# Water Management: Monitoring the water quality parameter of drinking water of Larkana district, Sindh, Pakistan

[1]S.AGHA, [2]A. W. MASTOI, [1]G.M. MATOI, [3]A.MEMON, [4]G. M. BHUTTO

[1]Dr. M.A.kazi, Institute of Chemistry, University of Sindh, Jamshoro, PAKISTAN
[2]Fresh water biology, University of Sindh, Jamshoro, PAKISTAN
[3]National Centre of Excellence in Analytical Chemistry, University of Sindh, Jamshoro, PAKISTAN
[4]Institute of business Administration, University of Sindh, Jamshoro, PAKISTAN

*Abstract:*Ground water is mostly used for human consumption in District Larkana. A number of representation samples will be collected from towns of District Larkana to show the water quality of District Larkana, to as a whole. The water samples will be collected from hand pumps, tube wells and open wells. The location of the source of ground Water, GPS reading, number of people using the source, approximate depth of the pump and water and air temperature will be noted at the site. Two bottles of 1.5 liter each will be filled from each site after allowing the water to flow at least for 5-10 minutes. The samples will be then transferred to the laboratories of Advance Research Studies in a Chemical Sciences and will be analyze for pH, conductivity, total dissolved salts (TDS), salinity, turbidity, chloride, Hardness, alkalinity, nitrate, nitrite, phosphate, chemical oxygen demand (COD), Sulphate, and Sodium, potassium, calcium, magnesium, copper, iron, cobalt, nickel, lead, zinc, chromium, Arsenic and fluoride. The analyses will be carried out by Titrimetry, spectrophotometry and Atomic absorption spectrometry. The observed values will be compared with the permissible Limits of World Health Organization (WHO). The water samples will be analyzed for the Suitability of human consumption and irrigation purposes. The results of analysis will be Validated by cation and anion balance. The obtained results will be analyzed by different Statistical methods to evaluate the distribution and nature of the ground water of District Larkana. The attempt will be made to evaluate possible health effect of .

Keywords: ground, water, Quality parameters ground Water for human consumption

## 1. Introduction

For the people most commonly the water is being used in various factors and for consumption respectively. Water is a most reactive substance and have an unlimited capability to dissolve material like solids, liquids and gases. Chemical and physical properties of water depend on some reasons such as the litho logy of the geology of area in which underground is flowing, (i.e., aquifer), period of residence of groundwater in the aquifer and environment of the situations. It is determined through numerous aspects, for example the proportion of microorganism's levels, poured in oxygen, the quantity of salt, the quantity of suspended substances in the groundwater, quantities of pesticides, herbicides, heavy metals and other contamination. Water quality is depending on the preferred usage of the water, for example, suitable water for drinking may be used for agriculture, but irrigation water cannot relate for drinking water guidelines. Hence, several uses need different conditions of water quality (S. Babiker et al., 2006 ). The quality of groundwater source can vary with time, even quick variations may go ignored, as the water can smell and taste the same. It is well known that, groundwater may contain minerals, chemicals and high levels of radioactivity, depending on the

type of the bed rock and the leaching ability of the over laying water. From an environmental protection point of view and depending on the concentration present in there can pose a health risk for people as well as for ecosystem. The groundwater plays an important role in ecological functions in various ecosystems. Due to increase of industrialization and urbanization gradually decreases the groundwater quality. However in some developing countries life time threat problem is unavailability of good quality groundwater (Rizwan and Riffat et al., 2009). Water is also called elixir of life. Almost 70% of earth surface area is enclosed by water commonly in oceans and other huge bodies of water, 1.6% of water is present into ground and 0.001% present in air as clouds, vapor etc. The underground water is the rain water that infiltrates through the layers of soil and accumulates in the underground reservoirs and is much cleaner than surface water (Satyanarayana and Gurus). The salinity of underground water depends upon the location and depth of water reservoir. The wells drilled near coastal areas usually contain highly saline water due to seepage from salty sea water, whereas wells near fresh water reservoirs often contain suitable drinking water. Apart from drinking and domestic use, water has numerous applica,tions on industrial scale such as its use as coolant, in agriculture and ice industry (Florence at al.,2013). Water as its formula is $H_2O$; 1 molecule of water contains 2 hydrogen atoms covalently joined to a solo oxygen atom (Karanth, at al.,1978). Principally water is used for drinking, hygiene and sanitation. Various observations for the different uses of water are revealed and quantified. In the advanced world groundwater consumed a pivot (sprinkler) in irrigation system that applies small amount of water at frequent intervals to unit area of crop. The groundwater is an important constituent of the hydrological cycle, the strength of the wetlands, rivers, lakes, ponds and related environments (Arshad Ali, at al.,2013). Our work revealed the study of temperature, pH, Turbidity, total absorbed salts (TDS), electrical conductivity (EC), alkalinity, nitrates, chlorides, hardness, and selected ions i.e. Mg, Ca, Na,K,Ca,As, Fe, Cd, Zn, Pb,Fe,Co,Cu

