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SUNLIGHT EFFECT ON PHYSICO-CHEMICAL PROPERTIES OF POTABLEWATER MARKETED IN PORT HARCOURT

[1] FajoyomiBridget.U., [2] John, Godson Nnamdi [3], WogaEberechi M., [4] Daodu Bamidele T

[1] Department of Microbiology Technology, School of Science Laboratory Technology, University of Port Harcourt.

[2]Department of Biochemistry/Chemistry Technology, School of Science Laboratory Technology, University of Port Harcourt

[3]Department of Microbiology Technology, School of Science Laboratory Technology, University of Port Harcourt.

[4]Department of Science Laboratory Technology, Delta State University of Science and Technology

Abstract: **1.2 billion people lack access to potable water worldwide and while only about 30 % of the Nigerian populace have access to clean drinking water. Safe drinking water is key to sustainable development, food production and quality health. The portability of 10 potable water marketed in Port Harcourt, Rivers State were analyzed. A total of 5 were exposed to sunlight for 1 month while 5 were analyzed without exposure to sunlight.The pH of the unexposed samples ranged from 5.9- 7.6, while pH for exposed samples ranged from 8.5-9.8. The Physiochemical analysis showed chlorine ranged from 10.0-15.7, lead ranged from 0.10-0.91 and turbidity ranged from 0.12-0.36. Results showed that all unexposed water sample met WHO standards for potable water for pH, turbidity, chlorine and lead. Exposed water sample did not meet all standards for a potable water for a healthy life style. This research advises that potable water stored in plastics should not be exposed to sunlight.**

Keywords: **Sunlight, Physico-Chemical, Portability, Water.**

1. INTRODUCTION

Water is one of the most essential commodities needed for the survival of eco-system (SalehandBobby, 2001). It is very abundant in nature as it's occupies about 70 % of the earth's crust. Despite its relative abundance, good quality drinking water is not readily available to man (Onweluzo and Akuagbazie, 2010). The non-availability of good quality drinking water has resulted into a number of health challenges as water is known to be a primary causative agent of many contagious diseases (Adekunle*et al.*, 2004). In developing countries of the world, 80 % of all diseases and over 30 % of deaths are related to drinking water (Onweluzo and Akuagbazie, 2010; Olaoye andOnilude, 2009). Water is a tasteless, odourless liquid at standard temperature and pressure. The colour of water and ice is, intrinsically, a very slight blue hue, although water appears colourless in small quantities. Ice also appears colourless, and water vapour is essentially invisible as a gas.Water is transparent, and thus aquatic plants can live within the water because sunlight can reach them. Only strong UV light is slightly absorbed(Ajewole2010).Water is a good solvent and is often referred to as *the universal solvent*. All the key components in cells (proteins, DNA and polysaccharides) are also dissolved in water.Pure water has a low electrical conductivity, but this increases significantly with the dissolution of a small amount of ionic material such as sodium chloride.The aim of this work is to determine the Sunlight Effect on Physico-Chemical Properties of Potable

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Water Marketed In Port Harcourt. The primary concern is to ensure that consumers are provided with water that is freefrom pathogens which could be consumed in any amount. Many infectious diseases are associated with faecally contaminated water and are a major cause of morbidity and mortality worldwide (Leclerc *et al.*, 2002; TheronandCloete, 2002). Waterborne spread of infection by these pathogenic microorganisms depends on several factors such as: the survival of these microorganisms in the water environment, the infectious dose of the microorganisms required to cause a disease in susceptible individuals, the microbiological and physico-chemical quality of the water, the presence or absence of water treatment and the season of the year (Theron and Cloete, 2002). The infectious dose of some bacteria range between 107 to 108 cells, with some enteric bacteria able to cause infections at doses as low as 101 cells (Edberg *et al.*, 2000). Viruses cannot replicate outside living cells, but can survive for extended periods in the water. The infectious dose of viruses has been established to be as low as 1 to 10 infectious particles (Leclerc *et al.*, 2002). Enteric protozoa such as *Giardia* and *Cryptosporidium* cannot replicate in water and are highly resistant to most disinfectants and antiseptics used for water treatment (Masago*et al.*, 2002).

2. MATERIALS AND METHODS

The water samples were collected from five different brands of water in Port Harcourt, Rivers State. In each factory, two sample were collected in which one was exposed to sunlight and the other was not exposed. The total number of samples collected were ten (1 from five (5) different water factory. Five samples were exposed to sunlight for one month and the other five were immediately taken to the laboratory for analysis.

