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Role of chemical composition of drinking water in human health of the community



Farwa Naseem ^a, Hafiza Zobia Zia ^b, Moaz Ishtiaq Tariq ^c, Muhammad Amjad Bashir ^{d,*},
 Syeda Amber Hameed ^e, Khizar Samiullah ^e, Asma Qayyoom ^e, Hasnain Farooq ^{f,g}, Rana Mehroz Afzal ^e,
 Mohamed Hashem ^{h,i}, Kareem Morsy ^{h,j}, Saad Bin Dajem ^h, Abdulrahman Alasmari ^{k,l},
 Mohammed Ali Alshehri ^{k,l}

^a RHD Badduke, Lahore, Punjab, Pakistan^b RHC, 148/EB Burewala, Vehari, Punjab, Pakistan^c THQ Mian Channu, District Khanewal, Punjab, Pakistan^d Department of Plant Protection Faculty of Agricultural Sciences, Ghazi University, Dera Ghazi Khan, Punjab, Pakistan^e Department of Zoology Faculty of Sciences, Ghazi University, Dera Ghazi Khan, Punjab, Pakistan^f Department of Environmental Sciences, University of California, Riverside, CA 92521, USA^g Department of Forestry, Faculty of Agricultural Sciences, Ghazi University, Dera Ghazi Khan 32200, Pakistan^h King Khalid University, College of Science, Department of Biology, Baha 61413, Saudi Arabiaⁱ Assiut University, Faculty of Science, Botany and Microbiology Department, Assiut 71516, Egypt^j Zoology Department Faculty of Science, Cairo University, Cairo, Egypt^k Genome and Biotechnology Unit, Faculty of Sciences, University of Tabuk, Tabuk, Saudi Arabia^l Department of Biology, Faculty of Sciences, University of Tabuk, Tabuk, Saudi Arabia

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ABSTRACT

Drinking water that is secure to drink is a basic human need that should be met by every-one. Waterborne disease prevention and control begin with ensuring the safety of drinking water. The present study was designed to evaluate the physical and chemical quality of ground water in 20 different localities of Tehsil Taunsa DG Khan, Punjab Pakistan. For this purpose, ground water samples were collected from Mangrotha, Sokar, BastiBuzdar, KotQaisrani, JhokeBodo, Litra, Vehova, Bohar, MakwalKalan, Bindi, Dona, NariJanubi, TibbiQaisrani, Morejhangi, Babbi, Nutkani, JaluWali, Lakhani, Kotani and Chulani were physico-chemically (Turbidity, Odor, Color, TDS, HCO₃, Alkalinity, Ca, CO₃, Cl, EC, Fl, Hardness, Mg, SO₄, pH, Na and K) characterized. The results revealed a significant increase in physical and chemical counts. Among Chemical parameters, the concentration of Alkalinity was in range of 205 mg/L to 235 mg/L, the concentration of Calcium was in range of 60 mg/L to 112 mg/L, the concentration of carbonates only in one location (BastiBuzdar) was slightly high 64 mg/L, the value of Electrical Conductivity was in range of 1230 μ S/cm to 1260 μ S/cm, the concentration of hardness varies between 145 mg/L to 550 mg/L. The levels of all other parameters were within WHO's acceptable ranges. A survey was also done to assess the impact of drinking water on city inhabitants' fitness. Globally, 780 million people, and 100 million people in Pakistan are exposed to insecure water sources. To estimate the health threat of infected water, a total of 160 residents interviewed. The information acquired from this field work will reveal a high prevalence of suspected water borne diseases like diarrhea, nausea & vomiting, gastrointestinal issues, Skin Rash, Skin irritation, Diabetes, Neural diseases, Renal dysfunction, Cholera, malaria, prolonged fever, Cancer, Hepatitis and jaundice. To resolve water and environmental problems, consciousness and regular monitoring programs of water organization and safe removal of waste was proposed. As a result, in all of the research areas, a well-organized waste disposal and management system is required. To make sure

* Corresponding author.

E-mail address: abashir@gudgk.edu.pk (M. Amjad Bashir).

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that the water is suitable for human consumption, regular drinking water quality assessments of the resource, main allotment tanks, distribution systems and pipes should be used.
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1. Introduction

Water is essential to live to tell the tale. All creatures need to have accessibility to a full-size amount of smooth drinking water. This is a substance with a wide range of characteristics this is utilized in almost each sphere of existence. At instances, water may be the remaining sink for a pollutant. Coastlines, streams, glaciers, swimming pools, mountainous streams, and private water reservoirs can all be located everywhere in the world. Maximum water reservoirs are not clearly infinite; as an alternative, their maintaining capability is constrained, and that they renew thru herbal strategies. Due to a spread of occasions, all the aforementioned herbal water sources are dwindling at an alarming price. Water shortage in living things could have a terrible effect on their nature. **Table 1.**

In Pakistan, water infection is some of the maximum severe risks to communal lifestyles. The high-quality of the intake water isn't always well maintained or checked. In phrases of drinking water superiority, Pakistan is positioned 80th out of 122 countries. Toxic metals and pesticides have been found in consuming water resources across the country, in addition to floor and groundwater. A diffusion of WHO drinking water first-class criteria are damaged down on a everyday foundation. The essential causes foremost to the decline of water excellent are human actions consisting of beside the point elimination of municipal and production effluents plus indiscriminate software of agrochemicals in agriculture. Microbial as well as chemical impurities are the primary causes of different public health problems, either alone or in mixture.

