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RESEARCH ARTICLE

PHYSICOCHEMICAL AND MICROBIOLOGICAL ANALYSIS OF TAP WATER SOURCE OF KALABURGI CITY

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ABSTRACT

The biological contamination in drinking water is a major problem of public health in developing world. WHO estimates that about 1.1 billion people globally drink unsafe water and the majority of diarrheal disease in the world (88%) is attributable to unsafe water, sanitation and hygiene (WHO 2003).The pace of urbanization is increasing globally, pulling more pressure on local water quality .The study was conducted to assess the water quality values of different areas in Kalaburagi city Karnataka. Different standard scientific test were conducted for each sample.

INTRODUCTION

Water of good drinking quality is of basic importance to human physiology and man's continued existence depends very much on its availability (Lamikanra, 1999; FAO, 1997). The provision of portable water to the rural and urban population is necessary to prevent health hazards (Nikoladze and Akastal, 1989; Lemo, 2002). Before water can be described as potable, it has to comply with certain physical, chemical and microbiological standards, which are designed to ensure that the water is palatable and safe for drinking (Tebutt, 1983). Potable water is defined as water that is free from diseases producing microorganisms and chemical substances deleterious to health (Ihekoronye and Ngoddy, 1985). Water can be obtained from a number of sources, among which are streams, lakes, rivers, ponds, rain, springs and wells (Linsely and Frazini, 1979; Kolade, 1982). Unfortunately, clean, pure and safe water only exists briefly in nature and is immediately polluted by prevailing environmental factors and human activities. Water from most sources is therefore unfit for immediate consumption without some sort of treatment (Raymond, 1992). The consequences of waterborne bacteria and virus infection; polio, hepatitis, cholera, typhoid, diarrhea, stomach cramps, etc, have been well established but nitrate contamination is just as deadly. Consequent to the realization of the potential health hazards that may result from contaminated drinking water, contamination of drinking water from any source is therefore of primary importance because of the danger and risk of water borne diseases (Edema *et al.,* 2001; Fapetu, 2000).

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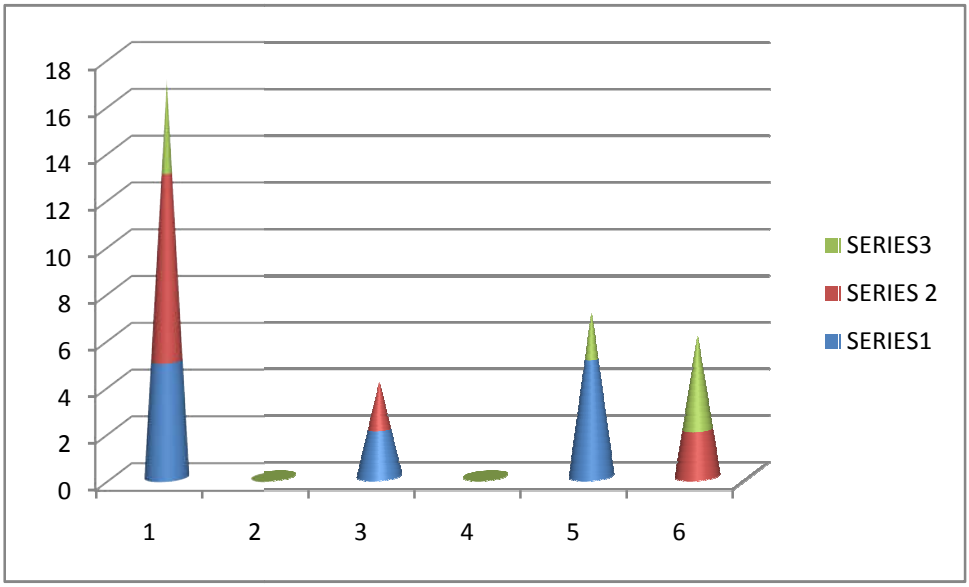
The original source of any drinking water is rich in aquatic microbes, some of which could be dangerous if they enter the human body. Accordingly, the treatment of water for drinking involves stages where microbes are removed or destroyed before the water gets into homes. After purification the water is subjected to tests by bacteriologists to ensure the safety for human consumption. A long series of dilutions is not necessary by some sample because most water supplied are fatty low in bacteria content, while others require long series of dilutions (Fawole and Oso, 2001). The greatest risk from microbes in water is associated with consumption of drinking water that is contaminated with human and animal excreta, although other sources and routes of exposure may also be significant. In many developing countries, availability of water has become a critical and urgent problem and it is a matter of great concern to families and communities depending on non-public water supply system. Conformation with microbiological standard is of special interest because of the capacity of water to spread diseases within a large population. Although the standards vary from place to place, the objective anywhere is to reduce the possibility of spreading water borne diseases to the barest minimum in addition to being pleasant to drink, which implies that it must be wholesome and palatable in all respects (Edema *et al.,* 2001). The principal objectives of municipal water are the production and the distribution of safe water that is fit for human consumption (Lamikanra, 1999).