Physio-Chemical Analysis

Physico-chemical parameters were carried out on the various brands of exposed an unexposed bottled water samples.

Turbidity

This is the amount of suspended particular matter in a fluid which interfere with the passage of light through water. The turbidity of each water samples was dispensed into a cuvette and placed in the chamber and the absorbance was measured. The turbidity values were recorded in nephlometer turbidity unit (NTU).

pH Determination

The water samples of different brands were transferred into different beaker each, pH meter was immersed into the sample contained in a beaker and the reading was taken.

Chlorine Test:

The reagent used are Standard silver nitrate ($AgNO_3$), 1ml of 0.5g chloride, a control standard chloride (1ml or 0.5g chloride), an aluminum hydroxide suspension, potassium chromate (K_2CrO_4) 5% and hydrogen peroxide (H_2O_2) 30%.A portion of sample was diluted into 100ml of double distilled water, 1ml of k_2Cr0_4 indicator was added.The change in color to pinkish yellow was recorded. About 20ml of the control standard was diluted to 100ml of double distilled water and 1ml of k_2S0_4 indicator was added. It was titrated with standard silver nitrate and there was a pinkish yellow color at end point. Using 100ml of double distilled water, 1ml of k_2S0_4 indicator was added, titrated with standard silver nitrate. The end point was pinkish yellow and the titration volume was titrated.

Lead Test:

The apparatus and equipment used are Beaker, flasks, solar tharmo elemental Atomic Absorption spectrophotometer (flameAAS) mode:S4=71096, Burner, Hollo Cathode lamps, Graphical display and recorder,pipets, Glassware, pressure-reducing value and volumemetricflask of suitable precision and accuracy. The reagents used are Air, Acetylene, Nitrogen dioxide gas, matal free water, stock metal, Potassium chloride solution, Aluminium nitrate solution, Hydrogen tetraoxosulphate(vi) acid (H_2S0_4), Trioxonitrate(v)acid ($HN0_3$), Perchloric acid ($HCl0_4$). Using a wet digestion method, the total volume of 100ml of H_2S0_4, $HN0_3$, and $HCl0_4$ in the ratio of 40%:40%: 20% was mixed together, 10ml of each sample was weighed into different conical flask of each samples. They were digested in a fume cupboard with a hot plate until a white fume appeared. Sample were cooled and filtered into 100ml volumetric flask and the ml was mark with distilled water. Concentration was calculated and recorded by appropriate dilution factor.

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3. RESULTS AND DISCUSSION

The safety of water in plastic bottles that have been left in the sun varies in decomposition. When water is stored properly, there is usually no toxin leakage from the plastic bottles. However, trace amount may appear after long period of exposure to sunlight. The increased in value of the results of exposed water sample of physico-chemical parameters proves that there is a chemical reaction in water when sunlight passes through it. HClO and HCl decomposition in a chlorine water in the presence of sunlight will decomposes into Oxygen and Hypochlorous acid which can cause cancer. The pH, turbidity, lead and chlorine of the exposed water samples had a significant increase after exposure for one month. This is not considered suitable for human consumption.

