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Analysis of Drinking Water and Effect of Contamination on Human Health: A Review

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ABSTRACT: Water is one of the most basic needs of all living beings. Water is required for various daily activities such as drinking, washing, bathing, cooking, and so on. If the water quality is poor, it becomes unfit for drinking and other activities. Water quality testing is an investigation of a specific entity. It begins when water enters the building and continues until wastewater is released, critically scrutinizing all aspects of use along the way. An excellent management method for minimizing losses, optimizing multiple services, and enabling significant water conservation is a water audit. The safety and security of drinking water are critical since it has an impact on public health and the economy. These testing are crucial for determining how well the water quality is doing and ensuring that the drinking water laws are being followed. Various testing techniques make recommendations for reducing water waste and use. Water is a basic human requirement that is required in a wide range of activities, particularly in households. However, in the vast majority of cases, this crucial item fails to meet commonly accepted safety criteria. The goal of the study was to look into the various parameters related to the physicochemical and bacteriological quality of drinking water. An analytical cross-sectional study was done to acquire information on the quality and safety of household drinking water.

KEYWORDS: Water Quality, Water Quality Index, Physical Parameter, Chemical Parameter, Biological Parameter, Water Quality Testing, Water Quality Auditing.

I. INTRODUCTION

Water is life's source; hence its security and safety are critical. A healthy and productive existence necessitates the availability of clean and safe water. The health of individuals and entire communities is determined by the quality of the water supply. The rates of these bodies of water vary greatly depending on their location and the surrounding environment. Drinking water safety is becoming one of the most pressing concerns since a variety of dangers can endanger public health. Waterborne illnesses and other water-related dangers have been identified by the World Health Organization (WHO). Drinking water safety is becoming widely recognized as a problem. Contaminated water has the potential to trigger epidemics, disrupt economic activity, and generate widespread fear. Water quality testing is an excellent management tool for minimizing losses, optimizing diverse uses, and enabling significant water conservation not only in the irrigation sector, but also in other water-using sectors such as household, electricity, and industry. The physical, chemical and biological aspects of water are used to describe its quality. As a result, it is necessary to monitor the water quality at regular intervals.

pH, Temperature, Turbidity, TDS, Total Hardness, Chloride, Total Alkalinity, and other parameters may be examined. Water quality testing is an analytical technique that evaluates water usage and quality while also allowing for an assessment of water management behavior. Water quality auditing is a crucial management tool for effective water conservation. Safe drinking water is critical for all humans because it is required for proper body function. It is estimated that 28% of the world's population lacks access to safe drinking water. It is a valuable resource that must be safeguarded at all costs. Water, like air, is seen as a basic requirement. Rapid population expansion, on the other hand, is a major concern in many developing countries, and it has had a significant impact on the supply of safe water. Unsafe water has been recognized as a global problem since it is linked to diseases and chemical poisoning. Waterborne infections, which are the world's second-biggest cause of child mortality, are caused by a lack of safe water and poor sanitation.

Water serves a variety of purposes in the human body. It functions as a bodily transport system, lubricant, and temperature regulator, among other things. Water makes up more than two-thirds of the human body. In developing countries, ensuring safe drinking water for urban and rural people is a barrier to long-term development. The quality of

drinking water is a major concern for humanity because it is directly tied to public health. In many countries, particularly in developing ones, drinking water quality has always been a severe issue. The chemical, physical, and biological components of water can all be used to determine its quality. Water quality in our country's surface water bodies is deteriorating due to traditional pollutants (heavy metals, pesticides), as well as various organic and inorganic compounds and toxins. Drinking water is a basic need for individuals all over the world, and a huge portion of the global population lacks access to safe drinking water. Water contamination has become a global issue. The presence of pathogenic germs and antibiotic-resistant microorganisms in drinking water has become a global problem.

