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Full Length Research Paper

The comparative study on the bacteriological examination of tap water and sachet water

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The comparative study on the bacteriological examination of tap water and sachet water was carried out in Ozoro Community, to ascertain the presence of bacteria in both water samples in Delta State. Twelve's (12) samples were used, six samples were collected from tap water and they are indicated, A, B, C, D, E and F. while the other six were collected from sachet water indicated as, G, H, I, J, K and L respectively. The pH of the tap water samples ranged from 6.0 to 8.0 while the temperature ranged from 26.50C to 27. 90C while pH of the sachet water ranged from 5.5 to 7.0 and temperature ranged from 26.30C to 27.50C. Total bacterial count for tap water ranged from 1.9x103 to 5.7x103 cfu/ml, total bacteria count for sachet water ranged from 1.2 x103 to 7.5 x 103 cfu/ml. Tap water percentage ranged from 1.14% to 3.51%, while the sachet water ranged from 0.72% to 4.41%. Eight (8) bacterial isolates were identified in tap water Samples; *Staphylococcus aureus, Salmonella typhi, E.coli, klebsiella, proteus, vibro cholerae, shigella* and *Enterbactera* cloacae while five (5) were isolates from sachet water, *salmonella, Staphylococcus aureus, vibro cholera, E.coli* and *shigella dysentaria*. After the examination of the six samples of tap water compared with six samples of sachet water, it was found that these sources of drinking water in the community are loaded with pathogenic organisms.

Key words: Tap water, Sachet water, Bacteriological, comparative, Examination

INTRODUCTION

Water is an important constituent of all forms of life. It helps to sustain life and plays a key role in cell metabolic process.Houghton (2005), described water in it's pure form as that colourless compound of hydrogen and oxygen that has freezing point of O0 C (32 0F) and boiling point of 1000C (2120F). These and other properties make it capable of dissolving other substances more than any other known solvent, thus making it a universal solvent (Nwachukwu *et al*., 2002).Water can be defined as a liquid substance that is clear, colourless, tasteless and odourless, capable of existing in liquid, solid, and gaseous state (i.e vapour).It is an unusually good solvent for a large variety of substance and essential component of all organisms. (Houghton, 2005)Apart from the fact that two third (2/3) of the earth surface is covered by water, human body is composed of 75% water. No wonder Okafor (1985) described water as an indispensable substance for life.

The usefulness of water to man cannot be over emphasized. It serves the following purposes:

- As source of transportation (i.e seas, ocean and rivers)
- For domestic activities (Swimming, fishing)
- For agricultural production.

Various water sources serves as habitats for living organisms ranging from bacteria, fungi, viruses, protozoa and algae. However, different water sources have characteristics microbial populations based on precailing environmental conditions such as air, soil, presences/nature of effluent discharges from industries and the sanitation practises of inhabitants (if present along the water catchment).Hence, the dangers of contamination prone to water sources are widespread

and varied. The round waters unlike surface waters are known to contain fewer populations of microorganism's due to the effects of filteration, distance, and exposure to unfavourable environmental factors in the course of such waters.Amongst the bacterial flora of water is the aerobic spore forming bacilli such as Bacillus magisterium and Bacillus subtilis. Others are species of the genera Chromobacter, Flavobacterium, Serratia and Pltalicen. Sewage – Laden rivers and streams are usually inhabited by fungi. Such as sapromyces and common soil Actinomycetes such as Kreptomces and Nacordia. Prescott *et al*. (1999) listed Leptomitus lacteus as a sewage fungus that shows massive growth in polluted waters.

Water borne pathogens may be divided into three (3) main categories; Bacterial, virus, and protozoa (Nwachukwu *et al*., 2002). Bacteria and viruses contaminate both surface and ground water, whereas protozoa appear predominately in surface water (Ford, 1999). Drinking water is critical part of the human diet and contamination of the municipal water with pathogenic microorganisms constitutes a serious threat to public health (Stender *et al*., 2001).

This study focus on the determination of sachet water (pure water) and tap water micro-biologically to know whether it meets the World Health Organization (WHO) standard for drinking water, With a view to examine sachet water (Pure Water) microbiologically and chemically to determine whether it meets the World Health organization (WHO) standard for drinking water.

METHODOLOGY

Collection of samples

Tap water was collected from different compounds and also sachet water sample were collected from various stores in Ozoro, Delta State. Six different Tap water namely, A, B, C, D, E, and F and, also six different products of sachet water namely, sachet water G, H, I, J, K, L were obtained and taken to the laboratory for examination to determine their suitability for drinking or consumption.

