ANALYSIS OF ARSENIC IN INDUSTRIAL AREAS OF HYDERABAD, INDIA

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ABSTRACT

The nature of water is the most important and it is essential for all forms of life. The water is mainly polluted by the different industrial effluents that directly contaminate the lakes, channels, rivers and seas. Due to this, the ground water is contaminated with the heavy metals. The surroundings of the Industrial areas are more affected by Arsenic where the people suffer from Arsenic related diseases. The World Health Organization (WHO) recommended the maximum concentration of arsenic in drinking water is 10 μg/l or below than this. The Arsenic concentration levels are more in summer than in winter season is observed from the analysis of ground water.

KEY WORDS : Arsenic, Arsenic contamination, Adsorbents, Arsenomolybdate method.

INTRODUCTION

Water is the important resource which is basic to the human life. Generally water obtained from two types of natural sources: surface water (lakes, ponds, rivers, streams etc.) and ground water (bore holes and well water). Water plays an important role like domestic, industrial supply, irrigation in all over the world. But increase of population, industrialization and urbanization cause the contamination of ground water. The contaminated ground water is not easy to restore. Hence it is necessary to protect quality of ground water. According to WHO 80% of diseases arise due to contaminated ground water.

As the ground water flows from recharge area to discharge area the ground water quality will decrease due to chemical reactions. Heavy metals are important environmental pollutants which are increased by human activities like mining, agriculture, discharging industrial effluents containing metals without giving any treatment from industries like steel plants, battery, thermal power plants and over usage of fertilizers containing heavy metals in agriculture are the main reasons to contaminate the ground water. The traces of Arsenic ions play an important role in human life which affects the central nervous system.

The objectives of this study are 1) to evaluate the dissolved heavy metals in the ground water 2) to provide controlling techniques.

Arsenic is naturally occurring element. It is odorless and tasteless. It is available in inorganic form in the environment. It enters into ground water through underground rocks, soil and industrial human activities. If the arsenic stocks in human body cancer, neural disorders are caused. Daily consumption of water with greater than 0.01 mg/l of arsenic, less than 0.2% of the fatal dose, can on long term lead to problems with the skin as well as circulatory and nervous systems.

METHODS AND MATERIALS

The adsorbents preliminary screened were Brick powder, Multani Mitti, Iron Dust and Lemon Peel powder (Table 1). Initially all the adsorbents were screened by adding 1 g of each adsorbent to 100 ml of solution Arsenic.

Adsorption methods were adopted for removal

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of heavy metals and these methods are suitable when Arsenic is present in low concentrations. For this purpose, an aqueous solution of 100 ml of Arsenic of various concentrations was taken in 100ml reagent bottles and 1 gm of adsorbent was added to the solutions. The initial and final concentrations of aqueous solution of Arsenic determined by Arsenomolybdate method and percentage removal of Arsenic were determined.

Study areas of Hyderabad

Katedan/Kattedan

Katedan is located in K.V Rangareddy District in Hyderabad. The average annual rain fall is 833mm. The areas are covered by granites, gneisses, shales, deccan trap, laterile and soils like Red soil, medium black soil, mixed soil. The peak temperature was recorded in the year 2017 was 40.90 °C in the month of April and the lowest temperature was 15.10 °C recorded in December. Relative humidity of 46 % and 85 % was observed in April and September respectively. The major rivers like Musi, Musa, Kagna, Manjeera. In general the water level is below 10 m. The water level fluctuates from 1.4 to 33.50 m in Pre-monsoon and 0.20 to 28.32 in Post-monsoon.

Katedan is one of the industrial areas of Hyderabad. It comprises the plastic industry, chemical industry, oil industry, packaging industry, food industry, Agro products, Electrical industry, paint industry etc.,

Spatial distribution and temporal trends studies were carried out at Katedan Industrial Development Area (KIDA) near Hyderabad, capital of Andhra Pradesh state, to find out the extent of contamination in ground water like bore wells from the discharge of industrial effluents. Samples were collected from the bore wells in different places of Katedan. The samples were analyzed by Arsenomolybdate method using U.V. Spectrophotometer for toxic Arsenic element. The studies reveal that the ground water has high concentration of some of the chronic element like arsenic. This occurs due to the discharge of effluents from different industries located in Katedan.