II. VARIOUS PARAMETERS RELATED TO WATER TESTING

- a) **Turbidity:** The turbidity of water depends on the quantity of solid matter present in the suspended state. It is a measure of the light-emitting properties of water and the test is used to indicate the quality of waste discharge concerning the colloidal matter. The mean turbidity value recommended by WHO is 5.00 NTU.
- b) **Total dissolved solids (TDS):** Water can dissolve a wide range of inorganic and some organic minerals or salts such as potassium, calcium, sodium, bicarbonates, chlorides, magnesium, sulfates, etc. These minerals produced an unwanted taste and diluted color in the appearance of water. This is an important parameter for the use of water. The water with a high TDS value indicates that water is highly mineralized. The desirable limit for TDS is 500 mg/l and the maximum limit is 1000 mg/l which is prescribed for drinking purposes.
- c) **Electrical conductivity (EC):** Pure water is not a good conductor of electric current rather it is a good insulator. An increase in ions concentration enhances the electrical conductivity of water. Generally, the number of dissolved solids in water determines electrical conductivity. Electrical conductivity (EC) measures the ionic process of a solution that enables it to transmit current. According to WHO standards, the EC value should not exceed 400 $\mu\text{S}/\text{cm}$.
- d) **PH of water:** PH is an important parameter in evaluating the acid-base balance of water. It is also the indicator of the acidic or alkaline condition of water status. WHO has recommended a maximum permissible limit of pH from 6.5 to 8.5. The pH is determined by the amount of dissolved carbon dioxide (CO_2), which forms carbonic acid in water. The present investigation was similar to reports made by other researchers' studies.
- e) **Chloride (Cl):** Chloride is mainly obtained from the dissolution of salts of hydrochloric acid as table salt (NaCl), and NaCO_2 and added through industrial waste, sewage, seawater, etc. Surface water bodies often have a low concentration of chlorides as compared to groundwater. It has key importance for metabolism activity in the human body and other main physiological processes. High chloride concentration damages metallic pipes and structure, as well as harms growing plants. According to WHO standards, the concentration of chloride should not exceed 250 mg/l.
- f) **Sulfate:** Sulfate mainly is derived from the dissolution of salts of sulfuric acid and is abundantly found in almost all water bodies. A high concentration of sulfate may be due to oxidation of pyrite and mine drainage etc. Sulfate concentration in natural water ranges from a few to several 100 mg/liter, but no major negative impact of sulfate on human health is reported. The WHO has established 250 mg/l as the highest desirable limit of sulfate in drinking water.
- g) **Magnesium (Mg):** Magnesium is the 8th most abundant element on earth's crust and a natural constituent of water. It is essential for the proper functioning of living organisms and is found in minerals like dolomite, magnetite, etc. The human body contains about 25 g of magnesium (60 % in bones and 40 % in muscles and tissues). According to WHO standards, the permissible range of magnesium in water should be 50 mg/l.
- h) **Calcium (Ca):** Calcium is the 5th most abundant element on the earth's crust and is very important for human cell physiology and bones. About 95 % of the calcium in the human body is stored in bones and teeth. The high deficiency of calcium in humans may cause rickets, poor blood clotting, bones fracture, etc., and the exceeding limit of calcium-produced cardiovascular diseases. According to WHO standards, its permissible range in drinking water is 75 mg/l.
- i) **Sodium (Na):** Sodium is a silver-white metallic element and is found in less quantity in water. A proper quantity of sodium in the human body prevents many fatal diseases like kidney damage, hypertension, headache, etc. In most countries, the majority of water supply bears less than 20 mg/l, while in some countries the sodium quantity in the water exceeded 250 mg/l (WHO). According to WHO standards, the concentration of sodium in drinking water is 200 mg/l.
- j) **Potassium (k):** Potassium is a silver-white alkali that is highly reactive with water. Potassium is necessary for living organisms to function hence found in all human and animal tissues, particularly in plants cells. The total potassium amount in the human body lies between 110 and 140 g. It is vital for the human body functions like heart protection, regulation of blood pressure, protein dissolution, muscle contraction, nerve stimulus, etc. Potassium is

deficient in rare but may be led to depression, muscle weakness, heart rhythm disorder, etc. According to WHO standards the permissible limit of potassium is 12 mg/l.

