

Physicochemical assessment of bottled water sold in Lagos metropolis, south-western Nigeria



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Introduction

- ❖ Water is Life.
- ❖ Safe Drinking water is vital to human health. It is one of the basic requirement of human consumption.
- ❖ Water not only accounts for 60% of the human body weight on average, it is also requirement of the human body for normal body functioning.
- ❖ Unfortunately, roughly 1 in 10 people on the planet (785 million) are living without access to even basic drinking water.¹
- ❖ Out of the about 140 million people projected to still be drawing water from untreated surface water, more than 50% of them are said to be living in sub-Saharan Africa.²
- ❖ Consumption of unsafe drinking water is linked to number of widespread diseases like cholera, diarrhoea, typhoid etc.
- ❖ Sustainable Development Goal 6.1 aims to make available safe and affordable quality drinking water for all by the year 2030.
- ❖ The Federal Government authorises private entities to treat and package water for sale as a means to make drinking water available to as many Nigerians as possible.
- ❖ Three major agencies are responsible for regulating the quality of drinking water and their producers. They are the National Agency for Food and Drug Administration (NAFDAC), Standard Organisation of Nigeria (SON) and the Consumer Protection Council (CPC).
- ❖ These three agencies alongside other stakeholders have drafted a document called the Nigerian Standard for Drinking Water Quality (NSDWQ), which serves as a standard for the water industry.

Aim

This study seeks to assess the quality of Bottled water consumed in Nigeria as a means to meet its SDG 6.1 goal with Lagos as a case study

Objectives

To achieve this, the study set out with the following objectives

- ❑ To assess the available of bottled water products in the state via the sampling
- ❑ To assess the safety of the sample products by testing for specific physicochemical parameters.
- ❑ To compare the results of the tests against WHO guidelines and NSDWQ recommendations.

Method

To achieve this goal, five (5) available bottled water products were sampled from each of the twenty local governments, yielding sixty-five (65) unique samples.

The physicochemical parameters analysed for each sample using the American Public Health Association standard methods were: temperature, pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), calcium, magnesium, chloride, total alkalinity, sulphate, sodium, potassium, manganese, cobalt, zinc, iron, copper and nickel.

TABLE 1: LIST OF SAMPLES BOTTLED WATER BRANDS

AQUADANA	AQUAFINA	AQUARITE	AQUA SPLENDID	AQUA LIFESPRIING	CASCADE	CMF	CRUX	CWAY	DANNYVINE
DEMDEM	DUDU	ELLO	ENNI	ESTEEX	EVA	EVINCE	FINS	FINCAP	FUNTUNA
GEOSAN	GOAL	GOSSY	IBAT WATER	IVY DEW	JAY Z	JEETOP	JAYSWILL	JULU-LIFE	KAINOS
KASHWATER	KOOWO	LASENA	LOGGERS	MAGJOY	MAJA	MASCHIL	MOREEK	MOTKLEEN	MR.V
NAW	NELLA	NEUVO	NIRVANA	NESTLE PURELIFE	OMEE	PAX	POLCOOP	PRESFY	REYEON
SACTUS	SPARKLETT	SHALLY	SKORD	SNOW FLAKES	SOMAX	SOPETIE	SWAN	TASTY TIME	THAMES
TLM	TOTAL GIVERS	TWIZZA	VARICH COOL	VASER					

References

- ¹UNW-DPAC. (2015). The Human Right to Water and Sanitation, Media brief: 50014 Zaragoza, Spain.
- ²WHO-UNICEF-JMP. (2017). Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines. Switzerland: WHO Library Cataloguing-in-Publication Data.
- ³WHO (2017). Guideline for drinking water quality: fourth edition incorporating the first addendum. Geneva.
- ⁴Nigerian Standard for Drinking Water Quality NIS 554, 2015.

