

AN ASSESSMENT OF MICROBIAL QUALITY OF SACHET WATER; IMPLICATION ON THE HEALTH OF STUDENTS

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ABSTRACT

This study is aimed at determining the microbial quality of sachet water sold in schools in Ogba/Egbema/Ndoni Local Government Area of Rivers State and its implication on the health of school children. Five (5) different brands of sachet water samples were randomly sampled for the study. An experimental design was used for the study. The samples were thereafter subjected to laboratory test to determine the type and quality of micro-organisms in each brand of the sample (sachet water). The findings show that the samples contain various qualities of micro-organisms. The percentage of the micro-organisms also varies with the sample. Implications and recommendations were also discussed.

INTRODUCTION

Water is an essential need to human life. It is a universal solvent that consists of hydrogen and oxygen atoms. Water is colorless, odorless and tasteless liquid. It is an inorganic substance that occurs in three states of liquid, gaseous and solid. (Anon, 2005). Water covers 71% of the earth surface and it is mostly found in oceans, rivers and other large water bodies. Clean and fresh drinking water is essential for human and other life forms. Access to safe drinking water has improved steadily and substantially over the last decades in almost every part of the world (Binnic, 2002).

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Water naturally exists in three main sources, rain water, ground water and surface water. Rain water is naturally the purest source of water but as it gets down, it absorbs compound from the atmosphere. Its main components are chlorides, nitrates, sulphate, sodium, potassium and ammonia. The rain water can be collected from roofs and water sheds which could assist in polluting and making it one of the most unfit sources of water for drinking (Huisman and Wood, 1981). Ground water is said to have emanated from the melting of meteoric water - rain, snow and hailstone, into the ground. They serve as sources of domestic water supply and offers cheaper and purer supply. This includes natural springs, well and boreholes (Kalua 2009). As it percolates into the earth, it is subjected to some purification actions by numerous chains of pervious impervious rock strata of layers. Due to disintegrating and dissolving power of water, rocks which make up the earth layers are dissolved making it to have impurities like oxides, nitrates, sulphates, magnesium and calcium, iron and magnesium (Kalua 2009).

Surface water on the other hand includes streams, ponds and lakes. Its main ionic compound includes: chlorides, nitrates, sulphates, magnesium and calcium. The concentration of components is more than those in rain water and ground water. Sea water can be considered as surface water but the salt content is so much that it cannot be used for drinking; it rust machines and kills crops (Lomborg, 2001). Access to safe quality drinking water is essential to human health. Water is a basic human right and a component of effective policy for health protection (WHO, 2014).

It is the duty of governments to protect the health of the citizens and in Nigeria, it is the responsibility of the National Agency for Food and Drug Administration and Control (NAFDAC), parastatals of Federal Ministry of Health, government owned public water utilities such as water corporations are statutorily charged with the responsibility of supplying water from conventional water treatment

plants that use water from reservoir (dams), flowing streams, lakes and boreholes.

As the country population grows and industries increase, the supply of water by the public utilities became inadequate in quality and quantity.

This led to the emergence and proliferation of private water enterprises that operated side by side with the government-owned public water utilities. Many people now depend on water vendors for provision of water for domestic and daily needs and this led to advent of locally sourced low cost alternative sachet water (pure water) becoming a major source of drinking water. The production, marketing and consumption of sachet water increased tremendously with several brands in Nigeria and other developing countries (Kassenga, 2007).

STATEMENT OF THE PROBLEM

Water in sachets is readily available and affordable but there are concerns about their purity. The integrity of the hygienic environment and the conditions where the majority of the sachet water are produced has also been questioned. There are claims of past outbreaks of water borne diseases that ensued from consumption of polluted sachet water (CAMN, 2001). According to Dufor and Ronchi (2013), an understanding of microbiological quality and safety of sachet water is therefore imperative and should be a cause of concern to both consumers, suppliers, regulators and public health authorities.

It has also been reported that diseases-causing micro-organisms transmitted via drinking water is predominantly of faecal origin and is referred to as enteric pathogens. However, many pure water producers in Nigeria give out unsterile or contaminated water to the public including school environments. It is against this backdrop that this research work is set out to assess the microbial quality of

sachet water in schools in Rivers State and its implication to the health of school children.

PURPOSE OF THE STUDY

The purpose of this study is to determine the microbial quality of sachet water (pure water) in Rivers State schools. In specific terms the study intend to:

1. Isolate and characterize micro-organisms in sachet water via standard microbiological processes.
- 2 determine the quantity in percentage of micro-organisms found in sachet water.

RESEARCH QUESTIONS

Based on the stated purpose, the following research questions were posed to achieve the goal of the study.

1. What are the possible microorganisms found in sachet water?
2. What is the quantity (percentage) of microorganisms found in sachet water?

SCOPE OF THE STUDY

The study covers all secondary schools in Ogba/Egbema/Ndoni Local Government Area of Rivers State.

AREA OF STUDY

This study was carried out in schools in Ogba/Egbema/Ndoni Local Government Area of Rivers State.

DESIGN OF THE STUDY

An experimental design was used in this study to determine the type and quality of microorganisms in sachet water sold in secondary schools in Ogba/Egbema/Ndoni Local Government Area of Rivers State.

THE POPULATION OF THE STUDY

The population of the study comprised of all brands of sachet water sold in secondary schools in Rivers State.

SAMPLE AND SAMPLING TECHNIQUE

Two sachets water each were randomly sampled from five most popular brands identified and selected based on patronage by consumers and distributors, bringing the total sample used for the study to ten (10).

INSTRUMENTATION

The research instrument comprised culture media, distilled water, incubator, anaerobic jar, autoclave, petri dishes and microscope.

