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# ASSESMENT OF WATER QUALITY INDEX AND RECOMMENDATIONS

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*Flouride; Motor-driven handpumps; Groundwater*

## *Abstract*

**Introduction**: Disposal of sewage water into fresh water aquifers is the main cause of groundwater pollution. The present study of groundwater monitoring was undertaken to investigate physicochemical characteristics of some groundwater samples from different area located in Punjab. Materials and Methods: 20 water samples, 10 each from urban and rural areas of district Faridkot, Punjab were obtained from hand-pumps with a power-driven motor used for drinking and other household activities. Data was collected, compiled and analyzed by using SPSS-16 and chi-square test was used for statistical analysis and p value<0.05 was considered as significant value. Results: In the present study ph, total hardness, chlorides, fluorides, iron were more than the permissible limits recommended by WHO guidelines in both rural and urban water, and alkalinity was more in case of rural water. Conclusion: The groundwater samples collected from hand-pumps showed deviations from water quality standards indicating groundwater contamination. Citizens, legislators and regulators should join hands together to save this valuable resource of nature.

## Introduction

The quality of ground water is of great importance in determining the suitability of particular ground water for a public water supply, irrigation, industrial applications, power generation etc.). This depends on a large number of individual hydrological, physical, chemical and biological factors. that have acted on the water from the moment it condensed in the atmosphere to the time it is discharged by a well.[1] According to WHO organization, about 80% of all the diseases in human beings are caused by water. Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source. It therefore becomes imperative to regularly monitor the quality of groundwater and to device ways and means to protect it.[2]

Disposal of sewage water into fresh water aquifers is the main cause of groundwater pollution. Thus, determination of groundwater quality is important to observe the suitability of water for particular use. Monitoring of groundwater procured from hands pump is one of the important tool for the evaluation of groundwater quality.[3] The present study of groundwater monitoring was undertaken to investigate physicochemical characteristics of some groundwater samples from different area located in Faridkot district of Punjab.

## Materials and methods

The present cross-sectional study comprising a total of 20 water samples, 10 each from urban and rural areas of district Faridkot, Punjab. Ethical clearance for the commencement of the study was taken from the college ethical committee. Water samples were obtained from hand-pumps with a power-driven motor used for drinking and other household activities and the sampling locations are listed in Table 1. For collection of samples a weighted sample bottle was used and were transported to the laboratory for analysis. Data was collected, compiled and analyzed by

using SPSS-16 and t-test was used to statistically analyze the data and p value <0.05 was considered as significant value.

***Table 1: Sampling locations***

| **Handpump with Motor(Urban)** | **Number of samples** |
|---|---|
| Near sewage treatment plant,Bazigar basti, Sadiq road, Faridkot. | 1 |
| Near LIC office, Sabji Mandi, Ferozpur Road. | 1 |
| Opposite Shaheed Bhagat Singh Park, main bazaar, Faridkot. | 1 |
| Near Gali no.12,Balbir basti,Faridkot. | 1 |
| Near Bhai Ghanaiya Chowk, Court Complex,Faridkot. | 1 |
| Sanjay Nagar,Faridkot. | 1 |
| Opposite Cantt.Road,Faridkot. | 1 |
| Gali no.4,Near GTB Water Works,GTB Nagar. | 1 |
| Dogar Basti,Faridkot. | 1 |
| Near Street No.5,Teacher Colony,Faridkot. | 1 |
| **Handpump with Motor(Rural)** | **Number of samples** |
| Near CHC Bajakhana, Faridkot. | 1 |
| Near Water Works,Jhakkarwala,Faridkot. | 1 |
| Village Lambwali,Faridkot | 1 |
| Near Gurdwara Sahib, Near main road, Dod. | 1 |
| Near Main Road,Bargari,Faridkot | 1 |
| Village Punjgrain kalan,Faridkot. | 1 |
| Near R.O system,Village Malla,Faridkot | 1 |
| Village Dhilwan Kalan,Faridkot. | 1 |
| Village Seda Singh Wala,Faridkot. | 1 |
| Village Wander Jatana,Faridkot. | 1 |

