***Original Research Article***

# Study of physical ground water quality parameters of different hospital areas of Faisalabad


## Abstract

The main sources of water are rain, surface and ground water. These resources are contaminated due to human and industrial activities. Clean water is basic need of us 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 WHO. 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.



**Keywords:** Ground Water; Physical Parameters; Water Quality.


## INTRODUCTION

Water is the universal solvent and that is why it is always at risk to contamination. It is most important component that effects 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 organization, 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 were 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 [13]. There were many reports which showed that these heavy metals and trace elements entered in human body through drinking water [14]. The objective of present study was 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 [11]. Excessive use of chemicals in agriculture and other domestic human activities are the major source of degradation of ground water now days [12].

## 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. Total 13 samples were collected from different hospitals of Faisalabad. These hospitals were covered almost the whole 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 getting maximum accuracy in results.

Some tests were performed such as color, taste, odor, pH, Electrical conductivity (EC), Total dissolved solids (TDS) on the samples of ground water. 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.

## RESULT AND DISCUSSION

The objective of present study was to check the quality of groundwater and to check whether it is fit for human use or not and to estimate how the difference was generated. 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 6290µS/cm which is significantly above according to WHO guideline. The value of total dissolved solids is 3130mg/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., Main trust and Faisal hospital then the predictable limits of WHO then other hospitals. The PH was logged high from the waterbodies of hospital

kardar, social security, and Al noor then the described acceptable limits by WHO while E.C in with nonstandard level was logged in case of Iqbal, Main trust, Social security, Kardar, Chiniot and DHQ hospitals of Faisalabad. T. D.S. was documented upto normal limits from Faisal, Main trust, Allied, Al-noor and Yasmin memorial. The taste of ground water is saltish 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.

**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 µS/cm (0-1990)** | **T.D.S mg/L (140-400)** |
|---|---|---|---|---|---|
| **Iqbal** | 0NTU | 35.1 | 7.9 | 6290 | 3130 |
| **Faisal** | 0NTU | 32.5 | 8.3 | 600 | 290 |
| **Main trust** | 0NTU | 33.6 | 8.5 | 2280 | 290 |
| **United** | 0NTU | 31.5 | 8.5 | 1530 | 750 |
| **Social security** | 0NTU | 30.2 | 8.6 | 5120 | 2550 |
| **Hilal-e-ahmar** | 0NTU | 30.7 | 8.5 | 1030 | 500 |
| **Allied** | 0NTU | 37.3 | 8.4 | 600 | 290 |
| **Kardar** | 0NTU | 33.8 | 8.8 | 3260 | 1620 |
| **Al-noor** | 0NTU | 35.5 | 8.5 | 850 | 420 |
| **T. B** | 0NTU | 34.6 | 8.1 | 650 | 320 |
| **Yasin memorial** | 0NTU | 29.7 | 8.3 | 720 | 320 |
| **Chiniot** | 0NTU | 29.1 | 8.7 | 5050 | 2510 |

| | | | | | |
|---|---|---|---|---|---|
| **DHQ** | 0NTU | 27.5 | 8.7 | 3100 | 1540 |

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 2: Comparison of Means±SEM at tukey's test**

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

| | | | |
|---|---|---|---|
| **DHQ** | 8.7±0.100AB | 3100.0±68.13C | 1540.0±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.

