*International Research Journal of Environmental Sciences*_____ ISSN 2319–1414
Vol. **6(6),** 8-11, June **(2017)** *Int. Res. J. Environmental Sci.*

Quality assessment and monitoring for presence of arsenic in tap water collected from various locations of Lahore, Pakistan

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Available online at: www.isca.in, www.isca.me
Received 3th April 2017, revised 8th June 2017, accepted 18th June 2017

Abstract

The present study aims to assess and monitor the tap water collected from various locations in Lahore, Pakistan for arsenic contamination. The presence of Arsenic (As) in tap drinking water is a somber threat to human health due to its carcinogenic nature. The quantity of Arsenic in tap water was detected by using inductively coupled plasma. 20 samples of tap water were collected for determination of arsenic contamination. Arsenic concentration in 16 samples was found beyond permissible limits i.e. 10 ppb as recommended by WHO. It is of worth importance that 80%; a large number of tap water samples collected from various areas of Lahore are contaminated with Arsenic which is toxic metal. Hence, it is direly needed to adapt alleviation and preventive measures for reducing the probability of health hazardous issues related to arsenic contamination.

Keywords: Arsenic, tap water, toxic, inductively coupled plasma.

Introduction

It is universally accepted human right to drink safe and uncontaminated water for good health. The brisk urbanization, industrialization and large developments have unswervingly affected the environment. The pollution and degradation in the ecosystem has now become a major risk for life on planet earth. The major problem in the global environment is water pollution due to release of unprocessed industrial effluents into water bodies. Various researchers worked on water quality and found a lot of contaminants exceeding the permissible limits of international standards. Input of heavy metals in water and soil is causing a severe dilemma in affecting human health and other creatures on earth. The high concentration of heavy metals in water is due to rapidly growing urbanization and poor planning[1-3].

The drinking water standards for the maximum permissible levels of different ingredients are set by different countries and the permissible limits for water quality parameters may vary from country to country[4]. It was estimated by WHO 2011 that 1,18, 400 people die due to diarrhea in 2002 which shows a very worse condition that 79 out of 1,00,000 people died. The reason behind this scarce reality is the "Poor Water Quality"[5].

Arsenic exposure in humans and animals is directly through drinking water[6]. Exposure to arsenic through water may cause various serious health issues, such as stomach and intestines irritations, decreasing synthesis of red and white blood cells, abdominal ache, muscular pain, skin allergies and lung irritation[7]. Arsenic presence in drinking tap water may raise risk of lung and bladder cancer and having arsenic concentrations 50ppb[8].

The water distribution through pipelines is causing deterioration of drinking water and making it poisonous for human consumption. In Lahore the Tap Water supplying system is not meeting consumer's perception about Quality of Water. According to WHO and PSQCA, the permissible level for presence of arsenic in drinking water is 10 ppb[9]. According to IARC (the international agency for research on cancer) [10], the inorganic compounds of arsenic have been classified as Category 1A. As the drinking water with high arsenic levels is too perilous and it is essential that water resources be monitored to ensure health, especially in areas where the water has high arsenic levels[11,12].

In the present study tap water samples were collected from various locations of Lahore and tested for Arsenic contamination.

Materials and methods

Research area: In the present work the study area was Lahore, the city in province of Punjab, Pakistan. Twenty (20) samples were collected from the different tap water sources at different locations in Lahore.

Collection of water samples: The tap water samples were directly obtained from the tap after allowing the water to run for

at least 5 minutes and sample bottles along with its cap was rinsed three times to remove dusts. Tap water was collected in washed and clean plastic bottles.

Analysis of water samples: For arsenic determination 100 ml of each sample was treated with 0.1ml nitric acid (HNO_3) and then the samples were filtered with Whatman filter paper (2 micron). Inductively Coupled Plasma (ICP-OES, Perkin Elmer, Optima 2000) was used to determine arsenic in tap water samples[13].