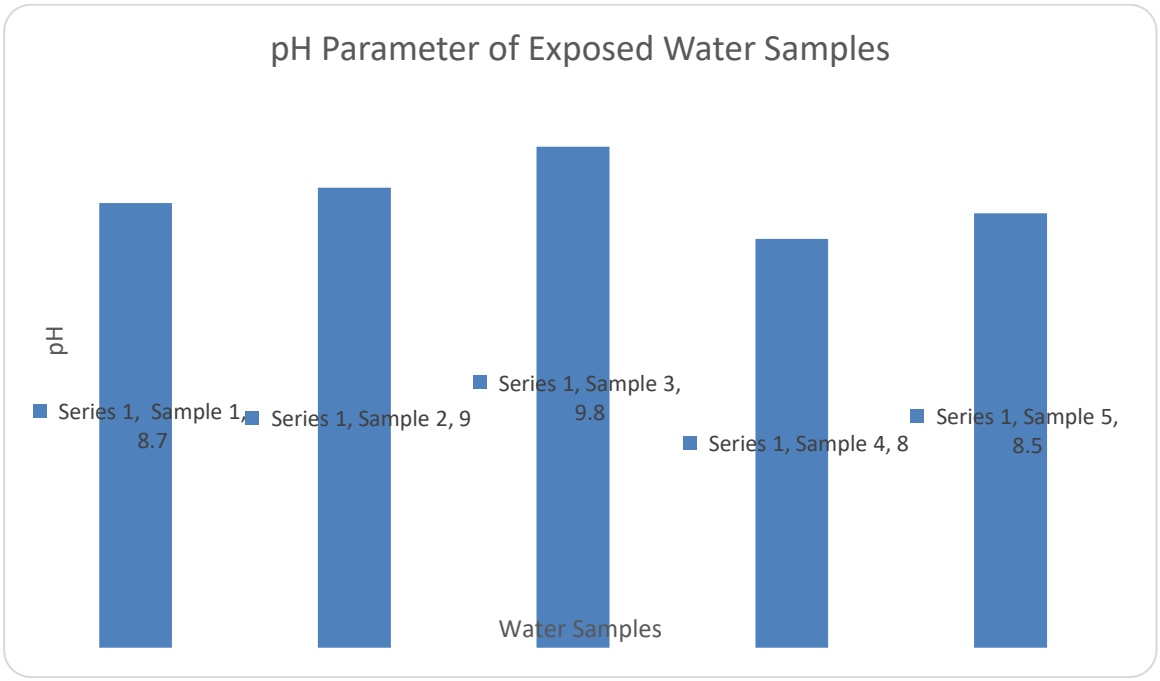

Figure 1: pH Parameter of Exposed Water Samples

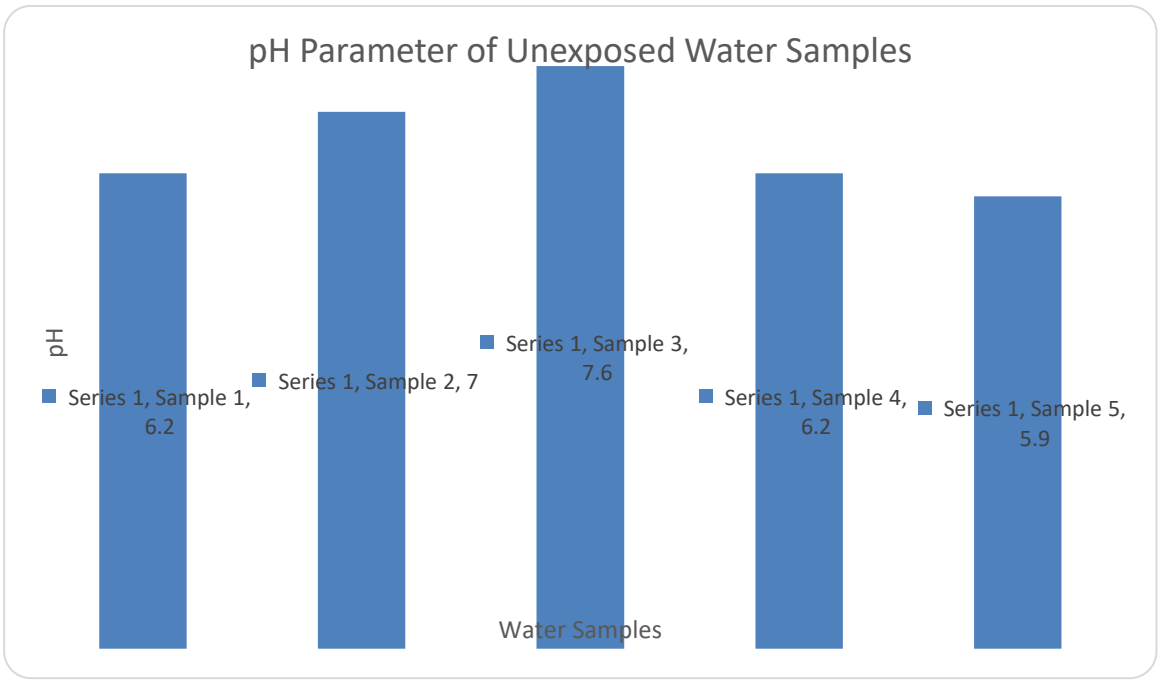

