A Case Study of Seasonal Variation of Heavy Metals in Amalner City (M. S.)

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Abstract

In present investigation, analysis was carried to evaluate the variation of heavy metals in drinking water in pre-monsoon, monsoon and post-monsoon season. Ten samples in season were collected from various sampling stations in order to study the variation of heavy metals in drinking water, analysed by Atomic Absorption Spectrophotometer.In most of the samples metals were within safe limits but some metals are found to be below detection limits.

Key words - *Heavy metals,AAS,Drinking Water.*

I. INTRODUCTION

Heavy metals such as Pb, Cu, Cd, As, Ni and Hg etc. are the precious constituents of the environment. In trace amount these metals are essential for the survival of living organism. For example, at low level metals such as Copper, Iron and Zinc etc. are playing a role of catalyst for the enzymatic processes (1,2) While other metals like Pb,Mn,Cd and Cu can cause detrimental effects. The main source of these heavy metal are water where they are present in dissolved form (3). The water sources have been used for various purposes such as drinking, cleaning, irrigation, recreation and several other purposes (4). The presence of excess amounts of these heavy metals in water sources createspollutions in aquatic systems. Variation in concentrations of the metals especially heavy metals may harmful to the ecological systems. An environmental point of view, the water pollution due to the heavy metals becomes a major issue which causes a several disorders. The presence of heavy metals in water sources and its side effects has been reported in various reports (5,14). In order to overcome these drawbacks, detection of the variation in concentrations and the removal of excess amount of these metals from the water sources is important.

The main aim of this study was to investigate the seasonal variations of heavy metals in drinking water collected from the various places of Amalner city.Amalner (India)is acity and a municipal council in Jalgaon district in the state of Maharashtra (India), situated on the bank of Bori river.

Here we particularly focused on Lead, Copper and Cadmium metals content in drinking water of Amalner city.

II. MATERIALS AND METHODS

From this Amalner city we have selected 10 sampling stations.

Sampling Stations	
(s_1)- Khaleshwar area	(s_6)-Near R.K.Nagar
(s_2)-Kharteshwar,	(s_7)- In the area of Pratap college
(s_3)-At MangalMandir	(s_8)-Near Dheku Road
(s_4)-Near Shivaji Garden	(s_9)-Area of wadiChauk
(s_5)- Near by Wipro	(s_{10})-Pimple Road.

All the water samples were collected and preserved by using the std. Process. The presented study was carried out into three season's namely premonsoon,monsoon and post monsoon season. In pre-monsoon season samples were collected in last week of May 2012 .In monsoon season samples were collected in last week of September 2012 .Similarly in post monsoonseason,samples were collected in last week of January 2013. Samples were collected in plastic bottles.

III. ANALYTICAL METHOD

All the samples were analysed by Atomic Absorption Spectrophotometer. (Thermo scientificS series/ A A Spectrophotometer) to detect the Pb, Cu, Cd

and Mn composition in the analytical laboratory of School of Environmental Science, North Maharashtra University, Jalgaon.

Metals	Wavelength (nm)	Lamp current	Band Path	Flame Type	FuelFlow (L/m)
Pb	217.0	75%	0.5	Air Acetylene	1.1
Cu	324.8	75%	0.5	Air Acetylene	1.1
Cd	279.5	75%	0.2	Air Acetylene	1.0
Mn	228.8	50%	0.5	Air Acetylene	1.2

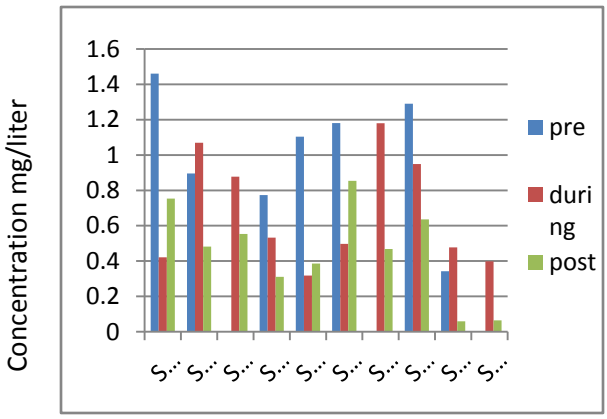
The Above table shows what type of wavelength lamp current, band path, flame type and fuel flow were used for the analysis of composition of the presented metals.

