

# Evaluating Microbial & Chemical Quality of Drinking Water & Spreading Mass Awareness at Banda city (U.P.) India

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**Abstract**— Survey was carried out in various localities for assessment of the quality of their drinking water, spreading mass awareness about the importance of safe drinking water, and recommending the use of an economical, easy to use “COLI-CHECK” kit for assessing their drinking water supply. This study has proved to be very relevant and useful, since it not only evaluates the current situation of water potability in Banda city, but also provides an opportunity to disseminate this information among the general public. Studies on chemical and microbiological parameters for water potability were done on water samples.

**Key words:** COLI-CHECK kit, drinking water, parameter, WHO& BIS

## I. INTRODUCTION

Banda, which is said to have derived its name from Bam dev, a sage mentioned in Hindu mythology as contemporary of Lord Rama. Bam dev is said to have had his hermitage at the foot of a hill Bambeshwer near kailashpuri locality in Banda. Banda is located in the Chitrakoot dham Division of Uttar Pradesh with its headquarter at Banda city and between Latitudinal  $24^{\circ} 53'$  and  $25^{\circ} 55'$  N and Longitudinal  $80^{\circ} 07'$  and  $81^{\circ} 34'$  E. It is bounded in the north by district of Fatehpur in the east by the district of Chitrakoot in the west, by the district of Hamirpur & Mahoba in the south. The water supply in Banda city is through river Ken and tube wells. The entire city comprises 25 wards which will be extended shortly to 28 wards. The supply water potability monitoring is to assess the suitability of water for drinking purposes. The surface water sample was collected randomly from a number from this area. Climate of Banda city is characterized by high temperature in summer, less rain in monsoon due to which after draught area and quite cold in night during winter season. The variation of temperature is from  $6^{\circ}\text{C}$  to  $49^{\circ}\text{C}$  over the year. Obviously the farmers remain in poor condition in comparison to western districts. WHO defines safe drinking water as that “which does not pose any significant risk to health over one lifetime of consumption, including certain special and sensitive stages of life”. Contaminated water may endanger our health and impair our life quality. Water that is free from disease causing micro-organisms and harmful chemicals is termed “potable water” and may be safely consumed without the risk of immediate or long term harm. Conversely, non-potable water is the one which is contaminated with either domestic or industrial wastes.

Physical parameters include easily perceivable aspects such as turbidity, color, odor, taste etc., pertaining to the appearance of the water. These are the factors by which people commonly assess the potability of water and make a decision if it is fit or unfit for drinking. Although pure water is colorless, but when it contains certain pollutants its color, odour, and taste may undergo changes. Salty water is felt to

be unable to quench our thirst most of the times. Water clarity, expressed in terms of turbidity, is also considered very important as it reduces the transmission of light into water, rendering it unacceptable for drinking purpose. Turbidity increases as a result of suspended solids in water, and is measured in NTU. Water is usually tested for its pH as well as for the presence of various organic and inorganic components. Chemical constituents have a number of serious consequences that cause a sharp decline in the potability of water, such as TDS leading to gastro-intestinal irritability; hardness (presence of calcium and magnesium ions) imparting a salty taste; Most of these chemicals accumulate in our body over time, and go on to produce hazardous symptomatic effects after such long durations, that it becomes increasingly difficult to even attribute the same to the aforementioned water defects.

The microbiological aspect of water contamination mainly signifies the presence of live bacteria in it. These may include the pathogenic ones too; predominantly those originating from fecal matter such as dreaded diseases like gastroenteritis, typhoid and cholera are known to be caused by water-borne pathogens *Escherichia coli*, coliform respectively. These, when discharged through household toilet sewage, may gain entrance into any water body that ultimately serves as a source of drinking water. Hence, the incidence of waterborne microbial diseases can increase due to human negligence. Water purification is the transition of dirty and harmful water into clean drinking water. The purpose of purifying water is to get rid of contaminants that can be detrimental to our health. Water purification generally means freeing water from any kind of impurity it contains, such as contaminants or microorganisms. Water purification, or drinking water treatment, is the process of removing contaminants from surface water or groundwater to make it safe and potable for human consumption. There are various methods of water purification and filtration, some more effective at removing certain types of contaminants than others.