Figure 2: pH Parameter of Unexposed Water Samples

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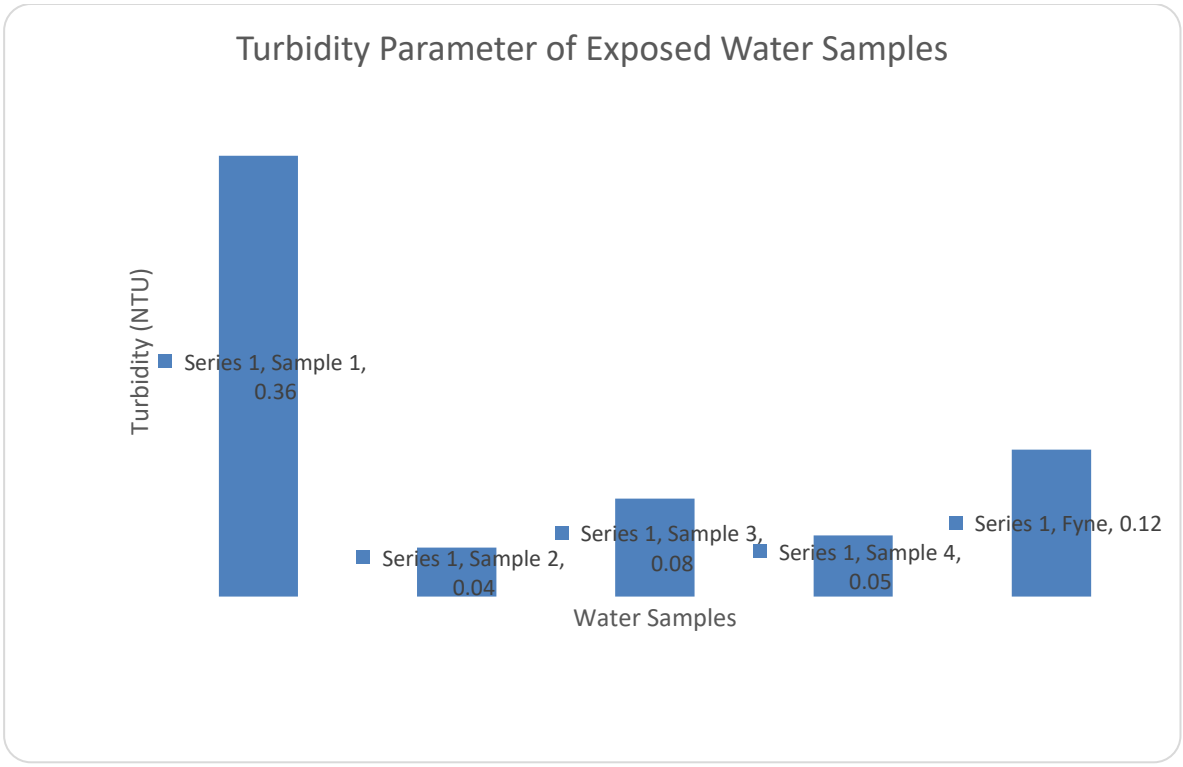

