



Study of Physiochemical Ground Water Quality Parameters of Different Hospital Areas of Faisalabad

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Authors' contributions

This work was carried out in collaboration among all authors. Authors SY and MAA designed the study. Authors SY, MAA, MN and SS performed the statistical analysis. Authors SA and MI wrote the protocol and wrote the first draft of the manuscript. Authors SY, MN, MI and SS managed the analyses of the study. Authors SY, SA and SS managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ASRJ/2019/v2i330054

Editor(s):

(1) Dr. Alessandro Buccolieri, Department of Biological and Environmental Sciences and Technologies (DiSTeBA), Università del Salento, Italy.

Reviewers:

(1) Ozegin, K.O, Ambrose Alli University, Nigeria.
(2) Ashok Kumar Yadav, Maharshi Dayanand Saraswati University, India.
Complete Peer review History: <http://www.sdiarticle4.com/review-history/52901>

Original Research Article

Received 20 September 2019

Accepted 25 November 2019

Published 17 December 2019

ABSTRACT

The main sources of water are rain, surface and ground water. These resources are contaminated due to human activities. Clean water is basic need at every step of life, it also ensures the good health. The main objective of this study was to access the quality of ground water in Faisalabad city. From different hospitals of the Faisalabad water samples were collected to estimate their physiochemical parameters. The physiochemical parameters such as (color, taste, odor, pH, Electrical Conductivity (EC) and Total Dissolved Solids (TDS) were analyzed and their values were compared with the standard values given by the World Health Organization. In majority of the colonies some parameters were found within permissible parameters of above standard such as pH and total hardness. But in few colonies EC and TDS values deviated with reference to the recommended values. On the completion of data physiochemical parameters of ground water, statistical analysis was applied. Statistical analysis was carried out to evaluate the significant different between means of samples.

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Keywords: Ground water; Faisalabad city; physiochemical parameters; water quality.

1. INTRODUCTION

Water is the universal solvent and that is why it is always at risk to contamination. It is most important component that affects life directly or indirectly [1]. The development of any country depends upon the fresh water resources which includes surface and ground water. Surface water is more likely to contaminate because of its easy access to waste waters while ground water is mainly used for irrigation purposes and other domestic purposes [2].

In many countries, ground water is a virtue of fresh water resources and contains about 75% of fresh water reservoirs. It is used as main source of drinking water. But quality of drinking water must be ensured as it should be free from pathogens and other toxic substances. In Pakistan, ground water is mainly used for drinking water. Due to overpopulation, there is an increasing demand for fresh water. The contamination of ground water is mainly done by agricultural, industrial waste disposal and by many other natural processes [3].

According to the survey of WHO, 80% of diseases in humans are the result of contamination of water [4]. Ingestion of contaminated water can be the mode in transmission of gastrointestinal infections [5]. In Pakistan, there are about 72% people who are living in rural areas and unfortunately most of them do not get facility to drink safe water. Due to this, they suffer from disease like typhoid, cholera, kidney problems and many others [6]. Quality of ground water varies from one area to the other [7]. About 40% deaths caused due to poor and unhygienic water quality in Pakistan among them are children that suffer from Diarrhea [8]. We can solve the problem of quality of water by raising public awareness.

Ground water pollution is also called as groundwater contamination. The quality of groundwater is getting worse when there is an unchecked sewage wastes and disposal material of industries, insecticides, pesticides and many others [9]. The network of pipes carrying ground water may be damaged and then wastes will be mixed with this ground water. The increasing demand of water badly affects its quality. In Pakistan, water is a major factor to comfort wellbeing of citizen as our country is already water stressed country [10].

There are many heavy metals and trace elements which can be easily entered in ground water which have harmful effects on health of human [11]. There were many reports which showed that these heavy metals and trace elements entered in human body through drinking water [12]. The objective of present study to determine the quality and pollution estimation of ground water.

To improve the quality of ground water for human consumption, a system must be developed which should conduct authentic chemical, physical and biological parameters which depend upon conditions being observed. Physical parameters include pH, Electrical conductivity, Turbidity, color, taste and odor. The impurities in ground water can be classified into biological, organic and inorganic and many others which may be responsible for the bad taste and odor [13]. Excessive use of chemicals in agriculture and other domestic human activities are the major source of degradation of ground water [14].

