



Physical and Chemical Contamination Studies of Drinking Water in the Vicinity of Jamshoro Area (Jetharo Village) Sindh, Pakistan

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Abstract:

District Jamshoro of Sindh Province, southern Pakistan lies at 25.6251° N, 67.9524° E Jamshoro is a city and capital of Jamshoro District, Sindh, Pakistan. Jamshoro, the site of largest University consisting of engineering, medical and general campuses in the country, located about 12 kilometers from Hyderabad city on the right bank of River Indus, Jamshoro district belongs to the Kohistan region of Sindh Province, southern Pakistan, its terrain is hilly and mountainous with arid climate, the rain fall intensity is low to medium and the surface and ground water is not in sufficient quantity though the mighty INDUS RIVER (effluent) runs in the middle of the Jamshoro but the recharge rate is very low because of hard and compacted limestone rocks having less than 5 % porosity in the subsurface which does not allow the water to be infiltrated and this is the reason that water table is below or near about 200 feet. Some of the portion of the area is irrigated with the canal water and some portion of INDUS water is utilized in the supply of municipal city of Hyderabad & Jamshoro while the rural population of Kohistan area (hilly /mountainous) uses the rain water restricted in to the local ponds and dam like barriers, dug wells in the drainage courses of rain gullies called "NAEN" in local language, this is a seasonal water course that flows when there are monsoon rains. The sand and gravels are carried out by the rain water in the stream channels which retain water within it for a period of 3 to 4 months and can be easily pumped out with the help of hand pumps for domestic purposes and with the help of solar pumps for agriculture cultivation. This paper is related to the BioPhysiochemical analysis of water samples collected from the villages in the mountainous and hilly areas where rain water is accumulated in the small ponds / dams, and dug wells specially from the village JETHARO in the western bank of CADET COLLEGE PETARO about 25 km from the famous campus of Mehran University of Engg. & Technology, Jamshoro.

The study includes the unprotected dug well • Tanker truck water • Surface water (e.g. river, stream, dam, lake, pond, and canal) It is important for us to CHECK the safety of water by taking into consideration:

- Microbiological organisms--(bacteria, viruses, protozoa, and worms),
- Chemical containing – (minerals, metals and chemicals)
- Physical properties -- (temperature, colour, smell, taste and turbidity).

Keywords: Physical properties, chemical properties, dug well water, surface water, polluted drinking water, and testing water samples.

1. INTRODUCTION

Water is one of the most dominant and superabundant amalgamation of the ecosystem. All species living on the earth need water to survive and grow. The Earth planet is having 70% of water. But due to enlarging human population, industrialization, fertilizers consumption in agriculture and anthropogenic activities, it is tremendously polluted with several harmful contaminants. Therefore it is mandatory that the quality of drinking water must be checked at consistent time interval, because due to consumption of contaminated drinking water, human population would be tolerating various types of water borne diseases. The good quality water availability is a vital distinctive attribute to prevent diseases and enhancing quality of life. Natural water carry different types of contaminants which are introduced in to an aquatic system by discrete ways such as rocks weathering, percolation of soil, cessation of aerosol particles from the atmosphere and from several human practices, including mining, processing and consumption of materials

which are based on metals. The increased consumption of fertilizer based on metals in agricultural revolution of the government can result in enlargement of hazardous metals in fresh water reservoir through water run-off. And also faecal pollution of drinking water causes water born disease which has led to the death of millions of people. (Adefemi and Awokunmi, 2010). Globally, water quality is a growing concern. Contaminated water and improper sanitation kill the humans on The Earth planet. Water quality is the physical, chemical and biological features of water in relation to a set of standards. These are parameters are being recognized which relate to drinkable water, human safety, and ecosystem health. The water analysis is necessary for providing good quality of water, it is necessary for the humans, animals and plants to be developed healthier (Naveen, 2007). According to the Australian drinking water guidelines: drinking water must not contain contaminants, chemicals, impure and unsafe metals. It should be at reasonable temperature and be free of unpleasant odors, taste and color. The guideline emphasizes that drinking water must be a

