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# Bacteriological and Physico-Chemical analysis of drinking water samples

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***Abstract:*** ***The World Health Organization has estimated that up to 80% of all sickness and disease in the world is caused by inadequate sanitation, polluted water or unavailability of water. So the study was conducted to identify the microorganisms responsible for the contamination of drinking water at Bilagi, Bagalkot and Mudhol taluka of Bagalkot district. Out of 20 samples collected (30%) were contaminated with either one or more than one type of organisms and results of water samples were unsatisfactory. Therefore it becomes imperative to determine the bacteriological status of drinking water. A regular monitoring of water quality for improvement not only prevents disease and hazards but also checks the water resources from going further polluted.***

**Keywords:** Drinking water, Bacteria, Bagalkot district

## 1. Introduction

Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70 % of water. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminants. Drinking water is indispensable for human existence. Public and environmental health protection requires safe drinking water. Present day water sources are being polluted largely by agricultural and industrial chemical waste disposals due to cross contamination with sewers, illegal connections, leakages and corrosions [1]. World Health Organization(WHO) survey has revealed that 1.2 billion people all over the world do not have access to pure and safe drinking water. According to WHO biological contamination of water is responsible for 80% of all human illness in the developing world [2]. A wide range of pathogenic microorganisms can be transmitted to humans via water contaminated with fecal material. Bacterioogical quality of drinking water is primarily determined by using "indicator organisms" whose presence indicates fecal contamination [3]. Higher level of indicator bacteria, higher the level of fecal contamination and greater risk of contracting disease [4]. Coliforms especially E.Coli is recommended indicator organism for portable water and indicator of direct or indirect fecal contamination [5]. It is found in large number in the intestinal flora of humans [6]. Fecal coliforms should not be present in 100 ml of drinking water especially Esch.coli. The presence of coliforms in water is a warning signal that more dangerous bacteria may be present. Disease resulting from ingestion of pathogens in contaminated water has the greatest public health impact worldwide. Diarrhoel diseases are among the leading cases of morbidity and mortality among children under five years of age [7]. WHO recommends that no faecal coli form be present in 100 ml drinking water. Good quality water is odourless, colourless, tasteless and free of faecal contamination and chemicals in harmful amounts. Escherichia coli and pseudomonas auruginosa that are very commonly found in the human or animal gut ant which if detected, may suggest the presence of sewage. Indicator organisms are used because even when a person is infected with more pathogenic bacteria, they will still be excreting many millions times more indicator organisms than pathogens. It is therefore reasonable to summarize that if indicator organism levels will be very much lower or absent.

The microorganisms of concern in contaminated water include following bacterial agents of Diarrhoea and Gastroenteritis namely salmonella sp, shigella sp, Escherichia coli and Vibro cholera, Protozoal agents of diarrhea include Entamoeba histolytica, Giardia lamblia, Balantidium coli and Cryptococcus parvum, Enteroviruses causing various clinical ailments not necessarily diarrhea but are transmitted by water include Polioviruses, Potaviruses, Hepatitis A viruses and Hepatitis E virus [7]. This study was therefore carried out to determine the Bacteriological quality of at Bilagi, Bagalkot and Mudhol taluka of Bagalkot district.

## 2. Materials and Methods

Sampling points which are representative of the different sources from which water is supplied to the public are selected. Drinking water samples from different sources in at Bilagi, Bagalkot and Mudhol taluka of Bagalkot district were collected and transported by standard methods as mentioned in APHA,1998 [8]. Random sampling was adopted for the study. Microbiological analysis of water samples was carried out using Rakiro Biotech test kits after incubation at 34$^{o}$C for 24 hours.

