INTERNATIONAL JOURNAL OF ADVANCED BIOLOGICAL RESEARCH

www.scienceandnature.org

MICROBIOLOGICAL QUALITY OF SOME SPRING DRINKING WATER SAMPLES IN TRIBAL AREAS OF CHINTAPALLI MANDAL, VISAKHAPATNAM DISTRICT, ANDHRA PRADESH, INDIA

Byragi Reddy, T., K. V. Lakshmi, Geetha, S., *Ch. Venkata Ramana & Syam Kumar, B.
Department of Environmental Sciences, Andhra University, Visakhapatnam.
Corresponding Author Email: *chintagunti_venki@yahoo.com

ABSTRACT
Drinking water quality is usually determined by its bacterial pathogenic content over the potential of water borne organisms and the source of contamination. In this work, microbial analysis was carried out on spring water that is used for drinking in the Lammasingi Panchayathi Chintapalli Mandal, (Tribal Area) Andhra Pradesh, India. Four spring water samples were collected during the period 2010 – 2012. Bacteriological examination based on MPN count in 100 ml of sample, revealed that 90% of samples do not meet Bureau of Indian Standards BIS & World Health Organization (WHO) standards. The samples that are taken from spring were highly contaminated Most Probable Number (MPN) count ranges between 39-1100MPN /100ml. The Faecal coliform counts on Eosin Methylene Blue Agar, EMB agar plate ranged between 0.69 x 10^4 CFU/100ml to 2.01 x 10^4 CFU /100 ml, exceeding the standard limit (BIS, 2006). Isolated and identified organisms were *Escherichia, staphylococci, salmonella, shegeila species, vibrio species, pseudomonas species, aeromonas etc.* The results indicate that prevalence of water borne diseases may be usually related to the source of drinking water. These interrelated effects have definite impact on developmental efforts and health status of the tribal community.

KEY WORDS: Microbial Quality, spring water and tribal area.

INTRODUCTION

The Quality of drinking water is a powerful environmental determinant of health. Drinking water quality management has been the foundation for the prevention and control of water borne diseases. In rural areas due to lack of awareness and maintenance, most of the families carry out the routine activities such as cloth washing, utensil washing, bathing cattle washing near to the ground water sources which is one of the reason for contamination. Hence, there is a need to assess the ground water quality in the rural areas. Due to lack of sanitation, improper waste disposal 40% or more of the disease out breaks were attributed to consumption of polluted ground water (Narani Rai and Sharma, 1995). In tropics about 5-10% deaths are due to water related diseases. In India, diarrheal diseases are major health problems among the children under the age of 5 years. Water supply and sanitation acknowledges that mortality and morbidity levels due to water borne diseases communicated through drinking water kill about 5 million annually and make 1/6th of the world population sick (WHO, 2004). Portable water is the water that is free from diseases producing microorganisms and chemical substances that are dangerous to health (Lamikanra, 1999). In Chinthapalli Mandal, majority of the tribal people do not have access to public water supply and therefore they depend on Openwell, spring and borewell waters for drinking and domestic use. The bacterial qualities of springs in Chintapalli Mandal have been reported to be unsatisfactory with coliforms count far exceeding the recommendation levels by WHO**.** 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. Confirmation with microbial standards 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 minimum in addition to being pleasant to drink and it must be wholesome and portable in all respects (Edema *et al*., 2001). The aim of the study was to determine the microbiological contamination of spring water sources in Lambasingi Panchayat,Chintapalli Mandal Visakhapatnam district, Andhra Pradesh, India and compare with standards of BIS and WHO.

MATERIALS & METHODS

Study Area

The study area was tribal area, located on the north eastern part of Visakhapatnam, Andhra Pradesh. India. It lies between 17^{o}44’22” North latitude to 18^{o}04’29” East to 82^{o}38’04”. The climatic conditions are very cool in this area on account of Elevation, green vegetation and thick forest. The temperature gets down with the onset of South West monsoon and tumbles and a mean minimum of 47.5^{o}C by January. After which there is reversal, trend the temperature reach mean maximum of 34^{o}C by end of May, that is April to June are warmest months. This tribal area has an average annual rain fall of 1178.0 mm of which rainy season account for 90% of rainfall.