“Hepatitis B and C are substantially supplementary dangerous viral infections than corona virus infectivity, causing 300 to 325 deaths every day in Pakistan, however Covid-19 is inflicting outlying fewer deaths than viral hepatitis. The presence of a massive quantity of quacks, in step with PMA, is the main reason for the growing quantity of hepatitis C cases in Pakistan”. Pesticides, business effluent and heavy metals (in particular arsenic, which occurs naturally near the Indus Basin) have infected 89 percentage of groundwater across the us. The whole fees of healthcare because of insufficient cleanliness, dirty water, overlooked work time because of water-related illness, and early loss of life are 3 times more than the mixed fees of water shortage, salinity, and flood harm. Pakistan can decorate not handiest the health of its inhabitants, however additionally the health of its economy, by using improving the satisfactory of its water.

Table 1
 Methods for the physical and Chemical evaluation.

Parameters	Methods	Reference Methods
Ph	Electrometer	American Public Health Association Color Scale-4500H ⁺ B
Alkalinity	Titration	American Public Health Association Color Scale-2130B
Nitrogen Dioxide	Spectrophotometric	American Public Health Association Color Scale-4500Cl B & C
Nitrate	Spectrophotometric	American Public Health Association Color Scale-4500F-/C
Phosphate	Spectrophotometric	American Public Health Association Color Scale 4500 NH ₃ C,
Sulphate	Spectrophotometric	American Public Health Association Color Scale-5530C

Pakistan is the sector’s 1/3-maximum water-scarce USA, consistent with the worldwide monetary Fund (IMF). Excessive water use, a loss of water garage techniques, evaporating lakes, decreasing water tables, populace explosion, and seasonal versions are all causes that make a contribution to water scarcity. As a result, there may be no national water strategy, and the predominant reason of water scarcity is the nuclear-armed disagreement between Pakistan and India, as well as the interests of the federal and neighborhood governments. Deforestation and the capacity for glacier assets to be harmed. Pakistan’s wooded area cover is shrinking at a charge of approximately 2 % every year. If cutting-edge tendencies keep, Pakistan’s forests could be depleted inside the next 50 years.

Water is a important detail that makes up 3 % of the earth’s surface. Simplest a small part of this overall, more or less 1.1 percent, exists for creature usage. In line with estimates, 1.1 billion citizens do not have way to covered ingesting water, 2.5 billion residents do no longer have good enough cleanliness, and 5 million human beings die each year on common from waterborne infection, ten times the digit of humans killed in conflicts. Although there’s enough or lots of water, contaminants and rising call for pose a severe threat.

Round 60 million people in Pakistan are at chance from excessive arsenic ranges of their drinking water. The most large large-scale poisoning incident in records. Arsenic poisoning can set off tumours, extreme lung troubles, skin problems, cardiac arrest, hyperglycemia, necrosis, cerebral perfusion, endocrine, immunological, hepatic, renal, and bladder issues, and also socioeconomic problems. Unfortunately, no epidemiological facts on arsenic poisoning in prone companies, change drinking water, or fitness measures are currently to be had (See Fig. 1).

The impact of infected water on underground water is prejudiced thru a figure of things, along with the intensity of the water desk, soil situations and wastewater pleasant. In moist areas with low sparkling water tables, wastewater irrigation has a sizeable impact on groundwater high-quality (Hussain et al., 2001). A study of groundwater pleasant in Faisalabad using numerous methodologies (graphical plotting, logarithmic nomography, trilinear charting) showed that groundwater in the city was no longer suitable for direct residential, agricultural, or commercial usage. Groundwater pollutants is generally because of an increase in industrial and domestic waste (Hassan et al., 1997).

Faisalabad, Pakistan’s maximum populous city calls for round 64.7 million gallons of consumption water in keeping with day to meet its requirements. But residential pumps that draw water from subsoil water and tube wells had been responsible for 3 million gallons of this water (Bashir et al., 1999) drinking water pollutants is answerable for 20 to forty% of the entire infections inside the USA, ensuing in yearly popular economic victims of Rs 25–fifty 8 billion. Water contamination inside the USA is on the whole as a result of unacceptable dumping of producing and metropolitan wastes, accompanied with the aid of move-infection due to outdated as well as leaking pipes and a be brief of water filtering and disinfection offerings pressing scenario movements are required to prevent prospect degradation of water fine and to get better existing water first-class in an effort to protect the humans from waterborne diseases (See Fig. 2).

Water contamination is also as a result of a loss of qualified employees, poor exceptional monitoring, and an inadequate and

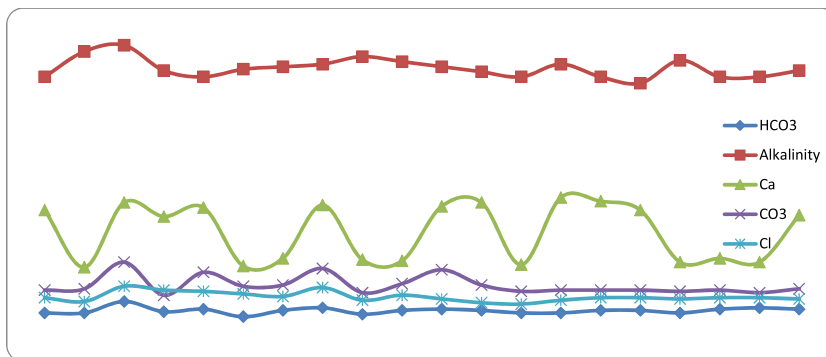


Fig. 1. Scattered graph showing the awareness of HCO₃, Alkalinity, Ca, CO₃ and Cl (in general gadgets) in the drinking water of the one of a kind places of look at regions.