It was observed that the Arsenic concentrations increased in the ground water during the dry season (pre-monsoon period). After the monsoon rains, the metal concentrations in the ground water were reduced by half which may be due to dilution. This contaminated ground water is utilized for drinking,
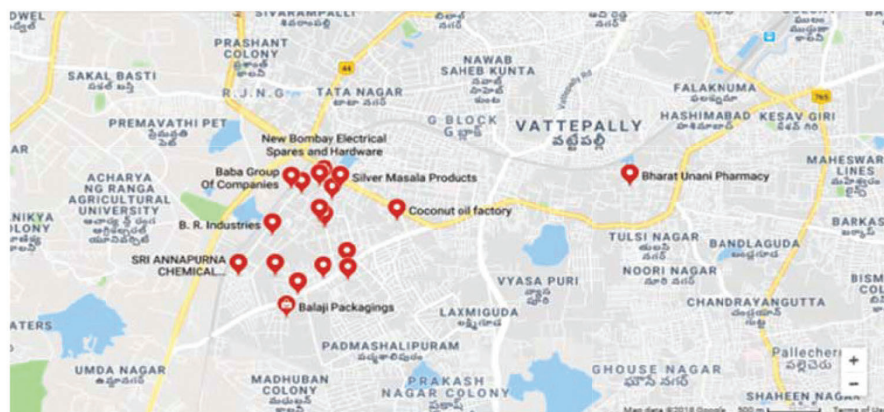
washing, cleaning etc., that leads to the various diseases which is hazardous to the survival of humans. Effect of toxic elements on the health of the residents in the surrounding residential areas is observed.

Patancheru

Patancheru, is an industrial zone located about 32 km from the city centre on the Hyderabad-Solapur highway. Patancheru is located at 17.53°N 78.27°E. It has an average elevation of 522 metres (1712 feet).
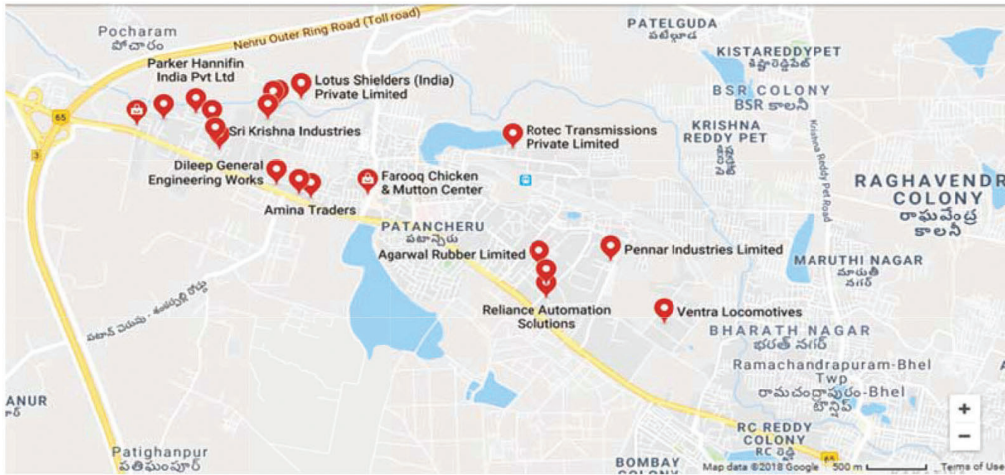

Table 1.

| Area	Place	Borewell Depth (ft)	Arsenic level in µg/l Summer season	Arsenic level in µg/l Rainy season
Patan cheruvu	Muttangi	430	22.4	5.6
	Ramachandra Puram	520	14.0	4.2
	Shankapalli	480	19.6	7.0
	Patan cheru village	800	13.7	8.4
	Tellapur	330	16.8	9.5
	Nallagandla	470	11.2	7.5
Katedan	Netaji Nagar	480	16.8	2.8
	Sivaram palli	550	19.6	2.7
	Sainagar	1000	25.2	1.4
	Padmasalipuram	150	14	2.8
	Sri Ram Nagar	145	14	2.8

Saki Lake is situated very close to the Patancheru Bus Terminus. Patancheru having a large number of pharmaceutical manufacturers, which has resulted in local river water being the most drug polluted water in the world.

Patancheru is located in Sangareddy District in Hyderabad. The average annual rain fall is 868mm. The areas are covered by hard rock like Archaeans, Deccan traps and recent Alluvium and the soils like Red loaming, Sandy and black cotton soil. The peak temperature was recorded in the year 2017 was

40.90 °C in the month of April and the lowest temperature was 15.10 °C recorded in December. Relative humidity of 46 % and 85 % was observed in April and September respectively. The major rivers like Manjira, Handi, Kundliar are located in surrounding of Patancheru. In general the water level is below 10 m. The water level fluctuates from 1.4 to 33.50 m in Pre-monsoon and 0.20 to 28.32 in Post-monsoon.

Patancheru is the major industrial hub of Telangana. Industries such as Agarwal Rubber Limited (makers of ARL and MARUTI brand of Tyres and Butyl tubes) and Asian Paints, Aurobindo Pharma, paragon polymer products Pvt Ltd, Hindware, Fenner, Pennar Kirby Building Systems, Rotec Transmissions and Sandvik (MNC) are located in this area. It received a major boost when Indira Gandhi started the Patancheru Industrial park, while serving as the MP of Medak constituency.