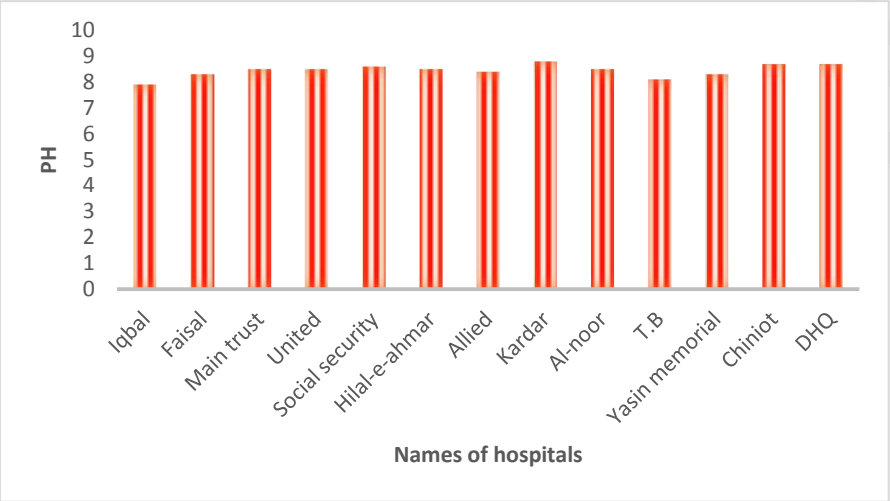


**Figure 1: Comparison of pH in different hospitals of Faisalabad.**

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

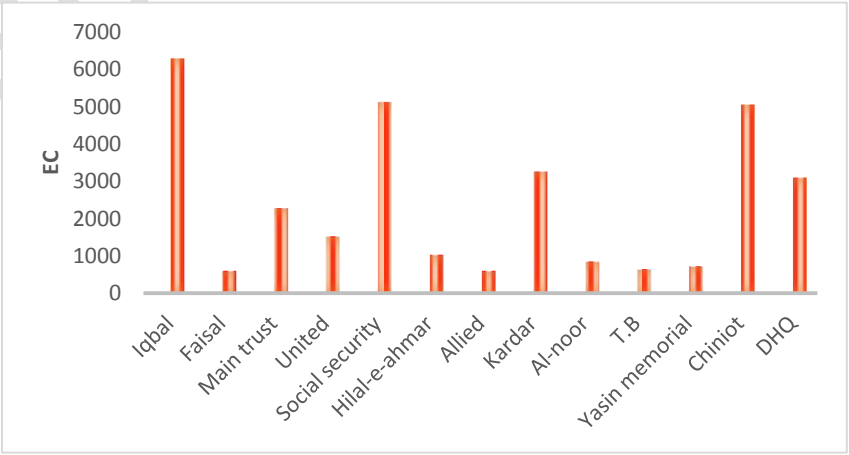

**Figure 2: Comparison of Electrical conductivity (EC) in different hospitals of Faisalabad.**

The amount of total dissolved solids in different hospitals varied up and below the normal value of WHO guidelines (0-1000mg/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. [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. [19] also studied the physio chemical parameters of ground water.

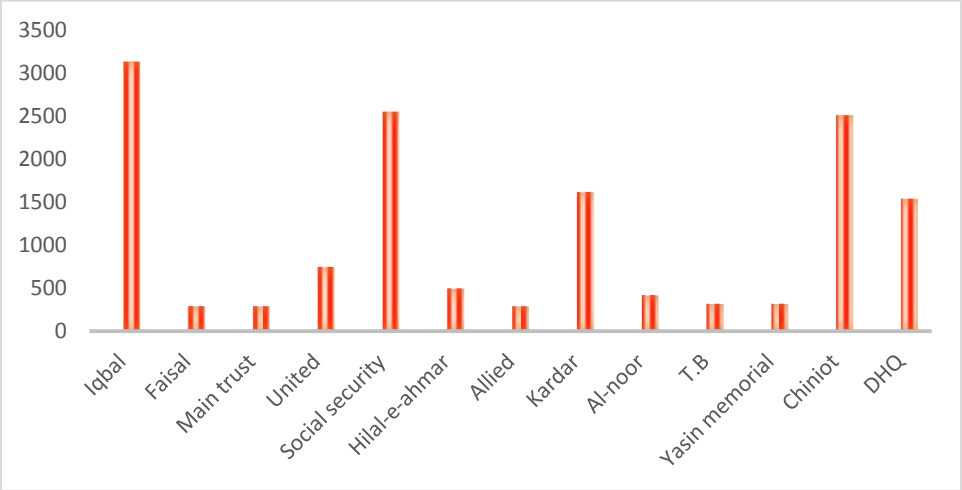


**Figure 3: Comparison of total dissolved solids (TDS) in different hospitals of Faisalabad.**

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 [20] as they are studying the different physiochemical parameters of ground water in Faisalabad city of Punjab Pakistan.

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