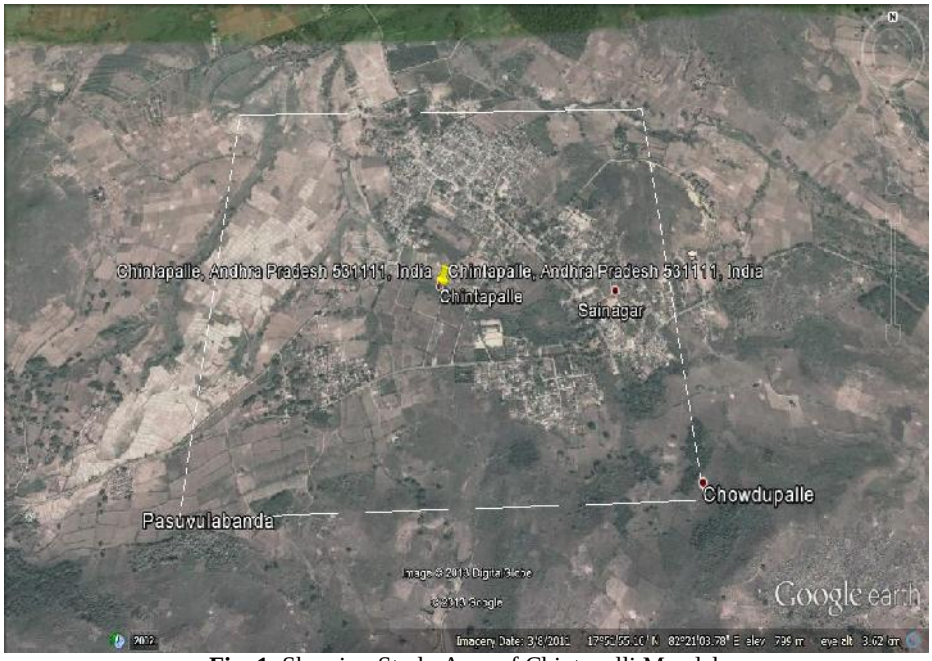

Fig. 1: Showing Study Area of Chintapalli Mandal

Sample Collection

Spring water samples were collected from different locations (Labbangi, Jallurmetta, Burada Veedhi, chitralugoppu) in Lammasingi Panchayat, Chintapalli mandal of Visakhapatnam District, Andhra Pradesh. India. The spring water sample were collected in sterile glass bottles each of 5 lts capacity, and samples were stored and transported in a cool box kept below 4ºC. Analysis was performed as soon as the samples were carried to the laboratory.

Analysis

The microbiological quality was determined by standard most probable number (MPN) method. In total coliform counts (TC) after the necessary dilution was carried out in the water samples. 10 ml of the sample was taken in three tubes each with double strength lactose broth tubes 1 ml was taken into each of first three single strength lactose broth tubes and 0.1 ml sample was transferred into each one of the other three tubes and incubated at 37ºC for 24-48 hrs. After the incubation period the gas accumulation in durham tubes was observed and most probable coliform number was determined using the MPN index (APHA, 2005). 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). A serial dilution method was used for total viable count and the presumptive tests for coliforms. Salmonella shegilla agar, thiosulphate citrate bile salt sugar agar were used to determine heterotrophic bacteria, salmonella and shigella, vibrio cholerae respectively.

RESULTS & DISCUSSION

The Most Propable Number (MPN) for presumptive Total Coliform Count of the water samples ranged from 39 to 1100 MPN Per 100ml.

TABLE 1: MPN Index per100ml and Fecal Coliform count in spring water samples in different villages:

Sample Code	Spring Water Samples	MPN/100ml	Faecal Coliform Count
S1	Lambasingi	1100	2.01×10^4
S2	Jallurmetta	43	0.69×10^4
S3	Burada Veedhi	39	0.82×10^4
S4	chitralugoppu	460	1.32×10^4

MPN counts were recorded highest at Lambsingi (1100MPN/100ml) and Burada Veedhi has recorded the lowest value of 39MPN/100ml as shown in the Table 1. Presence of coliforms in drinking water sources indicates inadequate treatment and sanitation which is necessary for drinking (Christine *et al*., 2006). Accordingly the Total Coliform Count for all the samples was higher than the BIS. The high Coliform count obtained in the samples may be an indication that the water sources are faecellly contaminated. According to BIS Standards every water sample that has coliform must be analyzed for either faecal coliforms or E.coli (BIS, 2005).

The fecal coliform count on EMB Agar plates ranged from 0.69×10^4 CFU/100ml and sample Lambasingi (S1) contains highest count of 2.01×10^4 CFU/100ml. The identified isolates are *Escherichia, staphylococci, salmonella, shigella species, Salmonella sp, vibrio species, pseudomonas species, Enterobacter aerogenes* and *Aeromonas sp*.**,** (Shown in table. 3)

TABLE 3: Morphological characteristics of isolates

Isolate	Morphological Characteristics	Organism
W1	Non- spore forming and non- motile, gram positive cocci, circular, low convex with entire margin, smooth, medium, opaque colony on Nutrient Agar, Yellow colure colonies on Mannitol Salt Agra Media grown at pH 7 and 37^0 C	*Staphylococcus sp.*
W2	Gram negative rod, circular, low convex, with entire margin, mucoid, opaque, growth on Nutrient Agar, green metallic sheen colony on Eosin Methlene Blue (EMB) Agar.	*E. coil*
W3	Gram negative rod, abundant, thin, white medium turns green on Nutrient Agar. Pink Colure colonies on Phenothalin diphospate Agar.	*Pseudomonas sp.,*
W4	Gram negative curved rod, abundant, thick, mucous white colure colonies on Nutrient Agar. Yellow colure colonies on TCBS agar	*Vibrio cholera*
W5	Gram negative curved rod abundant, thick, mucous white colure colonies on Nutrient Agar. Green colure colonies on TCBS agar	*Vibrio parahaemolytics*
W6	Gram negative rod, thin even grayish growth on Nutrient Agar	*Salmonella sp*
W7	Gram negative rod, thin even grayish growth on Nutrient Agar	*Shigella*
W8	Gram negative, non-spore forming rod shaped facultatively anaerobic bacteria. Thick, mucous white colure colonies on Nutrient Agar. Light yellow to light to tan homogenous free flowing powder on Starch Ampicillin Agar	*Aeromonas sp.,*
W9	Gram negative rod, abundant thick, white glistening growth on Nutrient Agar	*Enterobacter aerogenes*

