ANALYSIS OF DRINKING WATER QUALITY OF PESHAWAR CITY

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Abstract

In this paper, the authors analyze the drinking water quality of Peshawar city due to which authors concluded that water quality assessment of 18 locations inside Peshawar of various union council. Groundwater samples were collected from a tube well and subjected to physical, chemical and biological analysis to check their suitability for the purpose of drinking. Results exposed that out of 18 samples 10 samples of water were found unfit for drinking purposes. In the 10, samples most of the effect on the water quality was from the chemical and biological contamination. It is concluded that the old defective supply system, infrastructure and storage, as well as their lack of maintenance are the reason behind the pollution of drinking water in Peshawar.

Keywords: water quality assessment, physical, chemical and biological analysis, purpose of drinking Ground Water, Tube well,

I. Introduction

With sufficient water supplies, Pakistan is blessed. However, the country faces quantity and quality issues because of a lack of proper management policy for water supplies, quality water. The only limited population has access to public water supply (not even clean), while the rest of the population is dependent upon direct withdrawal of water from both surface and ground sources, where available, for their daily needs. Pakistan's environmental profile reveals that about 40 percent of deaths are attributable to water-borne diseases arising from the addition of effluent from various sources. Obviously, several studies have been carried out in the region, pointing to the declining quality of water sources. Research conducted they took water sample analysis from 15 sources in Abbottabad Pakistan, into Account and stated that due to microbiological problems, drinking water from different areas in the Abbottabad district was not appropriate for human health [III]. Similarly, another researcher also reported that most of the supplies of drinking water were fecally contaminated because the number of coliforms was found to be between 0 and 240. This study deliberates the degradation Engr. Furqan Wali et al
of groundwater quality due to natural subsoil pollutants or anthropogenic activities. Drinking water's low bacteriological content has also [I]. Contributed to a high incidence of waterborne diseases, whereas subsoil pollutants have exacerbated other conditions for customers. Besides, other studies have also highlighted the prevalence of excess heavy metals and nitrate content in the supply of drinking water, while also considering that it is unhealthy for human consumption [II]. Some researchers examined exceeded Manganese (Mn) and Lead (Pb) quantities (8.26 and 2.97 mg/l) in groundwater specimens collected from Peshawar city. Many of Pakistan's quality problems are due to lack of control of waste disposal, poor management of water distribution systems, lack of availability of treatment facilities and lack of public knowledge of water quality [V]. Therefore, there is a need for integrated management of water resources, which takes into account the environmental concerns. The public supply of water to Peshawar, the capital of the province of Khyber Pakhtunkhwa (KPK), relies on both surface and groundwater stored in overhead tanks and then distributed to households [VI]. However, this is limited to certain parts of the city while the suburban areas around the city are without proper water supply and sanitation systems. [VII] Contamination of drinking water because of many factors has led to various outbreaks of waterborne diseases. via extensive studies on the quality of drinking water and the identification of the different sources of pollution affecting groundwater in Peshawar, the present research in this regard was carried out in various Peshawar Union Councils [VIII] [IX]

The research focused on evaluating the area's drinking water quality with the following goals:

1. Depict the water samples for microbiological examination.
2. The fortitude of physio-chemical parameters of water samples.
3. Find out in collected samples the number of trace elements / heavy metals
4. Comparison of findings with limits for drinking water from The World Health Organization (WHO).

Water is a transparent, tasteless, odorless, and nearly colorless chemical substance. Drinking water, also known as potable water, is water that is safe to drink or to use for food preparation. There are some types of drinking water known as Palatable water, Tap water. [X]

II. Problem Statement and Motivation

In Peshawar and surrounding areas, the potable water quality is varying due to variation in depth of saturated zone, poor recharge processes and ill sewerage system. The water extracted from these zones is not properly monitored and there might be impurities in potable water. The water supplied to the household without filtration which might contain different chemical substances and can lead to various human disease. The research will help find the presence of different substances and their variations by taking samples from different sources

III. Aims and Objectives

This research aims to analyze physical, chemical and biological water quality and compare it with the WHO guideline. The aim will be achieved through the

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following objectives. To study the Physical, chemical and biological properties of potable water in the various union councils of the Peshawar area.