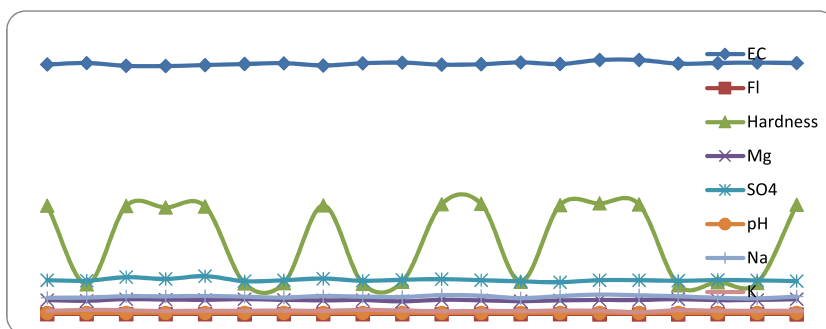


Fig. 2. Scattered graph Showing the concentration of Electrical conductivity, Fluoride, Hardness, Magnesium, Sulphates, pH, Na and K (in standard units) in the drinking water of the different locations of the study area.

infected water deliver. Herbal sources as well as a spread of human activities can contaminate floor water. Ground water best can be stimulated by way of residential, municipal, industrial, business, and agricultural operations. Contaminants can enter floor water via moves at the ground surface, which includes releases or spills from stored manufacturing wastes; sources under the land surface aside from on pinnacle of the water table, together with inflamed structures or leaking subversive petroleum shipment space structures; and structures under the water desk, inclusive of wells. Pakistan's present day water supply is round 79 percentage.

Groundwater is a essential supply of sparkling water for irrigation and consuming, as a result handling its availability and best is critical. Groundwater is probably infected chemically, bodily, or microbiologically. Absolutely every-one is attached to a ramification of sources as well as fitness-related troubles as well as effects. A combination of microbiological and physicochemical contamina-

tion is currently threatening the great of groundwater, that's a chief deliver of ingesting water (Pedley and Howard, 1997).

Diarrhea is precipitated in large fraction by means of faces pollutants of ground water each day, an predictable 2,000 youngsters under the duration of 5 expire from diarrheal infections around the arena about 90 % of diarrheal illness deaths in kids are because of grimy water, a lack of cleanliness, or negative sanitation countless others, including older children and adults, suffer from unwell fitness and ignored possibilities for activity and education for each youngster who dies. The most simple source of deliver inside the most Pakistani cities is ground water, which carries a variety of pathogens, together with numerous viral, bacterial in addition to protozoan agents, ensuing in 2.5 million fatalities each yr from established diarrheal infection (Kosek et al., 2003) as an end result, potable water is water that is freed from sickness-causing microbes and potentially harmful chemical compounds (See Fig. 3).

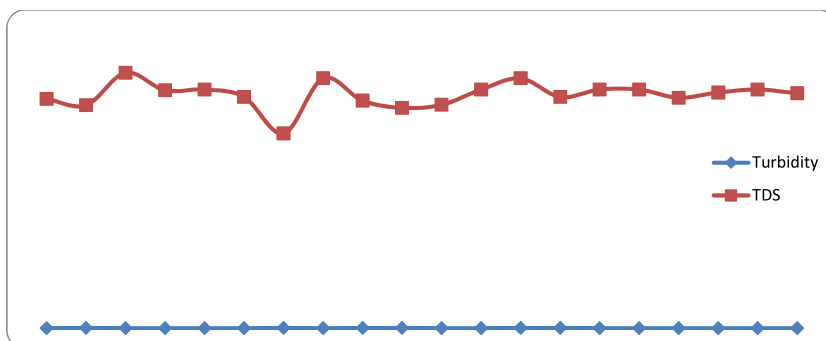


Fig. 3. Scattered graph showing the values of Turbidity and TDS (in standard unit) in the drinking water of the different locations of study Area.

There are just a few organizations in Pakistan which have their personal wastewater remedy centers. Consistent with the NEQS below the 1997 Act, the authorities must take rigorous measures for his or her industrial sewage disposal. If a commercial enterprise is confirmed to be breaking the policies, it should be fined heavily and imprisoned.

To address the importance of safe ingesting water, public attention initiatives should be released on the college, university, university plus society levels. NGOs might also have a function on this area. Rural regions should put into effect safe water storage manage measures as well as simple consuming water treatment technology.

Many research show that consuming water that has been boiled lessens the chance of contracting waterborne infections. Toba-Tek Singh, Multan and Rawalpindi are 3 districts in Punjab's city and rural regions wherein a observe became performed. A multistage sampling procedure became used to gather all of the samples. The findings revealed that forty 5.1 percentage of the populace in these 3 districts became not following country wide quality standards to enhance water fine, and that those human beings were experiencing diarrhea. The left-over citizens of those 3 areas follow countrywide excellent standards and have now not been set up to be unwell households' social and economic instances additionally play an essential effect in reducing diarrheal contamination it's also been discovered that the mom's schooling, household wages and life-style are all linked to the superiority of ingesting water and, as a result, the family's fitness.

2. Material and methods

The purpose of this research turned into to investigate the bodily and chemical composition of floor water of Tehsil Taunsa, DG Khan, Punjab, Pakistan. For this motive 20 water specimens have been accrued from 20 union councils of Tehsil Taunsa and a survey became completed through interviewing one hundred 6ty citizens of Tehsil Taunsa so as to investigate the humans belief expertise about position of water in human health in Tehsil Taunsa, DG Khan, Punjab, Pakistan.

2.1. Location

The look at turned into conducted in specific localities of Tehsil Taunsa, DG Khan, Punjab, Pakistan.

