



RESEARCH PAPER

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Investigation of physicochemical parameters and toxic effects of metals in drinking water of Quaid-E-Abad, Karachi

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Abstract

The aims of present study were to evaluate the physicochemical parameters such as pH, electric conductance (EC), total dissolved solids (TDS), Chlorides, carbonates and level of toxic elements such as Arsenic, Chromium, Cadmium and lead in Drinking water of Quaid-e-Abad Karachi, Sindh by using different techniques. Literature review indicates that in the study area such types of analysis has not been conducted by any organization in past. Therefore 100 drinking water samples were collected from 10 Union Councils of Quaid-e-Abad, Karachi during period of 2017 followed by GPS system. For analysis of Toxic elements such as Cd, Cr, Pb and As the samples were pre-concentrated with 2N HNO₃ & 35% H₂O₂ and were kept below <4°C prior to analysis. Results of present study indicates that pH, Total Dissolved Solid, Chlorides and carbonates concentration were found slightly high in few samples as compared to WHO permissible limits. While values of Electrical Conductance, level of Cadmium, Chromium, and Lead were found within the recommended guideline of WHO. Arsenic is highly toxic and human carcinogenic element which was fortunately not found in any drinking water sample of Quaid-e-Abad, Karachi. For taking some measurements regarding lowering the level of pH, TDS, Chloride and carbonates in drinking water of Quaid-e-Abad, Karachi the water could be made good for drinking purposes to the human population.

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Introduction

Groundwater is extremely significant resource for both human consumption and agricultural purpose. Contaminated water may become health risk for all types of life because water is required for metabolism for all living organisms. For continuance of life on the earth, presence of adequate water quality is very important. Heavy metals may be considered as toxins to ecosystem, however their main source is believed as weathering of rocks and anthropogenic activities. Usage of safe and satisfactory supply of drinking water helps in inhibiting the spread of various diseases, improves the living standard, and cares domestic as well as personal health (Storelli MM, Storelli A, D' Addabbo 2005). Nowadays, groundwater is going to become contaminated due to human activities by continuously adding agricultural, domestic and industrial wastes to groundwater pools at frightening level. Similarly, quality as well as quantity of water is affected by adding a pollutant either physical or chemical alters the water quality by increase in anthropogenic activities. Human health could possibly be threatened by presence of chemical contaminants in drinking water all over the world.

The aim of this study was to locate the actual concentration of arsenic in ground or public intake water of this area and to distinguish the likely pollution sources with the help of statistical and geochemical data. The samples from many sites of district have been collected and analyzed for the arsenic hunt using hydride generator system coupled with atomic absorption spectrophotometer.

Water must be tested before hand of using for drinking, native, agricultural and trade purpose. Various physicochemical parameters must be used to determine quality of water as given by WHO. Variety of constraints for water test is exclusively depending on the purpose of use, the extent of need of its purity & quality. Various physicochemical parameters for monitoring quality of water must be tested. Such as EC, pH, TDS chlorides-carbonates etc. while chemical tests should be performed for its toxic and trace another elements concentration. Potential health risk assessment of arsenic in drinkable water is very useful

to evaluate. (V Selvaraj 2013, Graff Zivin 2013). Serious health issues of arsenic polluted drinkable water may origin cancer, disease of lungs like effect on carcinogen, hypertension, exterior disease of vascular system, hyperkeratosis and skin disease. Arsenic (As) and many other toxic metals has been identified as a big hazard to health of public in many countries like India, Bangladesh, Vietnam, China Nepal, Myanmar and Pakistan (Fakir Md *et al.*, 2016, Seema Anjum Khattak *et al.*, 2016, Yi Huang, and Chihiro Inoue *et al.*, 2016, Ung-Duck Park *et al.*, 2016, Lei Huang and Haiyun Wu *et al.*, 2015, Sardar Khan *et al.*, 2015, Y Zheng and Ayotte JD 2015).

Trace metals should also be tested for getting more pure and good quality water, contaminations of organic pesticide in water needs more sophisticated instruments for analysis and well skilled individuals.

Following various physicochemical constraints must be analyzed frequently for special care to get excellent water quality. Such as pH, temperature, odor, color, TDS and turbidity etc. whereas tests of chemical must be performed for the COD, BOD, alkalinity, dissolved oxygen, toxic elements and hardness (Sawant *et al.*, 2012, Adefemi SO *et al.*, 2010, Adnan *et al.*, 2010, Agarwal *et al.*, 2011, Gupta DP *et al.*, 2012).

Therefore aims of the study to evaluate the physicochemical parameters such as pH, electric conductance (EC), total dissolved solids (TDS), Chlorides, carbonates and level of toxic elements such as Arsenic, Chromium, Cadmium and lead in Drinking water.

Materials and methods

Study Area

Karachi is known as the city of light. It is industrial zone and center of trade as well and heart of Pakistan. Quaid-e- Abad is an area of Karachi. It is the neighborhood of BIN QASAIM town in Karachi, Sindh Pakistan.

Quaid-e- Abad is a city and headquarters of Quaid-e-Abad Tehsil an administrative subdivision of the district Kushner District Bin Qasim town has 7 union councils.

Sample Collection

By following GPS system 100 drinking water samples were collected from 10 Union Councils of Quaid-e-Abad, Karachi during period of 2017. On the spot the pH and EC were determined with help of their respective meters while other physicochemical parameters chlorides, bicarbonates, TDS and other were determined in Institute of chemistry, Shah Abdul Latif University, kharipur methods are given below. For investigation of Toxic elements such as Cd, Cr, Pb and As the samples were pre-concentrated with 2NHNO₃ & 35% H₂O₂ and were kept below <4°C prior to analysis. All the preserved samples were by using ICP-Atomic Emission Spectrophotometer.