safe for a life time; it establishes no remarkable risks to human and all living species' health. The drinking water quality investigations have been continuously performed by many researchers around the world with rapid urbanization; the chemical aspects of water quality have become an origin of increasing concern as toxic chemicals in industrial effluents produce a high risk to human health. Two surveys of consumer satisfaction with drinking water quality conducted in Taiwan (Chung, 2007), in both surveys, the main reasons that respondents did not drink tap water was "watersources are inappropriate" and "unpleasant mouth feel". The quality of ground water mainly depends on various chemical constituents and their concentration, which are mostly derived from the geological data of the particular region. Industrial waste and the municipal solid waste have emerged as one of the leading cause of pollution of surface and ground water. In many parts of the country available water is rendered non-potable because of the presence of heavy metal in excess. The circumstance gets worsened Throughout those Spring season because of water shortage and sprinkle water release. Tainting from claiming water assets accessible to family and drinking purposes for overwhelming elements, metal ions What's more hurtful microorganisms will be a standout amongst the genuine major wellbeing issues. Those later Look into On Jetharo (Pakistan) closed. its recharging, unseemly dumping for robust and fluid wastes, absence of strict requirement of idea and defected governance would those reason for crumbling about ground water nature (5). Most of the rivers in the urban areas of the developing countries are the ends of effluents discharged from the industries. African countries and Asian countries experiencing rapid industrial growth and this is making environmental conservation a difficult task (10). Sea water contains large number of trace metals in very small concentration. This is a challenging matrix for the analytical chemist due to the very low concentrations of many important trace metals (9). An investigation directed on the level of inorganic components What's more overwhelming metals (Na, Mg, Fe, Ni, Co, Cu, Cd, pb What's more Zn) On Jetharo village, demonstrated that the fixation of the concentrated on components were not inside the protected farthest point during those testing locales for the concentrated on time and the water expended Toward the Jetharo villagers may be not suitability to drinking, cultivating Furthermore farming worker. This consider might have been sought after will assess those caliber for Jetharo town water for drinking Also watering system purposes. Also with figure out the physical, compound and the broken down centralization about contaminants Furthermore metals for drinking water On Jetharo village, region Jamshoro, Sindh, pakistan ; will meet the necessities Furthermore improve the effectiveness.

2. Physico- Chemical Parameters

It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physic-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose we going to use that water and what extent we need its quality and purity. Water does content different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities. Some physical test should be performed for testing of its physical appearance such as temperature, color, odour, pH, turbidity,

TDS etc, while chemical tests should be perform for its BOD, COD, dissolved oxygen, alkalinity, hardness and other characters. For obtaining more and more quality and purity water, it should be tested for its trace metal, heavy metal contents and organic i.e. pesticide residue. It is obvious that drinking water should pass these entire tests and it should content required amount of mineral level. Only in the developed countries all these criteria's are strictly monitored. Due to very low concentration of heavy metal and organic pesticide impurities present in water it need highly sophisticated analytical instruments and well trained manpower. Following different physic chemical parameters are tested regularly for monitoring quality of water.

2. 1 Temperature. Over a built framework the water temperature controls the rate for at concoction reactions, Also influences fish growth, propagation cost What's more resistance. Intense temperature progressions might a chance to be deadly mishap will fish.

2. 2 ph. Ph may be The greater part essential On deciding those destructive way from claiming water. More level thoseph esteem higher will be the destructive nature for water. Ph might have been emphatically corresponded for electrical conductance Furthermore aggregate alkalinity(Guptaa 2009). Those diminished rate for photosynthetic action those digestion of carbon dioxide What's more bicarbonates which need aid at last answerable for expand for pH, those low oxygen qualities matched for high engineering Throughout the Spring month. Different variables realize transforms the ph for water. Those higher ph qualities watched recommends that carbon dioxide, carbonate-bicarbonate harmony is influenced All the more because of progress over physico-chemical condition (Karant 1987).