TABLE 4: Biochemical Characteristics of isolates

Test	W1	W2	W3	W4	W5	W6	W7	W8
Catalase	+	+	+	+	+	+	+	-
Oxidase	-	-	+	+	-	-	+	-
Motility	-	+	+	+	-		+	+
Indole	-	+	-	+	-	+	+	-
Methyl-red	-	+	-	-	+	+	+	(+)
Voge-Proskauer	+	-	-	+	-	-	+	+
Citrate Utilization	-	-	+	+	+	-	+	+
Urease	+	-	-	-	-	-	+	+
Hydrogen sulphide	-	-	-		+	-	-	-
Starch hydrolysis	-	-	-	-	-	-	+	-
Nitrate Utilization	-	+	+	+	+	+	-	+
Gelatin liquefication	-	-	-	+	-	-	-	(+)
Lactose fermentation	-	AG	-	AG	-	-	AG	AG
Glucose fermentation	A	AG	-	AG	AG	A	AG	AG
Sucrose fermentation	A	A(+)	-	AG	AG	A+-	AG	-

(Note: *Staphylococcus, W2- E. coil, W3- Pseudomonas sp., W4- Vibrio sp., W5- Salmonella sp.,W6- Shigella, W7- Aeromonas sp.,W8- Enterobacter aerogenes,* A-Acid production only; AG - =Acid and gas production; +- = Variable reaction; + = Positive;- = Negative ;(+) = Late Positive**).**

Number of Salmonella, Shigella Species and Vibrio Cholerae were higher than the BIS water quality standards for recreational usage in the study area, this leads to the public health significance, such as gastrointestinal infections such as diarrohea, dysentery, typhoid and other infections (BIS, 2005). Other bacteria isolated from all the water samples such as S*taphylococcus aureus, Pseudomonas aeruginosa* and *Proteus species* are also of public health significance. *Entero bacter aerogenes* isolated from the water samples are examples of non-fecal coliforms and can be found in vegetation and soil which serves as sources by which the pathogens enter the water (Schlegel, 2002). The British Standard Institute (BSI, 1993) specified that counts greater than 104 is considered unsatisfactory for Enterobacter species.The presence of Total Coliforms, Fecal Coliforms, *E.Coli, Salmonella species, Shigella species, Vibrio species* have been documented as national primary drinking water regulations(NPDWRs) or primary standards which protect public health by limiting the levels of contaminants in drinking water(EPA 2002).

CONCLUSION

Due to improper disposal of refuse, contamination of water by sewage, surface runoff, the general public on the proper disposal of refuse, is the reason for the microbial contamination of the water body and Its evidence that water borne diseases, sewage treatment and purify the water to make it fit for drinking, since the associable organisms are of public health significance being implicated in one form of infection or other. The areas which are no facility of municipal tap water, in those areas

educative programmes must be organized by researchers and Government agencies to enlight the villagers on the proper use of surface water.

REFERENCES

APHA (2005) Standard methods for water and Waste Water Analysis,American Public Health Association. USA.

BIS (2005) Indian Standards for Drinking Water Quality Specifications (IS 10500 - 1991) Bureau of Indian standards.

Christine L. Moe and Richard D. Rheingans (2006) Global challenges in water, sanitation and health; Journal of Water and Health. 04.IWA Publishing 2006.

Edema, M.O., Omemu, A.M., Fapetu, O.M. (2001) Microbiology and physicochemical Analysis of different Sources of drinking water in Abeokuta. Nigeria. Niger J. Microbial. 15: 57-61.

EPA (2002) U.S. Environment Protection Agency, Safe Drinking Water Act. USA.

EPA (2003) U.S. Environment Protection Agency, Safe Drinking Water Act.USA.

Lamikanra (1999) Essential Microbiology of Students and Practitioners of Pharmacy, Medicine and Microbiology. 2nd ed. Amkra Books Lagos, P.406

Narain Rai, J. P. and Sharma, H.C. (1995) Bacterial Contamination of Ground Water in Rural Areas of North Uttarpradesh. Indian Journal Environmental Health. 37(1):37-41.

Schlegel, H.G. (2002) General Microbiology. 7th ed. cambridge University press.480p.

WHO (2004) Water Sanitation and Health Programme. Managing Water in the Home: Accelerated Health gains from Improved Water Sources. World Health Organization.www.who.int.