IV. RESULT AND DISCUSSION

In this study, we analysed lead, copper, cadmium and manganese from the drinking water collected from various places and the analytical data obtained has been given in Table 1.

V. LEAD

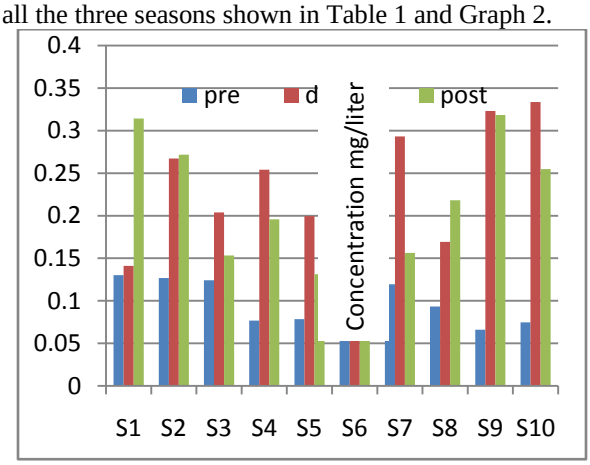
Table 1 and Graph 1 shows the concentration of Pb in the 10 samples of water, where 0.7046 mg/litre. 0.6717 mg/litre., 0.4566mg/litre are the average concentrationsof the Pb in the Pre-Monsoon, Monsoon, Post-Monsoon respectively. The overall average concentration is 0.611 which is above the desirable limit and near about the permissible limit. Lead from the atmosphere or soil can end up in ground water and surface water. It is also potentially in drinking water, Lead is very much toxic and has poisonous effect on human health, may cause acute poisoning, chronic poisoning and higher exposure may cause kidney damage.



Graph 1.Sampling Stations

VI. COPPER

Copper is the one of heavy metal essential to the environment and health, But the excess concentration of the copper leads to various disorders such as anaemia, liver and kidney damage (8).Seasonal variation of Cu in all the three seasons shown in Table 1 and Graph 2.



Graph 2. Sampling Stations

Table 1 Metal conc. In water (mg/lit)

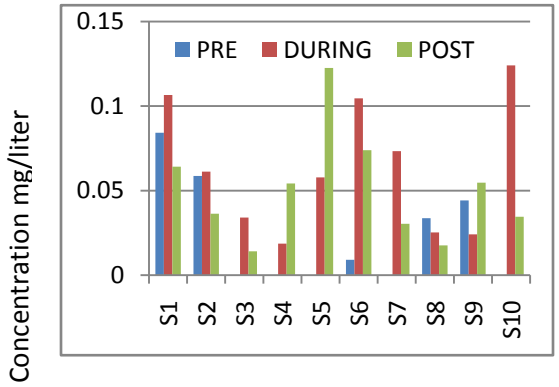
ss	Pb			Cu			Cd			Mn		
	Pre Monsoon	Monsoon	Post Monsoon	Pre Monsoon	Monsoon	Post Monsoon	Pre Monsoon	Monsoon	Post Monsoon	Pre Monsoon	Monsoon	Post Monsoon
S_1	1.4607	0.4209	0.7537	0.1302	0.1411	0.3142	0.0842	0.1066	0.0642	0.0012	0.044	0
S_2	0.8956	1.0691	0.4821	0.1268	0.2673	0.2717	0.0587	0.0612	0.0363	0.0067	0.002	0.0077
S_3	0	0.8774	0.5532	0.1241	0.2038	0.1532	0	0.0341	0.0141	0.0039	0	0
S_4	0.773	0.5322	0.3108	0.0767	0.2541	0.1957	0	0.0186	0.0542	0.003	0	0
S_5	1.1037	0.3174	0.3856	0.0784	0.1996	0.1313	0	0.0578	0.1226	0.0073	0.006	0.032
S_6	1.1809	0.4971	0.8541	0.0847	0.1672	0.1983	0.0091	0.1046	0.0739	0.0067	0.0033	0.0031
S_7	0	1.1799	0.4679	0.1195	0.2932	0.1563	0	0.0733	0.0304	0.001	0	0
S_8	1.2906	0.9486	0.6356	0.0932	0.1692	0.2182	0.0337	0.0253	0.0176	0.0009	0	0
S_9	0.3423	0.4768	0.0589	0.0661	0.3231	0.3184	0.0442	0.0241	0.0547	0.0046	0.0049	0.034
S_1	0	0.3982	0.0641	0.0747	0.3336	0.2548	0	0.1241	0.0345	0	0.0124	0.0168
Mean	0.70468	0.67176	0.4566	0.09744	0.2352	0.2212	0.02299	0.0629	0.0502	0.00353	0.00726	0.0936
AV	0.611			0.1846			0.04538			0.0347		