2.3 ec (Electrical Conductivity). Conductivity reveals to noteworthy connection with ten parameters for example, temperature, ph worth, alkalinity, downright hardness, calcium, downright solids, downright broken down solids, compound oxygen interest, chloride What's more iron focus for water. Navneet Kumar et al (2010) proposed that the underground drinking water nature about consider region camwood make checked viably Eventually Tom's perusing controlling conductivity for water Also this might additionally be connected should water nature administration from claiming different consider regions. It will be measured for the help for ec meter which measures the safety advertised Eventually Tom's perusing those water the middle of two platinized electrodes. Those instrument flying is institutionalized for known values from claiming conductance watched with standard KCl result. (9).

2.4 Alkalinity. It may be made essential about carbonate(CO_3^{2-}) Furthermore bicarbonate (HCO_3^-), alkalinity goes about Similarly as An stabilizer for ph. Alkalinity, ph Also hardness influence the poisonous quality for large portions substances in the water. It will be dead set Toward basic dilHCl titration in vicinity of phenolphthalein What's more methyl orange indicators. Alkalinity clinched alongside heater water basically comes about from those vicinity about hydroxyl Also carbonate ions. Hydroxyl alkalinity (causticity) in heater water will be important to ensure the heater against erosion. Excessively helter skelterAn causticity reasons different operating problems, for example, such that frothing. Exorbitantly secondary causticity levels camwood bring about a kind for harsh strike of the heater known as "embrittlement". (10).

2.5 Sulfate. It will be measured Toward nephelometric strategy Previously, which the fixation of turbidity will be measured against those known fixation from claiming synthetically readied sulfate result. Barium chloride is utilized for transforming turbidity because of barium sulfate What's more a mixture of natural substance (Glycerol alternately Gum acetia) Also sodium chloride is used to keep those settling for turbidity. (11).

2.6 Ammodytidae (Nitrogen). It will be measured spectroscopically In 425 nm radiation Toward making An shade complex for Nessler's reagent. The states of response are basic Furthermore cause extreme obstruction starting with hardness over water. (12).

2.7 calcium. It is measured Eventually Tom's perusing complexometric titration with standard result from claiming EDTA utilizing Patton's Also Reeder's pointer under the ph states of more than 12. 0. These states need aid attained by including a settled volume for 4N sodium hydroxide. The volume of titre (EDTA solution) against those known volume about test provides for the fixation of calcium in the example. (8).

2.8 Magnesium. It is likewise measured Toward complex metric titration for standard result of EDTA utilizing Ferrochrome dark t Concerning illustration pointer under those support states for ph 10. 0. Those cradle result will be made from ammonium carbonate and ammonium chloride. The result resists those ph varieties Throughout titration. (10).

2.9 Sodium. It is measured with the help of claiming fire photometer. The instrument flying will be institutionalized for the known centralization from claiming sodium particle (1 will 100 mg/litre). Those specimens Hosting higher fixation need aid bag weakened with refined water and the weakening element is connected of the watched values. (7).

2.10 Potassium. It is also measured for the assistance for fire photometer. Those instrument flying will be institutionalized for referred to fixation of potassium solution, in the reach about 1 mg should 5 mg/litre. The example Hosting higher centralization will be bag weakened with refined water and the weakening element is connected of the watched qualities. (5).

2.11 Chloride. It will be measured by titrating An known volume for example for institutionalized silver nitrate result utilizing potassium chromate result on water or eosin/fluorescein result for liquor Similarly as pointer. The last pointer will be a adsorption pointer same time those previous makes An red

shaded compound with silver Concerning illustration before long Concerning illustration those chlorides would precipitated starting with result. (3).