The other materials and equipment used in the course of this work are: Nutrient agar, Blood agar, distilled water, Autoclave, Bunsen Burner, wire loop, cotton wool, conical flask, Beaker, microscope slide, slip, microscope, Weigh Balance, Wash bottle, Petri dish pH meter, bucket centrifuge etc.

METHOD USED

All the agars used were prepared according to the manufacturers' directive and the media were made from commercially available products. They were dispensed into appropriate petri –dishes and BIJO 4 bottles.

METHOD OF INOCULATION

Pour plate method was used. With the aid pipettes 9ml of water was dispensed under sterile condition into test tubes for about 450C.1ml each of Tap water and packaged sachet water was transferred into the test tube. After which 0.02ml each was aseptically transferred into the sterile petri-dishes, swired and allowed to solidify, the petri dish were finally incubated upside down to prevent contamination and condensation for 24hrs at 370C.

PLATE COUNT

Colonies that appeared after incubation were counted and the growth colonies were observed for cultural characteristics.

ISOLATION OF MICROBES

After 24 hours incubation in the incubator, plates were removed from the incubator and examined under a very bright light, and the microbial were identifies by their characteristics and biochemical reaction.

DETERMINATION OF pH

The sachet (pure) water was measured into a beaker and also the tap water, and the pH meter was placed vertically until it stop and the reading was taken and recorded. The process was repeated and the average of the readings was found.

DETERMINATION TEST

Biochemical test is used for the isolation of pure isolate from overnight culture growth the biochemical test used were:

1.Indole production Test: for E.coli
2.Oxidase test for gram positive E.g . Staphylococcus aureus, shlegella etc.
3.Catalase test used for Staphylococcus for separating gram positive organism from gram negative.
4.Coagulase test: used for separating gram positive organism from gram negative organism.

Table 1: Comparative analysis of the microbilogical properties of tap water

CHARACTERISTICS	A	B	C	D	E	F	WHO PER-MISSBLE
TASTE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	
ODOUR	NONE	NONE	NONE	NONE	NONE	NONE	
pH	7.5	7.0	8.0	6.0	7.0	6.0	
TEMPERATURE	27.5	27.9	26.5	27.0	26.6	27.5	
ORGANISMS ISOLATED	*Salmone-lla, Typhi, E.coli, klebsiella, proteus vulgaris, Staphylo coccus aureus*	*Vibrio cholorae, Staphylo-coccus aureus, klebsiellia, E.coil*	*Entero-bacter cloacae*, Salmonella, *Shigella*, *dysentariae*	*E.coli, Staphylo-coccus, Salmonella, Typhi, Shigella dysentarias*.	*Vibriocho lo-riae Staphylo-coccus*, *aureus*, *proteus vutgaris*, E.*coli*.	E.*coli*, *Klebsiellapneum oniae*, *Salmonella Typhi*	

Table 2: Comparative analysis of the microbilogical properties of Sachet (PURE) water

CHARACTERISTICS	G	H	I	J	K	L	WHO PER-MISSBLE
TASTE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	
ODOUR	NONE	NONE	NONE	NONE	NONE	NONE	
pH	5.5	6.0	7.0	6.5	5.7	6.5	
TEMPERATURE	26.3	27.4	26.7	27.0	27.5	26.5	6.5-8.5
ORGANISMS ID SOLATE	*E-coli Vibrio cholerae, Salmonella Typhi*	*Staphylococ us avreus*, *Shigella dysentaria Vibro cholerae*	*Vibrio cholerae*	*E.coli*, *Salmonella Typhi*	*Staphylo-cocus aureus*, *E.coli*.	*E .coli*	

RESULTS AND DISCUSSION

Table 1 and 2 show the comparative analysis of the microbilogical properties of tap water and sachet water. WHO permissible for pH ranges from 6.5-8.5 from the results obtained in this study, all the sachet (pure water samples falls within this range. The temperature values of the six water samples both the tap water and sachet water ranges from 26.5 to 27.90C with sachet water A being the lowest in temperature (26.3), and Tap B being the highest in temperature (27.9).

This study examined the incidence of pathogens in drinking waters. It takes a look at the comparative analysis of the microbial examination between tap water and sachet water as the two major sources of drinking water in the community. The work made used of equal samples of waters randomly collected within the community. Six samples of tap waters were collected from different compounds, and six samples of sachet (pure) water were also collected from different stores.

