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Potable Water Quality of Thenhlum Village In Lunglei District, Mizoram, India

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ABSTRACT

Assessing and testing the status of potable water is an important task for ensuring a clean and healthy environment in hilly rural settlements of North East India. The water quality index obtained from the assessment of water sources facilitate how to address the conditions and problems of potable water problems. For optimum use of sustainability and suitability of water in rural areas, testing the water quality for intended uses like livestock, agriculture and domestic purposes will help a long way in making informed decisions. Ensuring the quality of the potable water from different sources in this frontier international trans boundary area is necessary under the BIS 10500:2012 standards since the quality of water is directly linked to all round development. A total of 12 water samples from natural springs and from the public water supply of Thenhlum village, Lunglei district in Mizoram were assessed to determine the present day status of water quality in the village.

Key words: Potable water, Quality, Groundwater, Thenhlum, Mizoram

Introduction

Thenhlum village is located in the western part of Lunglei town and is situated near the international boundary of Bangladesh in the west. This hilly village of Mizoram in North East India has a mere population of 1,009 as per the 2011 Census conducted by the Ministry of Home Affairs, Gov't of India. The village is located at 23° 12′07" N, 92° 34′ 28" E and is administered under the West Bunghmun Block. About 90% of the households took up agriculture as their main occupation.

The hilly state of Mizoram is influenced by the SW monsoons, normally receiving heavy rains and agriculture is the backbone of economy in the rural areas. The climate of Mizoram range from moist tropical to moist sub-tropical. In the present day Thenhlum village, many of the inhabitants of the village receive domestic public water supply from the

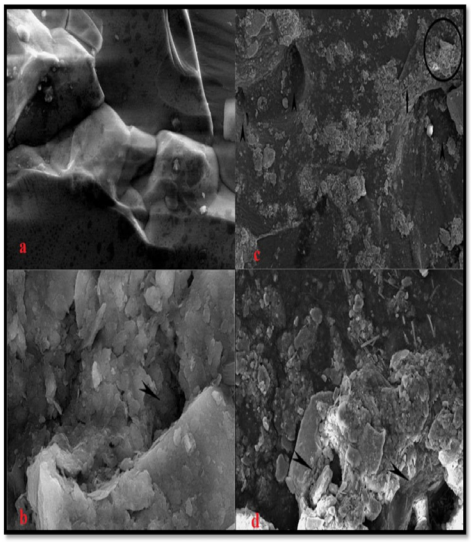

Fig. 1. Thenhlum located in the western part of mod ern Lunglei town in Mizoram

Govt of Mizoram which serve as the primary source of water. Also, groundwater seepages in the form of natural springs are crucial for the people as they serve secondary water sources in this agricultural dominated region. Most of the springs of Thenhlum are perennial but the quantity of water of the natural springs significantly reduced in the colder months between Novembers to January. Due to the changing climate patterns groundwater seepages (spring water) scarcity has been common in Mizoram over the years Saha *et al*. (2015) and Kumar *et al*. (2020). Thus groundwater water resources in the form of springs are becoming ever more important as the dependency on them by households increases every year. The geology and lithology of the study area is dominated by sandstones and shales of the Surma group. Many workers have studied water quality of groundwater from India and North East India Jindal and Dixit (2008); Shankar and Balasubramanya (2009); Tiwari and Nayak (2013); Singh *et al*. (2013); Khan and Jhariya (2017); Kumar *et al*. (2018); Kumar *et al*. (2010); Blick *et al*. (2016); Pallavi and Shivaji (2019) and Vashist *et al*. (2020).

Materials and Methods: A total of 12 natural springs and public water supply distribution points within Thenhlum village were selected for assessment of potable water. *Apera AI311* was used for the in-situ assessment for testing the pH of water samples, the TDS and E Conductivity values of the water sources were tested using *Hofun* portable tester. The hardness of the water sources of the village were assessed using *Accu Plus Portable* tester. Water samples of 1 L each were collected using *Tarson* bottles by using the grab sampling method as per the methods of (AWWA and APHA, 2005) in the month of February, 2021. Bottles were capped and sealed tightly to avoid any leakages which during the transportation and the sample bottles were placed *in PSM Vaccine Carrier* Ice boxes. At the Mizoram State Referral Institute, Govt of Mizoram (NABL Accredited Laboratory) in Aizawl, all the water samples were analysed for the other parameters using BIS 10500:2012 standards as shown in Table 1.