MATERIALS AND METHODS

Study area: Kalaburagi district lies in the northern part of Karnataka between 16o11' –17o45' N. latitudes and 76o03' - 77o30' E longitudes, with a geographical area of 16,174 sq km.

SL.No	PARAMETERS	S-1	S-2	S-3	S-4	S-5	S-6
1	Ph	7.0	7.5	6.85	6.8	6.48	7.01
2	Conductivity	1260µs/cm	630µs/cm	490µs/cm	476µs/cm	1706µs/cm	1488µs/cm
3	TDS	990 mg/l	410 mg/l	300 mg/l	320 mg/l	1210 mg/l	940 mg/l
4	Hardness	790 mg/l	260 mg/l	150 mg/l	130 mg/l	526 mg/l	600mg/l
5	Calcium	202 mg/l	75.2 mg/l	56 mg/l	50mg/l	130mg/l	110.6mg/l
6	Chloride	257 mg/l	79 mg/l	108 mg/l	115 mg/l	275 mg/l	198mg/l
7	Magnesium	142.8 mg/l	44.9 mg/l	22.8 mg/l	19.4 mg/l	96.2 mg/l	119.07mg/l
8	Alkanity	234 mg/l	198 mg/l	76 mg/l	66 mg/l	312 mg/l	268 mg/l
9	Nitrate	18 mg/l	9 mg/l	25 mg/l	40 mg/l	37 mg/l	15 mg/l
10	Sulphate	170mg/l	24 mg/l	19 mg/l	6 mg/l	179 mg/l	152 mg/l
11	Fluoride	0.03 mg/l	0.2 mg/l	0.03 mg/l	0.03 mg/l	0.17 mg/l	0.19 mg/l
12	Sodium	39 mg/l	27 mg/l	18 mg/l	20 mg/l	91 mg/l	33 mg/l
13	Potassium	01	Nil	Nil	Nil	19mg/l	01 mg/l
14	Total coli form MPN/100ml	4	Nil	Nil	Nil	nil	2/100ML
15	Fecal coli form MPN/100ml	Nil	Nil	Nil	Nil	nil	2/100ML

Graphical Presentation of Bacteria in All Stations



SERIES1	5	0	2	0	5	0
SERIES 2	8	0	2	0	0	2
SERIES3	4	0	0	0	2	4

The districts bounded by Bidar district in the north, Bijapur district in west, Raichur district in south and Andhra Pradesh in the east..As of the 2014 India, census Gulbarga had a population of 1,101,989. Males constitute 55% of the population and females 45%. Gulbarga has an average literacy rate of 67%, higher than the national average of59.5%: male literacy is 70%, and female Literacy is 30%. In Gulbarga, 15% of the population is under 6 years of age. The weather in Gulbarga consists of three main seasons. The summer spans from late February to mid-June. It is followed by the southwest monsoon, which spans from late June to late September. It is then followed by dry winter weather until mid-January. Temperatures during the different seasons are: Summer: 26 C to 49 °C, Monsoon: 23 to 33 °C, Winter: 30- 31◦c.