The examination of the six samples of tap water compared with six sachet (pure) water after the microbial analysis or examination, and the biochemical examination indicates that the major sources of the drinking water in the community are loaded with pathogenic organisms responsible for the spread of serious ailments in the community the total number and different species of microbial pathogens were detected in tap water samples, namely are: *Staphylococcus aureus, Salmonella typhi, E. coli, Klebsiella, Proteus, Vibro cholerae, Shigella, and Enterbacter* cloacae, while sachet (pure) waters are loaded with 5 different species of pathogenic organisms that are of serious medical importance. The pathogens found in sachet waters are: *E.coli, Salmonella, Staphylococcus aureus, Vibro cholerae,* and *Shigella dysentaria*: They get into water by a number of ways which includes poor hygiene and sanitary conditions (Prescott *et al*., 2008).

The detection of pathogenic microbial organisms in tap and sachet water which are the major sources of drinking

water in the community is a sources worry to the community. This is because; these microbial pathogens have jointly and severally incriminated as causative agents of many medically importance. This is in agreement with the work of Costerton *et al*., 1995. The high bacteria count in samples without chlorine over the period of analysis especially Escherichia coli is in agreement with the findings of September *et al*., 2004 who also proposed that the identity of putative pathogenic isolate revealed that high number of organisms including *Enterobacter* and *Klebsiella* were present.

Water borne diseases like Proteus vulgaris found in the water samples is known to caused nosocomial infections of the urinary tract, lower respiratory tract infections, sachet water contaminated with, *Enterobacter* clocae which causes infections immune compromised and malignancy among patients, Microbial organisms like *E.coli*, causes nosocomial unirary tract or pulmonary infection and associated with contamination of surgical equipments & operative solution (Drinkables water as permitted by world Health organization and vational Agency for food and Drugs Administration and control. E. coli cells are a major component of feces, and fecal-oral transmission is the major route through which pathogenic strains of the bacterium cause disease. Cells are able to survive outside the body for a limited amount of time, which makes them ideal indicator organisms to test environmental samples for fecal contamination (Feng *et al*., 2002, Thompson and Andrea 2007).

The variety of pathogenic organisms found in tap water samples is greater than the ones in sachet waters, this shows that tap water is more contaminated with pathogenic microbial from the analytical calculation, using the most probable method, it indicates that the result of both tap water and sachet (pure) waters is far above the normal . The result of tap water bacteria count of (2.08 X 104) and sachet waters of (1.5 X 104lCFU) is a serious cause of worry. The treatment to screen out pathogenic seems to ineffective because, all the six samples of water are contaminated with the load of pathogens microbial, reasons is that either the boll hale of these tap waters are not properly sealed or the water tanks are not chlorinated and properly washed as at when due. On the other hand, the sachet waters popularly called pure water are also packed with pathogenic microbial organism, though than tap waters, this can also be due to non-adherence of manufacturers to the standard operation procedures (sop), quality assurance which ensure that products are consistently produced and controlled to the quality standard, appropriation to intended units, and as required by products specification .Other factors include poor state of the manufacturing environment, dirty filling equipments, contaminated packaging materials, unhygienic handling of the products and lack of microbiologically controls. The failure of the government at all level to provide clean, hygienic and portable water for the populaces has led to the proliferation of these substandard sachet water, products that supposed urguement and bridge the vacuum, to cubed the incidence of these contaminated waters, are unfortunately load with microbial pathogens. It is therefore a wakeup call to individual tap water owners to seek their borehole properly, away from sewage pit and chlorinated their water properly, and sachet water factory owners should improved and maintained a high sense of hygiene, both in producing their products, packaging and storage to prevent the incidence of diarrhea and incidence of water borne disease.

CONCLUSION

From the experiment carried out, it can be concluded that after the examination of the six samples of tap water compared with six samples of sachet (pure) water, after the microbial analysis, it was found that these sources of drinking water in the community are loaded with pathogenic organisms responsible for the spread of serious ailments in the community, which can make them unfit for human and domestic consumption.

RECOMMENDATIONS

The following recommendation can help the existing water packaging factories to improve on their production, and tap water owners

1. Regular secreting should be performed on water to detect the presence of bacteria.
2.Tap waters owners should sealed the bole hole of this water properly and tank should be chlorinated and washed as at when it is due.
3. Periodic maintenance and evaluation of equipment used in water processing should be carried out to eliminate possible bacteria colonization.
4. Sick people should not be allowed to work in these factories.
5. National food and drug administration and control should regularly inspectthese factories to maintain standard.

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