*Correspondence Email*

*National Centre of Excellence in Analytical Chemistry
University of Sindh, Jamshoro Pakistan

## 2. Materials and Methods

**Collection of water sample:**
60 sampling locations in district Larkana City were examined based on the consumption of water used for drinking purpose prior to collect water samples.

**Determination of water quality parameters:**

The water samples were examined respectively for temperature, pH, Turbidity, total absorbed salts (TDS), electrical conductivity (EC), alkalinity, nitrates, chlorides, hardness, and selected ions i.e. Mg, Ca, As, Fe, Cd, Zn, Pb. The selected physicochemical parameters were tested based on the standard protocols of world health organization (WHO), Sindh Environmental Protection Agency (SEPA) and USEPA. Details of analytical approach of each parameter are consisting below:

### 3.2.1 APPEARANCE

Appearance is physical characteristic in which color, turbidity and odor of water body is observed. So it was taken in to practice visually.

### 3.2.2 COLOUR

Pure water is naturally without the colors but usually, it exhibits a light blue color mainly due to existence of some microbiological species such as plankton or metallic ions. Moreover, the color of water measured in the existence of suspended matter but true color of water may be known when turbidity is extricated. So it was also taken in to consideration with visual sense.

### 3.2.3 ORDER

Odor is an important water quality parameter to monitor and has the aesthetic value to clean water. The pure water has no odor. But the waters contaminated with carbon dioxide, hydrogen sulfide or some organic substance exhibit odor. The feeling

of odor was assessed through the natural sense of smelling.

### 3.2.4 TEMPERATURE

A moderate alteration is found in temperature regime which can counter act on the biochemical properties of water resources. A mild variation in temperature may effect on the aquatic life where temperature have a significant role in managing their essential life functions. A change in seasonal pattern can also impact on variation on temperature regime. It gradually increases in hot weather and reduces in cold weather.it was measured by, Digital Thermometer by France (Trivedy and Goel, at al.,1986).

### 3.2.5 TOTAL DISSOLVED SOLIDS [TDS]

The proportion of mineral and salt impurities in the water caused either by natural or anthropogenic activity is referred as the total dissolved salts. Moreover, the measuring unit for the calculation of total dissolved solids is ppm or milli gram/liter. TDS indicates the proportion of impurities in the water. TheTDS can be measured through the conductivity meter by using the electrode of conductivity meter. The tds range for the drinking water is 500 mg/L. for the water to be used in the agriculture its tds ratio ought to be less than 1200 mg/L(Jain, Kumar andSharma,at al.,2003).

### 3.2.6 PH

The pH understood as antilog of hydrogen ion deliberation (mol/dm³) of a solution. The pH of the solutions is varying from 0 – 14 respectively, pH of the pure water at 20°C is 7. The water with pH smaller than 7 is acidic and that with greater than 7 is basic. It is measured with the apparatus namely called Orin Digital 5star USA (G. Friedl at al.,2004).

### 3.2.7 DISSOLVED OXYGEN

It is revealed as the proportion of dissolved oxygen in the water. A suitable quantity of dissolved oxygen in water is important for aquatic life. Dissolved oxygen reveals methods the amount of gaseous oxygen ($O_2$) dissolved in a solution. Oxygen gets into water by effusion from the surrounding air, by aeration (abrupt movement), and as a by-product of photosynthesis. (DO) measure by Orin Digital 5star USA (Venkatesin wara Rao, at al.,2011).

