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Evaluation of the Water Quality of Two Different Bottled Waters Supplied Onboard Offshore Service Boat

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A B S T R A C T

The nature of water supplied onboard vessels denotes the fastidious problem with the supply of clean drinkable water. Intendedly, the provision of water to drink, for the preparation of food, for washing together with water to bathe can possibly be polluted at different stages, either direct from the source of the water or during loading. Based on this conspicuous reason of pollution or contaminants in drinking water, the evaluation of the water quality of two different bottled waters supplied onboard offshore service boats has been done. The two bottled waters were taken from two separate companies that supplied water to the Oil Service Tug boat for a water quality test. One of the bottled water was labelled – S and the other bottled water labelled – D according to the first initials of the two companies that supply the water respectively. These dissimilar samples of S and D were stored in a cool flask of about 250ml of ice block at less than 100C and then taken to the laboratory for physical, chemical coupled with biological evaluations. The test for the colour and odour shows colourless and unobjectionable and the other test results are pH is 6.6, turbidity - TDS – 2mg/L, electrical conductivity – 4us/cm, total alkalinity -20.8mg/L, chloride -60mg/L, total hardness – 0.1mg/L, sulphate -<1, nitrate – 0.09, total iron -<0.06 , lead -<0.01 and coliform is 0.00 cfu/100ml for Sample S and Sample D results are pH – 7.2, turbidity - <0.1, TDS – 23mg/L, electrical conductivity – 46.6us/cm, total alkalinity -62.2mg/L, chloride -75mg/L, total hardness – 0.2mg/L, sulphate -<1, nitrate – 0.04, total iron - <0.06, lead -<0.01 and coliform is 0.00 cfu/100ml respectively. These values were compared to WHO standard water values and they are in compliance with it, showing that the water is good for drinking. Also, the water is devoid of bacteria, has no suspended solid particles, and it is hygienically good for consumption.

Keywords: *Evaluation, Water Quality, Different Bottled Water, Supply Onboard, Offshore Service Boat.*

1. INTRODUCTION

Drinkable water is the incomparable staple that is utilized by all people living on planet earth despite their religion, race, socio – economic position or place (CD, 1998; WHO, 2001; Puntarić *et al.*, 2012). The nature of water supplied onboard vessels denotes the fastidious problem with the supply of clean drinkable water. Intendedly, the provision of water to drink, for the preparation of food, for washing together with water to bathe can possibly be polluted at different stages, either direct from the source of the water or during loading (Grenfell *et al*.,2008).

Precisely, onboard vessels, the function of the water supply are the job of the engine officer and the duty of the second mate or the chief officer is to monitor the water in the supply whether it meets the standard. The monitoring of the water will start on the ground through the healthcare units before conveying the water onboard. WHO cautions of water-associated challenges, particularly when the vessel is sailing in the sea of developing countries like Nigeria about the different types of infectious diseases that are transmittable via the utilization of non-clean drinkable water (WHO, 2001). However, in order to subdue the insurrection of such diseases enhanced aseptic conditions, potable drinkable water together with appropriate infrastructural aseptic need to be in a better position. Also, inappropriate water management can bring about infectious diseases. Studies have proven that above one hundred crew members or passengers onboard vessels have health-associated challenges because of bad water (Rooney *et al*., 2004; Bert *et al*., 2014; Oldenburg *et al*., 2007; WHO, 2011).

2. LITERATURE REVIEW

The number of cruise liners that have their passengers infected onboard is increasing annually and this is aposeable to a consequential public health challenge (Bert *et al*., 2014). Very many water-related infectious diseases onboard vessels are as a result of the consumption of polluted water (Grappasonni *et al*., 2013; Rosanda and Iris, 2020).

Painstakingly, outbreaks onboard vessels transmittable through polluted water are associated with bad quality water during the period of loading onto the vessels. And as a result of this lacuna, passengers' vessels are of public pertinence due to their confined cabins being doubled for the conspicuous reason that food, together with drinkable water provided, is distributed to very many passengers. This can expose individual passengers or crew members to the

peril of diseases. Also, reports on cargo vessels may have been underestimated because many of them are not detected. Meanwhile, in order for the prevention of water-associated diseases on ships, the water supplier must make sure the water supplied is good and drinkable in accordance to WHO, 2017 guidelines on drinking water quality or the WHO standard (Rooney *et al*., 2004; WHO, 2011;WHO, 2017; Schlaich *et al*., 2009.