## Results and discussion

Comparsion of chemical and physical parameters of water procured from handpump with motor in urban and rural area of Faridkot district showed that the turbidity of rural area was more, 2.17 as compared to 1.48 of urban area. The pH was same for urban and rural areas (9.0).The total dissolved solids of rural area was more, 9.56 as compared to 8.20 of urban area. The alkalinity of rural area was more, 231 as compared to 178. The hardness of rural area was more, 241 as compared to 139. Quantity of calcium in rural area water was more, 35.8 as compared to 35.0 of urban area, chlorides of urban area was more, 98.4 as compared to 1.20 of rural area, fluoride of rural area was more, 2.40 as compared to 1.65 and iron of rural water was more, 0.200 as compared to 0.180 of urban area. The residual free chlorine of rural was more, 0.170 as compared to 0.100 of urban area. Water was colourless, taste and odour was ordinary in both urban and rural area. It is a well known fact that the clean water is absolutely essential for for healthy living.[4] ph reflects quality of source of water and very acidic or very alkaline water produces sour or alkaline tastes. Higher values of pH reduces germicidal potential of chlorine. In the present study ph of both urban and rural water was more than the permissible limits.[5] In the present study ph, total hardness, chlorides, fluorides, iron were more than the permissible limits recommended by WHO guidelines in both rural and urban water, and alkalinity was more in case of rural water.

Hardness in water is due to the natural accumulation of salts from contact with soil and geological formations or it may enter from direct pollution by industrial effluents. Hardness of
water mainly depends upon the amount of calcium or magnesium salts or both.[3] In the present study, total hardness varied from 139.6 to 241.8 mg/L. The values for sample from both rural and urban area was higher than the prescribed limit by WHO.

Like many elements, fluorine (which generally occurs in nature as fluoride) is beneficial for calcification of dental enamel in trace amounts, but higher concentration can interfere with calcium metabolism in bones and teeth, causing

dental or skeletal fluorosis One of the main concentration in drinking water for calcification of dental enamel. However, it causes dental and skeletal fluorosis if it is in high concentration. High concentration in drinking water is associated with cancer and high intake causes acute effects like crippling, renal and thyroid disorder in human beings.[6] The fluoride concentration in the present study ranged between 1.6-2.4 (mg/L). As early as 1928, Stocks (1928) observed that children consuming well water in the village of Somerset, England exhibited both goiter and mottled enamel (dental fluorosis). Some years later, Wilson (1941) found dental fluorosis (DF) associated with goiter and cretinism among children living in areas of Punjab where fluoride was recognized geologically to be significantly high. Besides dental fluorosis and cretinism, children in endemic fluorosis areas of India often have low IQ, deaf mutism, knock-knee and bow-legs.[7,8]

Alkalinity is a total measure of substance in water that has acid-neutralizing capacity. In the present study total alkalinity level was higher in rural samples 231.4mg/L.[9]

The recommendations are only reaffirmation of what has been said by renowned workers in the field of improving water quality and these reaffirmations need to be employed at every level from citizens to legislators to regulators.

**Citizens:** Need information to understand environmental risks, exercise environmental stewardship through responsible behavior, and support needed policy and program changes.

**Keep paved surfaces clean:** Sweep grass clippings and rake leaves from the street and storm drain. Clean up spilled fertilizer, oil, and other chemicals and dispose of properly.

**Turn your downspout onto your lawn:** Runoff directed down your driveway can pick up oil, yard waste, and other debris. Be a good neighbor and be careful not to redirect the water towards your neighbor's property or a highly erodible area.

**Reduce fertilizer use:** Excess fertilizer can runoff or leach from the soil and impacts our lakes, creeks, and wetlands.

**Wash vehicles on the lawn:** Many soaps and detergents can contain phosphorus or other nutrients which may benefit your lawn but run off readily from paved surfaces where they can negatively impact our water resources.

**Capture and infiltrate your runoff:** Install a rain garden or rain barrel. Reduce unnecessary impervious surfaces or replace failing surfaces with pervious pavers to help increase the amount of runoff absorbed into the ground.

**Legislators**: Develop water-quality and related resource goals, policies, and programs and evaluate progress in achieving the goals.

**Regulators**: Plan, operate, and evaluate programs; protect public health, aquatic habitats, and wildlife populations; determine if water-quality standards and permit requirements are being met; and take appropriate enforcement action when necessary.

**Resource managers**: Develop plans and policies, support operational decisions, resolve water-use disputes, and evaluate the success of programs.

**Municipalities and industries** ---Plan and manage water supplies and discharges; identify sites for development, preservation, and other purposes; and comply with water-quality standards and permits.

**Environmental groups**: Evaluate government policies and programs and identify problems that need to be addressed.

**Scientists**: Improve understanding of the relations among ecological, chemical, physical, biological, and hydrological processes and conditions.