Result

SAMPLES	TEMP °C	pH	COND (µs/cm)	TDS (mg/L)	SULPHATE (mg/L)	HARDNESS (mg/L)	Ca (mg/L)	Mg (mg/L)	ALKALINITY (mg/L)	Cl (mg/L)	Na (mg/L)	K (mg/L)	Mn (mg/L)	Co (mg/L)	Zn (mg/L)	Fe (mg/L)	Cu (mg/L)	Ni (mg/L)
AQUADANA	25.3	8.35	322	193.6	53.60	7.27	2.63	0.34	142.33	6	34.432	1.68	0.0545	<0.005	0.1635	0.519	0.0085	<0.005
AQUAFINA	28.3	7.87	85	51.1	57.35	15.87	2.34	2.69	52.87	12.67	8.085	0.945	0	<0.005	0.907	0.155	0.009	<0.005
AQUARITE	29	6.52	108.6	65.3	41.79	5.95	1.46	0.67	65.07	10	22.605	2.52	0.035	<0.005	0.852	1.35	0	<0.005
CASCADE	27.8	8.23	163.1	98.4	32.56	10.58	2.34	1.35	126.07	24	59.2025	1.92	0.05	<0.005	0	2.11	0.0285	<0.005
CWAY	28	8.06	282	169.4	43.23	3.31	0	0.85	158.6	4	41.84	0.72	0.085	<0.005	0.6815	0.965	0.02	<0.005
EVA	26.6	8.16	217	130.3	44.96	19.84	5.26	2.02	105.73	10	18.69	0.96	0	<0.005	0.1295	1.305	0.0955	<0.005
MR.V	26.4	7.25	4.1	2.48	39.19	0	0	0	12.2	0	4.1055	0.72	0	<0.005	0.075	0.02	0.011	<0.005
NESTLE PURELIFE	25.9	6.95	285	71.2	46.97	79.99	37.72	0.5	12.2	58	1.1575	0.48	0	<0.005	0.7465	0.005	0.003	<0.005
NIRVANA	26.3	7.35	100.9	60.7	44.09	21.28	5.85	2.19	61	9.33	5.0315	2.88	0	<0.005	0.2275	0.43	0.037	<0.005
WHO (2017)	28	6.5 – 8.5	1000	NA	250	200	150	NA	NA	250	200	NA	0.4	NA	5	0.3	2	0.07
NSDWQ (2015)	28	6.5 - 8.5	1000	500	100	200	150	20	NA	250	200	NA	0.2	NA	3	0.3	1	0.02

- ❖ The Table above shows the parameter values for the six most available brands on the market during sampling.
- ❖ Determining the safety of water is a complex process which requires taking all parameter values into consideration.
- Iron for 6 out of 9 sampled brands shown above exceed recommendation. However, this doesn't mean the water isn't safe for consumption.
- The high concentration of Iron in samples can be linked to the high concentration of Iron in Lagos soil. These concentrations have no significant health impact and only affect the taste of water product.
- ❖ Some parameters don't have standard values because WHO considers them redundant.
- Samples with Total Alkalinity value tending towards 200 mg/L, have pH values closer to 8.5. This shows a correlation between pH and Total Alkalinity. Samples with pH of 8.5, which is the pH limit, are expected to have Total Alkalinity values about 200 mg/L. Hence, the lack of value standard for Total Alkalinity from WHO while some countries have 200 mg/L as the stated standard.
- ❖ Nickel and Cobalt are Potentially Toxic Metal with significant help impacts found in Lagos water. Neither metal was detected in any of the samples. Cobalt isn't expected to be found in drinking water.

Conclusion

The physicochemical parameters of the water samples were within the acceptable limits recommended by World Health Organization (WHO) and Nigerian Standard for Drinking Water Quality (NSDWQ), with the exception of iron for most samples, therefore products are safe for consumption.

Recommendation

Continuous monitoring is necessary to ensure bottle water products remain safe for human consumption in line with the Sustainable Development Goal.