Grappasonni *et al.* (2013) gave a recommendable assessment of the quality together with safe water onboard merchant vessels. They recommended that the quality of the water should be looked at periodically and that chemicals together with microbiological parametric devices that can identify doable pollutant sources should be developed.

Rosanda and Iris (2020) investigated how vessels can be supplied with clean drinkable water. They advised that the drinking water onboard should be managed in accordance with hygiene together with health standards applicable all over the supplying chain.

Grenfell et al. (2008) conducted the microbiological quality of drinkable water onboard vessels docking in the United Kingdom together with Channel Island. They collated nine hundred and fifty drinkable water samples from about three hundred and forty-two vessels docking at ports, and they compared it with the guidelines for safe water onboard by WHO, and they discovered that nine percent of the water samples entailed coliforms enterococci coupled with 2.8% faeces indicators. Also, actions were embarked upon, like aerobic colony count bacteria were detected in twenty percent and 21.5% of samples, and it was recommended that they should be disposed of as routine criteria for remediation. Also, ships should embrace the World Health Organization guidelines for safe water.

Thus, in this work, the evaluation of the water quality of two different bottled waters supplied onboard an offshore service boat will be looked at in order to ascertain the quality of water the supplier is supplying to the boat and whether it meets with the WHO standard.

3. METHODOLOGY

Two bottles of bottled water were taken from two separate companies that supplied water to the Oil Service Tug boat for a water quality test. One of the bottled water was labeled – S and the other bottled water labeled – D according to the first initials of the two companies that supply the water respectively. These dissimilar samples of S and D were stored in a cool flask of about 250ml of ice block with less 10^0C and then taken to the laboratory for physical, chemical coupled with biological evaluations which encompassed pH, turbidity, color, odor, total dissolved solids, conductivity, total alkalinity, chloride, total hardness, sulphate, nitrate, total iron, lead and coliform counts and the results was taken and recorded and compared to(Koda *et al*., 2017; Mbonu *et al*., 2021; Otuaro and Igoma, 2025).

RESULTS AND DISCUSSION

4.1 RESULTS

Table 1 contains the laboratory test results of the two samples, water S and D respectively. While, **Table 2** contains WHO standard values for safe drinking water worldwide.

Table 1: Laboratory Test Results of Samples S and D

S/No.	Parameters	S	D
1	pH	6.6	7.2
2	Turbidity (NTU)	< 0.1	< 0.1
3	Colour	colourless	colourless
4	Odour	Unobjectionable	Unobjectionable
5	Total Dissolved Solids (mg/l)	2.0	23.0
6	Conductivity (us/cm)	4.0	46.6
7	Total Alkalinity (mg/l)	20.8	62.2
8	Chloride (mg/l)	60.0	75.0
9	Total Hardness (mg/l)	0.1	0.2
10	Sulphate (mg/l)	< 1.00	< 1.00
11	Nitate (mg/l)	0.09	0.04
12	Total Iron (mg/l)	< 0.06	< 0.06
13	Lead (mg/l)	< 0.01	< 0.01

14	Coliform count (cfu/100ml)	0.0	0.0

Table 2: WHO Standard Values for Safe Drinking Water

S/No.	Parameters	WHO Standard
1	pH	6.5 – 8.5
2	Turbidity (NTU)	50
3	Colour	NA
4	Odour	NA
5	Total Dissolved Solids (mg/l)	500.0
6	Conductivity (us/cm)	250.0
7	Total Alkalinity (mg/l)	NA
8	Chloride (mg/l)	250.0
9	Total Hardness (mg/l)	500.0
10	Sulphate (mg/l)	250.0
11	Nitate (mg/l)	50.0
12	Total Iron (mg/l)	0.0 – 30.0
13	Lead (mg/l)	0.01
14	Coliform count (cfu/100ml)	0