2.12 Silicates & phosphate (2). These would Additionally measured spectroscopic ally. Yellow shade is produced starting with the movement from claiming phosphates and silicates on molybdate particle under solid acidic states. Those force from claiming color will be specifically proportional of the centralization from claiming phosphate Furthermore silicates in the example. Phosphate complexes would diminished by feeble decreasing operators for example, ascorbic corrosive or tartaric corrosive (potassium antimonyltartarate) the place Likewise silica complexes require solid diminishing states from claiming hydrazine alternately bisulphite. The shade for decreased mind bogging may be sky blue.

MATERIALS and routines.

Reagents What's more results. Explanatory reagent evaluation chemicals were utilized to those amalgamation from claiming know results. A test about Jetharo town deionized water might have been utilized within every last bit analyses. Mechanical assembly. Former to analysis, know instruments were adjusted as stated by manufacturer's proposals. Ph might have been measured by utilizing versatile ph -meter (Lovibond Sensoregulate 150) for joined cathode. Ec might have been dead set Toward conductivity meter HACH (44600-00). Sodium What's more Potassium ions were measured Eventually Tom's perusing fire photometer model 360 england (UK). Turbidity might have been measured Eventually Tom's perusing turbidity meter (LOVIBOND). Fe, Pb, Hg, Zn, Cd, Ni, Cu, and ag were confirmed by fire nuclear Absorption spectroscopy (HACH DR/2000). (10).

II. EXPERIMENTAL SITES

District Jamshoro of Sindh Province, southern Pakistan lies at 25.6251° N, 67.9524° E. Jamshoro is a city and capital of Jamshoro District, Sindh, Pakistan. Jamshoro, the site of largest University consisting of engineering , medical and general campuses in the country, located about 12 kilometers from Hyderabad city on the right bank of River Indus, Jamshoro district belongs to the kohistan region of sindh province, southern Pakistan.

Table.1 Different analytical water quality parameters with their analytical technique and guideline values as per WHO standard

S.NO.	Parameters	Technique Used	UNIT	WHO Standard	EPA Guidelines
01	Temperature	Thermometer	Celsius	---	
02	Colour	Visual	Hazen	5	
03	Odour	Physiological Sense	Unobjectionable	Acceptable	
04	Electrical conductivity	Conductivity meter	S/m(Simens per meter)		2500
05	pH	pH meter	---	6.5-8.5	6.5-8.5
06	Dissolved Oxygen	Redox Titration	Ppm		
07	Total hardness	Complexometric Titration	Ppm	200	<200
08	Alkalinity	Acid-Base Titration	Ppm		
09	Acidity	Acid-Base Titration	Ppm		
10	Ammonia	UV Visible Spectrophotometer	Ppm	0.3	0.5

11	Calcium	Complexometric Titration	mg/l	75	200
12	Magnesium	Complexometric Titration	mg/l	150	145
13	Sodium	Flame Photometer	mg/l	200	200
14	Potassium	Flame Photometer	mg/l	-	-
15	Chloride	Argentometric titration	mg/l	250	250
16	Biological Oxygen Demand	Incubation followed by titration	----	6	5
17	Chemical Oxygen Demand	C.O.D. Digester	----	10	40
18	Turbidity	Turbidity meter	NTU	<5	Below 1
19	Sulphate	Nephelometer	mg/L	250	250

Table.1 shows different parameters of water samples considered to be safe for domestic and drinking purposes. The WHO Standards and EPA guidelines are made for safety of water and human life. These standards and guidelines are to be followed accordingly.

Table .2 Some physical and chemical parameters of water samples of Jetharo Village

S.NO	Parameters	Sample 1 (J-1)	Sample 2 (J-2)	Sample 3 (J-3)	Sample 4 (J-4)
01	pH	7.5	7.15	8.06	7.75
02	TDS (g/L)	0.35 *1000	0.37	0.41	0.31
03	Turbidity (NTU)	10.1	1.83	191	669
04	EC (mS/cm)	0.75	3.66	0.82	0.62
05	Hardness	160 mg/L	155mg/L	165 mg/L	170 mg/L
06	Chloride	220 mg/L	230 mg/L	240 mg/L	250 mg/L
07	Alkalinity	140 mg/L	142 mg/L	140 mg/L	148 MG/L

Table.2 shows different parametric values obtained in laboratory test in which there are different values which does not match with the WHO standards and EPA guidelines. The obtained results are describing that the water samples taken from Jetharo Village are not compatible with drinking purposes and it may not be considered as safe for humans.