Figure 3: Turbidity Parameter of Exposed Water Samples

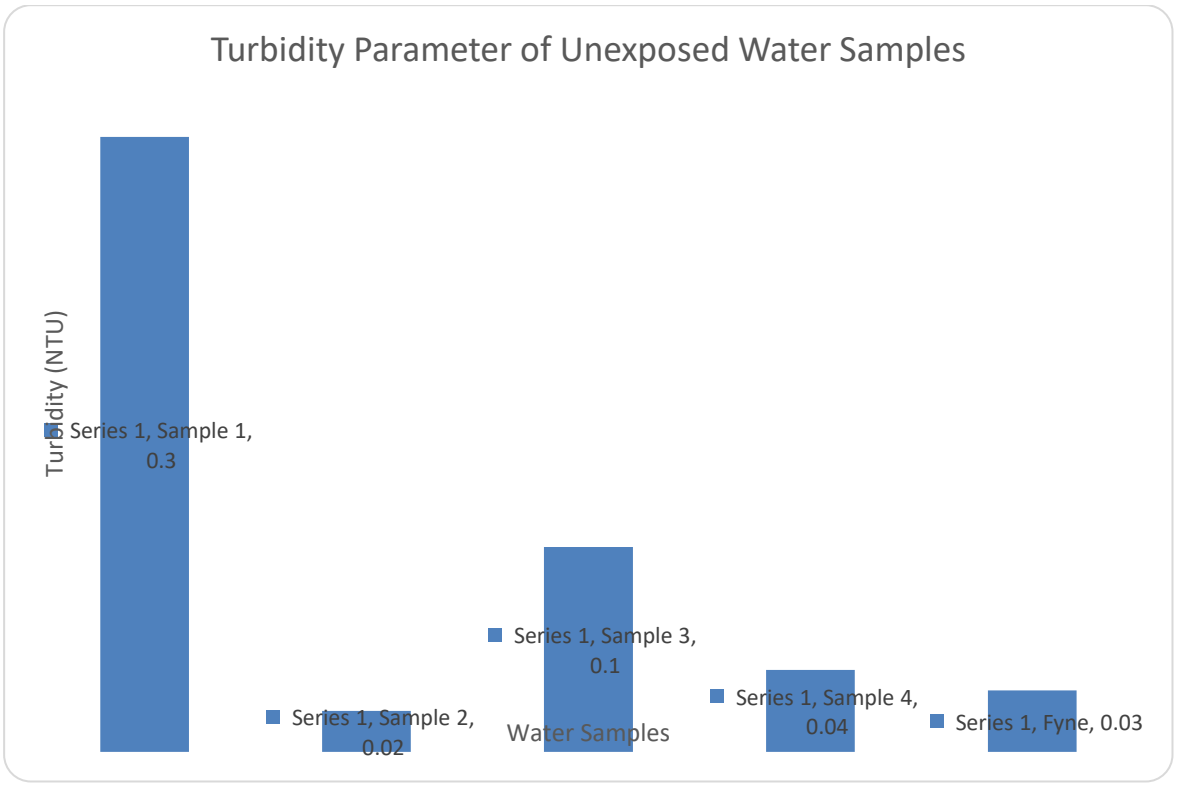

Figure 4: Turbidity Parameter of Unexposed Water Samples

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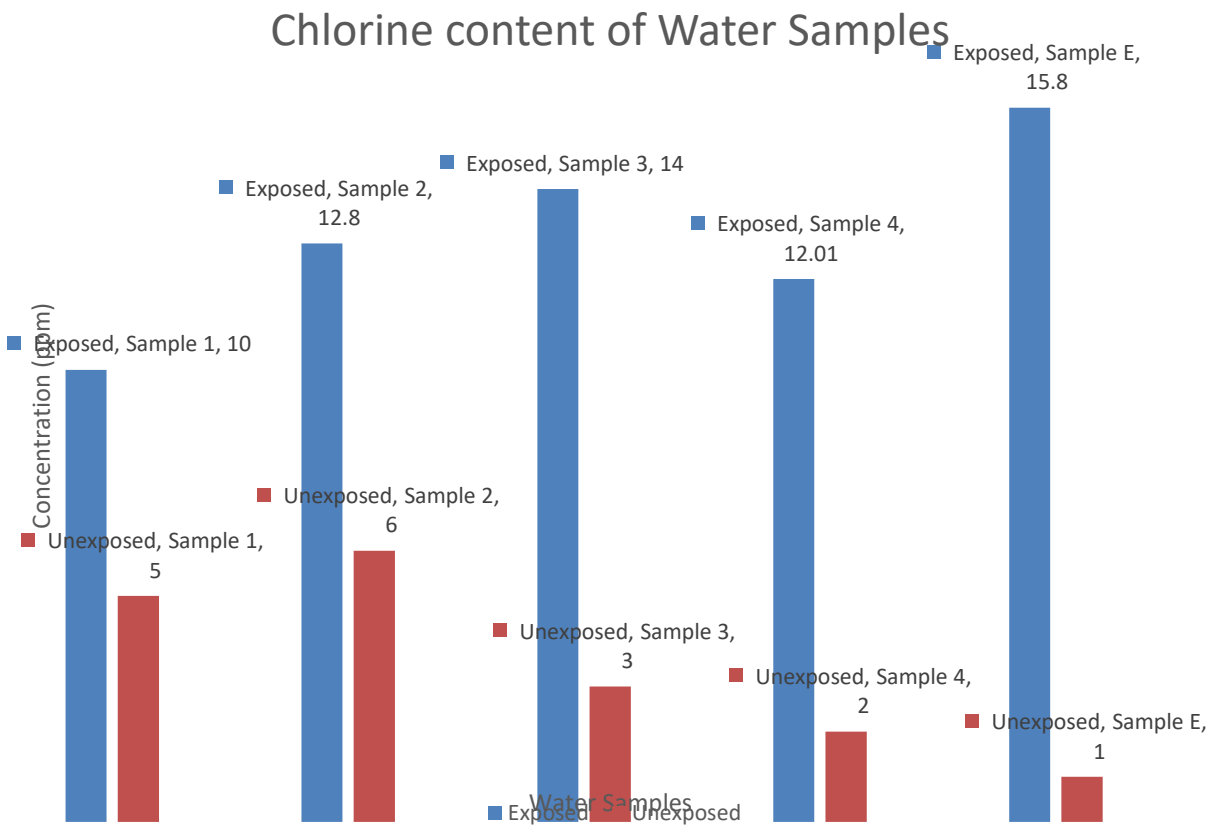

