STRATEGIC MANAGEMENT FRAMEWORK OF GROUND WATER QUALITY FOR HEALTH CARE ALONG JINNAH ROAD GUJRANWALA CITY

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ABSTRACT: The objective of the research was to investigate/assess the water quality standard according to WHO because the study area of research was a canal distributary of 32 cusec discharge for the period of 25 years up to 1972 and thereafter sewage remained flowing period for 50 years. In 2021 PHE Department converted to 42" Ø sewer pipe and polluted water Nallah up to Noshehra Road and constructed a metaled road. The seepage water samples were collected and tested by the Noshehra Road Laboratory. Accordingly, the results identified the water-borne diseases, metals, chemical, biological, fecal, and *E-coli* bacteria. It was therefore necessary to research the causes of diseases for the safety of health care. Drinking water remedial measures were asked of Health Deptt and other concerned Authorities related to Gujranwala City. The quality of water was assessed by comparing WHO standards. The seepage water contaminated was obtained through hand pumps and dug wells before Municipal water distribution through overhead reservoirs (OHR) duly chlorinated by Public Health Engg Department now WASA and the Municipal Corporation. There are certain industries, falling untreated effluents in drains, causing cancer and other fatal diseases, through agricultural foods, due to sullage water irrigating the vegetables, in the vicinity of subrubs area of the city.

Keywords: water quality, Gujranwala, Jinnah road, pH, TDS, Chloride, magnesium.

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INTRODUCTION

Water is essential for life as no life on earth without water. The only available freshwater which could be used for drinking purposes arises from groundwater. Water becomes pollutants when discharged directly or indirectly into water bodies without adequate treatment to remove the harmful constituents. In addition, natural phenomena such as volcanoes, algae blooms, storms and earthquakes heavy rainfall, and floods cause major changes in water quality and consequently toxins harmful to public health, animals, and insecticides. Groundwater resources are vulnerable to contamination from many directions. Nitrates in the water turn into nitrites which are detrimental to human health (Ward *et al*., 1996, Weyer *et al*., 1996). The research shows that most of the drinking water systems are contaminated with organic and inorganic pollutants. All drinking water sources should be protected and tapped as per international standards and water distribution systems should be chlorinated. Deterioration of water quality and contaminates of lakes, rivers, and groundwater aquifers have resulted in increased waterborne diseases. The source of drinking water for the majority of people is groundwater which may be saline and bacteriological contamination. Moreover, some industrial areas samples, identify the presence of lead, chromium, and cyanide. Due to the rapid increase in the population of Pakistan, the big cities are being badly affected due to the migration of rural people towards famous cities for availing facilities like education, sanitation, water supply & drainage, safety, banking, police, rail & transport, airports, etc. Drinking water quality also attracted people and jobs facility in industries, Govt. departments, and other organizations. These people need planning for house construction, water, and sand sewerage for the safety of human health, due to drinking water quality.

Water pollution occurs when the body of water becomes contaminated by chemicals or microorganisms (WHO and UNICEF. 2000). Water becomes toxic to humans and the environment (Medicine News Today) Clean water is used for manufacturing and social and economic development. According to WHO 2 billion, people have less amount of water than the quantity required. Wastewater can be domestic, toilets, sinks or showers, agricultural and industrial use. The rainwater seeps underground, oils, grease, road salts in hilly areas, fertilizers, animal waste, and pesticides contaminate water with Phosphorous, Nitrogen. These toxins kill fish, seabirds, and marine mammals and health problems for humans. Water quality is tested by samples that if not clean, may cause diseases like; Cancer; hormone disruption, brain function, cardiovascular and kidney problems. Swimming in contaminated water may cause rashes, pink eyes, respiratory, and hepatitis Water samples along the distributary Jinnah Road identify the

waterborne diseases which caused children's death in the area, which increased during the flow of dirty water in the Chanel.

