard methods for examination of water and waste water, American Public Health Association, Washington, D.C., 19th Edition.
2. DEFRA (Department of Environment Food and Rural affairs), 1999. Total diet study – aluminium, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, tin, and zinc. The Stationery office, London.
3. Dhote, S., Varghese, B., Mishra S.M.,(2001) Impact of Idol immersion on water quality of Twin Lakes of Bhopal. *Indian Journal Environmental protection*. Vol. 21, 998-1005.
4. H. Nistida, F. Miyai, E. Tada, S. Suzuk, 1982. Computation of the index of pollution caused by heavy metals in river sediment. *Environ. Pollut.* 4, 241-248.
5. L. Jarup, 2003. Hazards of heavy metals contamination. *Br. Med. Bull.*, 68:167-82,2003.
6. "Lead-laden paint still widely sold around the world". *Reuters*. August 25, 2009.
7. Mukerjee A.,(2003) Religious Activities and Management of Water Bodies. Case Study of Idol Immersion in Context of Urban lakes Management International Water History Association (3) 325.
8. Reddy, Vikram M., and Kumar, Vijay, A.(2001).Effect of Ganesh Idol Immersion on some water quality parameter of Hussain Sagar, *Current Science*, Vol. 81: 1412.
9. S. Khan, R. Farooq, S. Shabaz, M. A. Khan and M. Sadique, 2009. Health Risk Assessment of heavy metals for population via consumption of vegetables. *World Applied Sciences Journal* 6(12):1602-1606.
10. Vyas, Anju; Bajpai, A;Verma, N; Dixit, S.,(2007) Heavy metal contamination cause of idol immersion activities in urban lake bhopal, *J. Appl. Sci. Environ. Manage.* December, Vol. 11(4) 37 – 39

How to cite this article:

Shalini Pankanti (2018) 'Heavy Metal Contamination Due to Idol Immersion in Hussainsagar Lake, Hyderabad, India', *International Journal of Current Advanced Research*, 07(7), pp. 14235-14238.
DOI: <http://dx.doi.org/10.24327/ijcar.2018.14238.2572>