2.2. Sample series

20 ground water websites have been decided on in Tehsil Taunsa, DG Khan, Punjab, Pakistan for water sampling. Following the aseptic conditions, samples had been accumulated in sterile polypropylene plastic bottles. All specimens had been strongly preserved and directly taken to the laboratory for investigation. The time between sampling and exam turned into no longer extra than 6 h. All specimens had been chemically analyzed.

2.3. Experimental layout

Experimental work was divided specially into two phases.

In phase 1 ground water samples had been analyzed bodily, chemically and bacteriologically. For physico-chemical research, HCO₃, Ca, CO₃, Cl, EC, Fl, Hardness, Mg, Na, ok, TS, Alkalinity (mEq/l), NO₂, NO₃, PO₄, SO₄, PH, Turbidity, TDS, shade and odor of water had been analyzed. Physico-chemical investigation become executed in step with the same old methods (APHA, AWWA, WEF, 2005) detail of those fashionable techniques (APHA, AWWA, WEF, 2005) is given within the table.

In phase II, a survey look at became conducted to generate susceptible diseases profile of virtually 160 citizens of Tehsil Taunsa. For survey observe a questionnaire become carried out.

3. Results

This chapter presents the results of 20 different water samples collected from 20 Union Councils in Tehsil Taunsa, as well as graphical representations of each sample value.

4. Chemical analysis

4.1. Bicarbonates

Bicarbonate is an ordinary component of all limestone water. Mineral water from limestone-rich sites usually contains high levels of bicarbonate. Bicarbonates plays an important role in storing carbonate acid and keeping the taste of mineral water clean and fresh. Bicarbonate, also called hydrogen carbonate, is liable for maintaining the acid-base balance in your body, i.e. the pH value. It is a base or alkaline, and therefore an important "antagonist" of acid. Bicarbonate acts as an acid buffer. The permissible limits of Bicarbonates in drinking water ranges from 23 to 30 mEq/L in adults. The values of Bicarbonate in the 20 water samples varies between 23 and 28 mEq/L but its value was 33 mEq/L in the BastiBuzdar. 33 mEq/L means it exceed the permissible limit of WHO. The value of bicarbonates in Mangrotha was 24 mEq/L, in Sokar the value was 24 mEq/L, in BastiBuzdar, it was 33 mEq/L, in KotQaisrani, it was 25 mEq/L, in JhokeBodo its value was 27 mEq/L, in Litra the value of bicarbonate was 21 mEq/L, in Vehova its value was 26 mEq/L, in Bohar the value of bicarbonate was 28 mEq/L, in MakwalKalan its value was 23 mEq/L, in Bindi the value was 26 mEq/L, the value of bicarbonates in Dona was 27 mEq/L, in Narijanubi, this value was 26 mEq/L, the value of bicarbonates in TibbiQaisrani was 24 mEq/L, in MoreJhangi its value was 24 mEq/L, in Babbi the value was 26 mEq/L, in Nutkani the value was same as in Babbi 26 mEq/L, this value in JaluWali was 24 mEq/L, the value of bicarbonates in Lakhani was 27 mEq/L, in Kotani the value was 28 mEq/L and in Chulani the value was 27 mEq/L.

4.2. Alkalinity

Alkalinity refers back to the ability to neutralize water acids. The alkalinity of water can be due to the presence of one or more ions these substances must incorporate hydroxide, carbonate and bicarbonate, ingesting water and all water need to have a pH of 7 because of this it's far impartial. It is good to have greater alkalinity in our consuming water as it keeps the water secure for drinking. The quantity of Alkalinity that should be 20–200 mg/L for ordinary ingesting water. The values of alkalinity within the 20 water samples varies between 205 and 235 mg/L. The price of alkalinity in all of the sample places exceeds the permissible limit of WHO. The very best price which is 235 mg/L was visible in BastiBuzdar. The value of Alkalinity in Mangrothawas 210 mg/L, in Sokar the value changed into 230 mg/L, BastiBuzdar, it turned into 235 mg/L, in KotQaisrani, it changed into 215 mg/L, in JhokeBodo its price turned into 210 mg/L, in Litra the value of Alkalinity turned into 216 mg/L, in Vehova its value was 218 mg/L, in Bohar the value of Alkalinity become 220 mg/L, in MakwalKalan its cost changed into 226 mg/L, in Bindi the cost changed into 222 mg/L, the cost of Alkalinity in Dona became 218 mg/L, in Narijanubi, this price changed into 214 mg/L, the cost of Alkalinity in TibbiQaisrani became 210 mg/L, in Morejhangi its fee changed into 220 mg/L, in Babbi the cost turned into 210 mg/L, in Nutkani the cost was

205 mg/L, this price in JaluWali changed into 223 mg/L, the value of Alkalinity in Lakhani changed into 210 mg/L, in Kotani the price become 210 mg/L and in Chulani the cost became 215 mg/L.