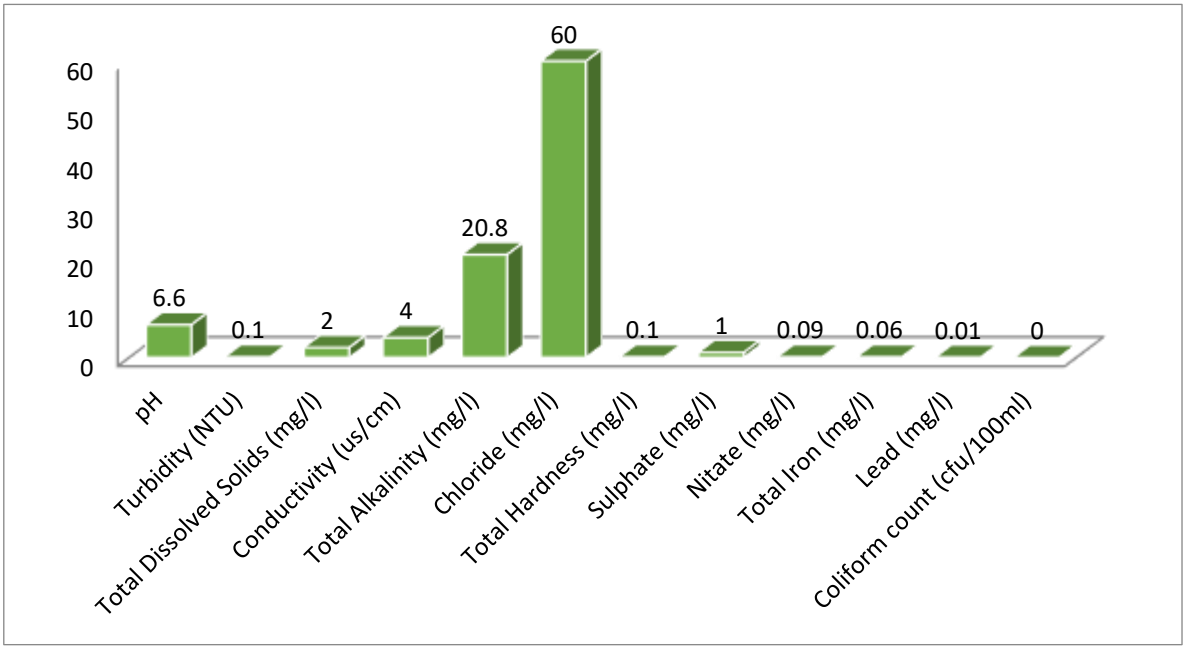

Figure 1 Single Bar Chart Representing the Parametric Laboratory Test Results of Sample 'S' Water

