Assessment of Ground Water Quality in Ankpa and Dekina Local Government Areas of Kogi State, Nigeria

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ABSTRACT:- Ground water is natural resources are of immense importance to life and its characteristics are greatly determined by the properties immediate geographic formations therefore its movement is controlled by the force of gravity which is relatively free from pollution as such, the proper development and utilization of this major natural resources is of paramount interest for all water supply requirements for safe drinking.In the determination of the assessment quality of ground water in Ankpa and Dekina Local Government Area, different samples were collected at the different points in those areas. The test results for physical, chemical and biological parameters in the ground water samples were recorded, examined and analyzed. pH values for the five sampled water for the two Local Governments Dekina and Ankpa respectively falls within 6.5-7.6 and was found to be within the limit stipulated by the World Health Organization (WHO) standard for ground water (6.0 to 8.5). There was high coli form count in KSU Ayingba, Egume Dekina, Odu Dekina with 240ml, 300ml and 320ml as compared to WHO (2009) permissible limit of not more than one 1per 100ml while for Ankpa Local Government the coli form count was high for Abache, Opulega and Amoke community with 340ml, 360ml and 300ml as compared to WHO (2009). The results analyzed indicated that there was high levels of chemical oxygen demand and biological oxygen demand shows elevated presence of bacterial and organic matter in the samples collected and examined in those locations for this research work. In lieu of the above research work done, further research work should be done to determine the concentration of parameters periodically in those locations beyond the scope of study

I. INTRODUCTION

Groundwater is natural resources are of immense importance to life and its characteristics are greatly determined by the properties of the immediate geologic formations. It is usually stored in the pores spaces within soil compartments and between unconsolidated formations Igboekwe and Akankpo (2012).Generally, the development of groundwater resource involves three main stages those includes exploration, evaluation and exploitation. This study focused on the evaluation stage, which generally encompasses measurement of hydrologic parameters of aquifers and estimation of aquifer yield and sustainability. The determination of aquifer characteristics involves the estimation of its hydraulic conductivity and transmissivity using data obtained from test wells and vertical electrical sounding Matias (2002).The effects of water pollution are not only devastating to people but also to animals, fish, and birds. Polluted water is unsuitable for drinking, recreation, agriculture and industrial purposes. Is it diminishes the aesthetic quality of lakes and rivers. Contaminated water destroys aquatic life and reduces its reproductive ability. This could be hazard as both human and plants health. Therefore, it is a burning need, to conserve the water and prevent it from every type of pollution. Water is very important in our daily life makes it imperative that thorough examination should be conducted on it, through physical, chemical and biological analysis. The physical analysis involved the measurement of the temperature, odour, colour, taste, and turbidity. The chemical analysis will involve the measurement of (metallic ions) anion (non-metallic ions) toxic and non-toxic compounds

by inorganic substances. And the biological analysis will involve the determination of biological life. Ground water is an important water resource in both the urban and rural areas of Nigeria but in the cities, borehole or tap water is also available. Rural dwellers rely basically on hand-dug wells for potable water supply as the streams usually dry up in dry season. These resources are under threat from pollution either from human lifestyle manifested by the low level of hygiene practiced in the developing nations. Environmental health involves all the factors, circumstances and conditions in the environment which surroundings of humans that can influence health and wellbeing. The rural dwellers in rural areas in most developing countries in terms of basic infrastructures such as pipe-borne water and sanitation facilities, space the villagers to various of health related problems such as water–borne diseases. The levels of some physical, chemical, biochemical and microbial water quality parameters in hand-dug wells located in the residential areas and in the vicinities of municipal waste dump sites and defecation sites in Ankpa and Anyigba town, a rural settlement, southwest Nigeria, were assessed. The effects of seasonal disparity and proximity to pollution sources .

(municipal waste dumps and defecation sites) as well as concentrations of the parameters were also evaluated and determined for further research.

Aim of the study
The aim of this project is to determine the assessment of ground water quality in Ankpa and Dekina Local Government Areas of Kogi State for consumption.