4.3. Calcium

Calcium is the fifth most common detail inside the crust of the earth but also is required for mobile and bone physiology in people. Bones and teeth store round 9ty 5 percent of the calcium inside the human body. Extra calcium deficiency in human beings can purpose rickets, blood clots, bone fractures, and calcium-induced heart disorder, amongst different things. According to the requirements of the sector health enterprise (2011), the permissible restrict in consuming water is 7ty 5 mg / liter. The consequences in the observe regions show that the calcium concentration levels from 60 mg / L to 112 mg / L. The price of Calcium in Mangrotha became 105 mg/L, in Sokar the fee was 60 mg/L, in BastiBuzdar, it was 111 mg/L, inKotQaisrani, it was 100 mg/L, in JhokeBodoits fee was 107 mg/L, in Litra the value of Calcium was 6ty one mg/L, in Vehova its fee become 67 mg/L, in Bohar the value of Calcium changed into 109 mg/L, in MakwalKalan its fee changed into 66 mg/L, in Bindi the fee became 65 mg/L, the cost of Calcium in Dona changed into 108 mg/L, in Narijanubi, this cost changed into 111 mg/L, the price of Calcium in TibbiQaisrani became 62 mg/L, in Morejhanghi its price become one hundred fifteen mg/L, in Babbi the value turned into 112 mg/L, in Nutkani the fee turned into a hundred and 5 mg/L, this fee in JaluWali became 6ty four mg/L, the price of Calcium in Lakhani became 6ty 7 mg/L, in Kotani the fee become 6ty four mg/L and in Chulani the fee turned into 101 mg/L. The cost of Calcium in 11 sample places which include Mangrotha, BastiBuzdar, KotQaisrani, JhokeBodo, Bohar, Dona, Narijanubi, Morejhanghi, Babbi, Nutkani and in Chulani exceed the permissible limits of WHO.

4.4. Carbonate

Carbonate values of less than 60 mg per litre are termed soft water. 60–120 mg/L, fairly difficult Solid, 120–180 mg/L. And more than 180 mg / L is quite difficult. The value of carbonate in the study areas was below 60 mg/L except in Gulshan Mehmood. Its value in BastiBuzdar was 64 mg/L. The values of carbonate varies between 38 and 64 mg/L. The value of Carbonate in Mangrotha was 42 mg/L, in Sokar the value was 43 mg/L, BastiBuzdar, it was 64 mg/L, in KotQaisrani, it was 38 mg/L, in JhokeBodo its value was 56 mg/L, in Litra the value of Carbonate was 45 mg/L, in Vehova its value was 46 mg/L, in Bohar the value of Carbonate was 59 mg/L, in MakwalKalan its value was 40 mg/L, in Bindi the value was 47 mg/L, the value of Carbonate in Dona was 58 mg/L, in Narijanubi, this value was 46 mg/L, the value of Carbonate in TibbiQaisrani was 41 mg/L, in Morejhanghi its value was 42 mg/L, in Babbi the value was 42 mg/L, in Nutkani the value was 42 mg/L, this value in JaluWali was 41 mg/L, the value of Carbonate in Lakhani was 42 mg/L, in Kotani the value was 40 mg/L and in Chulani the value was 43 mg/L.

4.5. Chloride

Chloride is normally acquired through mixing hydrochloric acid salts including NaCl and NaCO₂, and is added from a diffusion of sources, which include hazardous effluents, manure, and seawater. Chlorides are generally found in lower concentrations in surface water reservoirs than in groundwater. It's far essential for the human frame's metabolic sports in addition to different important bodily features. Metal tubes and structures, as well as developing flowers, are harmed via high chloride concentrations. Chloride concentrations ought to now not exceed 250 mg/L, in step with world

health business enterprise guidelines. In the observe regions, the price of chloride levels from 31–forty 5 mg / L. The value of Chloride in Mangrotha was 36 mg/L, in Sokar the cost became 33 mg/L, BastiBuzdar, it turned into 45 mg/L, in KotQaisrani, it turned into 42 mg/L, in JhokeBodo its value turned into 41 mg/L, in Litra the price of Chloride became 39 mg/L, in Vehova its fee become 37 mg/L, in Bohar the cost of Chloride became forty-four mg/L, in MakwalKalan its cost become 34 mg/L, in Bindi the cost was 38 mg/L, the cost of Chloride in Dona become 35 mg/L, in Narijanubi, this value become 32 mg/L, the cost of Chloride in TibbiQaisrani became 31 mg/L, in Morejhanghi its price turned into 34 mg/L, in Babbi the cost become 36 mg/L, in Nutkani the fee was 36 mg/L, this cost in JaluWali become 35 mg/L, the price of Chloride in Lakhani become 36 mg/L, in Kotani the fee was 36 mg/L and in Chulani the cost become 35 mg/L.

parent- 20 one-of-a-kind places of Taunsa Sharif includingMangrotha, Sokar, BastiBuzdar, KotQaisrani, JhokeBodo, Litra, Vehova, Bohar, MakwalKalan, Bindi, Dona, Narijanubi, TibbiQaisrani, Morejhanghi, Babbi, Nutkani, JaluWali, Lakhani, Kotani and Chulani. All these websites are 7–8 km far from each other.

4.6. Electrical conductivity

The electric conductivity of water is measured through conductivity. The presence of inorganic particles including chloride, nitrate, sulphate, and phosphate ions (negatively charged ions) or sodium, magnesium, calcium, iron, and aluminium impacts water conductivity dissolution (positively charged ions). Oils, phenols, alcohols, and sugars are natural substances that don't transmit electric modern-day nicely and so have low conductivity in water. Temperature has an effect on conductivity: the more the temperature of the water, the higher the conductivity. The values of conductivity inside the take a look at location varies among 1230–1260 μ S/cm. maximum cost of electrical conductivity is proven in Babbi and Nutkani. The cost of conductivity in Mangrotha changed into 1238 μ S/cm, in Sokar the cost became 1245 μ S/cm, BastiBuzdar, it became 1231 μ S/cm, in KotQaisrani, it changed into 1230 μ S/cm, in JhokeBodo its cost changed into 1235 μ S/cm, in Litra the fee of conductivity became 1240 μ S/cm, in Vehova its value was 1244 μ S/cm, in Bohar the fee of conductivity was 1233 μ S/cm, in MakwalKalan its value turned into 1244 μ S/cm, in Bindi the value turned into 1247 μ S/cm, the cost of conductivity in Dona was 1237 μ S/cm, in Narijanubi, this price become 1239 μ S/cm, the fee of conductivity in TibbiQaisrani changed into 1248 μ S/cm, in Morejhanghi its fee was 1240 μ S/cm, in Babbi the fee changed into 1260 μ S/cm, in Nutkani the fee became 1260 μ S/cm, this price in JaluWali became 1242 μ S/cm, the cost of conductivity in Lakhani changed into 1245 μ S/cm, in Kotani the price changed into 1247 μ S/cm and in Chulani the price become 1245 μ S/cm.

