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Analysis of Physio-Chemical Properties of Water Samples in Adekunle Ajasin University Community, Nigeria

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***Abstract**: The quality assessment of Well water, Borehole, Sachet water and Stream water has been investigated. Water samples were sourced at different locations in Adekunle Ajasin University community and analyzed for their physical properties namely; total dissolved solids, total Suspended Solid, total Solid test and conductivity, and chemical properties, pH, Dissolved Oxygen (DO), Na, K, Mg, Ca and Fe and chemical parameters using standard methods. The overall results obtained are in conformity as compared with the known desirable World Health Organization (WHO,2013) standards values with a slight variation in the assessment of well and stream water. The water samples sourced from Borehole and Sachet water are recommended for drinking.*

Keywords: Water samples, Analysis, Physio-chemical

I. INTRODUCTION

Water is a colorless, transparent, odorless, tasteless liquid that forms the seas, lakes, rivers, and rain fall as well as the basis of the fluids to living organisms (Micheal, 2000). Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70 % of water. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminants (Micheal, 2000; Harilal et al., 2004; Oseiy, 2005). The physico-chemical parameters are as well important as microbiological contaminants that could especially generate water borne diseases (Garba et al 2008). The physio-chemical analysis of water is therefore important for their desirable application in medicine, agriculture, recreation, household, environmental, industrial uses and particularly in power generation and amongst all others. Possibility of using chlorination, flocculation, coagulation, sedimentation and filtration followed by disinfection have been used to severally to increase the suitability of water for proper domestic use (Nikoladze, and Akastal, 1989).

The aim of the present work, however, is to analyze the physical properties of water namely; total dissolved solids, total Suspended Solid, total Solid test and conductivity, and chemical properties e.g. pH, Dissolved Oxygen (DO), Na, K, Mg, Ca and Fe test of water samples that are majorly used for domestic purposes in Adekunle Ajasing University communities and to make necessary recommendation towards their improvement and suitability to human and industrial use. The water samples are sourced from Well, Borehole, Sachet and Stream water.

II. MATERIALS AND METHODS

The water samples were collected from five different locations in Akungba-Akoko community in Ondo State, Nigeria. Adekunle Ajasin University is located in Akoko South West Local government area of Ondo State that is located between longitude 5.44^0E and 5.45^0E and latitude 7.24^0N and 7.28^0N. Well water samples were sourced from ILALE, AKWA, IGBELU, OKUSA and IBAKA. Similarly, the borehole water samples were sourced from ILALE, AWE, IBAKA, AKUNMI, GRASSLAND while the sachet water samples were sourced from the following brand name in Akungba community; AAUA pure water, TITU pure water, NO KING AS GOD (NKAG) pure water, DIVINE pure water and FOLU pure water. The stream water are sourced from ABATA, AKUNMI, independence stream (INDP), OROKE AND ADEFARATI area. Regular methods of collection and handling were adopted based on the standard procedures. The samples were collected in plastic canes of two litters capacity, the canes were thoroughly washed with detergent and also washed with tape water for rendered free of soap, they were thoroughly washed twice with distilled water, the plastic canes were rinsed with water samples and filled by water samples. The plastic canes were sealed without any air bubbles and labeled accordingly. All the samples were taken to Adekunle Ajasin University central laboratory for the physio-chemical tests.

III.RESULTS AND DISCUSSION

The results of the physio-chemical parameters carried out on the various water samples are presented in Tables 1 for well waters, Table 2 for borehole water, Table 3 for sachet water and Table 4 for stream water along side with the World Health Organisation (WHO)(2003)

Table I Physio-chemical analysis of well water samples in Akungba-Akoko community.

Physio-Chemical Parameter	ILALE	AKWA	IGBELU	OKUSA	IBAKA	MEAN VALUE	WHO (2013)
PH	7.04	7.13	7	6.57	6.49	6.846	6.5-8.5
Electrical conductivity	BDL	BDL	BDL	8.8	13.1	10.95	58-1000
Total suspended solids(mg/l)	23.86	24.08	23.41	23.45	23.45	23.65	100
Total dissolved solids(mg/l)	400	400	440	480	520	448	500
Total solids(mg/l)	423.86	424.86	463.41	503.45	543.45	471.806	500-1500
Dissolved oxygen(%)	41	39	41	42	41	40.8	40-60
Total hardness(mg/l)	87.49	182.76	240.97	707.49	176.05	278.952	200
Chloride(mg/l)	99.26	436.04	765.72	1247.84	1747.68	859.308	200
Calcium(mg/l)	22.04	50.9	65.33	558.12	48.49	148.976	75-300
Magnesium(mg/l)	10.45	4.86	12.64	4.37	6.56	7.776	20-150
Potassium(mg/l)	5.8	7.8	8.2	4.2	6.4	6.48	10-50
Sodium(mg/l)	24	32	50	44	42	38.4	200
Iron(mg/l)	0.92	0.58	1.1	2.45	0.23	1.056	0.3-1