Gujranwala City had become the dirty city in Asia, due to canal water passing through the city, and having ponds at different sites along distributaries before partition from 1947 up to 1971. Thereafter closed, due to heavy population which converted to a polluted Drain. So the Chanel was open, due to Municipal Garbage, diseases spread and people remained in trouble due to waterborne diseases till 2000. Ultimately, the drain was constructed with masonry, and sewage water was dropped in RCC sewage pipes of 42" Ø up to disposal works. The main objective of this study was to assess the water quality of established around the metaled road named Jinnah Road to prove the problem's significance to warrant investigation.

MATERIALS AND METHODS

The intent of the research was to assess ground water quality along Jinnah Road Gujranwala City. The water quality samples were collected from ten Chowk along Jinnah Road where 25 years canal water remained flowing for years. The samples of water from donkey pumps, borehole 100-150 feet deep seepage water, and 200 Away from the center line of the road where canal water remained flowing 24 years and the rafter 50 years Sewage water in Gujranwala dirty. Now, metaled Road & Separate Nallah & Sewage 42" Ø have been laid down the road the Seepage water, Shallow water. The samples were collected for testing the waterborne disease, in the vicinity of Jinnah Road and sent to GDA Laboratory Noshehra Road. Samples were stored in a cool place below 4°C for microbial, and chemical analyses. The Physical parameters of the collected samples such as color and odor were noted according to WHO recommended limits (WHO 2004).

RESULTS

As a general survey in Pakistan, Geologists describe that due to heavy rainfall, salty water is found underground which flows in different, layers of the earth, from where water is obtained by Tube wells like shallow tube wells, and deep tube groundwater is mixed with different salts, and minerals including metals waste from Industries Water is generally obtained through wells, Hand pumps, Reciprocating Pumps, Canal reservoirs, Lakes, springs, Rainwater seepage, glaciers. Water contains sodium, calcium Potassium, Magnesium, Bicarbonates, chlorides, and Sulfide water contains Hydrogen Sulfide has an obnoxious smell therefore water samples are tested in labs. Groundwater occurs below the Surface of the earth where it occupies void spaces in soil. It is called subsurface water. Aquifer water occurs when man-made products oil, salts, and chemicals mix. The research analysis is based on the channel of Gujranwala distributary of canal water seepage and 50 years of sewage water also spoiled the flowing with seepage water containing microorganisms, like bacteria, viruses, fungi, algae, Protozoa & Archaea.

The samples were taken from underground where soil remained under 25 years of canal water for Agriculture purposes thereafter 50 years, sewage water remained flowing. Thus seepage water of coal disty up to 100 feet depth samples were collected & analyzed in GDA Laboratory for Physico-chemical parameters like temperature, PH, conductivity, Total dissolved solids, Dissolved oxygen, hardness calcium, magnesium, Alkalinity, chloride, and nitrate. The range of the water quality index is 28 but the certain area is poor water quality. The seasonal fluctuation of the water table the samples are tested to control water pollution. The residential area increased day by day along Jinnah Road, which separated the 42" Ø sewer and drainage system from polluted water. The Data presented in this review are extracts from various studies published in national and International Journals. Groundwater pollution (Groundwater Contamination) occurs when pollutants are released into the ground and make their way into groundwater. When pollutants are released to the ground naturally due to the presence of minerals and unwanted contaminants, contaminants or impurities in the groundwater landfill leachate effluent from wastewater treatment plants, leaking Sewers, Petrol filling stations, hydraulic fracturing (Fracking), and fertilizers in agriculture. Arsenic or Fluoride causes hazards to Public Health through poisoning or waterborne diseases.

For this study the water samples were collected along Jinnah Road marked on the city map at the following sites 100-150 feet deep pumped out by reciprocating pumps, almost 100 feet away from the center line of the Road, seepage water from underground as shallow water. The shallow tube wells are avoided and overhead Reservoirs (O. H.R) turbine bore wells 600 ft approximately below ground Level pump pure water for city water supply distribution through G. I. Pipes and PVC pipes under GDA & Municipal authorities. The results related to water quality in different areas of Jinnah road Gujranwala are described in table 1.

Table 1: Quality of Drinking Water sampled from different sites at Jinnah Road Gujranwala.