4.7. Fluoride

Fluorine is a commonplace element that does not occur in nature due to its excessive reactivity. It represents 0.3 g / kg of the earth's crust and is gift as fluoride in a number of minerals, the most commonplace being fluorescein, cryolite and fluoropatite. The oxidation nation of fluoride ion is –1. The permissible restrict of Fluoride in consuming water is 1.5 mg/L. The value of fluoride in the look at region isn't exceeding 1.5 mg/L. The fluoride attention inside the have a look at place varies among 0.5–1 mg/L. The Fluoride attention in Mangrotha changed into 0.85 mg/L, in Sokar the price was 0.8 mg/L, Basti Buzdar, it was 0.80 mg/L, in KotQaisrani, it changed into 0.70 mg/L, in JhokeBodo its fee changed into 0.7ty 8 mg/L, in Litra the fee of Fluoride turned into 0.7 mg/L, in Vehova its price changed into 0.7 mg/L, in Bohar the attention of Fluoride changed into 0.7ty 8 mg/L, in Makwal Kalan its value

changed into 0.7 mg/L, in Bindi the value became 0.7 mg/L, the cost of Fluoride in Dona was 0.91 mg/L, in Nari Janubi, this fee became 1 mg/L, the cost of Fluoride in Tibbi Qaisrani turned into 0.8 mg/L, in greater jhangi its value changed into 0.8 mg/L, in Babbi the cost was 0.65 mg/L, in Nutkani the price changed into 0.6ty 5 mg/L, this price in JaluWali turned into 0.5 mg/L, the value of Fluoride in Lakhani turned into 0.8 mg/L, in Kotani the cost changed into 0.9 mg/L and in Chulani the price changed into 0.6 mg/L.

4.8. Hardness

Water hardness relates to the amount of ca and mg dissolved in water. In tough water, dissolved salts, in particular calcium and magnesium, are severa. you may have felt the consequences of difficult water the final time you washed your hands. After using the cleaning soap to clean your arms, you could notice a layer of remnant in your fingers depending at the hardness of the water. At tough water, soap combines with calcium (which is present in a high percentage) to supply “soap dirt.” whilst cleaning with hard water, you may want to use greater cleaning soap or detergent. Cleansing with hard water needs the usage of more soap or detergent. The permissible restriction of hardness in water is 500 mg/L. The cost of hardness within the observe region varies among one hundred forty 5–550 mg/L. In a few regions the values of hardness exceed the permissible limit of WHO. The value of hardness in Mangrotha was 539 mg/L, in Sokar the fee become a hundred and fifty mg/L, BastiBuzdar, it changed into 537 mg/L, in KotQaisrani, it was 530 mg/L, in JhokeBodo its value was 535 mg/L, in Litra the value of hardness was 154 mg/L, in Vehova its value became a hundred and fifty 5 mg/L, in Bohar the fee of hardness became 540 mg/L, in MakwalKalan its price become 152 mg/L, in Bindi the cost was 162 mg/L, the fee of hardness in Dona become 546 mg/L, in NariJanubi, this fee turned into 548 mg/L, the fee of hardness in TibbiQaisrani become 162 mg/L, in Morejhangi its price became 542 mg/L, in Babbi the cost was 550 mg/L, in Nutkani the value become 545 mg/L, this value in JaluWali become a hundred forty 5 mg/L, the value of hardness in Lakhani turned into a hundred and 6ty mg/L, in Kotani the price become 156 mg/L and in Chulani the fee become 544 mg/L.

4.9. Magnesium

Magnesium is determined certainly in water and is the 8th maximum evidently going on detail in the crust of the earth. it's found in minerals like dolomite and magnetite, and it's important for organisms to function normally. Magnesium is observed inside the human body in more or less 25 grammes (60 percent in bones and 40 percentage in muscle tissue and tissues). The most amount of magnesium allowed in water, in step with WHO guidelines, is a hundred and fifty mg in line with litre. The magnesium awareness within the examine location ranged from 6ty 5 to 7ty 6 milligrammes in line with litre. The observe's findings found out that the magnesium awareness in the look at area was lower than the WHO requirement.

4.10. Sulfate

Sulfate comes mainly from the dissolution of sulfate and is found in almost all aquifers. High concentrations of sulfate may be caused by oxidation of pyrite and mine drainage. In natural water, sulphate concentrations range from some milligrammes according to litre to loads of milligrammes in step with litre, but there are no reports that sulfate has a chief unfavorable impact on human fitness. The WHO has set a most perfect restrict of 250 mg / L for sulfate in consuming water. Sulfate concentrations inside the examine vicinity range from 165 to 85 mg/L. The out-

comes show that Taunsa Sharif's sulfate awareness is below fashionable and can't be harmful to human health.

4.11. pH

The pH fee is an crucial parameter for assessing the acid-base stability of water. It's also an illustration of the acidity of the water. The maximum allowable pH range endorsed by the who is 6.5 to 8.5. The scope of the current survey is 7.5–8.1, which falls within the scope of WHO standards. the general pH results show that Taunsa Sharif water supply is ideal and adequate. Basically, the pH value is determined by the quantity of dissolved CO₂, which forms carbonic acid in water.