IV. Scope and Limitation of the Research

The main scope and purpose of this research is to know about physical, chemical and biological characteristics of water of Peshawar city to treat them accordingly by water treatment plants taking requisite steps to make the water safe for drinking purpose. The research gives us awareness about the water quality of different areas. Infect the contaminated water use is the source of various disease caused by germs found inside water. By not drinking such contaminated water we can save ourselves from various diseases to a greater extent.

V. Methodology

Mix methodology was adopted agglomerating both Qualitative and Quantitative approaches respectively. The samples were collected from different 18 sources, approximately 1 sample from each source.

Samples were examined under three types of analysis i.e.

1. Physical analysis.
2. Chemical analysis.
3. Biological analysis.

Due to the physical analysis first, we did a pH test for the drinking water in which we get if the water is acidic, basic or neutral. For every experiment of the sample in which we figure out the variation of values due to two common values, we select only one value for our result which is in comparison with WHO standards. The next test which we performed is the Turbidity test in which we conclude the viscosity of drinking water and its value is compared with WHO standards. Then the other test is TDS Test in which we conclude that if the water has the dissolved substances in excess means it exceed WHO limitations. The other test is the Hardness test which showed us the hardness of the water. The next test is of Color in which we conclude the watercolor which is then compared with WHO standards and due to chemical analysis, we did tests on Arsenic which conclude that is the drinking water fit to drink means its value is equal with the WHO standards. Arsenic causes cancer in the body of humans. The other test which was performed was the Fluoride test and its value is compared to WHO standardization. The other test is of Nitrate which causes the disease blue baby syndrome for the avoidance of the disease we compared its value with WHO limitations. The next one is the Sulphate test which value was compared by WHO standardizations. The other once was Magnesium, chloride and through biological analysis, we determined biological contamination. The results of samples obtained in the lab were compared with WHO guidelines.

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V. Results

Parameters are the analysis of physical, chemical and biological characteristics of drinking water quality of Peshawar city. Which values are shown in the tables below and also some graphical representations are given.

Table 1 (Results of PH, Turbidity, TDS, Hardness, Colour, Arsenic)

| Parameters | PH | Turbidity | TDS | Hardness | Colour   | Arsenic | REMARKS |
|------------|----|-----------|-----|----------|----------|---------|---------|
| UC # 1     | 7.3| 0.1       | 592 | 370      | colourless| nil     | Unfit   |
| UC # 3     | 7.4| 0.6       | 497 | 380      | colourless| nil     | Unfit   |
| UC # 22    | 7.6| 3.1       | 347.5| 240     | colourless| nil     | Fit     |
| UC # 23    | 7.2| 0.4       | 506.5| 400      | colourless| nil     | Fit     |
| UC # 9     | 7.5| 0.01      | 487 | 410      | colourless| nil     | Unfit   |
| UC # 13    | 7.2| 0.05      | 437 | 350      | colourless| nil     | Fit     |
| UC # 4     | 7.3| 0.31      | 578.6| 440     | colourless| nil     | Fit     |
| UC # 7     | 7.3| 1.15      | 444 | 370      | colourless| nil     | Fit     |
| UC # 11 Ijaz Abad | 7.4| 0.02      | 514 | 350      | colourless| nil     | unfit   |
| UC # 12    | 7.3| 0.01      | 455 | 350      | colourless| nil     | fit     |
| UC # 14    | 7.1| 0.9       | 568 | 470      | colourless| nil     | unfit   |
| UC # 18    | 7.3| 0        | 488.8| 380     | colourless| nil     | unfit   |
| UC # 10    | 7.3| 1.5       | 613 | 430      | colourless| nil     | unfit   |
| UC # 19    | 7.2| 0.02      | 499 | 430      | colourless| nil     | fit     |
| UC # 8     | 7.2| 0.03      | 436 | 370      | colourless| nil     | unfit   |
| UC # 25    | 7.5| 0.01      | 495 | 420      | colourless| nil     | unfit   |
| UC # 15    | 7.1| 0.6       | 515 | 420      | colourless| nil     | unfit   |
| UC # 21    | 7.3| 0.01      | 460 | 370      | colourless| nil     | fit     |