### 3.2.8 ALKANITY

It is measure of capacity to reveal acid. It is because presence of salts of weak acids Alkanity is formed in three variations respects i.e. hydroxide OH, carbonate, and bicarbonate. Among these by carbon Alkanity is measure consequent. Alkanity might be present either with hydroxide or bicarbonate Alkanity but hydroxide by carbonate Alkanity cannot exist together. Unit of measurement mg/L of CoC3 the most common method implied to measure Alkanity is the volumetric or titration method. Simple glassware like burette of 25ml and 50ml capacity with burette stand and 100ml capacity of cylinder and conical flask 250ml capacity, glass funnel capacity, dropper. Moreover, Methyl orange indicator and sulphuric acid. Initially, fill the water sample in the 20ml cylinder and burette fill with the sulphuric acid. First sample was taken in flask, added drops of methyl orange than shook till mixed all material it had changed color then note the reading point initial and final. One sample was preceded twice. In such way all the prescribed samples were proceeded respectively (Chanda, at al.,1999).

### 3.2.9 HARDNESS

Water hardness is owing to multivariate mellitic cations the most abundant presence are calcium and magician. Two types Hardness are found first one is time been hardness and the second is specific hardness. Temporary hardness is becomes due to carbonate of calcium and magnesium. It is also term as carbohydrate hardness it can be removed by simple procedure such as boiling water etc. Permanent hardness is the occupancy of Sulphate occasionally chlorides and nitrate of calcium and magnesium, it is also called as non-carbonate hardness. Permanent hardness cannot be eradicated by process of boiling. Hardness is measure in ppm and calcium carbonate scale. It constriction of 100 ppm is obtainable for drinking water. We measure hardness by simple by manner led volumetric method. It is known as EDT titrimetric method.

Method of hardness. It is needed simple glassware like burette of 25ml and 50ml capacity with burette stand and 100ml capacity of cylinder and conical flask 250ml capacity, glass funnel and pipit 1ml capacity, dropper. The reagent required is sodium salt of EDTA erichrom black T and arousal hydrochloride, ammonia buffer solution, magnesium chloride and 95 percent ethyl alcohol. It is also need deionize water and now first we have to prepare reagents of dissolved construction EDTA stranded solution is prepared 4gram sodium EDTA .1gram magnesium chloride in 800ml of water fill the burette with EDTA solution, take the 20ml sample water in the cylinder then put in conical flask. Now we shall add ammonia buffer 1ml sometime shaking than some EDT grain mixed in conical flask, now it has changed the color in dark purple color. One can start the titration note down the initial reading point. One of the samples titrated twice and noted initial point. In short, the same process is repeated (Sundar and Saseetharan, at al., 2008).

### 3.2.10 SALINITY

Salinity is the measurement of sum of total salts which are being poured in the water. The presence salinity ratio varies such as in the water above the normal range makes that water unfit for the drinking. Moreover, Salinity is mainly measured in parts per thousand (ppt). The average salinity for the ocean water is 35 ppt and for the river water the salinity should be 0.5 ppt or less than 0.5 ppt. it is measured through conductivity meter (Trivedy and Goel,at al.,1986).

### 3.2.11 TURBIDITY

It is a significant water quality parameter. It tells about the appearance of water for drinking purposes that whether it should be consumed or not. Aquifer water tends to have low turbidity because of filtration effect of rocks and sand. The measuring unit of turbidity is NTU (Nephelometric turbidity unit). When it is measured of any water sample then it is expressed in NTU. The water samples were tested using Turbidity meter and readings are showed in NTU. It is a measurement of the ability of water to carry an electrical current. Electric conductivity was measured by the Orin Digital 5star USA.

### 3.2.12 CHLORIDE

Chloride is a major constituent of most waters. It is found t in low concentrations in surface waters, while groundwater will constitute respective amounts of chloride depending on the surrounding geology (R. P Gale,atal.,1981). The titration system was used to measure chlorides in samples of water. A total of 30 ml water sample was used. A few drops of methyl orange was used an indicator. It changed the color of water sample from yellow to red using AgNo3 (Silver Nitrate). The chlorides are expressed in mg/L (M. B. Katan at al.,2009).