Results and discussion

Arsenic being a very harmful and toxic metal is of great concern because in very minute quantity (parts per billion) it may cause cancer and other serious harms. Arsenic contamination in water is already reported in various countries responsible for serious harmful health issues. Mainly the serious smash up to health was taken place in West Bengal, India and Bangladesh in 1970s and 1980s. UNICEF and other international agencies helped for the provision of clean drinking water by installing more than four million water pumps for controlling major diseases like diarrhoea and infant mortality[14]. Similarly, in Pakistan awareness about arsenic presence in tap water was necessary, that's why the present research was conducted to assess the presence of arsenic in Lahore tap water samples.

It is clear from the present study that alarmingly and discouragingly all the tap water sources in 20 locations of Lahore selected for research are not supplying safe drinking water to the community. Arsenic concentration in water samples was found beyond permissible limits (10 ppb) in 16 samples.

Table-1: Concentration of arsenic in tap water collected from various areas of Lahore.

Sample No.	Different areas of Lahore selected for tap water collection	Arsenic concentration (ppb)
1	Model Town	25.0
2	Sheikhupura Road	50.0
3	Gulberg	40.0
4	Jati Umra, Raiwind	30.0
5	Shamma	11.0
6	Qartaba Chowk	30.0
7	Janazgah	30.0
8	Hailey College	40.0
9	Shadbagh	30.0
10	Township	Not Detected
11	Samanabad	0.25
12	Garden town	8.00
13	Ferozepur road	6.41
14	Mustafa Town	Not Detected
15	Badami Bagh	5.00
16	Lahore Cantt	Not Detected
17	DHA –Phase V	Not Detected
18	New Muslim Town	50.0
19	Izmir Town	70.0
20	Ichhra	70.0

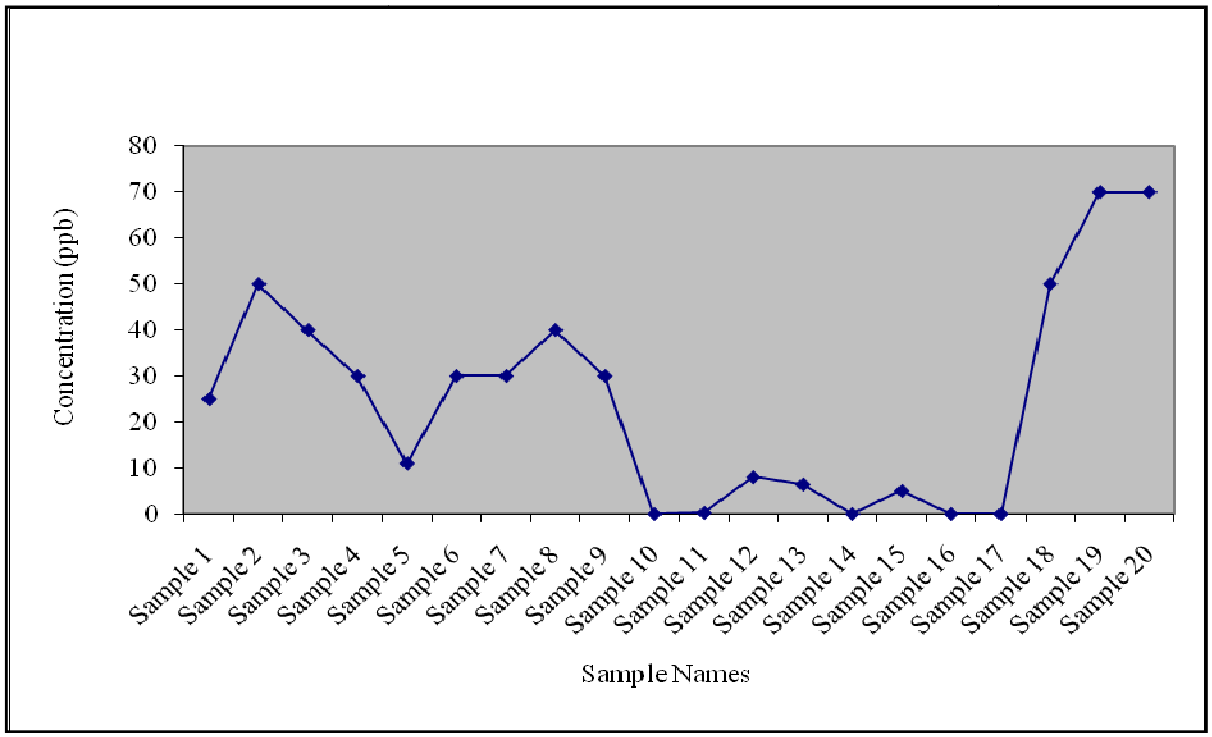

Figure-1: Arsenic Contamination in Various Samples.