- k) **Nitrate (NO₃):** Nitrate is one of the most important diseases causing parameters of water quality particularly blue baby syndrome in infants. The sources of nitrate are nitrogen cycle, industrial waste, nitrogenous fertilizers, etc. The WHO allows a maximum permissible limit of nitrate of 5 mg/l in drinking water.
- l) **Bacterial Contamination:** The total coliform group has been selected as the primary indicator bacteria for the presence of disease-causing organisms in drinking water. It is a primary indicator of the suitability of water for consumption. If large numbers of coliforms are found in water, there is a high probability that other pathogenic bacteria or organisms exist. The WHO and Ethiopian drinking water guidelines require the absence of total coliform in public drinking water supplies. In this study, all sampling sites were not detected as fecal coliform bacteria.

III. EFFECT OF WATER QUALITY ON RESIDENCE HEALTH

Diseases related to contamination of drinking water constitute a major burden on human health. Interventions to improve the quality of drinking water provide significant benefits to health. Water is essential to sustain life, and a satisfactory (adequate, safe, and accessible) supply must be available to all. Improving access to safe drinking water can result in tangible health benefits. Every effort should be made to achieve a drinking-water quality as safe as practicable. The great majority of evident water-related health problems are the result of microbial (bacteriological, viral, protozoan, or other biological) contamination. An excessive amount of physical, chemical, and biological parameters accumulated in drinking water sources, leads to affects human health.

IV. PROPERTIES OF WATER

The properties of water make it suitable for human beings to survive in differing weather conditions. Water is characterized by complex ominous properties that differentiate it from other substances. Water is the universal solvent due to its polar nature. It dissolves a large number of different chemical substances. Its properties are as follows:

4.1 Physical properties of Water

Water has a very high specific heat capacity and a high heat of vaporization. Both properties arise due to extensive hydrogen bonding between water molecules. Water's very high specific heat capacity is a good medium for spreading the earth's heat. Water has a high density, which depends on the dissolved solids and temperature of the water. Water is physically unique because it is less dense as solid (ice) than as a liquid. The maximum density of liquid water occurs at 4°C. Water has a high surface tension as compared to other liquids due to strong cohesion between molecules. Surface tension is responsible for capillary action, which allows water to move through the roots of plants. Water is the substance of which a solid-state can float on a liquid state. Various properties of water like melting point, boiling point, viscosity, slow heating, and cooling are the result of intermolecular hydrogen bonding between water molecules. Water has a high value of dielectric constant. Water also has an exceptionally high heat of vaporization. Water can dissolve most the gases like O₂, CO₂, N₂, H₂, SO₂, and NH₃.

4.2 Chemical properties of Water:

Water is a chemical substance with the chemical formula H₂O and a bent shape. Water is a liquid at room temperature due to hydrogen bonding. In the water molecule, both hydrogen atoms create a positive electrical charge while the oxygen atom creates a negative charge, therefore water molecules are polar. Water is thermally stable but at higher temperatures dissociates into hydrogen and oxygen gases. Water can ionize itself to a very small extent but in pure water the amounts of hydronium ions and hydroxide ions are equal. Hence pure water is neutral. Water is an amphoteric molecule it acts as acid as well as a base. Water oxidizes carbon to carbon monoxide behaving as an oxidizing agent while it reduces chlorine gas to hydrogen chloride acting as a reducing agent.

4.3 Biological properties of Water:

Water is the universal solvent because it dissolves a wide range of substances than other common solvents. Waterworks as transporting biotic molecules, biominerals, hormones, and vitamins to different parts of animal and plant bodies. Water is significant for all the metabolic reactions essential for life to take place in solution in the cytoplasm of living cells. Water molecules are adhesive due to their polar nature and therefore water sticks to other polar substances. This allows water to move upwards through the xylem of plants against gravity. Water dissolves oxygen gas from the air which is necessary for aquatic life.