Experimental

Samples were collected in clean and sterilized plastic bottles of 2 liter capacity. The samples were collected to examine the water quality in the month of February and the Year 2014 of different areas in Gulbarga, and brought to the laboratory for Physico-chemical parameters selected are pH, EC, Turbidity, Total Alkalinity, Total Hardness, Total Dissolved Solids, Dissolved Oxygen, carbondioxide, Chloride, BOD, COD, Chlorides, Phosphates and Nitrates, biological contamination, chemical contamination, analyzed by following standard methods. The media used for the bacteriological analysis of water include plate count agar (PCA), nutrient agar (NA), lactose broth (LB), and Eosin Methylene blue agar (EMB). All the media used were weighed out and prepared according to the manufacture's specification, with respect to the given instructions and directions. A serial dilution method was used for total viable count and the presumptive test for coliforms. The sterility of each batch of test medium was confirmed by incubating one or two uninoculated tubes or plates along with the inoculated tests. The uninoculated tubes or plates were always examined to show no evidence of bacterial growth. Any uninoculated tube or plate that showed evidence of bacterial growth was discarded. The pure cultures of the bacterial isolates were subjected to various morphological and biochemical characterization tests to determine the identity of the bacteria isolates with reference to Bergey's Manual of Determinative Bacteriology (Buchanan and Gibbon, 1974).

Drinking Water Standards

Characteristics	World Health Organization 1971		Ministry of Works & Housing 1975	
	Highest Desirable	Maximum Permissible	Acceptable	Cause of rejection
Physico – Chemical				
Turbidity , JTU	5.0	25.00	2.5	10.00
Taste and odour	Nothing	Disagreeable	Nothing	Disagreeable
Colour (Pt. scale)	5.00	50.00	5.00	25.00
pH	7.0-8.5	6.5-9.2	7.0-8.5	6.5-9.2
Total solids	500.0	1500.0	500.0	1500.0
Total Hardness (as $CaCo_2$)	100.00	500.0	200.0	600.0
Magnesium	30.0	150.0	30.0	150.0
Iron (Fe)	0.1	1.0	0.1	1.0
Managenese	0.05	0.5	0.05	0.5
Copper	0.05	1.0	0.05	1.5
Chloride	200.0	600.0	200.0	1000.0
Sulphates (as SO_2)	200.0	400.0	200.0	400.0
Phonetic substance	0.001	0.002	0.001	0.002
Fluoride	1.0	1.5	1.0	1.5
Nutrate	45.0	45.0	45.0	45.0
Zinc	5.0	15.0	5.0	15.0
Mineral Oil	0.01	0.30	0.01	0.30
Anionic detergents (as MBAS)	0.2	1.0	0.2	1.0
Arsenic	-	0.05	0.05	0.05
Hexavalent Chromium	-	0.01	0.05	0.05
Cvanide	-	0.05	0.05	0.05
Lead	-	0.10	0.10	0.10
Selenium	-	0.01	0.01	0.01
Cadmium	-	0.01	0.01	0.01
Mercury	-	0.001	0.001	0.001
PCB (4g /l)	-	0.2	0.2	0.2
Gross Alfa activity (PCi/l)	-	3.0	3.0	3.0
Gross Beta activity (PCi/l)	-	30.0	30.0	30.0

Total coli form

In the present study, the total coli forms were found in one of the station . But Fecal coli form were found at few stations. But the total coli form and fecal coli form were absent in underground waters and packed drinking water.

Fecal coli form

Fecal coli form were found at few stations but were absent in all underground water, refrigerator, packed drinking water .Among the water samples the maximum values pH 8.3, dissolved solids 600mg/L, hardness 165mg/L, magnesium 92mg/L, total coliforms >1600organisms/100ml, feacal coliform 900 organisms/100ml for water sample 2 and minimum limits of parameters were observed in sample1 as pH 8.0, dissolved solids 365mg/L, hardness 145mg/L, chlorides 86mg/L, magnesium 29.98mg/L. Since most of the water samples analyzed in the present investigation are contaminated it is an evidenced by higher values & presence of coli form alarming situation from public health point of view. The most probable number is a parameter which indicates the presence of coli form bacteria. Pollution in the water samples presence of coli form also indicates the possibility of presence of other pathogenic microorganism and further indicates the possibility of contamination of water source with drainage

Conclusion

Water supplies have been prominent sources of water in transmission disease for more than 150 years, during which primary focus of managing drinking water for the protection public health. The fundamental issues associated with public health impacts and the need for safe drinking water are currently well understood.

Hence based on these studies recommendations can be made to the local authorities water supply Boards to take suitable control measures for drinking water source in Kalaburagi.

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