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Bacteriological Analysis of Sachet Water Vended Within and Outside Kebbi State Polytechnic Dakingari, Kebbi State, Nigeria

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ABSTRACT

Water is a major component of all living creatures (both plans and animals) and none of the cell can develop and grow without water. Drinking of clean and uncontaminated or treated water is essential to quality health and wellbeing of man. This research was conducted to determine the Bacteriological Analysis of Sachet Water Vended Within and Outside Kebbi State Polytechnic Dakingari, Kebbi State, Nigeria. Ten (10) samples of sachet water collected, were cultured under aseptic and hygienic conditions following all processes of disinfection of glassware and work bench, sterilization of media and glass wares, all of the samples do not show any result with significant value indicating the presence of any of the targeted bacterial causing critical illness and neglected tropical diseases; *Pseudomonas aeroginosa, Escherichia coli, Shigella specie, Salmonella typhi, Klebseilla pneumonia.* All were absent in the samples tested. Thus, a clear indication that the water samples are within WHO, UNICEF, NAFDAC, SON standards and hence fit for human consumption and other domestic and industrial purposes, moreover, the water should also be tested physio-chemically so for pH, taste, colour, odour, free dissolved CO_2 , and total hardness. This would increase their level of acceptance as it has significant values in adding to the quality of communal drinking water.

Keywords: Coliform bacteria, living organism, Microbiological quality, packaged water.

1. INTRODUCTION

Water is necessary to human life, both for bathing, drinking and other domestic activities, the demand for clean portable drinking water, and expansion of businesses has leads to the production of sachet water to meet up with market demands. Potable drinking water serve as an important pillar for primary prevention of diseases and it continues to be the foundation for the prevention and control of water borne diseases (WHO, 2010, Isa *et al.,* 2013). Water testing for microbiological quality or safety rests on the ability of a microbiologist to determine Coliform bacteria and other contaminants in, lakes, ground or coastal ocean water to be sure that the water is safe for human consumption (Khan *et al.*, 1992; Welch *et al.,* 2000 and Andrew, 1998). However, the available sanitary facilities cannot sustain the growing population and habit may also lead to contamination of surface water sources with faecal materials either directly or indirectly. (Calamari *et al.,* 1994). Sachet- water or pure water is classified as food and is regulated and screened by National Agency for Food and Drug Administration and control in Nigeria, whose bacteriological standards are as recommended by World Health Organization (Afiukwa *et al.*, 2010). Many people in rural and urban communities rely on sachet water as the source(s) of their drinking water supply believing it to be clean and fit for consumption though analysis and studies confirm it not true. The integrity of these sachet waters is doubtful, in fact, reports abounds that most of the factories producing do not treat their sachet waters before selling to the public (Oladipo *et al.*, 2009). Coliforms are indicators of other potentially harmful microorganisms in drinking water. The organisms belongs to the order Eubacteria (true bacteria) and family Enterobacteriaceae. The members of this family are heterogenous small gram-negative rods that ferment sugars with the production of acid and gas. They give a positive catalase and negative oxidase reaction except a few strain of Erwinia which reduce nitrate to nitrite and in Taumella family which are motile strains that do not exhibit peritrichous flagellation (Douglas, 2006). Collectively, this group of gram-negative bacilli (with exception of proteus) is referred to as “coliform” because they share similar morphological and biochemical characteristics, with the exception of proteus, these organism ferment lactose, which are useful characteristic for differentiating them from salmonella and shigella. Safe drinking water is a basic need for human development, health and well-being; it is an internationally accepted human right (WHO, 2001This research is aimed to determine the microbiological quality of packaged water sold within and outside Kebbi State Polytechnic Dakingari. Water borne diseases are among the implications of drinking untreated water that does not meet the standard and recommendations of the World Health Organization (WHO).

