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Qualitative Assessments of Registered Sachet Water in Igboho, Southwest Nigeria

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ABSTRACT- Access to clean and safe drinking water is a fundamental human right, crucial for achieving Sustainable Development Goals (SDGs), particularly in developing nations like Nigeria. Despite global efforts to fulfill SDG 6, addressing clean water and sanitation, many regions in Nigeria still grapple with the challenge of delivering potable water to their communities. In Nigeria, a prevalent solution to this issue is the packaging and sale of portable water in sachets, attracting numerous local entrepreneurs to meet rising demand. However, a disconcerting issue within this sachet water industry is the inconsistent quality of water produced. Some entities prioritize profit over public health, disregarding water quality even when approved by regulatory agencies like the National Agency for Food and Drug Administration and Control (NAFDAC). This negligence has facilitated the contamination of water by harmful microorganisms. Igboho, an ancient southwest Nigerian town, exemplifies this dilemma. Despite having only four registered sachet water industries, the community's need for reliable clean water remains substantial. To address this concern, this study collected 5-litre samples labeled as Samples A, B, C, and D from these four industries. Comprehensive physicochemical and bacteriological analyses was conducted at 24 hrs following standard procedures, assessed microbial load and types. Remarkably, the study's findings reveal that all examined sachet water samples meet the standards for safe drinking water. Their physicochemical parameters align with NAFDAC's tolerable limits, and bacteriological requirements are met, with an absence of coliforms in all samples.

The study revealed that the suitability of water for drinking is not solely determined by the local environment in which the water industry is situated; rather, it is contingent upon proper sanitation practices. Therefore, routine checks by regulatory bodies like NAFDAC are vital to ensure ongoing safety and quality in sachet water production.

Keywords: clean water, sachet water, NAFDAC, water quality, sustainable development goals.

Introduction

Ensuring access to clean and safe drinking water is an inherent human right (Whelan and Willis, 2007; Semba et al., 2009)) a pivotal element for the realization of Sustainable Development Goals (SDGs), particularly in regions grappling with development challenges such as Nigeria. Despite global endeavours to achieve SDG 6, which focuses on clean water and sanitation (Adeel, 2017). rural communities in Nigeria confront a significant challenge when it comes to securing safe water sources as more than 70% of households lack access to improved water supply and resort to self-supplied water sources, leaving them vulnerable to waterborne diseases (Ishaku et al., 2011). A substantial portion of Nigeria continues to struggle with the essential task of providing its communities with safe drinking water. In Nigeria, a common response to this challenge is the production and sale of packaged drinking water in sachets (Dada, 2009), a move that has attracted a multitude of local entrepreneurs to meet the growing demand.

Regrettably, a concerning issue within this sachet water industry pertains to the inconsistent quality of the water produced (Olaoye and Onilude, 2009). Some operators prioritize financial gain over public health, often disregarding water quality standards even when they are sanctioned by regulatory bodies like the National Agency

for Food and Drug Administration and Control (NAFDAC). This neglect has paved the way for the contamination of water by harmful microorganisms, posing a grave risk to public health.

Igboho, an age-old town in southwestern Nigeria, serves as a prime example of this predicament. Even though the town boasts only four registered sachet water factories, the demand for dependable and clean water remains significant within the community. The objective of this research is to perform a comprehensive analysis, encompassing both physicochemical and bacteriological assessments, to determine if the sampled sachet water meets the established standards for safe drinking water.

Methodology

Five-liter samples, labelled as Samples A, B, C, and D, were collected into clean kegs from the four officially registered sachet water facilities in Igboho town with Latitude: 8.8375° N Longitude: 3.7561° E and an altitude of 405m – 445m above sea level. These samples were examined physically and information on the packages were recorded before they subsequently underwent comprehensive physicochemical and bacteriological analyses within 24 hours of production, using standard procedures to evaluate the microbial content and types present in each of them.

Results:

Table 1: Showing basic information of the samples

Sample name	**A**	**B**	**C**	**D**
Company name:	**Withheld**	**Withheld**	**Withheld**	**Withheld**
NAFDAC Reg. No	**Cl-3068L**	**E1-0082L**	**01-2064L**	**01-1113L**
Address	**1, Adarin Compound, Modeke Igboho, Oyo State.**	Agbomeji Compound, Ajegunle Area, Igboho, Oyo State.	25, Peregede street, BonniIgboho, Oyo State.	**Along Ilorin road, Igbope, Oyo State.**
Manufacturing date:	**23/01/2023**	**23/01/2023**	**23/01/2023**	**23/01/2023**

Table 2a: Results of Physicochemical analysis of selected sachet water samples in Igboho with the maximum permissible level