WHO Standards 8.5 5 1000 500 colourless 50 (PSQCA)

Table 2 (Results of Fluoride, Nitrate, Sulphate, Magnesium, Chloride, Biological Contamination)

| Parameters | Fluoride | Nitrate | Sulphate | Magnesium | Chloride | Biological Contamination | REMARKS |
|------------|----------|---------|----------|-----------|----------|--------------------------|---------|
| UC # 1     | 0.31     | 2.2     | 144      | 24.3      | 40       | (+ve)                    | Unfit   |
| UC # 3     | 0.29     | 7.2     | 70       | 22        | 30       | (+ve)                    | Unfit   |
| UC # 22    | 0.36     | 0.2     | 30       | 24.3      | 24       | (-ve)                    | Fit     |
| UC # 23    | 0.45     | 7       | 60       | 36.4      | 36       | (-ve)                    | Fit     |
| UC # 9     | 0.28     | 10.2    | 70       | 46        | 24       | (+ve)                    | Unfit   |
| UC # 13    | 0.42     | 2       | 55       | 45        | 28       | (-ve)                    | Fit     |
| UC # 4     | 0.24     | 5       | 106      | 31.5      | 40       | (-ve)                    | Fit     |
| UC # 7     | 0.36     | 9.2     | 50       | 29        | 20       | (-ve)                    | fit     |

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### Table 3 (UC Details)

| UC #   | Union Council                      | WHO Standards |
|--------|------------------------------------|---------------|
| 1      | Sethi Town                          | 1.5           |
| 2      | UC # 12 Shaheen Muslim Town II      | 10            |
| 3      | Afghan Colony                      | 250           |
| 4      | Supply Road                        | 150           |
| 5      | UC # 14 Police Station Kotwali      | 250           |
| 6      | UC # 22 Yakatoot III                | (-ve)         |
| 7      | UC # 18 Library Kohati Gate         | fit           |
| 8      | UC # 23 Dast Badast Pir             | unfit         |
| 9      | UC # 20 Krishan Pura                | unfit         |
| 10     | UC # 10 Gulbahar Colony Num 1       | fit           |
| 11     | UC # 13 Madarssa Shaikh Abad        | (-ve)         |
| 12     | UC # 19 Mohalla Hafiz Azeem         | fit           |
| 13     | UC # 8 Faqir Abad                  | unfit         |
| 14     | UC # 15 Govt High School. G T Road  | fit           |
| 15     | UC # 21 Habib Abad                 | unfit         |

**Graph of pH**

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Graph of Turbidity

Graph of TDS

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VI. Conclusion

From the above, it is concluded that 10 samples out of 18 were found contaminated and unhealthy for drinking purposes in the union council surveyed by the group. The study shows that out of 12 different parameters the presence of nitrate and risky microorganism exceeds the standards and making quality unsuitable for drinking purposes in the study area.

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Table 3 conclusion details

| Union Council No. | Remarks |
|------------------|---------|
| 1                | Unfit   |
| 2                | Unfit   |
| 3                | Fit     |
| 4                | Fit     |
| 5                | Unfit   |
| 6                | Fit     |
| 7                | Fit     |
| 8                | Fit     |
| 9                | Unfit   |
| 10               | Fit     |
| 11               | Unfit   |
| 12               | Unfit   |
| 13               | Unfit   |
| 14               | Fit     |
| 15               | Unfit   |
| 16               | Unfit   |
| 17               | Unfit   |
| 18               | Fit     |

VII. Recommendations

To provide quality water to the community of the union council no 1, 3, 9, 11, 14, 18, 10, 8, 25, 15 the following steps are therefore recommended:

The tube wells are very old and the supply lines have been rusted due to climatic and edaphic factors and therefore, proper maintenance or replacement of pipes required. To avoid contamination drainage systems of the studied area should be redesign and maintain by concerned authorities. Proper laws should be made by concerned authorities regarding disposal of the toilet wastes. At the local level, small treatment plants should be constructed for the monitoring and treatment of wastewater. Removal of nitrate and biological contamination can be possible by from different methods like distillation, reverse osmosis or ion exchange method.

Conflict of Interest:

Authors declared: No conflict of interest regarding this article
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