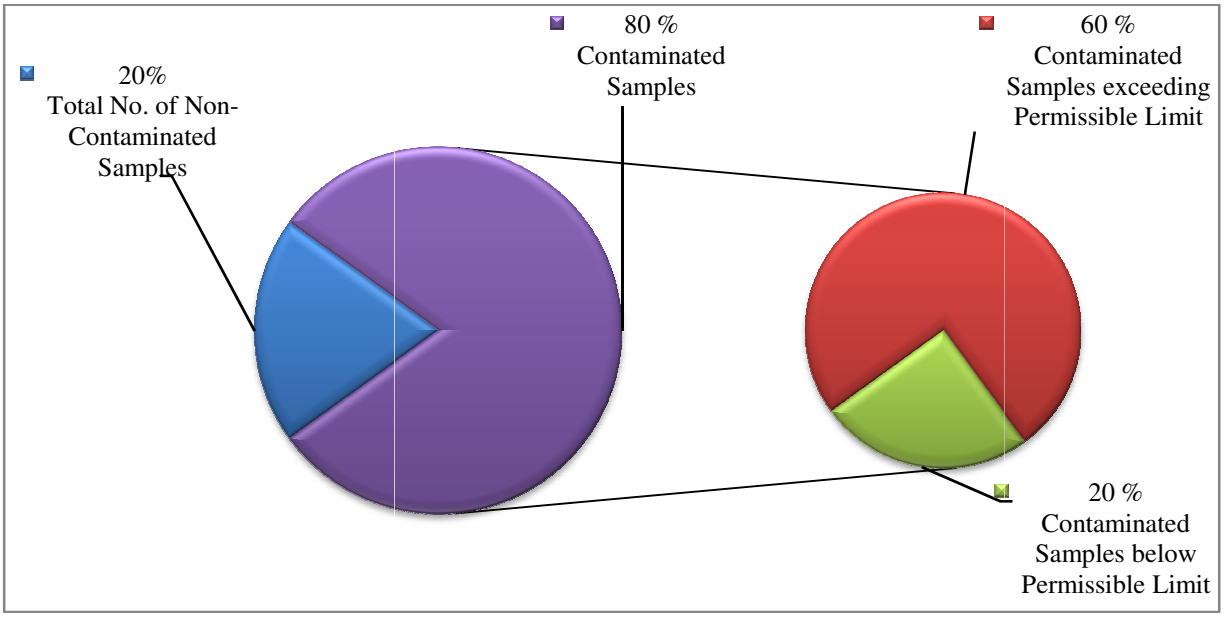

Figure-2: Percentage Analysis of Tap Water Samples for Arsenic Contamination.

Table-2: Percentage Analysis of Tap Water Samples for Arsenic Contamination.

Permissible Limit for Arsenic in Tap Water	10 ppb
Total Number of Samples	20
No. of Contaminated Samples	16
Non-Contaminated Samples	04
Contaminated Samples exceeding Permissible Limits	12
Contaminated Samples below Permissible Limits	04

The Figure-1 shows the percentage analysis of tap water samples collected from various locations of Lahore city for Arsenic Contamination. The Following Figure shows the arsenic contamination in samples of tap water collected from various Areas of Lahore. The analysis of tap water of the second largest city of Pakistan has revealed an alarming situation of tap/drinking water infectivity as 16 out of 20 sources are supplying precarious water having 80% Arsenic contamination.

The results in Figure-2 demonstrated that 20% total tap water samples were not contaminated with Arsenic while 80% of the total tap water samples were contaminated with Arsenic. Out of contaminated samples 60% had Arsenic beyond the permissible limits whereas 20% Arsenic contamination below the permissible limits.

It is of worth importance that 80%; a large number of tap water samples collected from various areas of Lahore are contaminated with Arsenic which is toxic metal. The high concentrations of arsenic in tap water increases the proportion of still-births and extemporaneous abortions, it also causes arsenism, hyperpigmentation, black-foot disease, skin cancer and cardiovascular diseases[15].