4.12. Sodium

Sodium is a white metallic element of silver, which is low in water ok quantities of sodium within the human body can prevent many lethal diseases consisting of kidney harm, excessive blood stress and headaches in line with the sector fitness business enterprise, the concentration of sodium in consuming water is 50 mg/l inside the look at area, the results of the have a look at show that the sodium concentration variety is 8y-9ty 9 mg / 1.

4.13. Potassium

Potassium is a silver white alkali, which reacts extraordinarily with water. Potassium is important for the functioning of organisms and is consequently found in all human and animal tissues, specifically plant cells. The whole amount of potassium in the human body is between 110-one hundred forty grams. It's miles critical for human features consisting of coronary heart safety, blood pressure law, protein breakdown, muscle contraction and nerve stimulation. Potassium deficiency is uncommon, but it can purpose depression, muscle weakness, and arrhythmias. The allowable restriction for potassium is 10mg / 1 in keeping with world fitness company requirements. The effects display that the potassium attention in the look at area is 12 to 21 mg / 1. Those results do not meet WHO requirements and can lead to sicknesses related to excessive potassium deficiency.

4.14. Turbidity

Turbidity is a measurement of a liquid's relative clarity. It is a measure of the quantity of light scattered from the substances in the water as light passes through the water sample, and it is an optical property of water. The dirtier it is, the higher the intensity of the scattered light. Substances that contaminate water include soil, odors, very small inorganic and organic matter, algae, dissolved organic compounds, and plankton and other microorganisms. The WHO has set 1 NTU as the highest ideal limit for drinking water contamination. In the study area, the results of the study show that the dirt values range from 0.12 to 0.9 NTU. Overall contamination results show that Taunsa Sharif water source is ideal and within reasonable limits.

4.15. Total dissolved solids (TDS)

The total concentration of soluble solids and soluble compounds in water is referred to as TDS. TDS is made up of inorganic salts and traces of biological materials. Calcium, magnesium, potassium, and sodium are some of the most common inorganic salts found in water. Subunits are what they are. Anions include carbonate, nitrate, bicarbonate, chloride, and sulphate. Ions are negatively charged cations, while cations are positively charged. The permissible TDS level for drinking water is 1000 mg/liter,

according to the World Health Organization. TDS levels in the study area range from 522 to 685 mg/L. The research area's TDS value did not surpass the WHO limit.

4.16. 7Odor

The taste and smell in drinking water can indicate any contamination or malfunction during water treatment or distribution. Therefore, it may indicate the presence of potentially harmful substances. The cause should be investigated and appropriate health officials should be consulted, especially in case of sudden or substantial changes. According to the World Health Organization, the smell and taste of drinking water should be pleasant. The water in the study area is completely tasteless. Overall, the odor results show that Taunsa Sharif water source is ideal and adequate.

4.17. Color

Although water does not reflect blue-green light and can be observed in deep places, it should look colorless when used at home. Ideally, tap water is not blue or blue-green. According to the World Health Organization, drinking water should be colorless. The water in the study area is completely colorless. Overall, the odor results show that Taunsa Sharif water source is ideal and adequate.

5. Discussion

The physiochemical characteristics of water samples accrued from resources (20 union councils of Tehsil Taunsa District Dera Ghazi Khan Punjab, Pakistan), disinfection, the consequences confirmed that the HCO₃, alkalinity, Ca and pH of water specimens become inside the reduced in size range of 23–28 mEq/L, 205–235 mg/L, 60–112 mg/L & 7.5–8.1 respectively and did not vary notably amongst sampling points. It remained within their commended widespread limits of 6.5. The pH values of water received on this observe are low than the consequences of preceding research, i.e., the common basic pH records of diverse cities water assets, pH 7.6 at AkakiKality, subcity of Addis Ababa, pH 8.3 at Ziway (Bedane, 2008) and pH of 7.8 at Adama (Eliku and Sulaiman, 2015). The variation might be because of geological conditions of the water sources.

The values of Fluorides, Mg, SO₄, Na, general hardness and turbidity of water samples became within the range of 0.5–1 mg/L, 65–76 mg/L, 85–165 mg/L, 80–99 mg/L, 145–550 mg/L and 0.12–0.9 NTU respectively. The TDS information of water samples within the gift have a look at were hooked up to be decrease than the advocated trendy limits of each (WHO 1997: Ethiopian requirements employer 2013) and the fee of TDS ranges from 522 to 685 mg/L.

The loose residual chlorine content material of water specimens from sampling factors tiers from 31 to 5 mg/L. Those values have been much less than the most awareness set by means of WHO. Those values are greatly better than the results pronounced at the remedy outlet of Ziway (0.79 mg/l) city (Bedane, 2008) and recorded at AkakiKality, subcity of Addis Ababa (0.67 mg/l). But, the FRC values had been by means of a ways better than 0.03 mg/l recorded from the main deliver tank of Bahir Dar town.

In herbal waterways, electrical conductivity is a standardized measure of the water's potential to hold electric cutting-edge. Dissolved salts like NaCl and potassium chloride have a massive effect on this. The best EC (1260 µs/cm) changed into recorded from Babbi and Nutkani water assets, though the bottom EC turned into recorded from water samples acquired from KotQaisrani (1230 µs/cm). The EC reports of water source from different towns of the

USA are much extra than the presentstudy (Meride and Ayenew, 2016). Those variations might originate from geological factors, agricultural interest, and the soil varieties of the study area.