		P.H.	Turbidity	TDS	Chloride mg/l
Canal Water UCC	7.5	0.50	138	35	
Fatomand Chowk	7.9	0.71	221	49	
Sui Gas Chowk	7.4	0.49	280	64	
G.T. Road Chowk	7.4	1.06	375	110	
Dhullay Chowk	7.3	0.91	340	92	
Crown Cinema Chowk	7.6	2.92	502	168	
Islamia College Chowk	7.7	1.41	226	41	
Bagbanpura Chowk	7.9	0.84	473	145	
Noshehra Road Chowk	7.9	1.04	223	46	
Hayat_un_Nabi Chowk	7.7	0.54	229	52	

Chemically fit & microbiologically unfit •

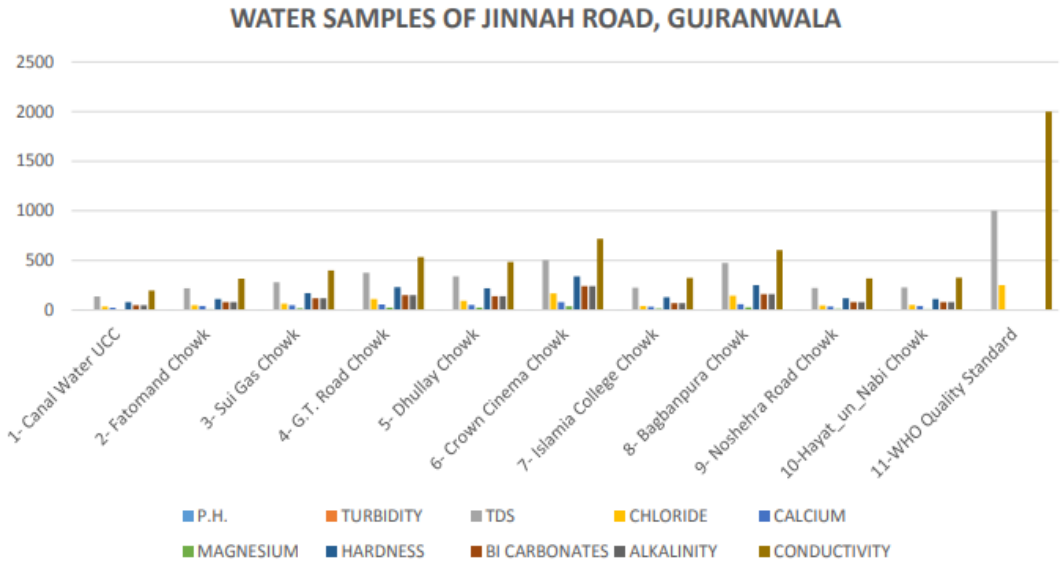

Figure 1 Water samples of Jinnah Road Gujranwala

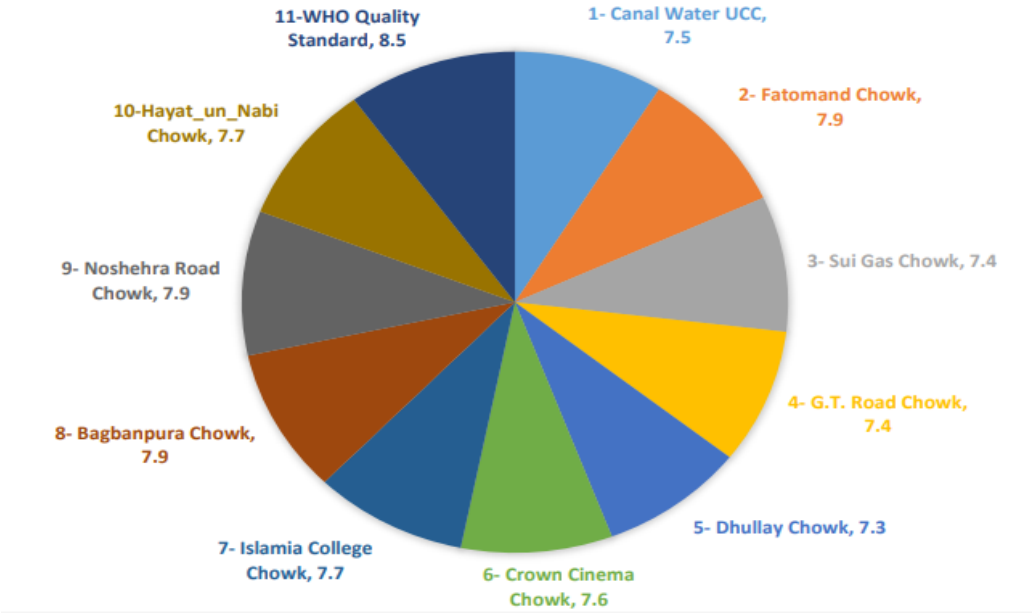

Figure 2 Water samples of Jinnah road Gujranwala

Fatomand Chowk

Sui gas Chowk

GT Road Chowk

Dhullay Chowk

- Crown Cinema Chowk

Islamia College Chowk

Bagbanpura Chowk

Figure 3 Canal Water UCC

DISCUSSION

The waste water percolates into the soil or surface water for sample testing will be considered for quality. The urban area causing unhygienic conditions and releasing pollutants that each into surface and ground water. The samples along Jinnah Road are taken for off and on analyzed, including dissolved oxygen, bacteriological and WHO standards for quality of water. Contaminants are complex and difficult to monitor and has long term health effects such as biological accumulations and cause cancer. Hydro quality of groundwater sources is quite important to evaluate society's development. Soil layers are different from one another in physiochemical properties of soil such as texture, PH, color, potassium, or phosphorus. Aquifers direct effect on water source quality. Salinity is not desirable for consumers. The hardness of water consists of inorganic salts, calcium, magnesium, potassium, sodium, and bicarbonates.

Public water supplies move water from its source from springs, Lakes, Rivers, oceans, Glaciers, Snow falls on mountains, melting ice, Rainfalls, and underground water due to seepage, ponds shallow water & Deep tube wells, Surface water of the canal, salty water of certain areas to get clean drinking water to treatment plants where it undergoes chemical disinfection and biological disinfection and delivered to households

