PHYSIO-CHEMICAL AND BIOLOGICAL PHYSIOGNOMIES OF DRINKING WATER AND ITS IMPACT ON HUMAN HEALTH, MURREE-FOOTHILLS-HIMALAYAS, PAKISTAN.

Zulfiqar Ali[1], Dr.Khalida Khan[2], Sohail Abbas[3]
[1]Centre for Integrated Mountain Research, University of the Punjab, Lahore-Pakistan
Corresponding email: pakgeo72@yahoo.com

***ABSTRACT*:** *Drinking water is a vital component of all forms of life. It attains from two sources, i.e. surface water that from rivers, canals, fresh water lakes, streams etc. Other is ground water like well water and borehole water. On account of exclusive chemical qualities of water due to its "polarity" and hydrogen bonding, it has capability to dangle dissolve, soak up and absorb many dissimilar compounds. The well-known hill station Murree. adoringly called " the queen of the Hills" by the people is lying on the sub-Himalayan mountains. It is most reachable and developed hill station and sanatorium in Pakistan. Murree is divided into cantonment areas, spread over most of the hill tops, and fifteen Union Councils including one representing the non cantonment urban areas of Murree city. Many admired tourist sites like Murree are still facing the unhygienic water. In a larger population, some people are most surely infected with a gastro-intestinal pathogen and as a result wastewater is usually connected with a health risk. Water is fundamental to health, welfare, food security and socio-economic progress of mankind. Therefore, the existence of contaminants in natural freshwater persists to one of the most important environmental problems. The Murree mountainous region Northern Pakistan is one of the most impressive charming mountainous regions of Pakistan and over five million peoples visit Murree every year. Health experts say that tourists visiting hill stations, including Murree and Galiat, should take extra care and keep away from food and water borne diseases and respiratory tract infections. The mass of tourists consume food and water being dish up in hotels and restaurants, which may cause infections mainly because of being highly contaminated and unhygienic.*

Key Words: (*Borehole water, Tourist sites, Contaminants, Unhygienic)*

INTRODUCTION:

Water is not pure in nature, as it attains contaminants from its adjacent areas and those the happening from humans and animals and other biological activities. Water quality guidelines form a basis for judgment of the acceptability of public drinking water supplies [1]. Any judgment of associated with use of bacteriological guidelines must, however take into account precession, validity, appropriateness of sampling procedures. Water is central to many critical environmental issues on Pakistan. The links between water quality and health risks are well established. The poor quality of drinking water has major socio-economic consequences for Pakistan. Inadequate quantity and quality of potable water are associated with host of illnesses such as diarrhea, typhoid, intestinal worms and hepatitis [2]. Murree has charm of its own. Glorious sights of snow-capped mountains of Kashmir can be viewed in the spring and autumn and dazzling twilight and cloud effects can be seen daily during the July and August rains. In Murree the tourists and local people are facing a host of problems including water shortage and water quality [3]. There is no water in the pipelines provided by the Tehsil Municipal Administration, and traders are left with no choice but to purchase water from the TMA tankers. The local people, especially those residing in Lower Bazaar, complained that they were getting contaminated water [4]. Murree mountainous region Northern Pakistan is one of the most spectacular scenic mountainous regions of Pakistan and over 5 million peoples visit Murree every year. But lives are at risk due to contaminated drinking water available at Murree [5]. Water is vital to health, well-being, food security and socio-economic development of mankind. Therefore, the presence of contaminants in freshwater continues to be one of the most important environmental issues in areas of world, particularly in developing countries, where several communities are far away from potable water supply. Drastic changes in climatic conditions make the situation worse. This paper has to be situated in the field of real applications of drinking water quality. The main objectives of the present study are: To make assessment and analysis of drinking water quality, physiochemical and bacteriological pollutants sources in Murree. To evaluate in depth the water born diseases caused by bacteriological and physiochemical indicators in study area.