V. GROUNDWATER CONTAMINATION & SOURCES OF WATER POLLUTION

Groundwater contamination occurs when man-made undesirable products get into the groundwater and cause it to become unsafe and unfit for human use. Serious health effects may be caused by contaminated groundwater. The movement of groundwater and dispersion within the aquifer spreads the contaminants over a wider area. Surface water percolates through soil then it picks up minerals, salt, and organic compounds. The water migrates downward therefore the concentration of dissolved solids is increased. In some areas, minerals concentration is enough high so that the groundwater is unfit for drinking and irrigation purposes without treatment.

Groundwater is located below the surface of the earth in spaces between rock and soil and it is a substantial source of water. Groundwater contaminants occur from both natural and human activity. The quality of groundwater is threatened by various sources of pollution, which are as follows: **Industrial Effluents:** Industrial effluents contain various materials, depending on the industry such as chemical manufacturers, metal processors, steel plants, and textile manufacturers. Industrial effluent consists of both organic substances and inorganic substances. The organic industrial effluents are produced by the industries such as pharmaceutical, organic dye, cosmetics, glue, soaps, synthetic detergents, herbicide, pesticides, textiles, paper plants, oil refining, metal processing, and fermentation industries.

Agriculture Discharges: Agriculture discharge occurs over a large area as non-point sources of pollution; therefore, its management and treatment are more difficult. Agricultural discharges contribute to degrading both ground and surface water. Chemicals from fertilizers, pesticides, insecticides, farm waste, plants and animal debris, inorganic material, and manure slurry are reported to cause huge pollution to surface and groundwater. **Sewage and Domestic wastes:** Sewage is a significant source of water pollution. Sewage is the term used for wastewater that often contains domestic and industrial wastes. Sewage is commonly water that is discharged after home or industrial use. Sewage contains human waste, soap, detergent, glass, metals, garden waste, and sewage sludge. Industrial sewage is used water from chemical processes while domestic sewage carries used water from houses. Untreated sewage may contain nitrogen, phosphorus, organic matter, bacteria, viruses, protozoa, oils, greases, mercury, cadmium, lead, chromium, copper, and many toxic chemicals. Sewage released into the lakes, rivers, and oceans causes a threat to human health.

Fertilizers: Fertilizer isn't a problem if it is used carefully but too much use of fertilizer at the wrong time easily washes off into storm drains and then flows untreated into lakes or streams. A fertilizer is a natural or synthetic material that supplies one or more plant nutrients essential to the growth of plants. Fertilizers are artificial or organic materials that can cause serious problems. Fertilizers are used mainly in agricultural fields they contain high levels of nitrogen and phosphorus so they cause ecological problems. Nitrogen fertilizers contaminate groundwater which is poison to humans at high levels. Due to fertilizer pollution biggest change occurs in algae populations (Algal blooms). The excess fertilizer use runs off into waterways, which causes algae blooms. **Runoff from Urban Areas:** Urban areas runoff created is a major source of water pollution in urban communities. In urban areas, water is often unable to infiltrate into the soil as a result, urban runoff flows across roadways and urban landscapes. The pollutants from urban runoff include plant material, fertilizers, pesticides, and household chemical waste. Urban runoff pollution is caused when the runoff while traveling across the urban environment, acquires contaminants that affect water quality. Urban runoff pollution is nonpoint source pollution.

Organic Chemicals: Several organic chemicals are used in chemical industries. A very small amount of the chemicals that may reach drinking water from various sources is a serious threat to human health. Synthetic organic chemicals enter the ecosystem through various human activities. Synthetic pesticides, food additives, synthetic detergents, pharmaceuticals, insecticides, synthetic fibers, plastics, solvents, and volatile organic compounds are important sources of toxic organic chemicals in the water. **Inorganic Pollutants:** Inorganic pollutants such as mineral acids, trace elements, inorganic salts, metals, metal compounds, cyanides, and sulfates are results of human activities and percolate in groundwater aquifers. Inorganic pollutants are non-biodegradable and persist in the environment. Toxic inorganic materials adversely affect biological communities and the aquatic ecosystem. Naturally occurring inorganic substances mainly contaminate groundwater.