TABLE III PHYSIO-CHEMICAL ANALYSIS OF BOREHOLE WATER SAMPLES IN AKUNGBA-AKOKO COMMUNITY.

PHYSIO-CHEMICAL PARAMETER	ABE	GRASSLAND	AKUNMI	ILALE	IBAKA	MEAN VALUE	WHO (2013)
PH	6.35	6.91	6.87	5.89	6.98	6.6	6.5-8.5
Electrical conductivity	20.6	BDL	43.6	42.7	BDL	35.63333	58-1000
Total suspended solids(mg/l)	24.3	24.12	23.07	24.45	24.64	24.116	100
Total dissolved solids(mg/l)	480	520	400	400	960	552	500
Total solids(mg/l)	504.3	544.12	423.07	424.45	984.64	576.116	500-1500
Dissolved oxygen(%)	40	39	39	39	40	39.4	40-60
Total hardness(mg/l)	200.83	279.1	362.76	392.31	345.26	316.052	200
Chloride(mg/l)	201.57	240.5	242	125.62	142.6	190.458	200
Calcium(mg/l)	48.08	70.54	98.99	108.22	92.18	83.602	75-300
Magnesium(mg/l)	60.75	32.56	16.77	14.09	23.08	29.45	20-150
Potassium(mg/l)	5	9.4	7.8	20	5.8	9.6	10—50
Sodium(mg/l)	24	40	54	48	26	38.4	200
Iron(mg/l)	0.07	0.09	0.06	0.12	0.27	0.122	0.3-1

TABLE IIIII PHYSIO-CHEMICAL ANALYSIS OF SATCHET WATER SAMPLES IN AKUNGBA-AKOKO COMMUNITY.

Physio-Chemical Parameter	AAUA	TITU	FOLU	NKAG	DIVINE	MEAN VALUE	WHO (2013)
PH	7.39	7.63	7.82	7.18	7.7	7.544	6.5-8.5
Electrical conductivity	BDL	BDL	BDL	BDL	BDL		58-1000
Total suspended solids(mg/l)	23.82	24.19	24.02	23.9	23.64	23.914	100
Total dissolved solids(mg/l)	400	320	320	400	400	368	500
Total solids(mg/l)	423.82	344.19	344.02	423.9	423.64	391.914	500-1500
Dissolved oxygen(%)	39	40	41	40	40	40	40-60
Chloride(mg/l)	251.69	127.62	92.17	216.25	163.07	170.16	200
Calcium(mg/l)	38.07	46.09	30.06	40.48	37.67	38.474	75-300
Magnesium(mg/l)	9.72	20.66	2.43	11.7	2.18	9.338	20-150
Potassium(mg/l)	4.2	2.8	4.8	5.2	5.3	4.46	10--50
Sodium(mg/l)	24	16	22	16	24	20.4	200
Iron(mg/l)	0.25	0.27	0.21	0.18	0.09	0.2	0.3-1

TABLE IVV PHYSIO-CHEMICAL ANALYSIS OF SREAM WATER SAMPLES IN AKUNGBA-AKOKO COMMUNITY.

Physio-Chemical Parameter	ABATA	AKUNMI STREAM	INDP	OROKE	ADEFARATI	MEAN VALUE	WHO (2013)
PH	7.55	7.89	8.31	7.77	7.95	7.894	6.5-8.5
Electrical conductivity	BDL	BDL	BDL	BDL	BDL		58-1000
Total suspended solids(mg/l)	23.22	24.28	23.96	23.94	23.89	23.858	100
Total dissolved solids(mg/l)	600	520	1200	440	400	632	500
Total solids(mg/l)	623.22	544.28	1223.96	463.94	423.89	655.858	500-1500
Dissolved oxygen(%)	41	40	45	39	41	41.2	40-60
Chloride(mg/l)	226.88	120.53	109.89	127.62	223.34	161.652	200
Calcium(mg/l)	46.5	50.5	85.37	42.08	64.53	57.796	75-300
Magnesium(mg/l)	16.52	4.86	14.58	8.99	1.94	9.378	20-150
Potassium(mg/l)	5.8	20	4.6	4.6	5	8	10-50
Sodium(mg/l)	32	20	26	20	26	24.8	200
Iron(mg/l)	0.58	0.25	0.25	0.52	0.5	0.42	0.3-1