MATERIALS AND METHODS:

Primary data for this study were collected from the field. A standardized data collection during all field work activities of GPS was initiated with introducing the locations of the surveyed areas. The data from hospitals/clinics were also collected to investigate the water born diseases related to drinking water available in the study area. This study has conducted to investigate such pollutants of drinking water which damaging human health. These indicators are pH, TDS, EC, Colour, Taste, Odour, Turbidity, Sulfate, Chloride Cadmium, Chromium, Lead, Copper, Iron, Total coli forms and E coli. For this purpose water samples were examined in laboratory for further analysis. It is very important to make a reliable and applicable plan for sampling. The drinking water samples were collected from the existing sources of drinking water from the study area. All these sources of water are using by the people for drinking and other domestic purposes. Water Quality Index (WQI) is a technique to assess the suitability of drinking water quality.[6] It is a technique to rating the influence of individual water quality parameters on the overall quality of water for human consumption. The standards recommended by WHO and National Standards for Drinking Water Quality (NSDWQ) has been used to calculate the WQI. The samples of drinking water have been analyzed in the laboratory to determine the Physical, Chemical and Biological characteristics of the collected water. The following equation has been used to evaluate the quality of drinking water in the study area.

Equation: [{(Av-Iv) / (Sv-Iv)}* 100]

Av. Available value,

Iv. Ideal value, Sv. Standard value,

Index.

0-25= Excellent water for drinking.
26-50= Good.
51-75= Poor.
76-100= Very Poor.
>100= Unfit For Drinking. (UFD)

RESULTS AND DISCUSSION

Ten sample sites have been selected for the analysis of drinking water. These sample sites are Lower Topa, Masoot, Murree Sunnay Bank, Kuldana, Murree Bus Stand, Murree Daewoo Bus Stand, Murree GPO, Murree Mall, Murree Pindi Point and Murree Kashmir Point. The elevation of this zone from the sea level is 6000 feet and above. The area of this zone comprises on Murree, the main tourist site in Pakistan

Lower topa Murree Sunny Bank and Murree Pindi Point shows alkaline trend but Kuldana, Murree Bus Stand and Murree GPO shows slightly acidic trend in drinking water. Six sample sites indicate the high values of EC as compared to the ideal value. These sites include Kuldana, Murree Bus Stand, Murree GPO, Murree Mall, Murree Pindi Point and Murree Kashmir Point. But Kuldana and Murree Mall shows the high value of EC than standard value.

Colour, taste and odor of drinking water from all sample sites are acceptable and satisfactory.

Murree Sunny Bank shows high value of Turbidity than standard value. Remaining sample sites have normal values of Turbidity. Sulfate is slightly higher at Murree Sunny Bank which is 511 mg/lit. While standard value is 500 mg/lit. Results shows an alarming position due to high concentration of Cadmium in drinking water. Except Masoot, all sample sites show extra quantity of Cadmium than normal. The standard value of Cadmium for drinking water is 0.01 mg/lit. Lower Topa, Murree Sunny Bank, Kuldan,Murree Bus Stand, Murree Mall, Murree Pindi point and Murree Kashmir Point show excessive value of Chromium. That is very dangerous and injurious for human health. Seven sample sites (Murree Sunny Bank, Kuldana, Murree Bus Stand, Murree Daewoo Bus Stand, Murre GPO, Murree Mall and Murree Kashmir point) show excessive quantity of Lead in drinking water. It is due to heavy traffic and burning of petroleum fuel. Lower Topa, Masoot, Murree Sunny Bank, and Murree Bus stand shows high values of Copper in drinking water. While Kuldana and Murree Pindi Point are at margin. Murree Sunny Bank, Murree GPO, and Murree Mall shows high value of Iron concentration in drinking water. The quantity of Iron at Lower Topa is at margin. All other sample sites show normal values of Iron.

