An Assessment of Water Quality from Hand-Dug Wells in Bayan Dutse Narayi in Chikun Local Government of Kaduna State Nigeria

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Abstract- **The demand for portable water which meets the required environmental standard is becoming major focus for humanity. In order to achieve these standards, water must be available in the needed quantity and quality. The physio-chemical test of water sample collected from hand dug wells of Bayan Dutse Narayi were carried out to ascertain the potability based on the criterias' that make up for quality water such as Temperature, PH, Electric conductivity, Dissolved Oxygen, Dissolved Solid, Turbidity, Acidity or Alkalinity, Chloride, Calcium, Magnesium and Iron. The average results of the acquired parameters were compared with the required World Health Organization (W.H.O) and Federal Ministry of Environment standard (FMENV). It is then observed from the parameters table that six wells out of sixteen sampled meet the required standard but the average PH value for the analysis falls below the required standard. The turbidity and dissolved oxygen are the only parameters that meet the W.H.O and FEMENV standard. Thus every other parameter is below the standard measures, except for biochemical oxygen demand which was not specified but from the average result analysis tends to be 38.56. Due to locations, the wells undergo some level of pollution which contaminates the water which is mostly affected by runoff from the sewage system. It is on this note that this study recommends good sewage system; proper sanitary education and enlightenment campaign should be embarked on by the government and to monthly or quarterly monitor the area by health officers or supervisors.**

Keywords- Assessment, Water Quality, Drainage, Hand-Dug Well, Parameters, Analysis, Hygiene, Pollution.

I. INTRODUCTION

Water in its liquid form makes live existence possible on the earth and all living organism found their habitation with cell composed which contained 75% of water, it exist in three states (Solid, Liquid and Gaseous), the solid form can be ice, the ocean, the sea and the lake are liquid in nature while the gaseous form is classified as vapour. It is the universal solvent that sustains life in which plants, animal and human beings survive, obtaining water from well is of great customs and events from ancient times. It was recorded by [6] that hand dug wells were more of excavation in the sides of rocks and hills where springs of water were plentiful, the method of ground water extraction is to dig hole in the ground below the water table.

The rain water that infiltrates the ground sips through fracture pores and other space in soil and rocks in which the layers of bedrocks cannot be penetrated by water. Ground water usually accumulate above this barriers, it is usually preferable by the filtering action of a soil through which it flows. The quality of drinkable water gotten from hand dug well in Bayan Duste Narayi is of great concern due to the effect it has on the health of the populace.

[3] Stated that "We cannot expect pure water in totality but we want safe water" the health effects of some contaminants in drinking water are not well understood and the presence of contaminant does not mean that your health will be harmed. Therefore, keeping the home and the environment clean and free from possible hazard is paramount [1].

II. STUDY AREA

Bayan Dutse is situated in Chikun Local Government area of Kaduna State Nigeria between latitude 7^0 27' 15" and 10^0 28' 06" and between longitude 7^0 27'44" and 10^0 28' 35" with the total area coverage of about 4,645 kilometer square (Km^2) with a population of 368,250, as projected by [5]. The drainage system of the area is typically of dendritic pattern owing to the uniformity of the underlying basement complex and it comprise of upland and lowland landscapes.
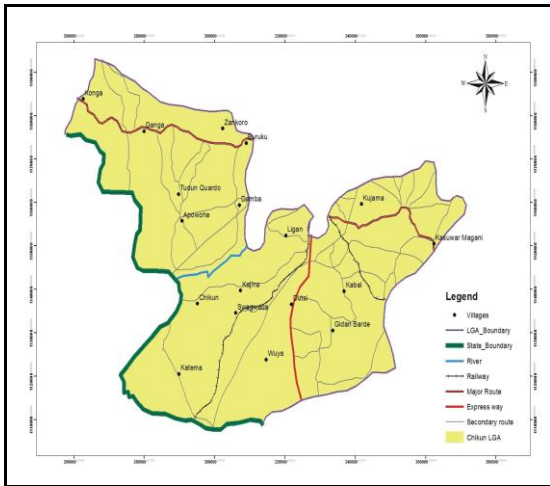
Figure 1: Map of Chikun LGA of Kaduna State. Nigeria.

A. Drainage

The drainage system is an important service that seeks to achieve many of MDG targets and goals. The implications goes beyond basic engineering solution to erosion, flooding, sanitation, the economy, the environment, recreation, urban planning, health and general living conditions in low income housing areas. Most of the drainage is presently become a refuse dump which causes blockage in the flow of water through the drainage system.

The public health view is with the drainage channels that link not only rainy season storm water from road and residential buildings and plots but increase discharge from septic tanks, overflow from pit latrines, used water dispensed from residence and effluence from commercial and industrial facilities. The combined drainage system is used in Nairayi and any sustainable approach to drainage addresses the drainage in an integrated so that dilution, pollution and blockage are realized.

III. METHODOLOGY

The water sample of the wells within the study area was collected randomly to determine the physiochemical Physical and chemical properties of the samples. The samples were taken to the laboratory for analysis, each of the well samples were collected twice (Early in the morning before use and in the evening after usage). The purpose of the practical test is to depict the Temperature, PH, Electric conductivity, Dissolved Oxygen, Dissolved Solid and Turbidity while the chemical parameter determines the Acidity or Alkalinity, Chloride, Calcium, Magnesium and Iron content of the water samples. This is in order to identify the variance in water quality standard requirement. Mathematical formulae were used to derive some parameters such as Chloride, Oxygen and total hardness of the water samples where necessary. After determining the parameter, the total average of same were calculated for the final comparism to give judgments to the discrepancies between the required standard and the result obtained from the laboratory test.

