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QUALITY ASSESSMENT OF DRINKING WATER IN ADDATHEEGA VILLAGE GANTYADA MANDAL, VIZIANAGARAM DISTRICT.

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ABSTRACT

The present study was undertaken to evaluate the water quality of the Addatheega Village Gantyada mandal, Vizianagaram dist. The physicochemical and the microbial studies are most important regions by which we are able to test the portability of water. The isolation and characterization of the pathogenic microorganism from the water sample collected were the main emphasized area of the study. In this study drinking water samples were collected from 5 sources i.e., three different bores, a well and a spring. The various constituents monitored include the physicochemical characters, the bacterial parameters like Total plate count (TPC), Most probable number (MPN) and isolation and identification of pathogenic bacteria. The physicochemical characters of all the three drinking water samples were within the recommended permissible level of WHO. The total plate count was above the WHO guidelines values (<10CFU's/ml) in the three water samples studied and the highest count was during August. The bacteria isolated were *E. coli, Salmonella, Shigella, Staphylococcus, Group D Streptococcus, Vibrio cholera and Pseudomonas.* The samples were inoculated and were incubated at 37^0C for 24 hrs or 48hrs.for appropriate bacterial growths. Thus we can use this study for the assessment of the water and to resolve the hygienic problems of the water.

KEYWORDS: Drinking water, Quality assessment, pathogenic bacteria, Addatheega.

INTRODUCTION

Water is an essential unique universal solvent needed for any living organism. Nearly three parts of the earth (75%) is covered by water. In the case of human being also weight of the

body is in the form of water. Life is not possible on this planet without water. It exists in three states namely solid, liquid and gas. It acts as a media for both chemical and biochemical reactions and also as an internal and external medium for several organisms. Most of the water is being utilized by man for drinking purpose. Water can be obtained from a number of sources among which are streams, lakes, rivers, ponds, rain, spring and wells. About 97.2% of water on earth is salty and only 2.8% is present as fresh water from which about 20% constitutes ground water. In our country 70% of the water is seriously polluted and 75% of illness and 80% of the child mortality is attributed to water pollution (Zoeleman, 1980). During the past decade, widespread reports of ground water contamination have increased public concern about drinking water quality (Yanggen and Born, 1990). The most dangerous water pollution occurs when faecal contaminants like *Escherichia coli, Salmonella, Shigella, Vibrio cholerae* enter the water. Though bacteriological quality of drinking water is being monitored in urban areas and some rural areas, such monitoring was uncommon in some rural areas and especially so in tribal areas. Hence, the bacteriological quality of drinking water is important and periodical monitoring is essential for potable water. The present work is to study the status of drinking water sources available in and around Addatheega Village, Gantyada mandal, Vizianagaram dist., and to ascertain their potability for human consumption.

MATERIAL AND METHODS

In the present study, water samples were collected from 5 sources i.e., three different bores, a well and a spring, in white plastic bottles, which were previously rinsed with distilled water and sterilized with 70% alcohol. At the collection point, the containers were rinsed thrice with the sample water before being used to collect the samples. The collected samples were placed in a thermocol box. The temperature in the box was maintained at $4^{o}C$ by using ice packs. The P^{H} of the water samples was measured by using the electrometric methods and other physicochemical parameters such as Total dissolved solids and Fluoride content were analyzed by standard methods given in APHA(1998). The microbial isolation was done by streak plate method on nutrient agar and on selective media for their identification (Sherman Cappuccino, 2009). The final identification of resulted isolates was done by the biochemical tests in accordance to the Bergey's Manual (Holt et al., 1984).

List of water sample collected

S1	Bore
S2	Bore
S3	Bore
S4	Well
S5	Spring

RESULTS

P^H values of the water samples ranged from 7.10 - 7.33. The P^H value of S_1 was 7.22, S_2 was 7.11, S_3 was 7.31, S_4 was 7.24 and S_5 was 7.31. The P^H of the five water samples is in the safe limit as recommended by WHO(2006). The P^H in most of the natural water ranges from 6.5-8.5 while deviation from the neutral 7.0 is as a result of the bicarbonate or carbonate equilibrium (Medera and Allen, 1982). The P^H values are set for domestic use as prescribed by APHA (1998).