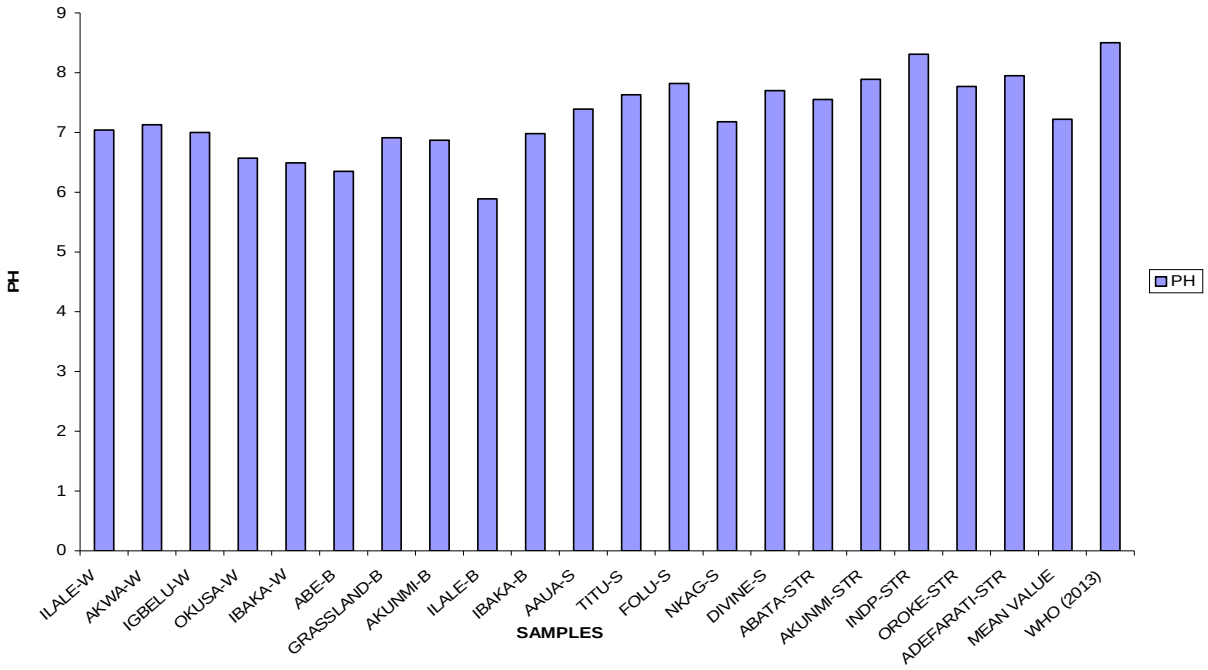

Fig1: PH values for all water samples.

