RESEARCH ARTICLE

The Groundwater Quality Analysis of Phaileng 'S' in Lunglei, Mizoram, India

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ABSTRACT

Many of the rural areas of Lunglei district depend on the groundwater for their secondary sources of water. The natural perennial springs which are seepages of the groundwater are vital for the inhabitants for domestic consumption, agriculture and other means of livelihood in Mizoram as they are the primary source of water in many areas. With the increase in population and the decline in quantity of the groundwater in recent years, the water that is consumed should be safe, clean, abundant and sufficient to maintain growth and development in the rural areas. Ensuring the quality by assessing the water sources is a must under BIS 10500:2012 standards. In this study, water samples from 10 natural springs from Phaileng 'S' village from Lunglei district in Mizoram were assessed for their physico-chemical and biological properties to determine their status for human consumption and other activities.

Keywords: Water quality, springs, groundwater, Lunglei, Mizoram.

INTRODUCTION

Everyone requires potable water, which is water that can be consumed by humans and animals. The availability of high-quality drinking water and securing its long-term supply to every household will be a priority for us all would have to take precautions. The demand for water has risen dramatically as the population has grown. In rural areas, In hilly areas like Lunglei, where subsurface water, groundwater, and precipitation are the primary sources of drinkable water, securing and maintaining their quality and sufficiency is a major problem for governments and people. It is extremely difficult to abolish and eliminate systems that impair water sources in rural communities, where the need for water surpasses the processes and protections in place to protect local water sources. It's not just that enacting stronger laws isn't the best solution for the people; it's also that enacting stricter laws isn't always the best answer for the people. It is not only the government that is responsible for supplying safe drinking water in rural areas, but also the communities and every household. Phaileng 'S' is one of the villages within Lunglei Block of Lunglei district, Mizoram in North East India. Lunglei district is bordered by Bangladesh in the west and Myanmar to its east. This hilly village has a population of 308 as per the 2011 Census conducted by the Ministry of Home Affairs, Gov't of India. Phaileng 'S' village is located in the northern part of modern Lunglei town (Fig.1) covered under Toposheet No 84B/13 prepared by Survey of India and is located at 23^{o}01'52" N and 92^o 50' 49" E.

Phaileng 'S' and its adjoining areas are influenced by the SW monsoons, normally receiving heavy rains from May to September with little rains in the dry (cold) seasons. Like the other parts of Mizoram, the climate range from moist tropical to moist sub-tropical. Many of the inhabitants of this village receive domestic public water supply from the Public Health Engineering Department of the Govt of Mizoram which serve as the primary source of water. However, seepages of groundwater in the form of natural springs are crucial for the people as they serve secondary water sources in this agricultural dominated region. Fed by the monsoons, most of the springs of Phaileng 'S' are perennial with their quantity reduced in the cold months. Due to changing climate patterns groundwater seepages (spring water) scarcity has been common in other parts of Mizoram in recent years [1] and [2]. Thus groundwater water resources in the form of springs are becoming ever more important as the population keeps on increasing. The lithology of the study area is dominated by sandstones, shales, siltstones of Middle Bhuban formation of the Surma group. Many workers have studied the quality of groundwater from India and North East India [3-9]. Studying and assessing the quality of groundwater is necessary as it is directly linked with the health and progress of any society. Sources of biological pollutants in drinking water. Unsanitary and filthy conditions are still common and pervasive in India's rural communities today. Now, though, with the deployment of new government schemes and programmes to address the difficulties of sanitary conditions for minimising water-borne infections such as typhoid, diarrhoea, and other diseases, such as in the last few years, the number of cases of waterborne infections has decreased dramatically. The results in Mizoram imply that Public Health Engineering Department which is the government agency for providing water in urban area is better than tuikhurs (subsurface water); however, the quality of water from both sources, which is used for drinking and domestic purposes, was determined to be more or less within the tolerance levels. But in most rural places, groundwater quality was also found to be safe for human consumption.

MATERIALS AND METHODS

A total of 10 natural springs within Phaileng 'S' village were selected for the study. In-situ assessment of the water samples for pH were done using *Apera AI311*, *Hofun* portable tester was used for testing both TDS and E Conductivity values of the water sources and the total hardness of the water sources were assessed using *Accu Plus Portable* tester. For the other parameters, water samples of 1 L each were collected using *Tarson* bottles using the grab sampling method as per the methods of [10] in the month of July, 2021. All the bottles were capped and sealed tightly to avoid any leakage which could happen during transportation and the sample bottles were placed *in PSM Vaccine Carrier* Ice boxes. The water samples were then analysed at the Mizoram State Referral Institute, Govt of Mizoram (NABL Accredited Laboratory), Aizawl using BIS 10500:2012 standards Table.1.