***Table 2: Comparsion of water procured from handpump with motor of rural and urban area***

| Chemical Parametes | Urban | | Rural | | WHO standards |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Turbidity | 1.4840 | 0.30823 | 2.1710 | .2554 | 5 NTU |
| pH Value | 9.0000 | 0.00000 | 9.0000 | .0000 | 7.0-8.0 |
| Total Dissolved Solids | 8.2000E2 | 2.2533E2 | 9.5670E2 | 1.9650E2 | 500 |

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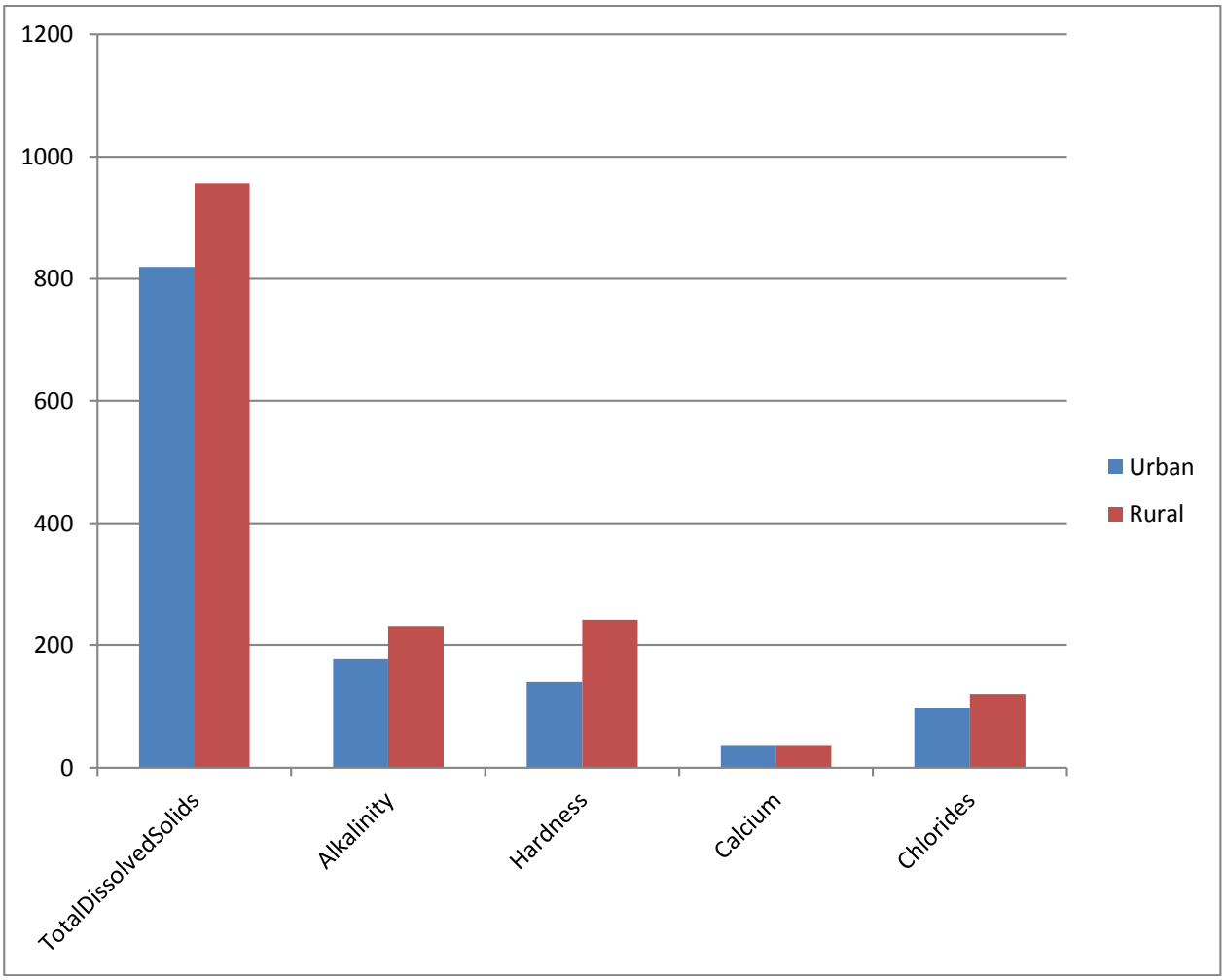
| | | | | | |
|---|---|---|---|---|---|
| Alkalinity mg/L | 178.0000 | 81.05965 | 231.4000 | 68.78663 | 200 |
| Total Hardness mg/L | 139.6000 | 40.88792 | 241.8000 | 69.71338 | 100 |
| Calcium mg/L | 35.0000 | 1.05409 | 35.8000 | .63246 | 75 |
| Chlorides mg/L | 98.4000 | 5.56177 | 1.2000 | 2.1725 | 250 |
| Flourides mg/L | 1.6500 | .47434 | 2.4000 | .45947 | 1 |
| Iron mg/L | .1800 | .04216 | .2000 | .00000 | 0.1 |
| Residual Free Chlorine | .1000 | .00000 | .1700 | .04830 | |
| Physical Parameters<br><br>Colour | Colourless | | Colourless | | |
| Taste And Odour | Ordinary | | Ordinary | | |