### 3.2.13 NITRATE

The high concentration of nitrate in water indicates pollution (Ghada Mohamed at al.,2010). High nitrate content may bring about blue baby disease**.** Nitrate results methaemoglobinaemia in infants. The nitrate was measured using Brucine method (Paul Supantha and Mishra Umesh,at al.,2011). Approximately 60 ml of water sample was taken, added 0.5 m Brucine reagent, added 8 ml of $H_2SO_4$, and added 2 ml NaCl, and put for 20 minutes for homogenous mixing (Karanth,at al.,2001). At final step, water samples tested by spectrophotometer using 410 nm wave lengths. Its concentration is expressed in mg/L (Dilip, Rajndra and Rewatkar,at al.,2001).

### 3.2.14 TRACE METALSs

**ARSENIC (AS)**

It is very toxic metal and global issue found in deepest ground level. It is carcinogenic agent it can be revealed by the method of atomic absorption the arsenic was detected by using prepared NaOH to dissolve sodium borohydrate into it for 0.5%, then prepared 1000 standard solution of Arsenic in NaOH and lamp of AAS was seted and temperature of quartz tube was adjusted 95 centigrade then borohydrin was ruined for making of calibration curve then all 10 samples was used to detect the arsenic respectively (Rude,at al.,2010).

**MAGNESIUM (MG)**

Magnesium is vast quantitative metal which is present in ground water, its hardness in water and hardness is the mix up of calcium and magnesium (Velpe, Erdman, Macdonald and Zeisel, at al.,2012). The magnesium had been detected by the procedure of atomic absorption the sample had been taken of 50 ml in beaker and more over ,added 50 mg of magnesium Sulphate MgSO4after that , it was mixed well and calibration was made by distilled water. Moreover, the sample water was sucked through the pipe of Atomic absorption for the detection of required metal and then burring of all other metals (C. G. Musso, at al.,2009). The other samples were studied respectively through similar procedure (Behera, Das and Rana,at al.,2012).

**CALCIUM (CA)**

The calcium is found in water the sources of calcium are limestone, rocks CaCo3 the calcium is vital source of hardness in water (Das,at al.,2013). Calcium was determined by the method of atomic absorption the total 50 ml volume was taken of desired water sample in beaker then added 50 mg of $CaCl_2$ calcium chloride and after that, mixed well calibrated by using distilled water the sample water was sucked through the pipe of atomic absorption for the detection of calcium and burning of all other non-required metal the other remaining samples was revealed respectively, by similar way (Emsley,at al.,1998).

**ZINC (ZN)**

Standard solution of zinc (1000 ppm) was organized by zinc chloride salt, the further solution were made diluting 1000 ppm solution (B. S. Mohan and B. B. Hosetti,at al.,1999). The zinc metal was observed by using Aurora A 1200 AAS, the hollow cathode lamp (HCL) of Zn metal was installed and the wavelength of Zn was set .so the equipment was warmed up through particular temperature and energy source was readjusted accordingly after that the burner head was installed and position head was adjusted. Finally, The air pressure and flow was adjusted by air compressor and the flow of acetylene gas was also accustomed press the ignite button to turn on the flame the blank consisted deionized water and acid was aspirated first, after that standard solutions with respective concentration such as 2ppm, 4ppm, 6ppm, 8ppm and 10ppm were aspirated and the calibration curve was prepared by plotting the linear graph. Finally the samples were run on AAS and the concentration of Zn metal in samples was measured by the equation of regression which was known by calibration curve (P. L. Goering and C. D. Klaassen,at al.,1984).

**LEAD (PB)**

The solution of Lead had been managed by lead nitrate the further solutions had been made attenuating 1000 ppm solution (S. K. Wadhwa,at al.,2011) .Observation of lead by flame AAS the lead metal had been known by using Atomic absorption equipment's model no(Hem,at al.,1985). A1200 the hallow cathode lamp of lead metal was installed and the wave length of desired metal set the equipment was heat upped and readjusted the some of energy the burner head was installed and also position head adjusted the air pressure and flow was adjusted through air compressor and flow of acetylene gas was adjusted too (Miller, G. T. Jr.at al.1997,). The blank consisted deionized water and acid aspirated first after that particular solution with different concentration such as 2 ppm, 4 ppm, 6 p pm, 8 ppm, and 10 p pm were aspirated and prepared calibration curve by plotting of linear graph finally samples run on AAS, and concentration of lead measured by the equation of regression, which derived through calibration curve (Jackson R. B. et al., 2001.).