Table.1 Bacteriological and Physicochemical analysis of drinking water

| S. No | Taluka | Source palce | pH | EC in mS | TDS in ppm | % Salinity | Turbidity NTU | Sulphate in ppm | BOD | COD | E.Coli | Pseudo monas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Bilagi | Anagawadi (garasina teggu) kere water | 8.7 | 1436 | 861 | 2.1 | 8.0 | 63 | 15.2 | 27.1 | ND | ND |
| 2 | Bilagi | Tumaramatti kere water | 10.0 | 266 | 159 | 0.1 | 8.1 | 48 | 16.3 | 28.4 | ND | ND |
| 3 | Bilagi | Ghataprabha river water near Budihal | 7.5 | 372 | 223 | 0.3 | 5.0 | 63 | 14.3 | 24.7 | ND | ND |
| 4 | Bilagi | Bisanal kere (tank) water | 4.5 | 94 | 56 | 0.1 | 4.0 | 9 | 8.9 | 15.6 | ND | $10^3$ |
| 5 | Bilagi | Siddapur borewell water | 8.2 | 294 | 176 | 0.12 | 10 | 47 | 7.8 | 12.7 | $10^2$ | ND |
| 6 | Bagalkot | Muchakandi kere water, Bagalkot | 7.2 | 510 | 306 | 0.5 | 8.0 | 58 | 13.8 | 21.9 | $10^2$ | $10^2$ |
| 7 | Bagalkot | Sorakoppa kere water | 7.1 | 144 | 86 | 0.0 | 8.0 | 11 | 14.1 | 18.3 | ND | ND |
| 8 | Bagalkot | Yadahalli - Ghataprabha back water | 8.5 | 577 | 346 | 0.6 | 6.0 | 35 | 9.1 | 17.8 | ND | ND |
| 9 | Bagalkot | Honnalli kere water | 5.0 | 294 | 176 | 0.1 | 10.0 | 40 | 13.2 | 21.9 | $10^3$ | $10^2$ |
| 10 | Bagalkot | Salagundi kere water | 5.5 | 307 | 184 | 0.1 | 8.0 | 13 | 15.8 | 26.9 | ND | ND |
| 11 | Bagalkot | Khajjidoni stream water | 9.5 | 700 | 420 | 11.6 | 14 | 238 | 18.1 | 33.7 | $10^2$ | $10^3$ |
| 12 | Bagalkot | Bagalkot | 5.0 | 356 | 213 | 0.2 | 8.0 | 41 | 14.2 | 23.9 | ND | ND |
| 13 | Bagalkot | Khajjidoni kere water | 8.5 | 284 | 170 | 0.1 | 16.0 | 25 | 25.8 | 43.6 | $10^2$ | $10^2$ |
| 14 | Bagalkot | Khajjidoni drinking well water | 9.5 | 276 | 165 | 0.1 | 6.0 | 40 | 11.6 | 20.6 | $10^4$ | $10^4$ |
| 15 | Bagalkot | Anadinni back water (Ghataprabha water) | 9.0 | 454 | 2724 | 7.6 | 12.0 | 212 | 28.7 | 52.1 | $10^3$ | $10^4$ |
| 16 | Mudhol | Marayan kere water, Mudhol | 9.0 | 904 | 542 | 1.2 | 13.0 | 68 | 29.0 | 48.7 | ND | ND |
| 17 | Mudhol | Malingapur well water | 8.8 | 2410 | 1446 | 3.8 | 14.0 | 175 | 26.8 | 44.8 | ND | ND |
| 18 | Mudhol | Chikkur stream water | 4.0 | 127 | 76 | 0.0 | 7.0 | 7 | 11.6 | 21.9 | ND | ND |
| 19 | Mudhol | Chichakunnidi kere water | 9.0 | 837 | 501 | 1.10 | 8.0 | 124 | 9.1 | 16.2 | $10^4$ | $10^2$ |
| 20 | Mudhol | Jeeragal kere water | 4.5 | 234 | 140 | 0.0 | 18.0 | 10 | 22.7 | 39.7 | ND | ND |

## 3. Results and Discussions

The results of biological and Physicochemical analysis of water samples were presented in Table.1. pH of water samples ranged from 4.0 to 10.0. pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance and total alkalinity[9].Electrical conductivity of water is a direct function of its total dissolved salts [10]. Hence it is an index to represent the total concentration of soluble salts in water [11]Electrical conductivity was recordes highest atAndani back water . The TDS values of all water sources ranged from 54 to 2724 mg/l. TDS is beyond permissible limit (PL) in some samples. A high value of TDS reduces water quality for drinking, irrigation and agriculture purposes [12]. Increase in TDS is mainly due to sea water intrusion and increase in salts ( carbonates, bicarbonates, sulphate, calcium, sodium, potassium and other ions) [13]. Salinity ranged from0.1 to 11.6 %. Turbidity of water samples varied between 4 to18 NTU. Sulphate concentration ranged from 7 to 238ppm, which is within the permissible limit(400mg/l). High concentration of sulphate has laxative effect [14]. BOD values varied from 7.8 to 29ppm and values are within permissible limits of Indian standards. The Chemical Oxygen Demand (COD) ranged from 9.1 to 43.6 mg/l. The test is commonly used to indirectly measure the amount of organic compounds in water [15]. E.Coli values ranged from $10^2$ to $10^5$/100ml. In present study, total coliform bacteria found in lake as well as in ground water. It could means that surface water may be getting in to ground and lake water during rainfall. This increases the risk of animal waste contaminating water sooner or later. Total coliforms are a group of bacteria commonly found in the environment e.g. in soil or vegetation as well as the intestines of mammals including humans. Total coliform bacteria are not likely to cause illness, but their presence indicates that water supply may be vulnerable to contamination by more harmful micro-organisms (The Canadian drinking water quality guideline for total coliform is none detectable per 100 ml). The health effects of exposure to disease causing bacteria, viruses and parasites in drinking water are varied. The most common symptoms of waterborne illness include nausea, vomiting and diarrhea [16]. Pseudomonas ranged from $10^2$ to $10^4$/100ml in some (30%) water samples. Some of the bacteria, such as Pseudomonas may be threat to human health due to their ability to multiply in drinking water. Others, especially those which constitute natural micro flora of human and animal food tracts, can induce acute or chronic gastric diseases [17].

## 4. Conclusions

The study areas were slightly polluted with respect to bacteriological. Some water of present study areas were not fit for drinking. Insects or other media may carry bacteria to enter the well, tube well, pond or supply water. The source of contamination may be septic system, too close to the well or the well casing isn't deep enough to assure that recharge water receives sufficient filtration to remove bacteria. The Newly made wells or tube wells often show contamination because the drill hole was contaminated by dirty tools, pipe or drilling water. Contaminated surface water or groundwater can enter an improperly constructed well. The e-coli and pseudomonas contaminated water can be treated using chlorine, ultra-violet light, or ozone, all of which act to kill or inactivate *E. coli*. We would like to recommend the following important points: proper sanitary survey, design and implementation of water and/or sanitation projects; regular disinfections, maintenances and supervisions of water sources; and regular bacteriological assessment of all water sources for drinking should be Planned and conducted.

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