2. MATERIALS AND METHODS

The present study was conducted at the laboratory of Water and Sanitation Agency (WASA) Faisalabad for the analysis of ground water quality parameters. Thirteen samples were collected from different hospitals of Faisalabad. These hospitals covered almost the entire vicinity of Faisalabad. Before sample collection, sampling bottles were washed with distilled water to remove any contamination and then samples were collected in bottles for maximum accuracy in results.

The following Tests were performed color, taste, odor, pH, Electrical Conductivity (EC) and Total dissolved solids (TDS). pH was estimated by a pH meter. System consists of a combination of electrode and display the result in either milli volts or after conversion into pH units. A glass electrode was placed in 100 ml beaker containing distilled water and the pH meter was calibrated according to manufacturer's recommendations and glass electrode was dipped into the other beaker having water sample. The deflection of readings was observed from rest position and when it was in stable condition, the pH of sample was read directly and noted. EC was measured by the electrical conductivity meter (Model DDS-120W). For measurement of EC same procedure was carried out like pH estimation.

3. RESULTS AND DISCUSSION

The quality of water being checked by applying different parameters and the results are as follows. The value of turbidity was noted low as compare to the WHO standard. The value of pH is 7.9 which lie within normal range according to WHO guideline. The value of electrical conductivity is 6290 μ S/cm which is significantly above according to WHO guideline. The value of total dissolved solids is 3130 mg/L which is significantly above according to WHO guideline. The taste of ground water is Salty, colorless and odorless.

Analysis of physical parameters of all the hospitals showed that amount of turbidity recorded was significantly lower than the WHO guideline. The temperature was recorded quite high in case of Allied, Kardar, Al Noor, T. B. The pH was logged high from the hospital kardar and Al Noor hospital than the acceptable limits by WHO while E.C was recorded high in Iqbal, Main

trust, Social Security, Kardar. TDS was documented up to normal limits from Faisal, Main trust, Allied, Al-noor and Yasmin memorial. The taste of ground water is salty, and water is colorless and odorless [15] conducted the research in tando Muhammad khan and endorsed the same results that all the physical parameters to check the water quality were recorded above the described limit of WHO.

The comparison of means and standard error mean by tukey's test. This analyses showed that means that do not share the same letter are significant and vice versa, as shown in (Table 2). [16] studied the quality of ground water and highlighted the same results that pollution contaminated the water in different ways either increasing or decreasing the values of parameters like pH, EC and TDS as described by the WHO [17] exposed the ground water condition of Faisalabad and found significant change in water chemistry.

Table 1. Comparison of all physical parameters of different hospitals in Faisalabad

Names of hospitals	Turbidity (<5)	Temp°C (25-32)	pH (6.5-8.5)	E.C μ S/cm (0-1990)	T.D.S mg/L (140-400)
Iqbal	ONTU	35.1	7.9	6290	3130
Faisal	ONTU	32.5	8.3	600	290
Main trust	ONTU	33.6	8.5	2280	290
United	ONTU	31.5	8.5	1530	750
Social security	ONTU	30.2	8.6	5120	2550
Hilal-e-ahmar	ONTU	30.7	8.5	1030	500
Allied	ONTU	37.3	8.4	600	290
Kardar	ONTU	33.8	8.8	3260	1620
Al-noor	ONTU	35.5	8.5	850	420
T. B	ONTU	34.6	8.1	650	320
Yasin memorial	ONTU	29.7	8.3	720	320
Chiniot	ONTU	29.1	8.7	5050	2510
DHQ	ONTU	27.5	8.7	3100	1540

Table 2. Comparison of Means \pm SEM at tukey's test

Hospitals	pH (Means \pm SEM)	EC (Means \pm SEM)	TDS (Means \pm SEM)
Iqbal	7.9 \pm 0.058B	6290.0 \pm 47.92A	3130.0 \pm 50.81A
Faisal	8.3 \pm 0.153AB	600.0 \pm 14.43G	290.0 \pm 7.51F
Mian trust	8.5 \pm 0.173AB	2280.0 \pm 67.55D	290.0 \pm 3.46F
United	8.5 \pm 0.252AB	1530.0 \pm 57.74E	750.0 \pm 24.25D
Social security	8.6 \pm 0.058AB	5120.0 \pm 69.86B	2550.0 \pm 29.44B
Hilal-e-Ahmar	8.5 \pm 0.200AB	1030.0 \pm 9.24F	500.0 \pm 15.59E
Allied	8.4 \pm 0.231AB	600.0 \pm 9.24G	290.0 \pm 6.35F
Kardar	8.8 \pm 0.173A	3260.0 \pm 107.39C	1620.0 \pm 40.41C
Al-Noor	8.5 \pm 0.115AB	850.0 \pm 16.17FG	420.0 \pm 9.24EF
T. B	8.1 \pm 0.173AB	650.0 \pm 6.35G	320.0 \pm 2.89F
Yasin memorial	8.3 \pm 0.173AB	720.0 \pm 4.04FG	320.0 \pm 9.24F
Chiniot	8.7 \pm 0.173AB	5050.0 \pm 129.33B	2510.0 \pm 67.55B
DHQ	8.7 \pm 0.100AB	3100.0 \pm 68.13C	1540.0 \pm 32.91C