According to US Environmental Protection Agency the higher the mineral contents in the water more total suspended solids will be formed. Total Dissolved Solids in the water consists of ammonia, nitrate, nitrite, phosphate, alkalis, some acids, sulphates, metallic ions etc. The Total Dissolved Solids values is not desirable for utility water because a high content of dissolved solids elevates the density of water, influence osmoregulation of fresh water, reduction of solubility of gases (oxygen) and utility of water for drinking purpose. In the present investigation an average S_1 has 3245mg/L, S2 has 378.4mg/L, S_3 has 147.1mg/L, S4 has 564.0mg/L and S_5 has 647.3mg/L. Hence the values of the five samples were in the permissible limits as recommended by WHO(2006).

Fluoride occurs naturally in most groundwater wells and can help to prevent dental cavities. As fluoride levels increases, there is an increase in the tendency to cause tooth mottling. Fluoride levels less than 2mg/L are not considered a problem for livestock. On an average the Fluoride content should be 0.109mg/L and coming to the present investigation S_1contains 0.2mg/L, S_2contains 0.1mg/L, S_3contains 0.1mg/L, S4contains 0.2mg/L and S_5contains 0.1mg/L. Hence the values are in permissible limits as recommended by WHO(2006).

The result obtained from the TPC is given in the figure 1. On an average from S_1 contains 45.5 CFU's/ml, S_2 contains 49.6 CFU's/ml, S_3 contains 40 CFU's/ml, S_4 contains 45 CFU's/ml, S_5 contains 53.5 CFU's/ml. all the five drinking water showed that bacteria in the samples are above the WHO guidelines values (<10CFU's/ml). In S_5 on an average higher

TPC value is observed. This may be due to unmanaged construction of bores from where the water continuously seeps into the pump houses of Andhra University. This study is in conformation with the result of (Zaky MM, 2006) who reported increased bacterial content in the water of Manzala Lake, Egypt which is polluted by drainage and sewage. The recommended standard MPN for water is less than 2 MPN for 100ml (FAO1997). In the present analysis the most probable number in the sample S_1 is 4.6 /100 ml, S_2 is 5.5 /100 ml, S_3 is 10.6 /100 ml, S_4 is 2.8 /100 ml, S_5 is 3.3 /100 ml observed from figure 2.The presence of coliform group in water sample generally suggests that a certain selection of water may have been contaminated with faeces either of human or animal origin. The other more dangerous microorganism could be present in the water sample (SapkotaRajendra et at., 2012). The present results obtained for Total plate count and Most probable number were similar to the results obtained by Okonoko et al., 2008 and Oluyege Jacob Olaoluwa et al .,2010.

During the study period all the five water samples (i.e. three different bores, a well and a spring) showed the presence of the ten pathogenic bacteria such as ***Staphylococcus, Streptococcus, Bacillus Sp., E. coil, Klebsiella Sp., Proteus Sp., Pseudomonas sp., Vibrio sp., Salmonella sp., Shigella.*** (Table 1 &2).

Table: 1 Morphological characteristics of isolates.

Isolate	Morphogical 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	***Staphlococcus sp***.
W2	Gram positive cocci, thin, even, growth on Nutrient Agar, black or brown colure colonies on Bile esilin Agar.	***Group DStreptococcus,***
W3	Gram positive rod, spore forming, abundant, opapue, white waxy growth on Nutrient Agar .	***Bacillus Sp.***
W4	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***
W5	Gram negative rod, Slimy, white somewhat translucent, raised growth on Nutrient Agar, Dark pink colure colonies on MacConkey Agar.	***Klebsiella Sp***
W6	Gram negative rod, thin, blue gray, spreading growth on Nutrient Agar.	***Proteus Sp.,***
W7	Gram negative rod, abundant, thin, white medium turns green on Nutrient Agar. pink Colure colonies on Phenothalin diphospate Agar.	***Pseudomonas sp.,***
W8	Gram negative curved rod, abundant, thick, mucous white colure colonies on Nutrient Agar. Yellow colure colonies on	***Vibrio cholera***

	TCBS agar	
W9	Gram negative rod, thin even grayish growth on Nutrient Agar	***Salmonella sp***
W10	Gram negative rod, thin even grayish growth on Nutrient Agar	***Shigella***

Table2: Biochemical Characteristics of isolates.