PROCEDURES FOR DATA COLLECTION

The samples (sachet water) were labeled according to the brands and transported in ice packs to the laboratory and examined for microbial analysis as follows:

PRIMARY ISOLATION

Primary isolation was done using MacConkey broth, a sterile 10ml syringe and needle and dispensed aseptically into 5 bottles each. The samples were dispensed into one bottle containing 50ml of the media broth. Each bottle contained an inverted Durham tube. The bottles were tightly closed and shaken to distribute the sample uniformly throughout the medium and to make sure the inverted Durham tube is full of broth and there is no air bubble trapped inside it. The bottles were then incubated at 37°C for 24 hours. After 24 hours it was observed that the tubes from the presumptive fermentation test shows gas and acid formation by a change in color from purple to amber yellow and entrapment of gas in the Durham tube. Enumeration of Bacterial population total bacterial count and coli form count in water samples were done in triplicates. Serial dilutions of water samples were made with peptone water and placed on

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Nutrient agar to determine total bacterial count (TBC) and Macconkey agar to determine Total Coli form Count (TTC).

The plates were incubated at 37⁰ for 24 hours. The bacterial isolated were also identified based on the biochemical tests. Following the culturing and isolation, the samples of sachet water were represented according to their brands with letters A, B, C, D and E.

DATA ANALYSIS TECHNIQUE

The data was analyzed using simple percentages in tables and charts.

PRESENTATION OF RESULTS

Research Question I: What are the possible micro-organisms found in sachet water sold in schools in Rivers State.

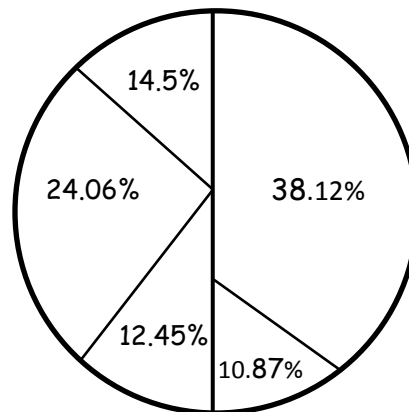
Table 1: Showing the Type of Microorganisms Found in Sachets Water.

S/N	MICRO-ORGANISMS	SAMPLES				
		A	B	C	D	E
1	Staphylococcus aureus	✓	✓			✓
2	Salmonella			✓		✓
3	Shiegella		✓			
4	Vibro-species	✓		✓	✓	
5	Escherichia Coli			✓	✓	✓
6	Feacal Coliform			✓		
7	Streptococci	✓				

The table shows that Staphylococcus aureus are found in sample A, B and E, Vibrospecies are found in sample B and D. Escherichacoli were isolated in samples C, D and E, Streptococci were isolated in sample A while feacal coli form was isolated in Sample A.

Research Question 2: What is the quantity in percentage of micro-organism found in each brand of sachet water?

Table 2: Chart showing percentage of Bacteria isolated from the samples



In above table, sample A = 38.12, B = 10.87, C = 12.45, D = 24.06 and E=14.5%.

DISCUSSION OF RESULTS

Table I: Shows that micro-organisms are found in all the brands of sachet water examined. The micro-organisms isolated were staphylococcus aureus found in Sample A, B and E, Salmonella found in Samples C and E, Shiegella found sample B, Vibro-species found sample B and D, Escherichia coli found in sample C, D, E, Feacal coli form found in sample C, and Streptococci found in Sample A. this finding is in line with the study done in Ghana which reported that various brands of sachet water produced in the municipality were contaminated with Escherichia coli and Staphylococcus aureus, (Doodoo, 2016). It has been established that when water contains coli form bacteria in a level greater than one per 100ml of water, it therefore means that the water contain pathogens that causes acute intestinal illness that may be fatal for infants, the elderly and those who are sick (Olowe, 2005).

The chart shows in percentages the quantity of micro-organisms found in sachet water examined in Samples A, B, C, D and E. Sample A was 32.12%, B=10.87%, C=12.45%, D=24.06% and E=14.5%. It is a known fact that contaminated water triggers unfavorable health conditions to man. This is in agreement with that of World Health

Organization (WHO, 2008), who stated that good water is water that is clear, tasteless, odorless, colorless and free from poisonous, corroding and contaminating substances and disease-causing organisms. The California state water board (1963) characterizes water pollution as any impairment of its qualities that adversely and unreasonably affects its subsequent beneficial use.

SUMMARY

This experimental study was carried out to determine the microbial quality of Sachet water sold in secondary schools in Ogba/Egbema/Ndoni local government area of Rivers State. To achieve the purpose of this study, five (5) samples were randomly sampled from Sachets water sold in the area and subjected to laboratory analysis. The findings show that sachet water contains various types and various quality of micro-organisms. The percentage of micro-organisms found in sachets water examined varies.

CONCLUSIONS

Sachet water sold in our secondary and primary schools in Rivers State does not meet the standard of World Health Organization, which states that good quality water is water that is tasteless, odorless, colorless and free from poisonous, corroding and contaminated substance and disease causing organism.

RECOMMENDATION

Based on the findings, the following recommendations were made:

1. Assessment of water quality every stage of factory production - preproduction, production and post-production stages.
2. National agency for food and drug administration and control (NAFDAC) and ministry of Health should be sure that producers of packaged water comply with national guidelines.
3. Communities and school children should be enlightened on the effects of patronizing fake water vendors.

4. Sachet water producers should do necessary investigations to identify the point of entry of contaminants and guide against it.

IMPLICATION FOR THE HEALTH OF THE STUDENTS

The health effect of drinking contaminated water by school children ranges from physical impact to severe illness or even death. Some of the effect of drinking contaminated water include gastrointestinal and stomach illnesses such as nausea, vomiting, cramps, diarrhea, etc.

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