The objectives of the study are**:**
 i.to determine the assessment of ground water required for human consumption and other purposes at Ankpa and Dekina Kogi State.
ii. to determine the factors affecting the ground water for human consumption and other purposes at Ankpa and Dekina Kogi State
iii. to examine factors influencing ground water quality in the areas understudy

II. METHODOLOGY
Method of sample collection
In the determination of the assessment quality of ground water in Ankpa and Dekina Local Government Area, different samples were collected at different points in those areas

Table 1.0 Shows samples collected at five different locations in two Local Government Areas

S/N	Ankpa L.G.A	Collection point/sample Symbol	Dekina L.G.A	Collection point/sample
1	Abache	APT 1	Kogi State university Anyigba (KSU)	DPT 1
2	Otukpo road	APT 2	Abeji Dekina	DPT 2
3	Opulega community	APT 3	Egume Dekina	DPT 3
4	Enjema community	APT 4	Unity square Anyigba	DPT 4
5	Amoke community	APT 5	Odu Dekina	DPT 5

source: Field Survey

Sampling points were represented as follow (APT1,APT2,APT3,APT4,APT5 for Ankpa Local government area. While (DPT1,DPT2,DPT3,DPT4,DPT5) were represented for Dekina Local Government Area as shown in Table 3.1. Sampling methods was adopted to

analyze the assessment of ground water quality of the water samples for human consumption in those Local Government Areas of the State. Physical, Chemical and Biological analysis tests were conducted on those samples collected

III. RESULTS AND DISCUSSION

Data presentation /Analysis

Table 2.0 Analysis carried out on five groundwater samples from Dekina Local Government and the results obtained for physical and chemical analysis are shown below.

SAMPLES	Na$^+$ (ppm)	K$^+$ (ppm)	Ca^{2+} (ppm)	PH	Tem (K)	Conduc (us/cm)	DO (ppm)	TA (ppm)	TH (ppm)	Chloride (ppm)	Acidity (ppm)	NO$_3^-$ (ppm)	SO$_4^{2-}$	Alkalinity
KSU Anyigba	35.0	10.0	93.0	7.5	26	$1X10^3$	5.1	19.8	18	49.8	_	30	60	57.3
Abeji Dekina	36.7	10.4	128.3	7.0	26	$1X10^3$	1.5	10	25	35.5	_	38	80	42.3
Egume Dekina	33.8	9.90	117.2	7.5	27	$1X10^3$	0.48	15	41	63.7	_	32.3	107	50.5
Unity square	33.5	10.40	167.9	6.5	28	$1X10^3$	1.0	15	33	72	211	24.6	98	55.6
Odu Dekina	38.3	10.80	143.3	7.6	26	$2X10^3$	9.3	15	20	28.4	_	28	105	39.8
WHO(2009)	20	NL	200	6-8.5	_	$1.2X10^3$	18	100	26	250	_	50	11	100

Table 3.0 Biological analysis for Dekina Local Government Area.

Dekina LGA	KSU Anyigba	Abeji Dekina	Egume Dekina	Unity square	Odu Dekina	WHO
Biological Oxygen Demand	20 mg/l	10 mg/l	20mg/l	10mg/l	24mg/l	favoured for drinking
Coliform Count	240ml	160ml	300ml	145ml	320ml	Only 1 per 100ml is favoured for drinking

Table 4.0 Analysis carried out on five groundwater samples for Ankpa Local Government the test results obtained for physical and chemical analysis are shown below

SAMPLES	Na$^+$ (ppm)	K$^+$ (ppm)	Ca^{2+} (ppm)	pH	Tem (K)	Conductivity (us/cm)	DO (ppm)	TA (ppm)	TH (ppm)	Chloride (ppm)	Acidity (ppm)	NO$_3^-$ (ppm)	SO$_4^{2-}$	Alkalinity
Abache Ankpa	33.5	10.6	100.0	6.5	27	$1.7X10^3$	6.1	19.8	20	50.0	_	33	40	50.0

Otukpo road	36.7	9.40	118.3	7.5	26	$1X10^3$	3.0	10	15	40.5	115	35	75	43.7
Opulega community	33.8	9.90	110.2	7.4	27	$2X10^3$	2.48	15	41	70.7	_	33.5	97	53.0
Enjema community	33.5	10.40	137.9	6.5	27	$1X10^3$	1.0	15	39	77.0	211	26	99	34.9
Amoke community	38.3	10.60	103.3	7.6	26	$2X10^3$	10.3	15	18	26.4	_	28	101	51.4
WHO (2009)	20	NL	200	6-8.5	_	$1.2X 10$	18	100	22	250	_	50	11	100

Table 5.0 Biological analysis for Ankpa Local Government Area.