SS = Sampling stations

In our study we found that the average concentrations of the copper were 0.0974 mg/L, 0.2352 mg/L and 0.2212 mg/L in pre-monsoon, monsoon and post-monsoon respectively. The average concentration of copper was to found lower in pre-monsoon season as compare to the monsoon and post-monsoon. The samples collected from sampling stationsS_1-S_9 shows the copper content quite higher than other stations in pre-monsoon and post-monsoon stations. While in monsoon season, higher copper concentration (0.3336 mg/L) was observed at S_{10}. The overall average concentration of copper in all three seasons is 0.1846 mg/L which is the above to the desirable limit and near about same to the permissible limit (6). In comparison to the overall the samples, Copper concentration was higher at S_{10} in monsoon and S_1,S_9in post-monsoon respectively.

VII. CADMIUM

In the similar way, we studied the cadmium variation over the 10 sampling stations in the three seasons. The obtained results are depicted in Table 1 and Graph 3.



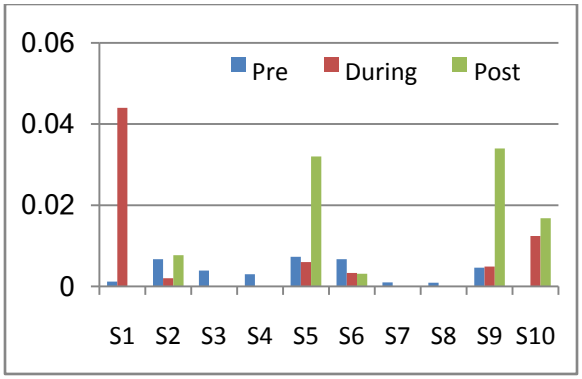
Cadmium has no known useful role in higher organism. The highest concentration of Cd has been found to be absorbed in the Kidneys of humans. During the study of Cd conc. In the water the average concentration of the Cadmium in Pre-Monsoon was found to be 0.0229 mg/L and 0.0629 mg/L and 0.0502 mg/L in monsoon and post-monsoon respectively. Whereas 0.04538 mg/lit is the overall average conc. of the Cd in all the three seasons, which is in between the desirable and permissible limit.

VIII. MANGANESE

Manganese is an important metal for human health, being absolutely necessary for development, metabolism and the antioxidant systems. Nevertheless excessive exposure or intake may lead to a condition known as Manganism. A neurodegenerative disorder that causes dopaminergic neuronal death and Perkinsonian like symptoms. Higher levels of exposure to Mn in drinking water are associated with increased intellectual impairment and reduced intelligent quotients in school age children's.

In the study of Mn the average conc. Of Mn were 0.00353 mg/lit.,0.00726 mg/lit.,0.0936 mg/lit in Pre-Monsoon, Monsoon, and Post-Monsoon rep. The average coc.ofMn was found lower in Pre-monsoon as compaired to monsoon and Post-Monsoon. The overall average conc. of Mn in all the three seasons is 0.0347 mg/lit which is below the permissible and desirable limit also.

Seasonal variation of Mn in all the three seasons shown in Table 1 and Graph 4.



Graph 4. Sampling Station

IX. CONCLUSION

The present investigation was carried out to find the seasonal variations of heavy metals such as Lead, Copper and Cadmium in drinking water collected from various places of Amalner city.

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