through a system of underground pipes. Tap water contains added minerals including calcium, magnesium, and Potassium. Hard tap water has higher mineral contents for healthcare & some corrode pipes & restrict water flow. Some contaminated water rust or leaking can pollute drinking water. According to Food & drug administration (FDA), mineral water must contain 250 parts per million of total dissolved solids. Minerals of water include calcium, magnesium, and potassium in bottled at the source where CO2 gas or eliminating toxic substances such as arsenic. The Bacterial growth is minimized by removing gas CO2.

The nutrients in water plays special roles in regulating blood pressure, blood glucose, and the nervous System. Some deficiency of magnesium shows symptoms e.g. loss of appetite, Fatigue muscle weakness, nausea & Vomiting, numbness, muscle cramps, mood changes heartbeat fluctuation, or cardiovascular diseases.

One-sixth of the global population suffers from a freshwater shortage (Elimelech, 2006). Most of the developed countries suffer most from chemical discharge problems, whereas developing countries from agricultural sources. Contaminated water leads to waterborne diseases. To prevent this certain measures even at the domestic level should be taken by introducing processes and technologies (Shannon *et al*. 2008). Water contamination is a common problem to all over the world. These may be anthropogenic or geological (Fawell and Nieuwenhuijsen 2003, Fawell *et al*., 2006). The types and/or concentrations of natural pollutes depend on the nature of the geological materials through which the groundwater flows and quality of recharge water. Whilst moving through sedimentary rocks and soil groundwater can pick up an extensive range of compounds e.g. calcium, magnesium, arsenate, fluoride, chloride, iron, and nitrate++ thus, the effect of these natural contaminations depends on their types and concentrations. The natural occurring elements present at unacceptable levels can contaminate water as well (Liu *et al*.2005; Charles *et al*. 2005; Rukah and Alsokhny 2004; Mulligan *et al*. 2001; Ghrefat *et al*. 2014; Meenakshi and Maheshwari 2006).