Ankpa LGA	Abache Ankpa	Otukpo road	Opulega community	Enjema community	Amoke community	WHO
Biological Oxygen Demand	25 mg/l	10 mg/l	30mg/l	10mg/l	24mg/l	favoured for drinking
Coliform Count	340ml	100ml	360ml	155ml	300ml	Only 1 per 100ml is favoured for drinking

The results of the analysis of the physical, chemical and biological parameters in the ground water samples were provided in Tables 4.1, 4.2 and 4.3 above The pH values for the five sampled water for the two Local Governments Dekina and Ankpa respectively falls within the limit stipulated by the World Health Organization (WHO) standard for ground water (6.0 to 8.5). This pH values obtained clearly shows that the water samples collected are safe for human consumption. The five samples measured for the two Local Governments Dekina and Ankpa respectively showed alkalinity below World Health Organization (WHO) standard which is 100 mg/l, the sample values fall within the range of 20.0 to 63.5mg/l. while the concentrations of chloride for all sampled sites were below World Health Organization (WHO) standard 250 mg/l, the values obtained ranges from 28.4 mg/l to 71 mg/l. Total Hardness, the values obtained were within the range while some were above the World Health Organization (WHO) standard of 26.0 mg/l. The concentrations of Nitrate were below the World Health Organization (WHO) permissible limit in drinking water of 50 mg/l. Nitrate in the table 2.0 and 4.0 recorded ranges from 26.0 mg/l to 35 mg/l. For total dissolved oxygen, the values obtained are below the World Health Organization (WHO) standard of 18 mg/l, the values range from 0.49 mg/l to 9.3 mg/l. The results obtained shows low level of conductivity when compared with the World Health Organization (WHO) standard of 1200 us/cm, the values obtained range from $1x10^2$ us/cm to $2x10^2$ us/cm. The values obtained shows low level of sulphate when compared to the World Health Organization (WHO) standard of 500 mg/l, the values ranges from 42.5 mg/l to 78 mg/l. All the water samples analyzed have high levels of NH3 when compared to World Health

Organization (WHO) standard 10 mg/l, the values ranges from 79 mg/l to 107 mg/l. This is due to the presence of inorganic contaminants in the water samples. One of the water samples is very acidic showing value of 210 mg/l and pH of 6.5. Generally, All the samples shows high level of Na^+ when compared with the World Health Organization (WHO) standard of 20 mg/l, the values obtained ranges from 33.5 mg/l to 38.4 mg/l. The concentrations of Ca_2^+ in the water samples are below the World Health Organization (WHO) standard of 200 mg/l, the values ranges from 92.5 mg/l to 167.8 mg/l. There was high coli form count in KSU Ayingba, Egume Dekina, Odu Dekina with 240ml, 300ml and 320ml as compared to WHO (2009) with permissible limit of not more than one 1 per 100ml while for Ankpa Local Government the coli form count was high for Abache, Opulega and Amoke community with 340ml, 360ml and 300ml as compared to WHO (2009). With permissible limit of not more than one 1 pre 100ml. BOD for both Local Government and recorded is favourably safe for drinking in accordance with WHO standard as recommended. There was high level of bacterial contaminants recorded at different locations and points of the water. WHO (2009) set permissible limit of not more than one (1 per 100ml). However, high levels of chemical oxygen demand and biological oxygen demand indicate elevated presence of bacterial and organic matter on the samples collected and examined in those locations for this research work.

IV. CONCLUSION
Conclusively, the results obtained from the physical, chemical and biological analysis indicates that the water parameters such as pH, Total Hardness falls within the permissible limit of WHO standard.Total Alkalinity, Chloride (Cl^-), nitrate, dissolved oxygen, conductivity, sulphate and calcium were below the WHO standard. The results also shows that there was high concentration of NH_3 were due to the presence of inorganic contaminants in the water samples analyzed. There was also a high amount of coli form counts in ksu Anyiba,Egume Dekina, odu Dekina as compared to WHO (2009).In Ankpa Local Government Area the colifom counts was high for Abache,opulega community and amoke community as compared to WHO (2009).From the water samples recorded from different points in both Ankpa and Dekina Local Government Areas. BOD as examined and recorded is favorable for drinking in accordance with WHO standard as recommended.

Solution for the parameters higher than WHO standard
Water quality requirements should be agreed with the water quality standards which are put down by government agency and represent the legislation requirements by doing so,water contaminants will be reduced drastically

In ksu ,Egume ,Dekina,Odu and Odu Dekina where coliforms is high should subjected to thorough analysis tests periodically

Water unsuitable for one use may be quite satisfactory for another and water may be considered acceptable for a particular use if water of better quality is not available in those areas

V. RECOMMENDATIONS
i. Further work should be carried out to determine the concentration of parameters periodically in those locations and beyond the scope of the study.
ii. Federal Government of Nigeria should empower environmental Agencies to always check the level of pollutants in ground water bodies.
iii. Policies should be put in place to assess groundwater quality promptly

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