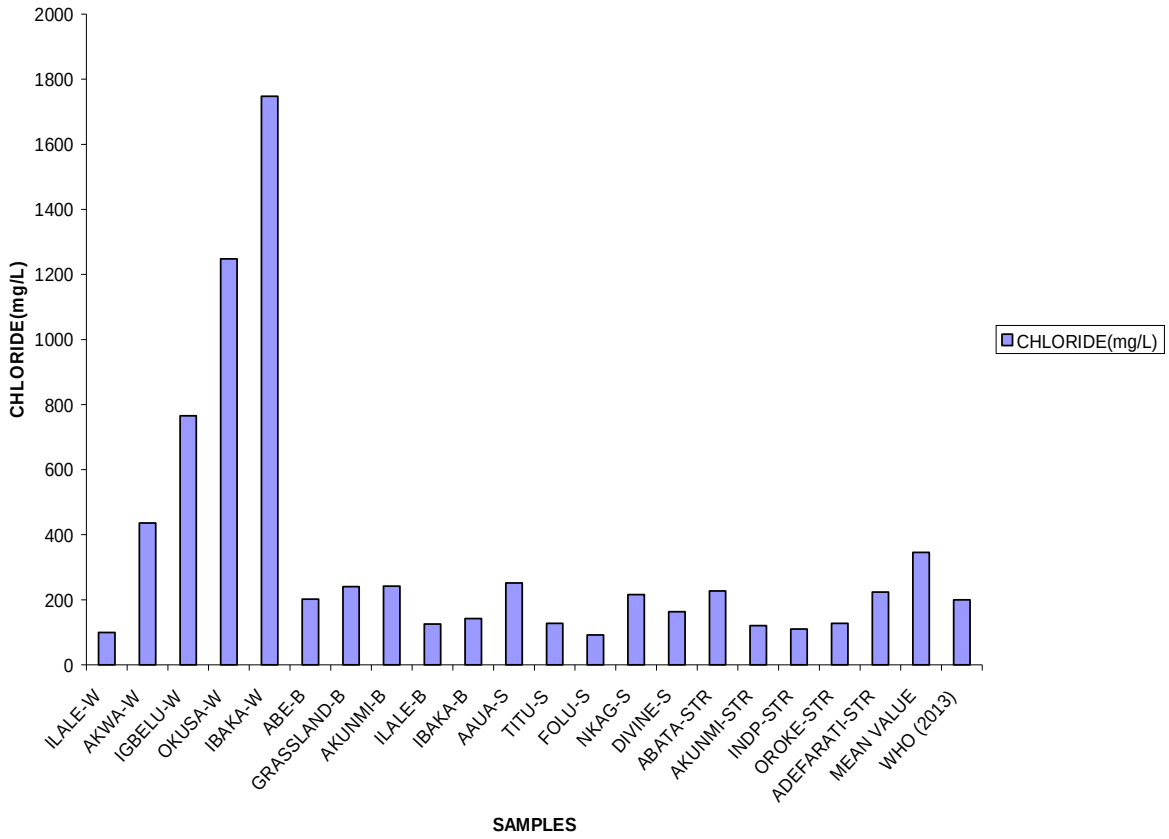

Fig2: Chloride values for all the water samples

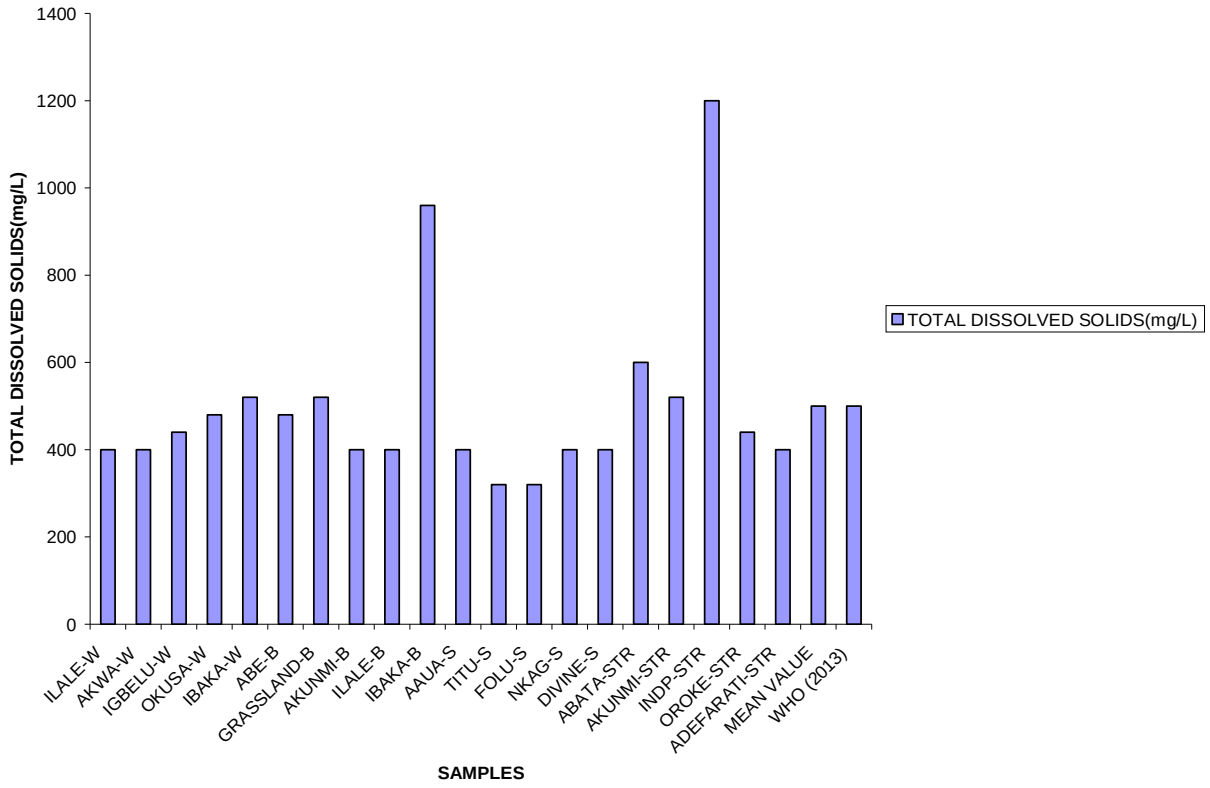

Fig3: Total dissolved solids values for all the water samples

guidelines for drinking water supplies. While borehole and sachet water are majorly consumed as drinking water, well and stream water are seldom consumed. On the overall, most of the physio-chemical parameters detected in all the waters are within the WHO (2003) guidelines for drinking.

As observed from both Figure 1 and Tables 1-4, well water from INDP stream is the most acidic with 8.31 while the ILALE borehole is the less acidic with PH value 5.89. The former and all the water samples investigated fall within the expected value of pH for drinking water in World Health Organisation (WHO, 2013) and the United States Environmental Protection Agency (USEPA, 2013) standards for drinking water except ELALE. The possible effect from drinking this particular type of water is probable cancer infection,

As shown in Tables 1-4, the electrical conductivity for all the water sources are all below the detection limit except for OKUSA and IBAKA well water and GRASSLAND and ILALE for borehole. Even the values obtained for these are bellow the highest desirable level prescribed by the WHO, (2013) standards for drinking water. Electrical conductivity is due to ionizable ions and higher conductivity increases the corrosive nature of water, this implies that the water from each location are suitable for drinking. As result the water can cause Anemia; liver, kidney and changes in blood pressure since they are below the guideline of WHO (2013). Finally, electrical conductivity of water is a direct function of its total dissolved salts. Hence it is an index to represent the total concentration of soluble salts in water (Bruvold and Ongerth 1969; Wright et al., 2004).

It was observed that chloride value in all the water samples analysed meet the prescribed value of chloride by WHO (2103) and USEPA (2013) for drinking water apart the one from AKWA, IGBELU, OKUSA and IBAKA(well water), GRASLAND borehole, AKUNMI borehole, AAUA sachet, NKAG sachet ABATA and ADEFARATI streams water that were all above the standard values. See Tables 1-4 and Figure 2. This high value could lead to corrosion and shorten the life of pipes, pumps and hot water heaters. Higher chloride concentrations above 250mg/L usually produce a taste in drinking water and could be due to the trace of pollution from sewage sources (WHO 2013).