Test	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Catalase	+	-	+	+	+	+	+	+	+	-
Oxidase	-	-	-	-	-	-	+	+	-	-
Motility	-	-	+	+	-	-	+	+		+
Indole	-	-	-	+	-	+	-	+	+	-
Methyl-red	-	+	-	+	-	+	-	-	+	(+)
Voge-Proskauer	+	-	+	-	+-	-	-	+	-	+
Citrate Utilization	-	-	-	-	+	-	+	+	-	+
Urease	+	-	-	-	+	+	-	-	-	+
Hydrogen sulphide	-	-	+	-	-	+	-		-	-
Starch hydrolysis	-	-	+	-	-	-	-	-	-	-
Nitrate Utilization	-	-	+	+	+	+	+	+	+	+
Gelatin liquefication	-	-	+	-	-	+	-	+	-	(+)
Lactose fermentation	-	A	-	AG	AG	-	-	AG	-	AG
Glucose fermentation	A	A	A	AG	AG	AG	-	AG	A	AG
Sucrose fermentation	A	A	A	A(+)	AG	AG+-	-	AG	A+-	-

W1-Staphylococcus, W2-Streptococcus,W3- Bacillus Sp.,W4- E. coil,W5- Klebsiella Sp

W6-, Proteus Sp.,W7- Pseudomonas sp., W8- Vibrio sp., W9- Salmonella sp.,

W10- Shigella, W11- Enterobacter aerogenes, W12- Micrococcus sp.,

W13- Acinetobacter sp., W14- Flavobacter sp., W15- Aeromas sp.,

A- Acid production only; AG - Acid and gas production; +- = Variable reaction; + - Positive; - = Negative ;(+) – Late Positive.

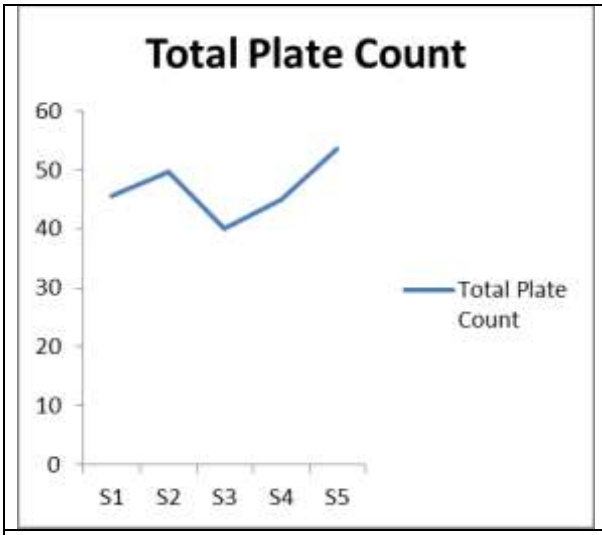

Figure 1: Total Plate Count (CFU/ml) of Bacteria in five water samples:

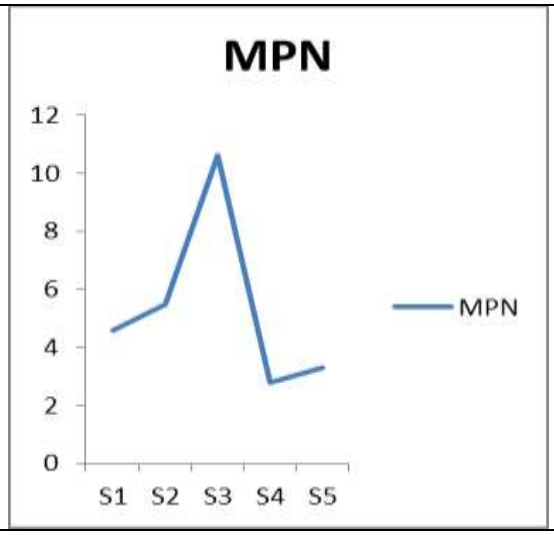

Figure 2: Most Probable Number (/100ml) of Coliforms in five water samples:

CONCLUSION

This study reveals that the increased in the microbial loads at the consumer points (i.e three different bores, a well and a spring) was due to the observed activities. At some points, the direct washing of human clothing and washing of other household utensils around the sampling point. The presence of animals and the intense agricultural related activities going on around the consumer point could lead to contamination. The direct washing of legs, hands, clothes and utensils in the stream could also lead to contamination (Banwo, 2006).

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