Diseases Related to Drinking Water in Murree

Polluted water has certain effects on human health. Water is the most urgent requirement of all living organisms including human beings. It is necessary to maintain the quality of drinking water for better health. Cadmium is primarily toxic to the kidney, especially to the proximal tubular cells, the main site of accumulation. Cd can also cause bone demineralization, either through direct bone damage or indirectly as a result of renal dysfunction. In the industry, excessive exposures to airborne Cd may impair lung function and increase the risk of lung cancer.[7] People can be uncovered to chromium through breathing, eating or drinking and through skin get in touch with chromium or chromium compounds. Major diseases originated by Chromium are skin rashes, disturb stomachs and ulcers, Respiratory problems, Kidney and liver injure and Lung-Cancer. Copper can be found in many types of food, in drinking water and in air. In the working environment, copper contagion can lead to a flu-like condition known as metal fever. [8] Continuing revelation to copper can cause frustration, mouth and eyes and it produce "headaches, stomachaches, dizziness, vomiting and diarrhea". Deliberately high uptakes of copper may cause liver and kidney spoil and even death. Renal disease has long been connected with lead poisoning; however, persistent nephropathy in adults and children has not been perceived below blood lead levels of 40 μg/dl .Damage to the kidneys includes sensitive proximal tubular dysfunction and is differentiated by manifestation of outstanding insertion bodies of a lead– protein intricate in the proximal tubular epithelial cells at blood lead meditation of 40–80 μg/dl[9]. Diseases spread by the faecal–oral route, such as "hepatitis A, bacillary dysentery, and many diarrhoeal" diseases; these are transmitted by water and also by other sources, such as food or hands. Better hygiene therefore donates to their control.

Table 1 shows the turbidity, sulfate and chloride quantity

Name of Sample Site	Ph	TDS	EC	Turbidity	Sulfate	Chloride
Lower Topa.	7.9	998	1465	3.4	378	198
Masoot.	7.5	1023	1198	4.4	422	178
Murree Sunny Bank.	7.8	2145	1326	5.1	511	210
Kuldana.	7.3	2219	2265	3.3	477	234
Murree Bus Stand.	7.2	1534	1786	1.3	455	198
Murree Daewoo Bus Stand	7.6	1134	1455	2.1	398	210
Murree GPO.	7.2	1001	1790	1.8	501	176
Murree Mall.	7.7	967	2102	3.9	498	189
Murree Pindi Point	7.8	998	1866	4.5	450	190
Murree Kashmir Point	7.4	1103	1923	3.9	432	157

Source: Samples Collected from the Field

Table 2 shows the quantity of Cadmium,Chromium, Lead ,Copper and Iron

Name of Sample Site	Cadmium	Chromimum	Lead	Copper	Iron	Total coli.	E.Coli.
Lower Topa.	0.07	0.07	0.04	2.1	0.3	Positive	Positive
Masoot.	0.008	0.05	0.02	2.5	0.2	Positive	Neg.
Murree Sunny Bank.	0.02	0.06	0.07	3.1	0.4	Positive	Positive
Kuldana.	0.06	0.06	0.08	2	0.2	Positive	Positive
Murree Bus Stand.	0.08	0.08	0.09	3.1	0.1	Positive	Neg.
Murree Daewoo Bus Stand	0.06	0.04	0.09	1.9	0.2	Positive	Neg.
Murree GPO.	0.07	0.05	0.06	1.6	0.5	Positive	Positive
Murree Mall.	0.04	0.07	0.07	1.3	0.6	Positive	Positive
Murree Pindi Point	0.03	0.08	0.05	2	0.1	Positive	Neg.
Murree Kashmir Point	0.04	0.07	0.07	1.9	0.2	Positive	Positive

Source: Samples Collected from the Field

Water is an important caused by pathogenic micro-organisms. Recent studies have shown that 90 percent of drinking water at study area contains "Total Coliform" and 52 percent "E. Coliforms", 19.4 percent of samples show high quantity of Sulfate in consumption water. The quantity of Cadmium and Chromium in water is showing alarming situation. The study of collected water shows that 70 percent of study area bears high concentration of Cadmium and Chromium. Lead is another important element present in the water. Lead is released from the burning of fossil fuel. It directly dissolved in open water from the air. Murree is over populated and traffic pressure is very high during summer season[10] . This is the main source of contamination especially the emission of Lead in the air which caused water pollution. More than 58 percent of study area shows extreme quantity of Lead in drinking water. 38 percent of water samples show high concentration of Iron. Data collected from the hospitals and basic health units shows that about 80 percent peoples are victim from water born diseases like vomiting, or diarrhea, congestive heart failure, cirrhosis, or kidney disease.