III. DISCUSSION.

All around people are increasingly concerned for controlling the contamination of both surface and groundwater. Ground water will be those primary problem, particularly the place urban areas must depend on their own ground water to the new water procurement. Surface water suffers all over principally from eutrophication, brought about by those absence of sewage treatment plants (or indeed going its finish nonattendance Similarly as over Jamshoro) in the streams taking off the urban regions. Inside the urban zone eutrophication will be brought about Eventually Tom's perusing dirtied storm water streaming off those fixed surfaces. Also, The majority waterway banks need aid misleadingly constructed. This reasons a

paramount living hall on a chance to be lost and additionally those water clearing work of the vegetation. Those thoughtfulness regarding groundwater issues Also its insurance would extremely different, depending principally with respect to its use:.

- but from An general hydrological guide those region doesn't bring majority of the data something like ground water. New water supply hails starting with inaccessible mountain zones and the principle issues up to this point bring been storm water stream off control and sewage medication.
- Jetharo relies principally on his own ground water to those new water supply, holds exact majority of the data on groundwater contamination (i. E. In the old dirtied locales.
- Jetharo&Jamshoro countenances those issue about an amazing groundwater level climb because of the shutting for A large number streamlined wells, need information on the ground water level, the amounts concentrated from private wells and a screening programme to those nature control.
- in the region there may be an intricate hydrogeological majority of the data giving exact signs once soil permeability, groundwater profundity What's more stream bearing. Freshwater

supply goes verifiably from outside, Be that on the provincial domain would no significant springs of mineral water which need aid safeguarded trounce a groundwater contamination following programme.

IV. CONCLUSION

Groundwater quality in JAMSHORO region is crumbling like in other principle urban areas of Pakistan. The circumstance is abundantly bothered in JETHARO and encompassing where ground water quality is exceptionally poisonous. Study comes about portray that in JETHARO 60% inhabitants have weakened water, 40 % occupants have harsh water and 45 % occupants have water with slight smell. In encompassing towns 25 % inhabitants have clear water, 25 % occupants approach sweet water and 20% occupants approach water with no odor. The research facility investigation of physical and compound parameters of gathered water tests uncovered the reality of noteworthy tainting in ground water. The discoveries of these parameters either were surpass the reasonable qualities built up by WHO or going underneath as far as possible. For example, among physical parameters, Electrical conductivity (EC) of water tests was high from allowable utmost of 400 μ S/cm. Add up to broke up solids (TDS) and Hardness of ground water in Islamic settlement and Satellite were likewise expanding and caused destructive ailments. Likewise, the pH estimations of water tests were over the unbiased (> 7) farthest point and falls in essential (antacid) run. The estimations of sulfate (SO₄) and calcium (Ca) in JETHARO were 250 mg/l and 84 mg/l which were over the reasonable furthest reaches of 250 mg/l and 75 mg/l separately causing wellbeing related issues. In JEYHARO, chloride (Cl) recorded 16-66 mg/l which is very beneath than WHO standard of 250 mg/l. Sodium amount in surrounding was 28-33 mg/l which was likewise unobtrusively bring down from WHO standard farthest point of 200 mg/l and could be hurtful for the soundness of nearby occupants. Different parameters likewise reflect huge varieties to WHO measures. Because of this low quality of water, the waterborne illnesses like loose bowels, cholera, typhoid and so forth were normal in ponder zones especially in Islamic province around 36% occupants have been confronting genuine ailments. While, the seriousness of waterborne illnesses among the occupants of region along these lines, with a specific end goal to protect valuable human lives from water related infections momentum examine recommends; standard observing of ground water quality ought to be honed.

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