Figure 5: Chlorine Content of Water Samples

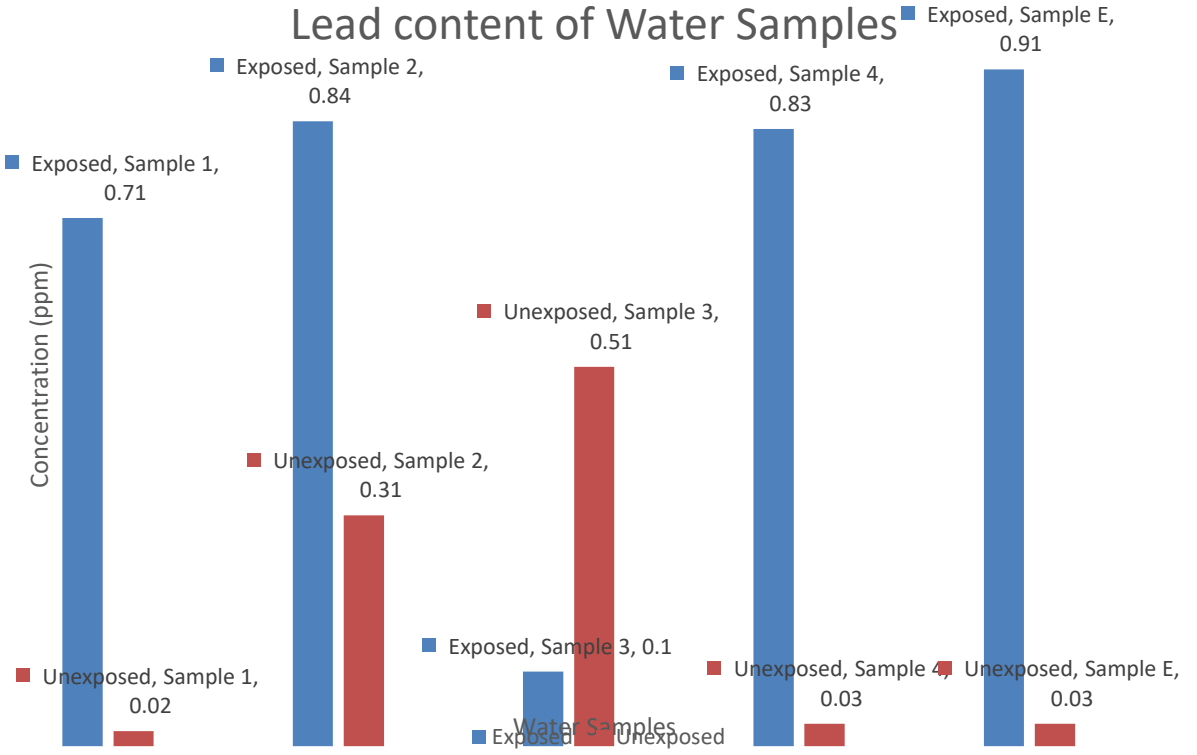

Figure 6: Lead Content of Water Samples

4. CONCLUSION

The analysis carried out showed that results from samples exposed to sunlight did not meet WHO standard for potable water this is in line with the work carried out by Abubakar*et al*., 2020&Uchechukwu& Edna 2016,which stated that significant changes were seen for some chemical parameters where there was higher concentration of parameters after exposure to sunlight which they described that probably there is the possibility of leaching of chemical constituents from the sachet container into the water as a result of increase intemperature during exposure caused by direct sunlight. It is advisable that potable water stored in plastics should not be exposed to sunlight and should not be taken because failure to store water in a safe environment will endanger lives when consumed. The frequent monitoring of packaged water sold to the public is of great importance as failure to check for a well-tested and treated water will be dangerous to humans.

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