Reagents and glassware

Double de-ionized ultra-pure water was used throughout the research work. Analytical reagent grade HNO₃ and HCl, by Merck (Darmstadt, Germany) were used. Pure argon (99.99%) gas was used as sheath/carrier gas for atomizer. For the preparation of Sodium tetra hydro borate solution, powdered NaBH₄ was dissolved in 0.5 M potassium iodide (KI). All the standards for analysis of Cd, Cr, Pb and As were made by dilution method from stock standard (1000mg l⁻¹) solutions.

Results and discussion

pH in drinking water

Ten samples of drinking water were taken from each UCs for the purpose of analysis of different parameters. Maximum value of pH 8.14, 8.58, 8.32, 8.33, 8.12 and 8.12 was measured from UC No.01, 02,03,04,05 and 06.

Level of E.C in drinking water of Quaid Abad Karachi

Ten samples of drinking water were taken from each UCs of Quaid Abad Karachi for the purpose of analysis of different parameters. Maximum level OF E.C was measured 840, 982, 1857, 1477, 2191 and 1909 from UC No.01, 02,03,04,05 and 06.

Level of (TDSmgL⁻¹) in Drinking water of Quaid-e-Abad Karachi

Ten samples of drinking water were taken from each UCs of Quaid Abad Karachi for the purpose of

analysis of different parameters. Maximum level of TDS was measured 740, 491, 930, 956, 1102 and 956mgL⁻¹ from UC No.01, 02, 03, 04, 05 and 06. Level of TDS was found maximum in sample no 05 while low level was noted in sample no 01. Among all the samples of drinking water which were analyzed.

Level of Chlorides in Drinking water Quaid-e-Abad, Karachi

Ten samples of drinking water were taken from each UCs of Quaid Abad Karachi for the purpose of analysis of different parameters. Maximum level of chloride was measured 181, 156, 331, 181, 332 and 297mgL⁻¹ from UC No.01, 02, 03, 04, 05 and 06.

Level of Bicarbonates in Drinking water Quaid-e-Abad, Karachi

Ten Samples of drinking water were taken from UC 01 Quaid Abad Karachi for the purpose of analysis of different parameters. Maximum Level of Bicarbonates was measured 531, 271, 271, 425, 501 and 422mgL⁻¹ from UC No.01, 02, 03, 04, 05 and 06.

Level of Cadmium in Drinking water Quaid-e-Abad, Karachi

Ten Samples of drinking water were taken from UC 01 Quaid Abad Karachi for the purpose of analysis of different parameters. Maximum Level OF Cadmium was measured 0.24, 0.18, 0.18, 0.21, 0.19 and 0.21µgL⁻¹ from UC No.01, 02, 03, 04, 05 and 06.

Level of Chromium in Drinking water Quaid-e-Abad, Karachi

Ten Samples of drinking water were taken from UC 01 Quaid Abad, Karachi for the purpose of analysis of different parameters. Maximum Level OF Chromium was measured 0.31, 1.02, 1.21, 1.23, 1.02 and 0.69µgL⁻¹ UC No.01, 02, 03, 04, 05 and 06.

Level of Lead in Drinking water Quaid-e-Abad, Karachi

Ten Samples of drinking water were taken from UC 01 Quaid Abad Karachi for the purpose of analysis of different parameters. Maximum Level OF Lead (pb) was measured 1.35, 2.87, 1.37, 1.36, 1.36 and 2.88 UC No.01, 02, 03, 04, 05 and 06.

Different other factors may be the cause of contamination of underground water including fertilizers, varnishes, and other chemical industries (Wang and Shpeyzer 1997; Mandal and Suzuki 2002). The study area is very much famous for cotton production in Sindh because of enhanced yield. For this purpose, the farmers use high quantity arsenical pesticides to kill the pests without investigating the actual dosages.

Table 01. Level of different parameters in drinking water of UC-1 to 6 of Quaid-e-Abad, Karachi.

Parameters	UC :01	UC No:02	UC: 03	UC :04	UC :05	UC:06
pH	8.14	8.58	8.32	8.33	8.12	8.12
E.C	840	982	1857	1477	2191	1909
TDS (mgL ⁻¹)	740	491	930	956	1102	956
Chlorides (mgL ⁻¹)	181	156	331	181	332	297
Bicarbonates (mgL ⁻¹)	531	271	271	425	501	422
Cadmium μgL^{-1}	0.24	0.18	0.18	0.21	0.19	0.21
Chromium μgL^{-1}	0.31	1.02	1.21	1.23	1.02	0.69
Lead	1.35	2.87	1.37	1.36	1.36	2.88

Conclusion

The present study was conducted in order to analyze different parameter in drinking water of Quaid bad Karachi. It is revealed that maximum level of pH was observed in sample no 02 while low level was noted in sample no 03 among all the samples of drinking water which were analyzed. Maximum level of chlorides was observed in sample no 04 whereas low level was found in sample no 06 in different samples of drinking water of study area which were analyzed.

It has been concluded that pH, Total Dissolved Solid, Chlorides and carbonates concentration were found slightly high in few samples as compared to WHO allowable limits. However, the values of Electrical Conductance, level of Cadmium, Chromium, and Lead were found within the suggested standard of WHO. In every sample which was analyzed Arsenic is highly toxic and human carcinogen which was fortunately not detected in any drinking water sample of Quaid-e-Abad, Karachi. For taking some measurements concerning lowering the level of pH, TDS, Chloride and carbonates in drinking water of

Quaid-e-Abad, Karachi the water might be made good for drinking drives to the human population.

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Conflicts

The authors have not declared any conflict of interests.

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