Moreover, the water treatment methods used by common man also depend on their social as well as economic status. The simplest water purifying methods include boiling and use of alum/ chlorine tablets. However, on resorting to these, the water quality becomes acceptable but not very palatable owing to their undesirable side effects. It offers the advantages of removing not only the dissolved substances, but also the residual tastes and odors from water. The activated carbon absorbs mostly all the contaminants from water leading to potable drinking water. However, to maintain its merit and efficacy, its cartridge must be replaced routinely.

The main disadvantage is removal of even those ions necessary for our body in minute quantities, and also that its membrane rapidly loses efficacy and needs to be replaced regularly, adding to its maintenance cost it is

important to monitor the toxicity of its drinking water regularly so as to match the standards laid by BIS and WHO for the drinking water quality. Mainly, the potability of the collected water samples was assessed and the presence of indicator organisms and chemical constituents were detected. Our finding may have a significant impact on the society due to its role in spreading mass awareness regarding importance of potable drinking water, and at the same time, to effectively compare various techniques available in the market for water purification, empowering people to decide their method of choice for water purification.

## II. METHODS & RESULT DISCUSSION

The samples were collected in sterilized & phosphate free bottle from all the eight stations following the standard methods of collection. Water sample were brought to the laboratory and kept in presser water at 4<sup>0</sup>c for further analysis of various parameters (winter season 2017). Abiotic Parameters viz- as pH, alkalinity, TDS, total hardness and turbidity were analyzed as per the Methods given In APHA (2005).

Assess various water purifying technologies available in the market to enhance its potable quality, and last but not most significant, to spread awareness among common masses about the need and importance of safe drinking water. Our project commenced with aseptic collection of water samples from different regions of Banda city, followed by immediate execution of their chemical and microbial analyses by standard protocols.

Coliform contamination in drinking water supply may easily be executed using a three step procedure comprising-

- Presumptive test
- Confirmed test
- Completed test

### A. Sampling locations

- Madia nagar -----A
- Sedu talia-----B
- Kalu kuawa-----C
- Chhoti bajar-----D
- Kyotra-----E
- Nunia mohal-----F
- Bijli khera-----G
- Phoota kuawa-----H

### B. Chemical Analyses:

Most important chemical parameters, such as pH, alkalinity, TDS, total hardness and turbidity values of all drinking water samples collected from Banda city regions are presented.

Alkalinity of any fluid is closely related to its pH value, which in turn is a measure of free hydrogen ions. As the alkalinity of any water sample decreases, its pH value approaches neutrality (pH 7), which is desirable. However, beyond a limit, the same feature renders the water acidic. This makes the water non-potable and unacceptable. The present study verified in general that as the drinking water sample is passed through progressively more efficient and costly water purifying technologies, its quality indeed improved, and reached almost neutrality in the end. Total Dissolved Solids is a measure of the combined content of

both organic and inorganic substances dissolved in water. Besides imparting an undesirable salty taste to the water, a high concentration of TDS also affects plumbing appliances. Evaluation of Total Dissolved Solids of water samples collected from different regions. The TDS content of the drinking water samples collected from various sites was found to range between 458 mg/L to 491 mg/L.

This may be attributed to the high TDS value of this water. Hardness of water is caused by the presence of multivalent metallic cations and is largely due to the presence of calcium and magnesium ions. Hardness is conventionally reported in terms of presence of calcium carbonate in the water. Its presence adversely affects the capacity of this water sample to react with soap.

In other words, if the water is hard, it requires considerably more soap to produce the same quantity of lather, as it would have produced as soft water. It is influenced by a variety of dissolved polyvalent metallic ions, predominantly calcium and magnesium cations. The total hardness of water samples lay within the range 351 mg/L and 367 mg/L. The turbidity of all the water samples analyses ranged between 2.0 – 2.9 NTU.

### C. Microbial Analyses:

The major goal was maintained on detection of total coliforms, and E. coli, while planning the microbial analyses of the drinking water samples. Coliforms qualify as good indicator micro-organisms in assessing potability of water because they are the most common microbes found in water samples, are easy to detect, nonpathogenic and possess life spans similar to those of the pathogenic ones in the collected water samples. All drinking water being supplied in Banda city households is essentially derived from treated sewage and treated river water. Since both of these sources are likely to be heavily contaminated with fecal matter, chances of finding coliforms in these are very high and easy if the water is not treated adequately. Therefore, our work was majorly focused on detecting their presence in drinking water. Coliforms by nature are Gram negative fermentative micro-organisms, which grow by fermenting carbon sources, producing acid and gas.