Thermal Pollutants: Thermal pollution is defined as a sudden change in the temperature of natural sources of water which may be lakes, rivers, and oceans by human influence. Manufacturing and Production plants are a major source of thermal pollution. The discharge of hot water from nuclear power plants, thermal power plants, and industries causes thermal pollution. The temperature of the water body increases adversely affecting aquatic animals such as fish, amphibians, and other aquatic organisms. Thermal pollution can change the oxygen levels and affect local ecosystems and communities. The warm temperature reduces the levels of Dissolved Oxygen in water. The warm water holds

relatively less oxygen than cold water. Aquatic species are more sensitive to temperature changes because it causes significant changes in organisms' metabolism and other biological changes. Thermal pollution increases the metabolic rate of organisms by increasing enzyme activity; therefore, the stability of the food chain disrupts and alters the balance of species composition.

Radioactive Pollutants: Radioactive waste has been created by humans as a co-product of various activities such as mining and refining of a radioactive element, production, and explosion of nuclear weapons, nuclear power plants, nuclear fuels, and preparation of radioactive isotopes. Radioactive waste is a material that has been contaminated by radionuclides. A radionuclide is an unstable atom of an element that decays emitting energy in the form of radiation. Human activities produce a large number of radioactive elements into the environment. The radioactive materials are reaching into human and animals body through food chains. The radioactive materials are reaching water bodies where the aquatic species absorb them. Wastewaters containing these radioactive materials enter the human body through food chains from wastewater. All organisms are affected by radiation pollution.

Toxic Metals: Toxic metals such as aluminum, arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, may be harmful to human health including cardiovascular diseases, developmental abnormalities, neurologic and neurobehavioral disorders, diabetes, hearing loss, hematologic and immunologic disorders, and various types of cancer. Contamination of water resources by toxic metals occurs largely due to human activity. Toxic metals are widely distributed in the air, drinking water, food, and elsewhere. Toxic Metals in water sources may occur naturally or may be the result of contamination. Naturally, metals are dissolved in water when coming in contact with rock or soil. Other sources of metal contamination are leakage from waste disposal sites and corrosion of pipes.

VI. OBJECTIVES OF THE STUDY

The goal of this study is to look at the link between drinking water quality and human health and longevity. The aims and objectives of the present study are as follows: -

- a) To study the causes of water contamination.
- b) To investigate the physicochemical and biological analysis of water.
- c) To examine how to improve the water quality.
- d) To observe the effect of various impurities on human health.
- e) To identify the locations of bottlenecks for clean water and eliminate them.
- f) To investigate techniques for minimizing the water impurities.
- g) To find opportunities for water conservation. etc.

VII. LITERATURE REVIEW

O. K. Jean-Eudes et al. (2022) accessed the quality and portability of underground water resources in the hills. They analyzed 21 drinking water resources on physical (temperature, pH, and electrical conductivity) and chemical (cations and anions) parameters. *Dr. P. Sarada (2016)* assessed the groundwater quality of the first industrial residential confluence area of Visakhapatnam. He has performed various tests for water quality and found that groundwater in that study area is not palatable. *Rachna Bhateria and Disha Jain (2016)* reviewed that due to the presence of impurities in the lake, there are many different parameters found to be increased during the summer season and have got diluted during the rainy season. *Ashish Kumar Singh et al. (2019)* performed an analysis in Sikkim, the community considered springs as a holy pristine source of water that is safe for drinking and other household purposes.