**CADMIUM**

The solution of cadmium had prepared by cadmium sulfate salt the rest of the solutions were acquired diluting 1000 ppm solution .Examination of cadmium

by flame AAS the cadmium metal was detected by using Atomic absorption equipment model no (Karanth,at al.,1987). A1200 the hallow cathode lamp of cadmium metal was installed and the wave length of desired metal set the equipment was heat upped and readjusted the some of energy the burner head was installed and also position head adjusted the air pressure and flow was adjusted through air compressor and flow of acetylene gas was managed too. The blank consisted deionized water and acid aspirated first after that standard solutions with respective concentration such as 2 ppm , 4 ppm,6 ppm, 8 ppm, and 10 ppm were aspirated and made calibration curve by plotting of linear graph finally samples run on AAS, and concentration of lead measured by the equation of regression by standardization curve (Karanth,at al.,1987).

**IRON (FE)**

The elucidation of iron had been made by iron chloride the further solutions had diluting 1000 ppm solution .Analysis of iron by flame AAS the iron metal had been detected by using Atomic absorption equipment model no (C. G. Musso,at al.,2009). A1200 the hallow cathode lamp of iron metal was installed and the wave length of desired metal set the equipment was heat upped and readjusted the some of energy the burner head was installed and also position head adjusted the air pressure and flow was managed by air compressor and flow of acetylene gas was adjusted too (Behera, Das and Rana,at al.,2012). The blank consisted deionized water and acid aspirated first after that particular solutions with various concentration for example 2 ppm, 4 ppm, 6 ppm, 8 ppm, and 10 ppm were aspirated and prepared calibration curve by plotting of linear graph finally samples run on AAS, and concentration of lead measured by the equation of regression, which taken through calibration curve (Ghada Mohamed at al., 2010). Moreover, The concentration of As, Cd, Fe, Pb, Zn was measured using APHA 3111B) and analyzed arranging AAS. The concentration of magnesium (Mg) was tested using AAS. A total of 50 ml water was taken and added 50 mg $MgSO_4$. The sample was correctly mixed and assessed using AAS. The reading of Mg was expressed in mg/L. The consideration of calcium (Ca) was tested using AAS. A total of 50 ml water was taken and added 50 mg $CaCl_2$. The sample was exactly inter mixed and assessed using AAS. The reading of Ca was articulated in mg/L.

## 3 Results and Discussion

Table No: 01 Concentration of Essential Metals from District Larkana

| S. No | Site | Hardness (mg/L) | Temp. ($^{O}$C) | pH | EC (µS/cm) | Salinity (ppt) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|
| 1 | Police training school | 150 | 24 | 7.5 | 870 | 0.1 | 560 |
| 2 | Professor colony | 160 | 25 | 7.6 | 892 | 0.1 | 570 |
| 3 | BISE larkana board office | 130 | 27 | 7.4 | 720 | 0.1 | 440 |
| 4 | City school larkana | 110 | 23.5 | 7.7 | 1015 | 0.4 | 650 |
| 5 | District Jail larkana | 100 | 22.9 | 7.1 | 1235 | 0.4 | 790 |
| 6 | Karma Bagh | 120 | 28 | 7.5 | 1130 | 0.4 | 723 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | Shah Nawaz Bhutto library | 186 | 28 | 7.5 | 114 | 0.3 | 970 |
| 8 | Zubaida Fazal Decent High School | 130 | 28 | 7.3 | 860 | 0.5 | 590 |
| 9 | Abu Bakar grave yard | 165 | 28 | 7.4 | 1130 | 0.2 | 723 |
| 10 | Rehmat pur Muhalla | 135 | 28 | 7.6 | 834 | 0.3 | 533 |
| 11 | Cricket ground | 125 | 27 | 7.5 | 865 | 0.5 | 533 |
| 12 | Site Area | 9 | 24 | 7.7 | 964 | 0.2 | 444 |
| 13 | Peoples colony | 85 | 22.2 | 7.3 | 1470 | 0.1 | 940 |
| 14 | Old Bus Stand | 76 | 28 | 7.4 | 1220 | 0.3 | 786 |
| 15 | Municipal Stadium | 60 | 23.2 | 7.7 | 780 | 0.2 | 500 |
| 16 | PTCL Digital Exchange | 85 | 27 | 7.8 | 1220 | 0.2 | 780 |
| 17 | Khichi Muhalla Aligoharabad | 84 | 22.2 | 8.1 | 780 | 0.3 | 1220 |
| 18 | Jamia Islamia Isha-atul Quran Wal Hadeeth | 65 | 26 | 8.2 | 1220 | 0.4 | 780 |
| 19 | Shaheed Benazir Bhutto University of Medical Science | 68 | 27 | 7.5 | 1416 | 0.2 | 906 |
| 20 | Degree Collage | 70 | 28 | 7.5 | 810 | 0.2 | 518 |
| **Average** | | **105.65** | **25.85** | **7.565** | **877.25** | **0.27** | **697.8** |
| **WHO** | | **500** | **12** | **6.5-9.2** | **0.4** | **NGV** | **1000** |