The highest level of drug pollution in water was found in Patancheru from 2009. Researchers found measurable quantities of 21 different manufactured drugs in the water. The pollution results from waste water dumped into the river by the over 90 local pharmaceutical manufacturers.
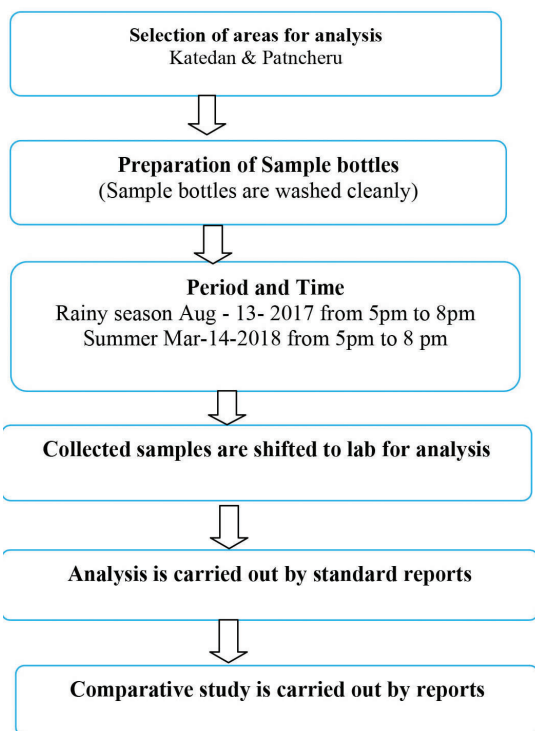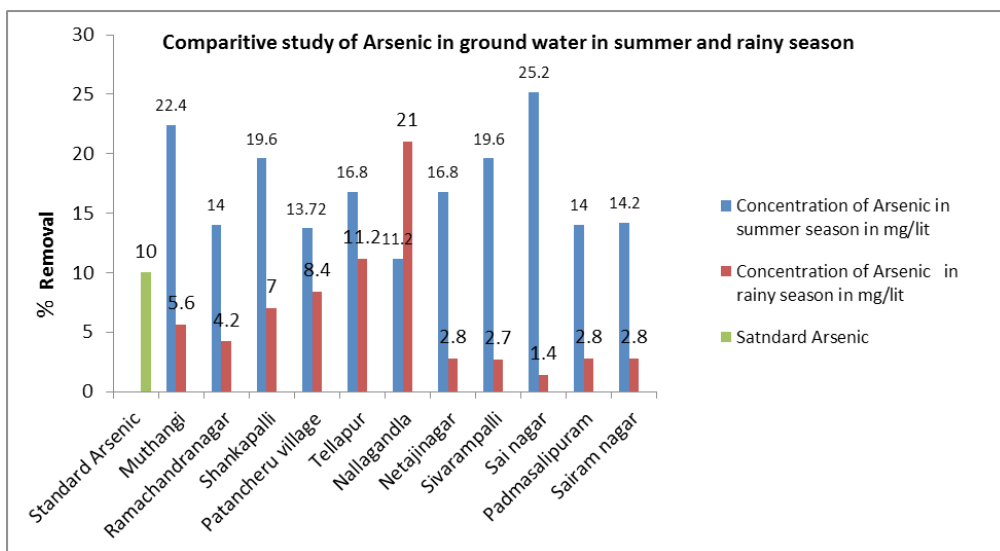
METHODS OF ANALYSIS

Arsenic kit

Arsenomolybdate methods

RESULTS AND DISCUSSION

The ground water analysis is done in summer and

Selection of areas for analysis
Katedan & Patncheru

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Preparation of Sample bottles
(Sample bottles are washed cleanly)

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Period and Time
Rainy season Aug - 13- 2017 from 5pm to 8pm
Summer Mar-14-2018 from 5pm to 8 pm

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Collected samples are shifted to lab for analysis

⬇

Analysis is carried out by standard reports

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Comparative study is carried out by reports

Comparitive study of Arsenic in ground water in summer and rainy season

rainy seasons. The Arsenic concentration level in ground water is high in summer season and low in rain season. This is due to dilution by rain water in rainy season. In summer Arsenic concentration is very high due to accumulation of Arsenic in deeper level. The highest Arsenic concentration level is 25.2 µg/l in Sainagar and The lowest Arsenic concentation level is 11.2 µg/l in Nallagandla. In Rainy season the Arsenic level 9.5 µg/l is more in Tellapur and The arsenic level 1.4 µg/l is less in Sainagar.

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