***Figure 3: Bar diagram showing the comparison of handpump with motor in rural and urban area***




Comparing Mean
Y-Axis=Values
X-axis= Parameters

**Figure 4: Bar diagram showing the comparison of handpump with motor in rural and urban area**

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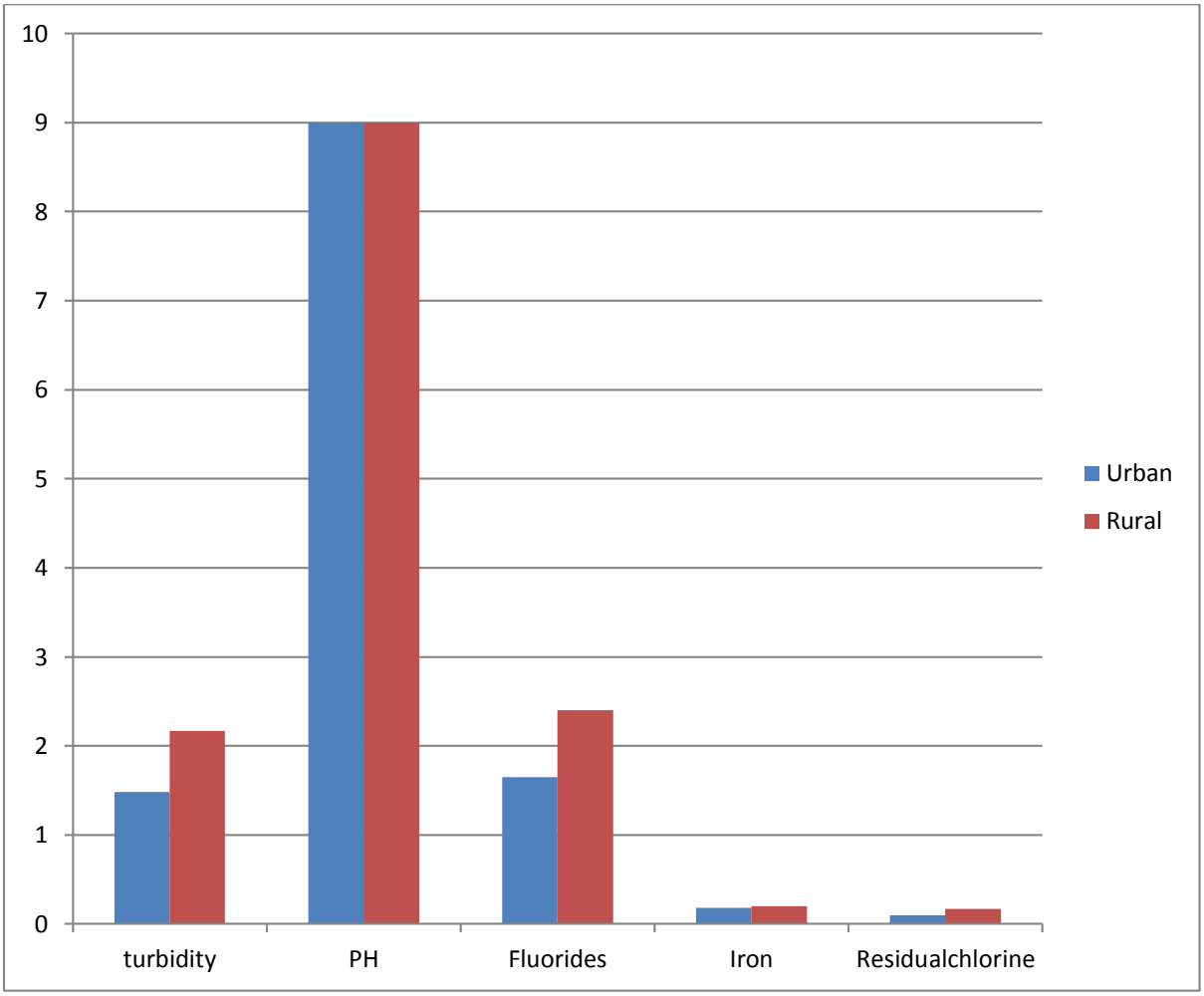


Comparing Mean
Y-Axis=Values
X-axis= Parameters

## Conclusion

In the present study, the groundwater samples collected from hand-pumps showed deviations from water quality standards indicating groundwater contamination. Citizens, legislators and regulators should join hands together to save this valuable resource of nature.

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