Table No: 1.1Concentration of Essential Metals from District Larkana

| **S. No** | **Site** | **Chloride (mg/L)** | **Alkalinity (mg/L)** | **Turbidity (NTU)** | **DO (ppm)** | **Nitrates (mg/L)** |
|---|---|---|---|---|---|---|
| 1 | Police training school | 58 | 130 | 1.22 | 2 | 2.5 |
| 2 | Professor colony | 60 | 85 | 0.61 | 2.3 | 2.1 |
| 3 | BISE larkana board office | 70 | 90 | 0.91 | 2.1 | 2.4 |
| 4 | City school larkana | 55 | 140 | 0.71 | 2.5 | 2.5 |
| 5 | District Jail larkana | 65 | 130 | 1.20 | 2.1 | 3.2 |
| 6 | Karma Bagh | 57 | 135 | 0.81 | 2.3 | 2.6 |
| 7 | Shah Nawaz Bhutto library | 45 | 280 | 1.60 | 1.1 | 2.3 |
| 8 | Zubaida Fazal Decent High School | 53 | 250 | 1.92 | 2.2 | 2.3 |
| 9 | Abu Bakar grave yard | 45 | 290 | 2.10 | 2.1 | 2.4 |
| 10 | Rehmat pur Muhalla | 53 | 270 | 1.40 | 2.1 | 2.4 |
| 11 | Cricket ground | 45 | 245 | 1.30 | 2.3 | 5.3 |
| 12 | Site Area | 54 | 65 | 0.22 | 1.2 | 2.4 |
| 13 | Peoples colony | 65 | 256 | 1.40 | 2.3 | 4.3 |
| 14 | Old Bus Stand | 35 | 247 | 1.91 | 2.2 | 7.2 |
| 15 | Municipal Stadium | 40 | 150 | 1.34 | 2.3 | 5.3 |
| 16 | PTCL Digital | 56 | 156 | 1.22 | 2.3 | 2.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Exchange | | | | | |
| 17 | Khichi Muhalla Aligoharabad | 65 | 290 | 1.30 | 3.2 | 5.3 |
| 18 | Jamia Islamia Isha-atul Quran Wal Hadeeth | 53 | 240 | 1.40 | 2.3 | 6.2 |
| 19 | Shaheed Benazir Bhutto University of Medical Science | 58 | 150 | 1.44 | 2.3 | 6.1 |
| 20 | Degree Collage | 56 | 215 | 1.268 | 2.1 | 3.1 |
| **Average** | | **54.4** | **190.7** | **1.2639** | **2.165** | **3.61** |
| **WHO** | | **200-500** | **NGV** | **NGV** | **3** | **50** |