Behailu TW et al. (2017) improved water quality, there should be a mechanism of keeping safe water sources from chemical contaminants effectively and protectively through the application of regular check-ups and with interventions by taking exact measures periodically before it is supplied for usage. *Maqbul Hussain et al. (2021)* assessed the status of drinking water quality from four different water sources available in and around an institutional campus of Nagaland University, with special reference to the detection of trace heavy metal elements. *Amod Kumar Choudhary et al. (2017)* focused on the quality, monitoring, and treatment methods of drinking water in rural villages of Himachal Pradesh. To realize this goal, they assessed local perceptions and behavior regarding drinking water.

Andrew J. Whelton et al. (2015) performed water testing was conducted 2 weeks following the spill to understand resident perceptions, tap water chemical levels, and premise plumbing flushing effectiveness. *Suchpreet Kaur et al. (2014)* performed a Physico-chemical analysis of the water in the present study and found all the parameters within an acceptable range of Indian drinking water standards (IS: 10500). *Anilesh Kumar Yadav (2016) et al.* did a

physicochemical assessment of groundwater samples of five tehsils of Kota District was used to evaluate the suitability of groundwater for drinking, industrial and agricultural purposes. *Nandini Thakur et al. (2017)* suggested a new approach and determine the quality of the water and the possible geochemical processes impacting the water quality in the Kullu valley of Himachal Himalayas. *Azza Daghara et al. (2019)* investigated the physical and chemical characteristics of water from springs that were within the acceptable standard limits, except for turbidity and chloride and nitrate concentrations.

MekuanintLewoyehu et al. (2021) indicated the pollution load of Koga irrigation on the water quality of the area drinking water from the groundwater well was above the WHO standard for turbidity and well above the recommended bacteria levels. *Mohd Saleem et al. (2016)* analyzed the underground water quality of the Greater Noida region by water quality index. Nine Physico-chemical parameters such as Calcium, Magnesium, Chloride, Sulphate, Total Hardness, Fluoride, Nitrate, Total Dissolved Solids, and Alkalinity were collected from 10 different locations since a period of 2015. *Remy Babich et al. (2021)* analyzed 4016 metal-mixture combinations showing that changes in zebrafish behavior are highly mixture dependent, and indicate that certain combinations of metals, especially those containing arsenic, cadmium, lead, and uranium, even at levels considered safe in drinking water, are significant drivers of behavioral toxicity.

Sunali Mahajan et al. (2020) assessed the water quality of Tehsil Balh, District Mandi of State Himanchal Pradesh for drinking purposes to ascertain the magnitude of anions and other physicochemical parameters. Public Tap and Groundwater are major sources of drinking water in the area for both human consumption and plant production. *Aniqa Batoool et al. (2018)* observed that the quality of drinking water is just as important as its quantity. Quality varies from place to place because geological settings affect the drinking water quality of the area. *Akhil Pathak et al. (2021)* analyzed various parameters in the lab and plotted them on a map using the GIS interpolation method. It helps find the variation of different parameters at different locations.

Ghaffar Ali et al. (2021) were involved in using perilous water sources. Socio-economic factors were also considered. A multidisciplinary approach was employed to analyze the data, including the cost of illness (COI), regression technique, and irrigation water efficiency methods. *Sharma RK et al. (2018)* carried out to quantify the pH, conductivity, and iron content in the Galore area of Hamirpur district in Himachal Pradesh. *Meseret B Addisie et al. (2021)* considered a combination of user perceptions with the measured water quality parameters determined using the water quality index (WQI) tool. *Lekan Taofeek Popoola et al. (2019)* investigated groundwater quality collected from two industrial and residential locations in each Lagos metropolis. Prescribed standard procedures of the American Public Health Association were used to measure the physicochemical parameters of each of the groundwater samples.