Results and Discussion

The pH of all the water samples collected from Thenhlum village have pH values between 6.5 to 7.3. The permissible limit of potable water under BIS 10500:2012 is 6.5 to 8.5. We can infer that all the natural springs and public water supply were suitable for different purposes. Slash burning of forest cover might also effect the acidity of the soil, which in turn may control the acidity of the springs during monsoons. Sediments which remain suspended in water whether in natural groundwater or in the public water supply systems determine the Turbidity of water. All the water samples have values of 1 NTU which are all within the permissible limits for drinking water. E conductivity is a physical parameter which measures dissolved substances in water. The samples collected from the springs and public water supply scheme showed that all samples have values < 162.8 µ/mhos/cm at 25.5 °C. The concentration of any dissolved particle; whether they are organic or inorganic determine the Total Dissolved Solids (TDS) of water. Here all the values showed excellent

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

Sample No	pH	Turbidity NTU	EConductivity µ/mhos/cm @ 25.5 °C	TDS mg/l	Alkalinity mg/l	Cl mg/l	Total Hardness mg/l	Fe mg/l	F mg/l	Faecal Coliform (cfu)
1	6.5	1.0	38.1	19.0	40.0	10.0	92.0	NIL	NIL	NIL
2	6.9	1.0	49.7	22.8	50.0	14.0	80.0	NIL	NIL	NIL
3	6.7	1.0	75.8	32.8	64.0	21.0	63.0	NIL	NIL	NIL
4	6.8	1.0	77.7	28.9	34.0	15.0	76.0	NIL	NIL	NIL
5	7.1	1.0	58.0	43.6	34.0	35.0	60.0	NIL	NIL	NIL
6	7.2	1.0	87.0	61.2	44.0	14.0	58.0	NIL	NIL	NIL
7	6.9	1.0	162.8	11.0	62.0	30.0	68.0	NIL	NIL	NIL
8	6.8	1.0	22.1	17.7	28.0	10.0	40.0	NIL	NIL	NIL
9	7.0	1.0	35.5	20.1	24.0	16.0	30.0	NIL	NIL	NIL
10	7.3	1.0	40.1	55.3	36.0	14.0	26.0	NIL	NIL	NIL
11	7.2	1.0	110.5	43.9	64.0	08.0	50.0	NIL	NIL	NIL
12	6.9	1.0	88.0	33.1	62.0	12.0	32.0	NIL	NIL	NIL

values which are all < 61.2 mg/l. To determine the acidity of potable water, alkalinity is the measurement which is a chemical parameter. All water samples have values between 24.0 to 64.0 mg/l which are all within the permissible limits. The low alkalinity of the water sources can be attributed due to the very sparse developmental and construction activities like cement work etc going in this rural area. Most of the rocks of Thenhlum are sandstones and shales, which are all sedimentary rocks. Since carbonate rocks can play a huge significance by increasing the total hardness of water sources, their absence may be the reason for the low hardness levels of the natural springs. The highest hardness values from the water sources in Thenhlum show 92.0 mg/l which is well within BIS 10500:2012 permissible limit for potable water. Dental and skeletal fluorosis can be caused by excessive intake of fluoride regularly. The total absence of Flouride is showing healthy signs as all the water sources and water supply are fit for consumption. The limit of Fe which is permissible in potable water is 0.3 mg/l, all the water sources do not have any presence of this element. All the water sources of Thenhlum village have no indication any biological contaminants which are reflected by the absence of Faecal coliform.

After assessing all the physical-chemical and bacteriological parameters of water samples from the different natural springs and public water supply systems of Thenhlum village, it can be concluded that the present day water sources are well within the permissible limits of BIS 10500:2012 standards and can be consumed for domestic, agricultural, development and other activities. Also, it is highly recommended that every household must have provisions for rainwater harvesting in this hilly rural terrain of Mizoram.

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Conflict of interest: No conflict of interest took place

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