2. MATERIAL AND METHODS

Some samples of sachet water brands (10) purchased randomly within and outside Kebbi State Polytechnic Dakingari, were transported in cool boxes cultured under aseptic under aseptic and hygienic conditions following all processes of disinfection of glassware samples and work bench, sterilization

of media,glass wares, inoculation of all the each sample per petridis pair, all of the samples do not show any result with significant value indicating the presence of any of the targeted bacterial causing critical illness and neglected tropical diseases; *Pseudomonas aeroginosa, Escherichia coli, Shigella specie, Salmonella typhi, Klebseilla pneumonia.* All were absent in the samples tested. Thus, a clear indication that the water samples were within WHO, UNICEF, NAFDAC, SON standards and hence fit for human consumption and other domestic and industrial purposes, moreover, the water should also be tested physio-chemically so for pH, taste, colour, odour, free dissolved CO_2, and total hardness. This would increase their level of acceptance as it has significant values in adding to the quality of communal drinking water.

A. SAMPLES INCLUDE

A	B	C	D	E	F	G	H	I	J
ADN	DFLT	C. DBH	SBL	E. YTWY	MJI	SRY	RJY	BZBRM	SRF

B. MEDIA PREPARATION

Media	Amount (g)	Amount of distilled water
MacConkey Agar	18.8g	400mls
Nutrient Agar	11.2g	400mls
Peptone Water	1.35g	400mls

C. STERILIZATION PROCEDURE

The prepared media were autoclaved at the temperature of 121^{o}C for 15minutes, glass wares (Petri dishes and conical flasks) were sterilized in hot air oven at the temperature of 180^{o}C for 2hours.

D. INOCULATION PROCEDURE

Water samples were purchased from the manufacturers within the two neighboring communities, Dakingari (6 sample) and Suru (4 sample), which were conveyed to the laboratory in a coolant containing ice within the shortest possible time of less than an hour of collection from factory. The surface of each of the sample was disinfected by rubbing the surface with cotton wool dipped in methylated spirit (70% ethanol). With the aid of a syringe, 1ml from each of the water sample was collected and transferred into a test tube containing 9mls of peptone water (diluent), then each of the mixture was taken with a syringe (1ml each) and transferred into a petri dish and swirled. The agar was pour-plated into the petri dish containing the inoculated sample, swirled and was allowed to solidify.

E. The plates (petri dishes) containing the inoculated samples and solidified agar were incubated for 24hours at the temperature of 37^{o}C.

F. RESULTS:

SAMPLE A (ADN)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^{3}$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^{2}$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Klebseilla pneumoniae*	NIL	NIL Cfu/ml

SAMPLE B (DFLT)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^{3}$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^{2}$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Klebseilla pneumoniae*	NIL	NIL Cfu/ml

SAMPLE C (DBH)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^{3}$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^{2}$Cfu/ml

3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

SAMPLE D (SBL)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^3$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^2$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

SAMPLE E (YTWY)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^3$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^2$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

SAMPLE F (MJI)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^3$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^2$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

SAMPLE G (SRY)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^3$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^2$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

SAMPLE H (RYJ)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^3$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^2$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

SAMPLE I (BZBRM)

S/no	Test	Count	Limit
1	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^3$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^2$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

SAMPLE J (SRF)

S/no	Test	Count	Limit
1.	Total Aerobic Mesophylic Plate Count	NIL	$<1.0\times10^3$Cfu/ml
2	P*seudomonas aeroginosa*	NIL	$<1.0\times10^2$Cfu/ml
3	*Escherichia coli*	NIL	NIL Cfu/ml
4	*Shigella spp.*	NIL	NIL Cfu/ml
5	*Salmonella typhi*	NIL	NIL Cfu/ml
6	*Kiebsella pneumoniae*	NIL	NIL Cfu/ml

3. RESULT DISCUSSION

From all the 10 (ten) samples of sachet water collected, cultured under aseptic and hygienic conditions following all processes of disinfection of glassware and work bench, sterilization of media and glass wares, all of the samples do not show any result with significant value indicating the presence of any of the targeted bacterial causing critical illness and neglected tropical diseases; *Pseudomonas aeroginosa, Escherichia coli, Shigella specie, Salmonella typhi, Klebseilla pneumonia.* All were absent in the samples tested. Thus, a clear indication that the water samples are within WHO, UNICEF, NAFDAC, SON standards and hence fit for human consumption and other domestic and industrial purposes, moreover, the water should also be tested physio-chemically so for pH, taste, color, odor, free dissolved CO^{-2}, and total hardness. This would increase their level of acceptance as it has significant values in adding to the quality of communal drinking water.

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