Industrial, and agricultural contaminants include heavy metals like mercury, lead, copper, chromium, and hazardous chemicals, dyes and compounds like fertilizers and insecticides. disposing or inappropriate storage of household chemicals i.e. paints, solvents, synthetic detergents, oils, disinfectants, medicines, pool chemicals, pesticides, batteries, diesel and gasoline fuel are also involved to contaminate the ground water (Kass *et al*. 2005; Anwar 2003) About 2 million tons of sewage, agricultural and industrial waste are discharged into the global water each day (UN WWAP 2003).The pathogens like viruses, bacteria, protozoa and parasites are also added in ground water by human and animal wastes.Some contaminants can be easily detected by checking odor, color, taste and turbidity of the water. Whereas most require lab tests to reveal whether water is contaminated or not. Color of water usually not noticed lest it is one of high concentration (ground water having high iron contents appear reddish likewise, high tannin contents makes the water appear brown). Water color is measured by matching a water sample to the color standard. A 1 color unit shows no effect on quality and is not detectable whereas 100 color units is compared to the light tea color (Ligor and Buszewski 2006).

The Punjab Environmental Protection Act, 1997 (XXXIV) 1997 Amended Act 35 of 2012 Dated 18-4-2012 to provide protection, conservation, Rehabilitation, and improvement of the environment for the prevention and control of Pollution and Prevention of Sustainable development and matters connected therewith and incidental these to which is enacted.

Infectious diseases like cholera, typhoid fever, and gastroenteritis, diarrhea, vomiting, skin problems and kidney problems can cause water pollution and these problems usually through contaminated water. Water pollution can cause water to become toxic to humans and the environment such as cancer or cardiovascular conditions. A person who injects chemical toxins into water is affected by cancer, hormone disruption, altered brain function, damage to the reproductive system, and hepatitis respiratory infections. Pollution and health are associated problems because disease-causing microorganisms are known as pathogens that spread diseases in humans due to goods and vegetables. Metal Contaminated water leads to hair loss, Liver cirrhosis, and renal failure.

Ground water sample of most of the areas of the study showed higher TDS levels and amongst these water samples taken from crown cinema chowk showed highest TDS level. Water laws are therefore enforced by the state like the environmental pollution act 1997, to protect the basic health laws. Water shortage for people has adversely affected the quality of water. Water sources like surface and groundwater are contaminated with Bacteriological (arsenic nitrates and fluoride) municipal, agricultural, and industrial wastewater supply pipelines are laid close to sewerage lines therefore water-borne diseases cause serious effects. According to the survey, water is used in 32% of tap water, 28% of hand pumps, 27% of motor pumps, 4% of dug wells, and 57% of urban and 15% of rural access house connections. In Pakistan, water quality testing shows bacteriological 68%, arsenic 24%, nitrate 13%, and fluoride 5%, about 20% of the whole population has access to safe drinking water, and the remaining 80% is forced to use unsafe drinking water. The contamination is due to fecal. The secondary source of contamination is the disposal of toxic material, through industrial waste and agricultural waste pesticides. The main purpose of the dissertation, thesis, or research

proposal is to prove The problem's significance to warrant investigation.

This research was based on water quality and its users (Health care) therefore the stakes holders are also considered as the Public water supplies are taken from Deep Tube wells & Chlorinated arcading WHO standard under Environmental Protection Agency (EPA). The clean water gets delivered to households through a system of underground pipes. Tap water contains minerals, including calcium magnesium, and Potassium which corrode pipes or restricts the flow. The contaminants from rusted or leaking pipes can pollute drinking water. Some people prefer mineral water due to its perceived purity. To meet WHO standard water is treated to remove the contaminants, therefore laboratory testing of samples play a major role to prevent waterborne diseases and dehydration.

Recommendations: On the basis of the results of the study, it is concluded that discharge and leakage of domestic waste and industrial waste, marine dumping, atmosphere sulfur, rainfall, and Municipal waste are the major source of pollution. Drinking water must be filtered & purified. Water should be treated in a filtration plant and chlorinated groundwater, before use for this purpose The water should be Cholinated before supplying to the Public, to save from water-borne diseases (Diarrhea, Hepatitis, Cancer, Dysentery, Malaria, Polio, and Viruses). The distribution pipes are corroded which should be replaced after ten years to remove, fungi, Algae, Corrosion, etc., microorganisms, bacteria, and viruses.

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