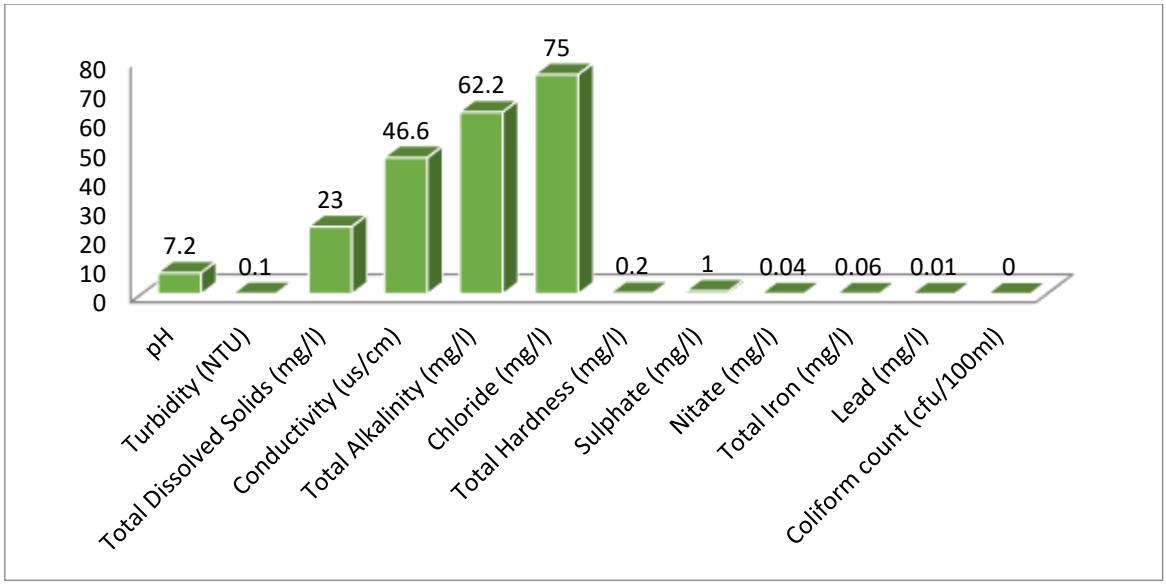

Figure 2 Single Bar Chart Representing the Parametric Laboratory Test Results of Sample 'D' Water

4.2 DISCUSSION

Figure 1 is a single - bar chart that depicts the parametric laboratory test results of sample 'S' water: it involves the entire test conducted for sample S water except the test for the colour and odour, which shows colourless and unobjectionable as tabulated in **Table 1**. The colourless and unobjectionable prove that the water has no offensive smell and that it is good for aquatic life and also good for drinking. The Figure also shows the test for pH is 6.6, turbidity - TDS – 2mg/L, electrical conductivity – 4us/cm, total alkalinity -20.8mg/L, chloride -60mg/L, total hardness – 0.1mg/L, sulphate -< 1, nitrate – 0.09, total iron -< 0.06 , lead -< 0.01 and coliform is 0.00 cfu/100ml respectively. These values were compared to the WHO standard values in **Table 2**, and they are all in agreement, thereby giving the revelation that Sample S water is clean and devoid of waterborne diseases, and it is good for drinking.

Similarly, **Figure 2** is a single bar chart representing the parametric laboratory test results of Sample D water. The test for the odour and colour as contained in Table 1 shows that the water is colourless and odourless, thereby giving proof of good water since it has no offensive smell or colour. The **Figure 2** like **Figure 1**, contains test results of pH – 7.2, turbidity - < 0.1, TDS – 23mg/L, electrical conductivity – 46.6us/cm, total alkalinity -62.2mg/L, chloride -75mg/L, total hardness – 0.2mg/L, sulphate -< 1, nitrate – 0.04, total iron - < 0.06, lead -< 0.01 and coliform is 0.00 cfu/100ml respectively. These values were compared to WHO standard water values in **Table 2**, and they are in compliance with it, showing that the water is good for drinking. Also, the water is devoid of bacterial content, has no suspended solid particles, and it is hygienically good for consumption.

CONCLUSION

The evaluation of the water quality of two different bottled waters supplied onboard offshore service boats has been done. The two bottled waters were taken from two separate companies that supplied water to the Oil Service Tug boat for a water quality test. One of the bottled water was labeled – S and the other bottled water labeled – D according to the first initials of the two companies that supply the water respectively. These dissimilar samples of S and D were stored in a cool flask of about 250ml of ice block at less than 100C and then taken to the laboratory for physical, chemical coupled with biological evaluations. The test for the colour and odour shows colourless and unobjectionable and the other test results are pH is 6.6, turbidity - TDS – 2mg/L, electrical conductivity – 4us/cm, total alkalinity -20.8mg/L, chloride -60mg/L, total hardness – 0.1mg/L, sulphate -< 1, nitrate – 0.09, total iron -< 0.06 , lead -< 0.01 and coliform is 0.00 cfu/100ml for Sample S and Sample D results are pH – 7.2, turbidity - < 0.1, TDS – 23mg/L, electrical conductivity – 46.6us/cm, total alkalinity -62.2mg/L, chloride -75mg/L, total hardness – 0.2mg/L, sulphate -< 1, nitrate – 0.04, total iron - < 0.06, lead -< 0.01 and coliform is 0.00 cfu/100ml respectively. These values were compared to WHO standard water values and they are in compliance with it, showing that the water is good for drinking. Also, the water is devoid of bacteria, has no suspended solid particles, and it is hygienically good for consumption.

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