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Microbial Examination of Spring Water in Tribal Area of Chinthapalli Mandal, Visakhapatnam District, A.P, India

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Abstract: ***Water is defined as portable when it is free from disease producing microorganisms. In the tribal area of Visakhapatnam springs are one sources of drinking water and ever year people die due to drinking contaminated water which causes water brone diseases in rainy season. In the present study spring water samples collected from Chithapalli Mandal, Visakhapatnam District, A.P, India. The microbial examination of The microbiological quality was determined by the standard Most Probable number (MPN) method, Heterotrophic Plate Count (HPC), Faecal coliform Count (FCC), and Faecal Streptococcal count (FSC) examined and comparing the results against the drinking water standards lead by BIS and WHO.***

Keywords: tribal area, spring water, MPN, quality, standards

1.Introduction

Water is one of the most important elements for all forms of life. It is indispensable in the maintenance of life on earth. It is also essential for the composition and renewal of cells. Despite of this, human beings are continuing to pollute water sources resulting in provoking water related illnesses (WHO, 2008). In our country a large section of population is dependent on ground water without any treatment. The ground water is generally believed to be free from contamination and thus considered safe for drinking purpose. Contamination of drinking water may occur by percolation of toxic through the soil to ground water (Sargaonkar et al., 2003). Due to continuous population growth demand for fresh water increases rapidly. In remote and tribal settlements Spring water forms a very important feature of man's existence. Even early human civilizations centered on springs and streams. Springs are a good source of potable water supply especially for small towns wherever available spring water is likely to contain minerals dissolved from sub soil layers as well as other pollutants which dissolve into the rain water.

The quality of water is typically determined by monitoring microbial presence, especially ***fecal coliform*** bacteria (FC) and physical chemical parameters (**EPA 1999**). Coliform bacteria are used as microbiologic indicators for water quality because human fecal matter is generally considered to be a great risk to human health as it is more likely to contain human enteric pathogens (**Scott et al., 2003**).

The study area Chinthapalli is located on the north eastern part of Visakhapatnam district, Andhra Pradesh, India. The main source of drinking water in this area is open wells and kundi's (spring water storage device). Natural springs are the only source available for drinking water as well as for utility purpose in remote villages. Most of the agricultural lands are rain fed, and in the lean season people practices stream cultivation, which is perennially fed by the springs. Second crop is only possible for those whose fields are fed by the natural springs.

The aim of this study was to determine the microbiological condition of spring water sources from tribal area in Chintapalli and all the results were compared with the World Health Organization (WHO) and Bureau of Indian Standards (BIS).

2.Materials and Methods

Study Area

The chinthapalli mandal located on the North Easter part of Visakhapatnam dist., in A.P state of India. It lies between 17°44'22" North Latitude to 18°04'29" East to 82°38'04" East. The climate conditions are very cool in the area on account of elevation, green vegetation and think forest. The temperature gets down with the onset of south west monsoon and tumbles to a mean minimum of 4°C by January after which there is reversal trend till the temperature reaches mean maximum of 34°C by end of May, that is April to June are warmest Months. This tribal area which rain season account for 90% of rain fall an average Annual rain fall of 1178.mm.

Sample Collection

Water samples were collected in the morning hours (between 8am to 10am) during 2008 to 2012. Water were collected sterile bottles. They were kept cool, preferable between 4°C-10°C but not frozen. After sampling, analysis was taken up as soon as possible and followed by microbial drinking water analysis standards.

Microbiological Analysis

The microbiological quality was determined by the standard most probable number (MPN) method, Heterotrophic Plate Count (HPC), Faecal coliform Count (FCC), and Faecal Streptococcal count (FSC) analyzed in 100ml spring water according to APHA 2005.

3.Result & Discussions

In this study Twenty Spring water sources were collected during period of 2008-2012 years. The microbiological analysis of the water shown in Table 1. The heterotrophic plate count which indicates the total microbial load in drinking water was in the ranges of 1.16 X 10^4 to 6.82 X10^4 in different villages. According to WHO guidelines (2009), the occurrence of pathogens or indicator organisms in ground and surface water sources mainly depends on intrinsic physical & chemical charactertics of the catchment area and magnitude and range of human activities and animal sources that release pathogens to the environment.

The most probable number (MPN) for the presumptive total coliform count of the water samples ranges from 23 to 1100 MPN/100 ml. it indicates that water from Bandabayalu Chowdupalli and Labbangi spring had the highest total coliform counts of 1100 MPN/100ml followed by the Chinnagedda and Lingalagudi spring s having 210 MPN/100ml. As per the desceibed limit of WHO, the drinking water samples were under the category of polluted (WHO 1984). The presence of coliforms shows the danger of faecal pollution and consequent hazard of contracting diseases through pathogenic organisms. None the less, the disease- causing organisms (pathogens) mostly transmitted via drinking water are predominantly of faecal origin (Suridra Suther et al., 2009).

The fecal coliform counts per 100ml of the water samples on EMB agar plat ranged between 0.53X10^4 and 3.26X10^4 cfu, which also exceeds the standard limit for water. The presence of coliforms group in this water samples generally suggests that a certain selection of water may have been contaminated with faeces either of animal origin (Okonko et al 2008). This result compared favorably with the report of Banwo 2006 which indicates that the presence of bushes and shrubs makes likely possible that smaller mammals may have been coming around these water bodies to drinking water, thereby passing out feces into the water.