Table No: 02 Concentration of trace metals from District Larkana

| **S. No** | **Site** | **Zn (mg/L)** | **As (mg/L)** | **Cd (mg/L)** | **Fe (mg/l)** | **Pb (mg/L)** | **Ca (mg/L)** | **Mg (mg/L)** |
|---|---|---|---|---|---|---|---|---|
| 1 | Police training school | 0.026 | 8.2 | 9.2 | 11 | 5.4 | 45 | 20 |
| 2 | Professor colony | 0.042 | 2.1 | 7.2 | 9.6 | 5.2 | 55 | 18 |
| 3 | BISE larkana board office | 0.028 | 7.2 | 0.6 | 4 | 3.7 | 60 | 29 |
| 4 | City school larkana | 0.051 | 7.2 | 22 | 20.4 | 5.4 | 70 | 35 |
| 5 | District Jail larkana | 0.045 | 7.3 | 2 | 14.1 | 53 | 55 | 26 |
| 6 | Karma Bagh | 0.031 | 0.001 | 11.9 | 16.1 | 33 | 89 | 50 |
| 7 | Shah Nawaz Bhutto library | 0.022 | 8.2 | 13.7 | 24.1 | 7.7 | 90 | 40 |
| 8 | Zubaida Fazal Decent High School | 0.025 | 3.2 | 5.2 | 15.1 | 13.7 | 80 | 45 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | Abu Bakar grave yard | 0.044 | 8.28 | 1.2 | 96 | 14 | 80 | 39 |
| 10 | Rehmat pur Muhalla | 0.029 | 8.26 | 8.2 | 504 | 42 | 85 | 40 |
| 11 | Cricket ground | 0.028 | 0.00 | 7.8 | 205 | 1.1 | 35 | 20 |
| 12 | Site Area | 0.029 | 8.2 | 18.2 | 96 | 8.2 | 85 | 55 |
| 13 | Peoples colony | 0.027 | 7.2 | 19.4 | 205 | 27.9 | 55 | 34 |
| 14 | Old Bus Stand | 0.023 | 5.2 | 11.1 | 133.1 | 18.3 | 45 | 20 |
| 15 | Municipal Stadium | 0.031 | 4.3 | 11.7 | 85.3 | 8.2 | 70 | 60 |
| 16 | PTCL Digital Exchange | 0.024 | 2.1 | 8.2 | 37.7 | 9.1 | 65 | 8 |
| 17 | Khichi Muhalla Aligoharabad | 0.028 | 7.2 | 8.4 | 96.7 | 8.2 | 55 | 27 |
| 18 | Jamia Islamia Isha-atul Quran Wal Hadeeth | 0.032 | 8.2 | 9.2 | 1.1 | 5.4 | 45 | 30 |
| 19 | Shaheed Benazir Bhutto University of Medical Science | 0.044 | 4.3 | 8.2 | 8.2 | 5.2 | 40 | 33 |
| 20 | Degree Collage | 0.045 | 8.2 | 9.2 | 4 | 3.7 | 44 | 11 |
| **Average** | | **0.032** | **5.742** | **9.63** | **79.325** | **13.92** | **62.4** | **32** |
| **WHO** | | **5.0** | **0.05** | **BDL** | **0.3** | **0.05** | **100** | **150** |

# 4. Conclusion

The determination of present exploration is to speculate the filtered water quality and present results with WHO standards in district larkana. The Samples of water were taken randomly in respective locations based on the proportion of population and water consumption pattern of each site of the respective areas. Twenty sites had been selected and 1000 ml of water samples collected from mentioned locations. The ordinary physicochemical parameters i.e. electrical conductivity (EC), water salinity, pH, dissolved oxygen (DO), total dissolved solids (TDS), water temperature, alkalinity, hardness, turbidity, nitrates, chlorides and selected trace metals i.e. Zn, As, Ca, Mg, Fe, and Pb. The focus of physicochemical parameters i.e. EC, hardness, TDS, Ca and Mg exceeding the safe limits of WHO for drinking water. It reveals that drinking water at study sites is not appropriate and suitable for human consumption. Rest of the factors was in accordance with WHO stipulations. Over-all, results demonstrate that physicochemical quality of sampled water does not suitable for drinking. To safeguard the safety of

local resident, a regular and gradual valuation should be carried out at respective time intervals. The current water technologies i.e. Nano filtration, reverse osmosis, and nanotechnology can be applied to treat contamination of groundwater.

## Acknowledgment

The authors are grateful to the, Institute of Advanced Research Studies in Chemical Sciences
University of Sindh, Jamshoro Pakistan and National Centre of Excellence in Analytical Chemistry
University of Sindh, Jamshoro Pakistan,

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