RESULTS AND DISCUSSION

The pH of all the water samples collected from Phaileng 'S' are within the permissible limits as prescribed by BIS 10500:2012. This pH determines how acidic or basic the water is. Five water samples > 7 pH indicate basic water sources and the other 5 water samples show acidic water amongst the water sources in their permissible limits. The reason for their acidic nature could be due to burning of forest cover (jhumming) practises, which when they reached the groundwater after water percolates in the groundwater, they tend to change the pH of water. The Turbidity of water indicates the presence of sediments suspended in the water, and all the water sources are having 1 NTU values which are all within the desired limit for potable water. The physical parameter of E conductivity which measures the amount of dissolved substances show that all the water sources have very less amount of impurities and they all have values < 187 µ/mhos/cm. The Total Dissolved Solids (TDS) could be organic, inorganic compounds or concentration of any dissolved particle. The permissible limit of TDS is 500 mg/l and all the water samples show TDS values < 78.0 mg/l. The alkalinity is an important chemical parameter for the water sources which is their capacity to neutralize the acid present in water. All the water samples have Alkalinity values between 10.0-28.0 mg/l which are all under the permissible limits as per BIS 10500:2012 standards and the reason for their low values can be attributed to the fact that the study area is a rural area, so activities like urbanization like cement and construction materials which can increase the alkalinity values don't reach the groundwater and hence they are very low. The total hardness values of the water samples are all well within the permissible limits. Since hardness of water could also be defined by the presence of carbonate terrain and its local geology, there are no rocks which could influence the hardness values since all the rocks are of arenaceous and argillaceous rocks, and this is why none of the samples have total hardness values < 32.0 mg/l. Fluoride upto 1 mg/l is permissible in potable water in BIS 20100:2012 standards. Excessive exposure to fluoride > 1 mg/l in consumed water leads to dental and skeletal fluorosis. Frequent exposure to Iron (Fe^{2+}) in potable water can promote bacteriological growth and increase the turbidity of water. The troublesome chemicals like Iron (Fe) and Flouride (F) are totally absent in all the water samples. Faecal coliform gives information on the presence of sewage wastes, pollutants and other bacteriological pollutants is an unhealthy indicator in water sources. All the water sources also have no indication any biological constituents which are reflected by the absence of Faecal coliform.

CONCLUSION

rom the assessment of all the physical-chemical parameters of water samples from the different natural springs in Phaileng 'S' it has been found that all the water sources are well within the permissible limits of BIS 10500:2012 standards and can be consumed for domestic, agricultural, development and other purposes. It is recommended that every household must have provisions for rainwater harvesting which is the purest form of water. Also more public water storage tanks must be built for the dry seasons. To prevent any bacteriological contamination of the water sources strict guidelines and laws must be adopted and enforced for judicial and sustainable use of water sources in the village.

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Table 1: Results of Physico-Chemical and Bacteriological parameters of water samples analysed

Sample No	pH	Turbidity NTU	EConductivity µ/mhos/cm @ 25.5ºc	TDS mg/l	Alkalinity mg/l	Cl mg/l	Total Hardness mg/l	Fe mg/l	F mg/l	Faecal Coliform (cfu)
1	6.4	1.0	110.9	65.8	26.0	10.0	16.0	NIL	NIL	NIL
2	7.4	1.0	91.7	78.0	24.0	8.0	28.0	NIL	NIL	NIL
3	7.5	1.0	87.3	77.0	24.0	6.0	28.0	NIL	NIL	NIL
4	7.5	1.0	91.8	74.0	28.0	10.0	30.0	NIL	NIL	NIL
5	7.6	1.0	102.2	77.0	24.0	6.0	28.0	NIL	NIL	NIL
6	6.8	1.0	135.3	49.7	20.0	16.0	26.0	NIL	NIL	NIL
7	5.8	1.0	187.0	24.4	14.0	14.0	32.0	NIL	NIL	NIL
8	6.6	1.0	74.9	22.0	14.0	12.0	28.0	NIL	NIL	NIL
9	7.6	1.0	114.0	76.0	24.0	8.0	28.0	NIL	NIL	NIL
10	6.9	1.0	101.3	38.6	10.0	17.0	32.0	NIL	NIL	NIL

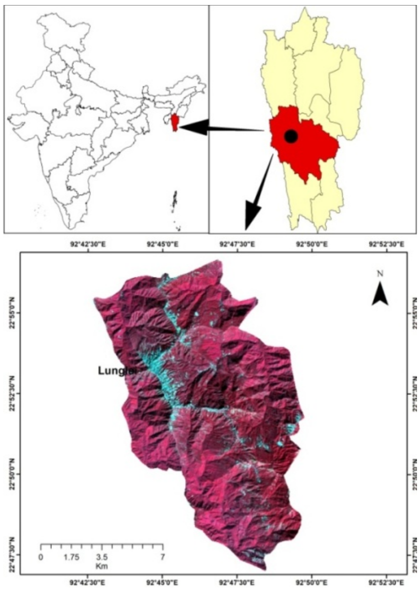

Fig 1: Location of the study area