The fecal streptococci counts per 100ml of the water samples on Bile esculin agar plate ranged between 0.45X10^4 to 2.38X10^4 cfu. The *Faecal Streptococci* are a group of gram-positive Lancefield group D ***Streptococci***. The faecal streptococci belong to the genera ***Enterococcu*** and ***Streptococcus*** **(**Gleeson and Gray, 1997**)**. ***Fecal Streptococci*** and ***Enterococci***, which are gram positive bacteria, have received widespread acceptance as useful indicators of microbiological water quality, because they show a high and close relationship with health hazards, mainly gastrointestinal symptoms, associated with bathing in aquatic environments.

4.Conclusion

The majority of the water sources had unacceptable total coliform count and all the water sources which were positive for presumptive coliform count had E. coli showing fecal contamination of water sources. The data clearly suggests that people of this region are under severe threat of water related diseases and health risks. The continuous consumption of such polluted water could pose serious health risks especially in infants. So, pollution sources must be taken under control and treatment waters by purification plants. Thus, water quality of springs can be improved in the future.

5.Acknowledgements

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Table 1: Microbiological Analysis of Drinking Water of Different Villages

S. No	Name of the Sample	HPC cfu/100ml	MPN Index per 100ml	FCC cfu/100ml	FSC cfu/100ml
1	Chinnagedda	3.66 X10^4	210	1.56X10^4	1.23X10^4
2	Bandabayalu	5.69 X10^4	1100	2.72X10^4	1.04X10^4
3	Lothugedda	1.16 X10^4	210	1.32X10^4	0.67X10^4
4	Lingalagudi	1.34 X10^4	210	1.22X10^4	1.18X10^4
5	Chowdupalli	4.60 X10^4	1100	2.60X10^4	1.24X10^4
6	Bladadram	1.16 X10^4	23	2.01X10^4	1.61X10^4
7	Labbangi	5.60 X10^4	1100	2.42X10^4	1.78X10^4
8	Jallurmetta	2.32 X10^4	43	0.53X10^4	1.26X10^4
9	Burada Veedhi	3.26 X10^4	39	0.16X10^4	1.32X10^4
10	Kommangi I	2.35 X10^4	93	0.56X10^4	2.38X10^4
11	Kommangi II	3.02 X10^4	150	0.73X10^4	1.23X10^4
12	Kolapari	2.68 X10^4	210	1.22X10^4	0.45X10^4
13	Rowrinthada	4.36 X10^4	460	1.56X10^4	0.98X10^4
14	Yerrabommalu	2.42 X10^4	460	1.60X10^4	1.04X10^4
15	Jerrigedda	2.52 X10^4	120	1.22X10^4	0.57X10^4
16	Kikkisalabanda	2.36 X10^4	93	0.69X10^4	0.40X10^4
17	Dabbagaruva	6.36 X10^4	1100	3.26X10^4	2.16X10^4
18	Mamidipalli	6.82 X10^4	1100	3.12X10^4	2.18X10^4
19	Chintaluru	2.33 X10^4	93	0.55X10^4	0.78X10^4
20	B.D.Pakala	2.78 X10^4	150	0.82X10^4	1.56X10^4

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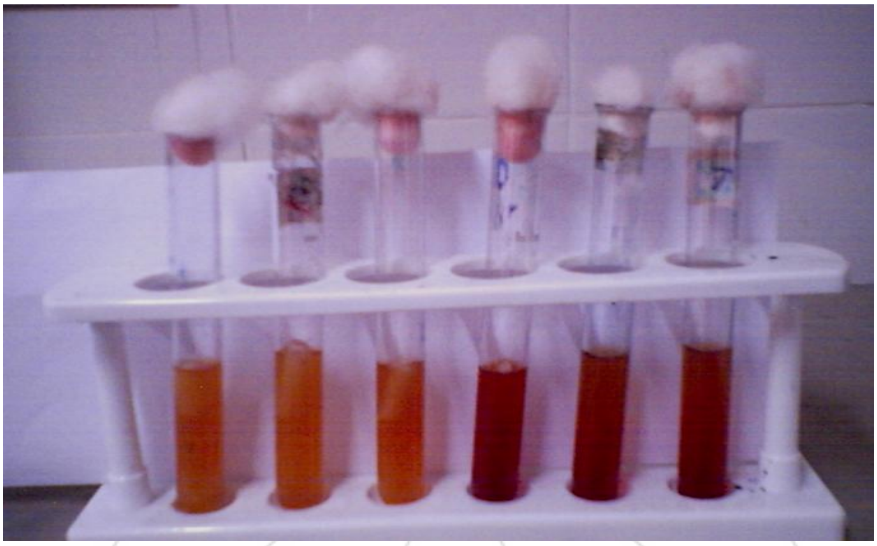
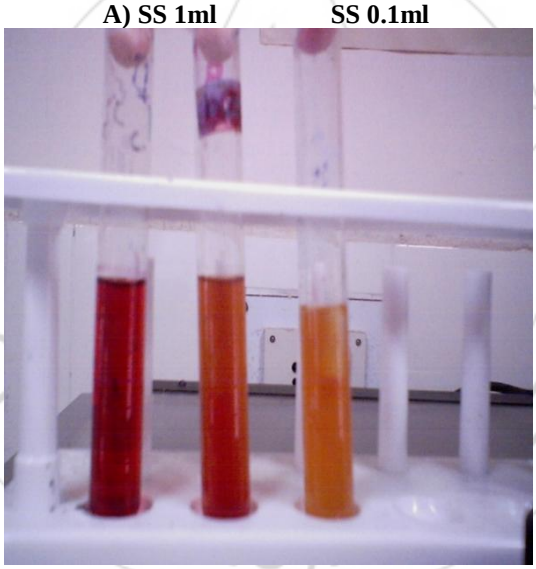


A) SS 1ml SS 0.1ml



B) DS 10ml

Figure 1: Experiential results of Total coliforms by MPN method using MacConkey broth