It was interesting that a commercially available, easy to use and economical "COLI-CHECK" kit gave results consistent to the PA test. It was capable of accommodating and analyzing larger volumes of water samples. Hence, during the course of this investigation, it was inferred that all tedious, labor-intensive, time-consuming laboratory based experiments carried out by trained hands could be substituted with a simple home kit for checking the microbiological quality of drinking water in every household even by the layman, if the accompanying simple instructions were carefully followed.

Parameter(mg/l)	Sample Locations							
	A	B	C	D	E	F	G	H
PH	8.1	8.2	8.0	8.7	8.1	8.2	8.0	8.4
TA	63 4	64 4	63 1	65 2	63 3	64 1	63 1	64 8
Turbidity	2.3	2.1	2.2	2.6	2.9	2.3	2.0	2.2
TH	36 4	36 7	35 1	35 9	35 8	35 7	35 1	35 8
TDS	47 8	45 8	48 5	47 7	48 9	49 1	46 5	47 5

Total coliform	76 8	76 5	78 9	79 1	79 8	78 4	78 2	77 8
E.Coli	61 1	62 3	64 5	64 7	62 9	63 5	64 1	63 3

Table 1: Chemical & Microbial Factors Winter Season Years (2017)

### III. CONCLUSION

It was relieving and reassuring that the Municipality treated drinking water supply across Banda city was found to be of reasonably good quality, adequately treated and safe for consumption. Chemical parameters like pH, total hardness, and conductivity, turbidity and TDS values of the water supplies were found to be mostly within permissible limits, based on microbiological tests like MPN, spread plating on special culture media, water testing kit etc., the quality of drinking water supply in most localities. As expected, Reverse Osmosis technology proved to be the best technology towards enhancing water potability, both chemically and microbiologically, as compared to other techniques. However, taking into consideration the ease of operation, cost/maintenance and portability of equipment, the use of at least an inexpensive tap attachment may be recommended to the end users, particularly if they have not been using water purifiers till now due to financial constraints and/or lack of awareness.

#### A. Awareness Program

The efforts of our team trying to spread mass awareness among general public proved to be very fruitful and satisfying. Questionnaires about the necessity of clean drinking water for a healthy life got people really interested and receptive to the information shared by the students, though a portion of the assesses were found to be already educated on the topic.

### REFERENCES

- [1] APHA, AWWA, WEF. (2005) Standard methods for the examination of water and waste, 21<sup>st</sup> ed. Washington DC.
- [2] APHA AWWA, WEF. (2012) Standard methods for examination of water and waste water. 22<sup>nd</sup> ed. Washington: American Public Health Association; 1360pp.
- [3] Amanial Haile Reda (2016) Physico-chemical analysis of drinking water quality. Arbaminch Town. J Environ analytical toxicology., vol. 6: 356.
- [4] Angelillo, I.E., I Torre, C.G. Nobile & P. Villare. (1999) Carries & fluorosis prevalence in communities with different concentrations of fluorides in water. carious Res., vol. 33(2):144-122.
- [5] Arunabh Mishra & Vasishta Bhatt. (2008) Physico-chemical & Microbiological analysis of under ground water in V.V Nager & Near by place of Anand Distt., Gujrat, India. E-Journal of Chemistry., vol.5 (3): 487-492.
- [6] BIS:IS:10500, Indian standard for drinking water bureau of Indian standards, New Delhi, India, 1991, Second revision of IS:10500, 24/12/2009.
- [7] Baum, K.W. Barner, C. Reiners & E.Moll. (1981) Bone density and thyroid gland function in aolescents in

relation to fluoride content of drinking in German. Fortschr. Med., vol. 99(36): 1470-1472.

- [8] WHO 2011 Hardness in drinking water. Back ground do cement for preparation of WHO guidelines for drinking water quality. Geneva: (WHO/HSE/WSH/10.01/10/Rev/1).