CONCLUSION

Water is imperative to survival of all living organisms, but this treasured resource is ever more being endangered as human populations grow and requirement of more water of high quality for household purposes and economic activities. Water extraction for domestic use, agricultural production, mining, industrial production, power generation, and forestry practices can lead to worsening in water quality and quantity that impact not only the marine ecosystem but also the accessibility of secure water for human use. The microbiological feature of drinking water is utmost significance. Poor water quality is reason of high disease and death ratio. Diarrhea and gastroenteritis are the two notable diseases playing a principal role in causing death. Murree is over occupied and traffic pressure is very high during summer season. This is the main cause of pollution especially the emission of Lead in air contamination. Bacteriological contamination of water has been stated to be one of the most severe problems right through the country in rural as well as urban areas. Such pollution is ascribed to leakage of pipes, pollutants from sewerage pipes due to problem within the distribution system, sporadic water supply.

RECOMMENDATIONS

To make awareness among local society, visitors and tourists about drinking water standard and water born diseases. The following recommendations should be implement. Regular supervision of all water sources and significant points should be ensured in order to detect problem areas and the causes of pollution with remedial plans. No new rural water supply scheme should be approved except comprehensive investigations of the water quality, quantity and its sustainability has been carried out. It should be obligatory for the agencies accountable to frequently monitor the quality of the water being supplied to the local population through examination done at their own laboratories or other qualified laboratories of good status. Consciousness activities should be augmented in the pretentious areas as level of water contaminations have been originate extremely high and most plausible reasons for this may be sanitation and unhygienic exercise due to lack of education. Local population should be encouraged to occasionally clean all household underground and overhead tanks. For this purpose, well-planned wakefulness movements should be initiated.

REFERENCES:

1- CENSUS ORGANIZATION, District Census Report Rawalpindi 1998, Buru of Statistics, Islamabad.
2- "Planning and Development in a Hill Side City, A Case Study of Murree", Pakistan Journal of Geography, Vol. 2- No. 1&2. 1992. Pp. 145-161.
3- MASTER PLAN MURREE TOWN, (1988) Deputy Director Regional Planning Rawalpindi District, Govt. of The Punjab.
4- MCM., (1967) Murree: Past, Present and Future, Centenary Municipal Committee, Murree.
5- MASTER PLAN MURREE TOWN, (1988) Deputy Director Regional Planning Rawalpindi District, Govt. of The Punjab.
6- World Health Organisation 1996, Guidelines for drinking water quality, 2nd Ed, Vol. 2
Health criteria and other supporting information, Geneva, World Health Organization
7- Krajnc EI et al. (1987) *Integrated criteria document. Cadmium — Effects. Appendix*. Bilthoven,National

Institute of Public Health and Environmental Protection (Report No. 758476004)

8- WHO 1972-73 Technical Reports Series No. 505, 532. World Health Organization, Geneva.

9- Harlan WR et al.(1973) Blood lead and blood pressure. Relationship in the adolescent and adult US inactivated delta-aminolevulinic acid dehydratase of whole blood and the blood lead level. *Biochemical medicine*, 1973, 8:149-159.

10- Risebro, H.L.; Breton, L.; Aird, H.; Hooper, A.; Hunter, P.R. Contaminated small drinking water supplies and risk of infectious intestinal disease: A prospective cohort study. *PLoS One* 2012, *7*, doi:10.1371/journal.