DulamsurenGanpurev et al. (2021) demonstrated that the nitrate ion and microbiological assay results have come together to present a reasonably cohesive image of a positive correlation between nitrate ion concentration and bacteriological contamination of the water. *J.K. Ondieki et al. (2021)* found household water in Kisii town to be within the WHO recommended standards with regards to TDS and EC. In terms of turbidity and pH, 91.9% and 69.4% of the drinking water samples were compliant respectively. *M. F. Alam et al. (2017)* assessed six brands of bottled water in Dhaka City, Bangladesh, for the physical and chemical parameters. *Huda Kamal et al. (2021)* highlighted that all the selected physicochemical parameters for raw and chlorinated water were found within the permissible limits set by WHO and PSDWQ except TSS and Chlorine (free & total). *Meseret B Addisie et al. (2022)* assessed the quality of drinking water sources in the highlands of Ethiopia. The study considered a combination of users' perceptions with the measured water quality parameters determined using the water quality index (WQI) tool.

Hemant PATHAK (2020) used numerous chemometric techniques to evaluate and interpret water quality data obtained from the drinking water resources namely municipal water bore well, groundwater of Sagar city, a divisional headquarter of Madhya Pradesh, India. *Kanji Fatema Nishan et al. (2020)* indicated that almost all the physicochemical parameters of sample water were not within a recommended level, and also the microbial parameter was not matched with the acceptable limit. *Motuma Shiferaw et al. (2021)* aimed to assess and compare the water quality of Nekemte Town's water supply with WHO standards and suggest suitable solutions for the water quality problem. *Jetty Elizabeth Philip et al. (2021)* observed that the water was not safe for drinking without proper purification. Therefore, it is essential to test the quality of water before it is used for drinking, domestic and agricultural purposes.

Sunali Mahajan et al. (2020) selected ten quality parameters (Colour, Odour, Temperature, pH, Turbidity, TDS, TSS, Conductivity, Total hardness, and Alkalinity) to decide the water quality status of Balh Tehsil, District Mandi,



H.P (India). *Namita Soni et al. (2015)* aimed to find out the quality of drinking water at the household level in Jaipur city of Rajasthan. In, Jaipur the main source of water supply is groundwater. It is either supplied by the piped line by the Public Health and Engineering Department (PHED) of the households or hasits bore-wells at their premises. *Radhika Jamwal (2020)* performed Physico-Chemical and Bacteriological analysis on natural water resources of Mandi town of Himachal Pradesh to assess the quality of drinking water.

VII. SUMMARY OF LITERATURE

The summary of the literature indicates that most of the research work was done by experts in the area of physical and chemical analysis of drinking water and the effect of water impurities on the health of residents. For more clarification, many testing and analysis results for studying the effect of water contamination are brief next. To take care of the health of human beings, s water analysis is very much important.

VIII. GAPS IN EXISTING LITERATURE

- a) No proper research work is carried out on the chemical analysis of the water in the Nerchowk area.
- b) Very less literature is available regarding the effect of water contamination on human health.
- c) Very less experimental data were found regarding the effect of impurities on human health.
- d) The understanding of water contamination parameters and their relation to the residents is still limited.
- e) Many researchers have done a detailed study of chemical analysis of water and the effect of water impurities on the health individually but their combined or relative study has not been carried out yet.

IX. DISCUSSIONS

From the literature survey following points are needs to be discussed:-

- a) No compromise with the water quality for drinking, domestic purposes, agricultural requirements, etc.
- b) Strict action should be taken against those who pollute the water sources directly or indirectly.
- c) Physico-Chemical and Biological Analysis of Water should be done frequently to ensure water quality.
- d) The effect of various contaminants on the health of living beings should be studied properly.
- e) In case the water has impurities greater than the permissible value it should be treated well before supply.
- f) Water sources should be conserved well and sources should be isolated from any type of pollution.

X. CONCLUSION

Based on findings from the literature, it was concluded that the physicochemical and bacteriological parameters of drinking water should be within permissible limits as compared to World Health Organization standards for drinking water (WHO). In addition, there is a great need for time to time audits of drinking water sources to ensure water is safe for drinking and other domestic application. The study concluded that poor water quality exposes the residents to several types of health disorders. If water is found unfit for drinking, domestic and agricultural purposes it should be treated by specific technique until the safe limit is attained as recommended by WHO.

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