IV. HYGIENE EDUCATION ASPECT

Hygiene education help establish the integration between improved facilities and the user facilities of water hygiene, every health programme should instigate people to use more water for domestic and personal purposes and when properly incorporated, the benefits is immeasurable which help to prevent water and sanitation related disease like diarrhea, worm infection, skin, eye and mosquitoes borne diseases.
The contamination of water in the environment and risky hygienic practices account for almost 30% of water borne disease in developing countries which has serious health consequences and economic loses to governments [4].

V. RESULTS AND DISCUSSIONS

It is observed that the quality of hand dug well is determined by the overall sanitation of the studied area and research has shown that qualities of water drawn from some of the hand dug well are not to be compared with the required standard due to pollution from the pit latrins, unkept environment which allows other materials to enter the wells which are sited indiscriminately at close range to the well which serve as the source of drinking water [2].

The practical test carried out in the laboratory as shown in table 1 below, it is observed that the temperatures of the wells are below the (W.H.O.) and (FEMENV) standards, the PH for six wells out of sixteen sampled meet the required standard but the average PH value for the analysis falls below the required standard. The turbidity and dissolved oxygen are the only parameters that meet the W.H.O and FEMENV standard, every other parameter is below the standard measures, except for biochemical oxygen demand which was not specified but from the average result analysis tends to be 38.56 in table 2.

Some individual wells met the standard requirement but with the average result, the tendency of the requirement was reduced based on the numbers of wells under investigation.

TABLE 1: RESULT OF PHYSICAL AND CHEMICAL WATER ANALYSIS SAMPLE

NO	LOCATION	TEMP ºC	PH	ELECTRIC CONDUCTIVITY mg/L	DISSOLVE OXYGEN PPM	DISSOLVE SOLID (µg)	TURBIDITY (NTU)	SULPHATE SO^4 PPM	CHLORIDE CL PPM	BIOCHEMICAL O^2 DEMAND	TOTAL HARDNES Mg/L
1.	JABA ROAD	26	6.95	120.25	25.01	16.42	0.5	158.22	23.96	42.10	182
2.	NINZO STREET	26	6.86	138.40	22.81	16.40	02	147.74	23.92	40.79	117
3.	FULANI ROAD	25	6.72	146.71	24.11	16.32	07	144.90	22.98	40.12	180
4.	SARKI PAWA RD. (A)	26	6.45	130.11	20.89	18.22	03	72.82	16.91	37.21	111
5.	SALIENT ROAD	26	6.55	149.31	22.23	18.32	03	74.09	16.37	36.62	166
6.	CHIROMA STREET A	25	6.18	139.55	28.28	15.38	04	156.28	23.11	40.35	110
7.	KATAF ROAD	25	6.20	136.01	20.03	16.18	05	148.33	23.19	38.22	151
8.	KAURA ROAD	25	6.20	148.81	21.00	17.10	09	146.03	23.83	40.83	100
9.	MARAFA CLOSE	25	6.23	149.20	23.11	18.08	08	70.81	18.05	41.17	171
10.	WALE STREET	25	6.20	148.30	26.04	18.91	06	72.15	18.18	38.71	168
11.	BANDA STREET	25	6.35	128.42	23.14	19.11	02	129.91	20.18	42.01	128
12.	CHIROMA STREET B	26	6.36	136.27	28.11	15.19	09	142.14	18.24	28.95	186
13.	KUJAMA STREET	25	6.36	143.53	20.61	18.80	11	138.38	23.11	42.83	131
14.	KAGORO STREET	25	6.45	132.65	29.03	18.30	04	131.05	20.88	42.01	148
15.	MAKARFI ROAD	25	6.16	145.24	25.41	16.11	05	111076	16.10	28.95	130
16.	SARKI PAWA RD. (B)	26	6.13	129.01	22.91	18.43	06	130.10	18.11	36.06	120

Table 2: THE SAMPLE TEST RESULT COMPARISM TABLES WITH WORLD HEALTH ORGANISATION (WHO) AND FEDERAL MINISTRY OF ENVIRONMENT (FMENV) STANDARD.

PARMETER	(W.H.O) STANDARDS	(FMENV.) STANDARD	AVERAGE RESULT CARRIED OUT
TEMPERATURE		30^0C	25.38^oC
PH	Desirable 6.5-8.5	6.5-8.5	6.40
ELECTRIC CONDUCTIVITY	250 Micros/cm	NS	138.86 micros/cm
DISSOLVE OXYGEN	Less than 75% of Saturation concentration	20	23.92 ppm
DISSOLVE SOLID PPM		2000	17.33
TURBIDITY		NS	
SULPHATE SO42-PPM	500	500	123.42
CHLORIDE PPM	600	500	20.45
TOTAL HARDNESS	150-500 mg/l $CaCo_3$	150 mg/l	14369 mg/l
BIOCHEMICAL OXYGEN DEMAND	NS		38.56

VI.   CONCLUSION AND RECOMMENDATION

The physio-chemical analysis of water samples randomly collected   from hand dug wells in Bayan-Dutse Narayi shows a slightly pollution of some well exposed to adverse environmental conditions, some of these wells are wrongly located on low terrain and causes runoff water during raining season to drain into the wells which as result contaminate the water quality. It is on this note that many populaces within the area fall sick due to well water consumption without treatment. These are reasons why recommendations were made to reduce the health hazard and to intensify water quality awareness and advantages to humanity; more also, the government should provide social amenities in forms of quality water, good drainage system, health officers and supervisors to monitor the environment sanitary and where individuals embarked on dug well, the well should be rightly located and covered when not in use.

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