PARAMETERS	A	B	C	D	Maximum Permissible levels
Date and time of Analysis	06-02-2022 08:00a.m	06-02-2022 08:00a.m	06-02-2022 08:00a.m	06-02-2022 08:00a.m	
Appearance	Clear	Clear	Clear	Clear	
Colour (H.U)	15.0	15.0	15.0	15.0	16
Taste and Odour	Unobjectionable				
pH at Laboratory	7.8	7.6	7.8	7.8	6.5 – 8.5
Turbidity (FTU)	1.08	1.77	2.01	2.11	5
Dissolved Oxygen	0.88	0.63	0.78	0.98	NS
Temperature ^{o}C	31.40	31.00	31.10	31.2	Ambient
Total Alkalinity (mg/l)	486.00	216.00	218.00	50.00	
Total Hardness (mg/l)	270.00	106.00	78.00	22.00	150
Calcium Hardness (mg/l)	154.00	52.00	54.00	18.00	NS
Calcium ions (mg/l)	61.60	20.88	21.60	7.2	NS

NS=Not Stated

Table 2b: Results of Physicochemical analysis of selected sachet water samples in Igboho with the maximum permissible level

PARAMETERS	A	B	C	D	Maximum Permissible levels
Magnesium hardness (mg/l)	116.00	54.00	24.00	04.00	NS
Magnesium ion (mg/l)	29.00	13.50	06.00	01.00	20
Chloride ions (mg/l)	15.00	5.50	5.00	5.50	250
Iron (mg/l)	0.00	0.00	0.01	0.70	0.3
Silica (mg/l)	0.00	0.02	0.00	0.34	NS
Nitrate Nitrogen (NO_3^{2-}) (mg/l)	0.001	0.00	0.00	0.00	50
Nitrite Nitrogen (NO_2^{2-}) (mg/l)	0.009	0.00	0.00	0.00	0.2
Copper (mg/l)	0.00	0.00	0.00	0.00	1
Manganese (mg/l)	0.00	0.00	0.00	0.00	0.2
Aluminium (mg/l)	0.00	0.00	0.00	0.00	0.2
Fluoride (mg/l)	0.00	0.00	0.00	0.00	1.5
Sulphide (mg/l)	0.00	0.00	0.00	0.00	NS
Chromium (mg/l)	0.06	0.05	0.05	0.05	0.05

NS=Not Stated

Table 2c: Results of Physicochemical analysis of selected sachet water samples in Igboho with the maximum permissible level

PARAMETERS	A	B	C	D	Maximum Permissible levels
Conductivity (mg/l)	1012	601.3	633.9	127.7	1000
Sulphate (mg/l)	0.00	0.00	0.00	0.00	100
Potassium (mg/l)	01.00	0.00	0.00	0.00	NS
Phosphate (mg/l)	0.00	0.09	0.00	0.29	NS
Zinc (mg/l)	0.18	0.18	0.00	0.18	3
Carbonate (mg/l)	270.00	106.00	78.00	22.00	NS
Bicarbonate (mg/l)	1000.4	366	317.2	97.60	NS
Flocculation (PPM)	15.00	15.00	15.00	15.00	NS
Chloride residual (mg/l)	Nil	Nil	Nil	Nil	200
COD (mg/l)	5.00	11.00	6.00	9.00	NS
BOD (mg/l)	-	-	-	-	NS
Total filtrable solids (mg/l)/Nitrite	0.01	0.00	0.00	0.00	NS
Total non-filtrable solids (mg/l)/TDS	275.7	174.3	182.5	36.75	500

NS=Not State

Table3: Results of Bacteriological analysis of the selected sachet water sample in Igboho Metropolis and their maximum permissible levels.

Samples		A	B	C	D	Maximum Permitted levels(cfu/ml)
Colonies per CC Growing On Nutrient Agar at 37°C in 24 Hours		Nil	03	07	Nil	10
Presumptive Results of Coliform Organisms at 48 Hours of Incubation at 37°C.	50ml	0	0	0	0	0
	10ml	0	0	0	0	0
	1ml	0	0	0	0	0
Most probably Number of Bacteria Coliform per 100ml of Water Sample		0	0	0	0	0

Discussions

From the results of the physicochemical properties, Sample A has significantly high total alkalinity at 486.00 mg/l. Elevated alkalinity can affect the taste and quality of the water. Chloride ions in Sample A is at 15.00 mg/l, which is still within the permissible limit, but it's at the upper end. When Chloride levels is too high, can affect the taste of the water. Sample D has an iron concentration of 0.70 mg/l, which exceeds the permissible level of 0.3 mg/l. Elevated iron levels can lead to water discoloration and an unpleasant metallic taste. Sample A has a relatively high conductivity value of 1012 mg/l, which is slightly above the maximum permissible level of 1000 mg/l. High conductivity can indicate the presence of dissolved solids in the water.

In the light of the foregoing, based on the results of the physicochemical properties, sample B and C have the best set of results. However, from the results of the bacteriological analysis, all the four samples (Samples A, B, C, and D) are fit for drinking. The coliform organisms in all the samples are well below the maximum permitted levels, indicating that they meet the standard for safe drinking water.

Conclusion and Recommendation

This study revealed that the suitability of water for drinking is not solely determined by the local environment in which the water industry is situated; rather, it is contingent upon proper sanitation practices. However, it is recommended that these sets of analyses be repeated on the same sets of samples after a longer time such as (7 days, 2 weeks, and a month) after production to se the whether there will be much variance in the results. Routine checks by regulatory bodies like NAFDAC are vital to ensure ongoing safety and quality in sachet water production

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