Conclusion

Water quality is necessary to maintain various processes. Any meticulous use will have certain requirements for the physical, chemical or biological characteristics of water. Arsenic is toxic metal and may cause cancer. It may severely harm the human health due to its carcinogenic nature. There should proper and proactive monitoring of water samples on regular basis. It was horrendous matter that almost 80% water supply in taps of Lahore is contaminated with arsenic which may cause harmful and deadly diseases in human beings as well as other living creature. The results show alarming circumstances for the households and tap water supplying companies in Lahore. Improvement and quality practices in supplying tap water are to be addressed on urgent basis. For this purpose, it is essential to monitor the quality of water regularly, keeping in view the health and safety of the populaces of Lahore. Quality assurance of tap water quality can save many lives as arsenic is very injurious to health.

References

1. Arora M., Kiran B., Rani S., Rani A., Kaur B. and Mittal N. (2008). Heavy metal accumulation in vegetables irrigated with water from different sources. Food Chemistry, 111(4), 811-815.

2. Barati A.H., Maleki A. and Alasvand M. (2010). Multi-trace element level in drinking water and the prevalence of multi-chronic arsenical poisoning in residents in the west area of Iran. *Sci. Total Environ*, 408(7), 1523-1529.

3. Li J., He M., Han W. and Gu Y. (2009). Analysis and assessment on heavy metal sources in the coastal soils developed from alluvial deposits using multivariate statistical methods. *J. Hazar. Mater*., 164(2), 976-981.

4. Misund A., Frengstad B., Siewer U. and Reimann C. (1999). Variation of 66 elements in European bottled mineral waters. *Sci. Total Environ.*, 243, 21-41.

5. World Health Organization WHO. (2003). United Nations Synthesis Report on Arsenic in Drinking Water.

6. Roychowdhury T., Tokunaga H. and Ando M. (2003). Survey of arsenic and other heavy metals in food composites and drinking water and estimation of dietary intake by the villagers from an arsenic affected area of West Bengal, India. *Sci. Total Environ*, 308(1-3)**,** 15-35.

7. Hughes M.F. (2002). Arsenic toxicity and potential mechanisms of action. *Toxicology Letters*, 133, 1-16.

8. Steinmaus C., Yuan Y., Bates M.N. and Smith A.H. (2003). Case-control study of bladder cancer and drinking water arsenic in the western United States. *American J. Epidemiology*, 158**,** 1193-1201.

9. WHO. (2011). Guidelines for drinking water quality, volume 1, recommendations. Geneva, World Health Organization. http://whqlibdoc.who.int/publications/2011/9789241548151_eng.pdf).

10. Mahar M.T., Khuhawar M.Y., Jahangir T.M. and Baloch M.A. (2015). Determination of arsenic contents in groundwater of District Rahim Yar Khan Southern Punjab, Pakistan. *Arabian Journal of Geosciences*, 8(12), 10983-10994.

11. Litter M.I., Morgada M.E. and Bundschuh J. (2010). Possible treatments for arsenic removal in Latin American waters for human consumption. Environmental Pollution, 158(5), 1105-1118.

12. Mosaferi M., Taghipour H., Hassani A.M., Borghei M., Kamali Z. and Ghadirzadeh A. (2008). Study of arsenic presence in drinking water sources: a case study. *Iranian Journal of Health and Environment*, 1(1), 19-28.

13. Mondal D., Banerjee M., Kundu M., Banerjee N., Bhattacharya U., Giri A.K., Ganguli B., Roy S.S. and Polya D.A. (2010). Comparison of drinking water, raw rice and cooking of rice as arsenic exposure routes in three contrasting areas of West Bengal, India. *Environmental geochemistry and health*, 32(6), 463-477.

14. Petrusevski B., Sharma S., Schippers J.C. and Shordt K. (2007). Arsenic in drinking water. Delft: IRC International Water and Sanitation Centre. 17(1), 36-44.

15. Jain C.K. and Ali I. (2000). Arsenic: occurrence, toxicity and speciation techniques. *Water Res*., 34(17), 4304-4312.