Comparison of pH in different hospitals was demonstrated in Fig. 1. The normal range of pH ranges between 6.5-8.5 according to WHO guidelines and the highest value of pH is being observed in following hospitals DHQ, Chiniot, Kardar, Social security while rest of hospitals lies within normal range.

Fig. 2 illustrates the comparison of EC in different hospitals. The normal value of EC according to WHO guidelines is (0-1990 $\mu\text{S}/\text{cm}$). The highest value of EC is being observed in the following hospitals Iqbal, Social security, Chiniot, Kardar hospital while the hospitals which lie between the normal range are as follows Faisal, United, Hilal-e-ahmar, Allied, Al-noor, T.B, Yasin memorial hospital.

The amount of total dissolved solids in different hospitals varied up and below the normal value of WHO guidelines (0-1000 mg/L). The hospitals which showed normal values are as follows

Faisal, Main trust, United, Hilal-e-ahmar, Allied, Al-noor, T.B, Yasin memorial while the highest values are being observed in Iqbal, Social security, Kardar, Chiniot, DHQ (Fig. 3). Sudani [18] studied the pollution factors due to urbanization. The obtained results were same as perceived in above results and confirmed the effect of pollution in spoiling the ground water. Balakrishnan et al. [19] also studied the physio chemical parameters of ground water.

Analysis of variance showed that is statistically significant difference among the samples of water collecting around the different hospitals meaning that the water of these areas is filthy by pollution and drinking of such type of water causes serious health issues in humans. The same results were obtained by Nasir et al. [20] as they are studying the different physiochemical parameters of ground water in Faisalabad city of Punjab Pakistan.



Fig. 1. Comparison of pH in different hospitals of Faisalabad

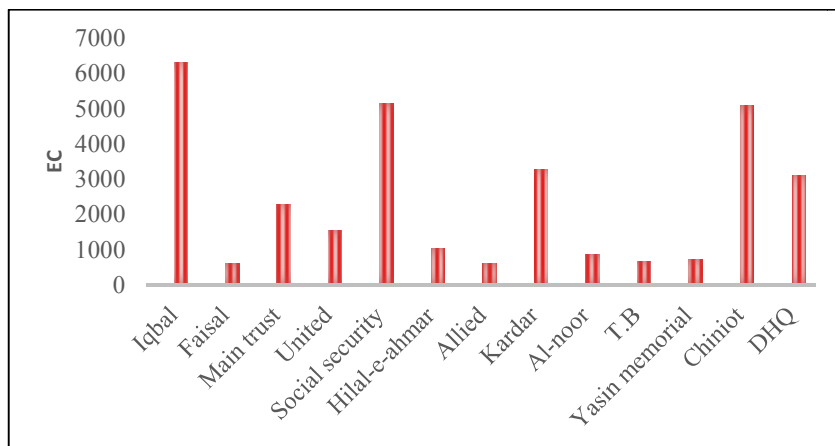


Fig. 2. Comparison of electrical conductivity (EC) in different hospitals of Faisalabad

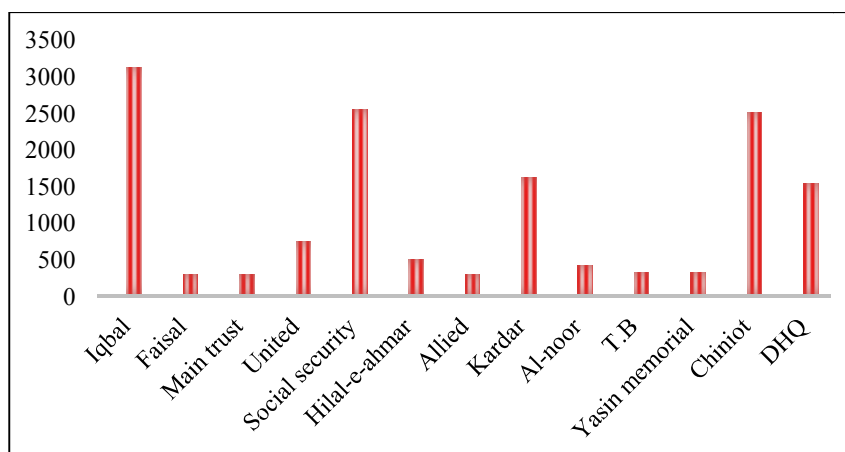


Fig. 3. Comparison of total dissolved solids (TDS) in different hospitals of Faisalabad