From Tables 1-4 for well, borehole, sachet and stream water respectively, it was observed that all the samples meet the expected values of suspended solids for drinking. In accordance to WHO (2013) standard, the samples from Borehole and sachet have a good degree of dissolve solids as shown in Figure 3 and Tables 1-4, the dissolved solids meet the standard value of World Health

Organization (WHO, 2013) for drinking water except IBAKA well, GRASSLAND boreholes, IBAKA Borehole, ABATA stream and INDP stream which is higher. However, all the values of total solids in all the water analyzed are within the expectable range.
The Analysis as shown in Tables 1-4 reveals that the concentration of calcium present in all the water investigated are very well bellow the prescribed standard values by WHO, (2013) for drinking water except for OKUSA well water with very high value of 558.12 mg/L. This is about 4 factor high than the 150 prescribed by WHO (2013). This high value of calcium could results to skim milk in colour and high indissolved minerals which are the major cause of hardness in water (who2003). The values of dissolved oxygen, magnesium, potassium and sodium analysed in all the samples are below the, upper limit of WHO, (2013) drinking water standards as contained in Tables 1-4. The valuees obtained for iron are all bellow the upper limit of WHO, (2013) drinking water standards aside those of two well water namely, IGBELU and OKUSA.

IV. CONCLUSIONS

The quality assessment of Well water, Borehole, Sachet water and Stream water has been investigated. The overall results obtained are in conformity as compared with the known desirable World Health Organization (WHO,2013) standards values with a slight variation in the assessment of well and stream water. The water samples sourced from Borehole and Sachet water are recommended for drinking.

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