A enough deliver of water is needed for a healthful existence. The extra the variety of sources, the extra the amount of water handy. Specialists trust that the water has a greater impact on health improvement. Fitness incidences associated with water can be avoided by adopting measures to enhance water first-rate. In keeping with numerous research, families that boiled their drinking water had a lower prevalence of diarrheal sickness (Blake et al., 1993). In step with the findings, 11.9 percentage of respondents enhance the pleasant in their water deliver through boiling it, even though heating is the least costly method of disposing of contaminants at the domestic level and can be carried out by almost all people, whereas other strategies such as filtration and others are high priced and tough to accommodate. Moreover 28.8 % of consultant corporations both purification in addition to boiling to enhance the great of their drinking water, indicating that they have been greater worried approximately the quality of the water they consumed. In step with specialists, the best of consuming water became so bad that it could not be fed on without any precautions. In his have a look at, targeted at the movements taken by using families to enhance the best of their water supply. In keeping with studies, a few homes boiled water earlier than consuming it, whilst others sold water filters to decorate the fine in their consuming water. Safe ingesting water is vital for human fitness. According to numerous studies, supplying safe drinking water can reduce diarrhea by way of 15–20 %. It may be that most of the interviewees, 60 7.5 percent, were manifestly conscious that poor water first-class harms human fitness because they have been now dealing with water-associated problems. The general public of members (86.1 percent) said that Pakistan is now experiencing acute water shortages, in line with the findings. People had been properly-conscious of water-related issues on the other hand, just 19 four percent of respondents were conscious that terrible water great has an impact on human fitness in some manner. no one in their family has suffered as a result of poor water fine, in step with 24.4 percent of respondents. Actually, they were employing super water assets consisting of tube wells and water filtration plant life, and some of them had been doing normal water quality development efforts.

On the opposite side, 6ty 7.5 percent of respondents said that their individuals of the circle of relatives suffered as a result of negative water satisfactory used for consuming according to a UNICEF record, humans affected by water-borne illnesses like as gastroenteritis, typhoid, and jaundice occupy 20–40 percentage of sanatorium beds in Pakistan (nameless, 2006) while pressed similarly approximately the results they have been experiencing, 23.1 percentage of families said they regularly experienced stomach/belly cramps. The other houses, then again, had been rarely suffering from this difficulty. 12.5 percent of households had loose motions/watery motions on a ordinary foundation, whereas fifty-one out of 246 (20.7) had this condition best now and again. 6teen.9 % of families suggested having issues with vomiting. Human beings have been also tormented by bloody stools and constipation.

Numerous studies have found that the relationship among water exceptional and diarrhea differs based on the extent of availability of water, indicating that amount of water has a larger effect on fitness improvement than water great, and that availability of water is dependent on the life or loss of a first-rate backup gadget (Van der Hoek et al., 2001). In step with the findings, more than half of the respondents, or 44 four percentage, said they have been very careful in their water utilization since they frequently had to cope with water shortages at home. but, a handful of them discovered that losing water become in opposition to Islamic stan-

dards, and as a result, they were extremely conscientious approximately water utilization and avoided losing it. Furthermore, 40.6 percent of respondents have been rather aware of their water usage, while 0.6 percent changed into completely ignorant of their water utilization in keeping with respondents, one of the essential motives for now not being worried approximately water use was the need to keep suitable hygiene, which couldn't be executed with restricted water use. furthermore, as mentioned in FGDs, ablution changed into one of the motives given by using respondents for the use of more water due to the fact people typically squandered water throughout this pastime to preserve their our bodies easy (paak). The need of conserving water in Islam turned into noted with the aid of 38.8 % of respondents. And the second most common reason changed into to store cash on excessive bills (29.4 %). Water is stated to be the maximum precious useful resource required by using all residing matters. A number of passages within the Holy Quran speak the connection among life and water. That is truly stated in both the Holy Quran and the Sunnah (De Chatel, 2002). Furthermore, the 0.33 maximum usually stated purpose turned into the need to conserve water sources, as Pakistan already has a excessive water shortage. A shortage of sanitation offerings is the arena's finest motive of sickness (United Nations Children Fund (UNICEF), 2007). In keeping with the world fitness enterprise, growing sanitation reduces diarrhoea morbidity by 37 % (2004), possessing a bathroom, in step with professionals (Van der Hoek et al., 2001), is one of the chance variable for acute gastroenteritis. As a result, the bathroom is a key function in enhancing one's fitness.

It is a famous fact that washing one's hands is important for true health. Hand washing at critical moments can assist to reduce the severity of diarrheal sickness (Macan-Markar, 2006). An knowledgeable mother, who's aware about numerous ingesting water problems consisting of hygiene and sanitation practises, that have an impact on human health, performs a crucial role in educating their circle of relatives. In maximum cultural settings, moms are mainly accountable for overseeing of water materials, as well as household management, sanitary conditions, cleanliness, and health, in addition to the improvement of kids in hygiene-associated matters for you to understand the impact of insufficient hygiene on health, according to IANGWE (2004).

In terms of little one mortality, Esrey showed that parental training and the advantages of toilets in addition to piped water had been interdependent. Literate women blanketed their young kids, especially in unclean regions with out a or few restrooms, and with the arrival of piped water, efficient utilization of it turned into practiced to provide improved hygienic conditions for his or her newborns. In the same way, in underdeveloped international locations, mom time of schooling turned into frequently discovered to be firmly associated with more advantageous child health (boadi and kuitunen, 2005).

The multivariate evaluation certainly indicates that families with extra wages have been fewer vulnerable to go through than people with lower family wages. In terms of socioeconomic factors,

well-educated moms are greater concerned about the health in their own family, are extra aware of the high-quality in their drinking water, and use efforts to enhance it subsequently, it's miles concluded that the maximum vital and contributing factors in explaining the health final results were the household earnings, Respondent's education, kind of family, source of drinking Water and Separate Water garage container.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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