4. CONCLUSION

The assessment of the groundwater quality parameters from different areas of hospitals in the Faisalabad demonstrate that the total hardness and pH value are well within the permissible limits while others are high or below of the WHO standard. Limited water samples of ground water from these areas were useful for residential use but rather these were bad to drink uses. From the results of the proposed study it may be concluded that the groundwater of Faisalabad is though unfit for domestic and drinking purpose and treatments should be applied to minimalize the pollution.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Gorde SP, Jadhav MV. Assessment of water quality parameters: A Review. *Journal of Engineering and Applied Research*. 2013;3:2029-2035.
- Carpenter SR, Caraco NF, Correll DI, Sharpely AN, Smith VH. Non point pollution of surface waters with phosphorus and nitrogen. *Journal of Applied Economy*. 1998;8:559-568.
- Sattar SA, S Ramia. Water borne transmission of viral infections; Implications for the developing world. *J.MPA*. 1981;381:181.
- Kavitha R, Elangovan K. Review article on ground water quality characteristics at Erode district, (India). *Int. J. Environment Science*. 2010;12:342-345.
- WHO. Surveillance for drinking water quality. WHO Geneva; 1976.
- Ilyas M. Community medicine. *Journal of Medicine Research*. 1999;29:503-514.
- Sharma BK, Prakashan K. *Environmental chemistry media* Mureet, India. 2000;138.
- Kahlown MA, Tahir MA, Rasheed H, Bhatti H. Water quality status, national water quality monitoring programme. 4th technical report, Pakistan council of research in water resources; 2006.
- Udiwal KH, Patel VM. *International Journal of Chemical and Environment and Pharmaceutical Research*. 2010;1:17-26.
- Aher KR. Groundwater quality studies of Chikalthana area of Aurangabad, Ph. D thesis, Dr. B. A. Marathwada, University, Aurangabad, India. 2012;1-10.
- Mile II, Jande JA, Dagba BI. Bacteriological contamination of well water in Makurdi town, Benue state, Nigeria. *Pakistan Journal of Biological Sciences*. 2012;15:1048-1051.
- Ravikumar P, Venkatesharaju K, Somashekar RK. Major ion chemistry and hydro chemical studies of groundwater of Bangalore South Taluk, India. *Environmental Monitoring and Assessment*. 2009;163:643-653.
- Kavcar P, Sofuoglu A, Sofuoglu SC. A health risk assessment for exposure to trace metals via drinking water ingestions pathway. *International Journal of Hygienic Environment Health*. 2009;2:216-227.
- WHO. Guidelines for drinking-water quality. WHO Geneva; 2006.

15. Daudpota WM, Memon NUN, Miano TF. Determination of groundwater quality for agriculture and drinking purpose in Sindh, Pakistan. *Science International*. 2016;28: 701-704.
16. Ojo IO, Ontieno AOF, Ochieng GM. Groundwater: Characteristics, quality, pollutions and treatments. *International Journal of Water Research and Engineering Environment*. 2012;4:162-170.
17. Khurshid M. Analysis of underground water of Faisalabad city Sector-1 (Areas along Canal Rakh Branch from Manawala to Abdullah Bridge). *Pakistan Journal of Biological Sciences*. 1999;2:105-109.
18. Sudani BR. Comparative study of chemical, physical and biological analysis of some pond water ecosystems in Valsad of state Gujrat, India. *International Journal Chemistry and Physical Science*. 2015;4: 75-82.
19. Balakrishnan M, Antony SA, Gunasekaran S, Natarajan RK. Impact of dyeing industrial effluents on the ground water quality in Kancheepuram (India). *Journal of Science and Technology*. 2008;1:1-2.
20. Nasir S, Samad A, Majeed W, Nargis S, Ramzan U, Ijaz M. Analysis of physiochemical parameters of ground water: A case study. *Asian Journal of Advanced Research and Reports*. 2019;5: 1-7.

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The peer review history for this paper can be accessed here:
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