Water Shortage And Health Problems In Benue State-Nigeria: Impacts And Prospects For Solutions

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Abstract - In view of the importance of water to the existence of human life, this research attempts to identify the various sources of water, their quality, and the resulting effects when in short supply within the Tse-Agberagba , Akpagher and Ibbilaalukpo communities of Benue state. In this study, questionnaires were administered, field survey which involves direct observation of the existing water sources and oral interview were conducted. The field survey and oral interviews revealed the available sources of water in the areas which include; Stream, Borehole, Rain, and Well. The questionnaires explored the various uses of water as well as the effects of water shortage within the communities. Also, water samples from the various sources were analysed for; Colour, pH, Temperature, Turbidity, Alkalinity, Total Hardness, Total Iron, Chloride concentration, Sulphate, Total Suspended Solids, E-Coli, and Total Coliform. It is discovered that, there is short in water supply to meet the water demand of the people; hence, high prevalence of water shortage and associated health and other problems. About 95% of the settlements have no water supply facilities to compliment natural water supply sources like streams and rainwater. The result of the analysis indicated that almost all the streams and well water in the three communities were not safe for drinking as a result of high E-coli and coliform count, thus causing pathogenic diseases. Borehole and rainwater sources which are short in supply within the communities were discovered to be the best if properly collected and stored.

Keywords: Water shortage, Health, Crisis, Benue State, Contamination.

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1 INTRODUCTION

In recent times there has been population explosion in so many part of Nigeria and relatively no increase in the supply of portable water. This has brought so many problems to the country. Water, food and air are three basic needs for the survival of human beings. Water is perhaps the most precious assets on earth. This is why it is important that drinking water should be safe and portable. Water is available from different sources which may not be always safe and available throughout the year [1]. Water is one of nature's most important gifts to mankind. Essential to life, a person's survival depends on drinking water. Water is one of the most essential elements to good health, it is necessary for the digestion and absorption of food; helps maintain proper muscle tone; supplies oxygen and nutrients to the cells; rids the body of wastes; and serves as a natural air conditioning system. Health officials emphasize the importance of drinking at least eight glasses of clean water each and every day to maintain good health [2]. Water is also a key component in determining the quality of our lives. Today, people are concerned about the quality of the water they drink. Although water covers more than 70% of the Earth, only 1% of the Earth's water is available as a source of drinking. Access to safe drinking water has improved steadily and substantially over the last decades in almost every part of the world. There is a clear correlation between access to safe water and GDP per capita.

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However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability [3]. A recent report (November 2009) suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50% [4], [5]. Reports by international bodies like the United Nations (UN) and World Health Organization (WHO) and other non-governmental organization have indicated that water supply is not always commensurate with demand worldwide. According to WHO [6] only 32% of rural population in developing countries have access to safe drinking water. Today, a large percentage of the rural population in developing countries continues to live without adequate access to safe and convenient water supply and sanitation and water supply is still unreliable [7]. In Nigeria, more than 90% of rural areas and 60% of urban areas face water related problems [8]. The daily per capita consumption of water in Nigeria varies between 10-27 litres, with an average of 46 litres, which is far below the internationally recommended minimum requirement of 115 liters per person per day. This shortfall in water requirement is due to differences in availability and supply [9], [10]. Benue State is faced with serious water supply problem. Some studies have been carried out to assess the water supply situation in different parts of Benue State and examine the explanatory factors and implications on the people [11]. The common finding is that water scarcity is a recurrent scene in Benue. According to Ifan [11], the people of Mbatiav district in Gboko Local Government Area of Benue State for example, face water supply shortages with cases of typhoid, cholera, bilharzias, dysentery and guinea-worm. To address the problem of water supply, the Benue State government established the Benue State Water Board, Benue State Rural Water Supply and Sanitation Agency (BERWASSA), Ministry of Water Resources and Environment, in addition to external interventions from Water Aid, UK and UNICEF. These agencies were guided by the responsibility to provide water and alleviate water supply problems in Benue State. Yet, inadequate water supply is still prevalent in many communities such as Ibbilaalukpo community for example, which has a mean household water need of 5,577 lpd of which only 1,325 lpd is available. This situation creates an excess mean household water demand of about 4,252 lpd (63%) [11]. In an attempt to evaluate the impact of this water shortage, this study therefore investigates the role of some physical and socio-economic factors in determining the water supply situation in the study areas.

1.1 Study Area
Benue is a state in north-central Nigeria. Its capital is Makurdi and it is named after the Benue River. It covers about 34, 059km^2. It had a population of about 2.8 million in 1991 and 4.21 million estimate in 2006. Benue is a rich agricultural region, full of rivers, and could be called the breadbasket of Nigeria.

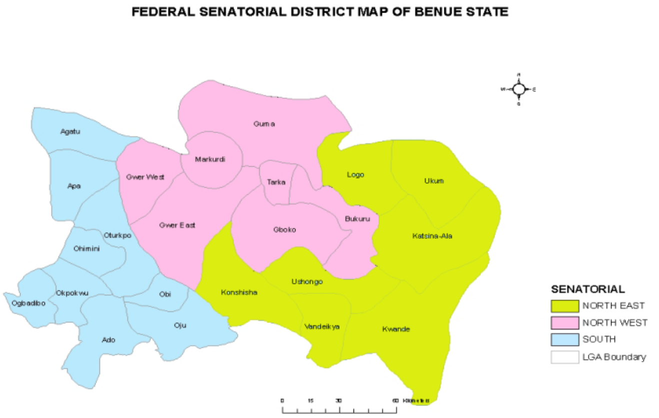

Figure 1: Map of Benue State

1.2 Relief and Drainage
Though Benue State has high drainage density many of the streams are seasonal. Also, the permanent water table in many parts of the state is very low, as a consequence of the thick overlying permeable meta-sediments and the great depth to which weathering has reached. Hence, there is an acute water shortage in the dry season in LGAs such as Guma, Okpokwu, Ogbadibo, Gwer-West and Oju.

1.3 Climate: Benue State has a tropical sub-humid climate, with two distinct seasons, namely a wet season and a dry season. The wet season which last for seven months starts from April and ends in October. The annual rainfall total ranges from 1,200mm to 1, 500mm. Temperatures are generally very high during the day, particularly in March and April. Makurdi, the state capital, for example, records average maximum and minimum daily temperatures of 35^{o}C and 21^{o}C in summer and 37^{o}C and 16^{o}C in winter, respectively.

1.4 Vegetation: Benue State lies in the southern Guinea Savannah. The grasses however grow very tall, coarse and tough on maturity. The scattered trees are mainly those of economic value and include locust bean, shear butter, mango, silk cotton, African iron, Isoberlinia, cashew, oil palm etc. In the southern part of the State, particularly in Oju, Ado, Obi, Ogbadibo and Okpokwu LGAs, the vegetation is mainly oil palm bush. This study evaluates the resulting effects due to water shortage within the three senatorial districts of Benue state. Figure 1 represents the map of Benue State showing the Local government Areas within the three senatorial districts.

2 MATERIALS AND METHODS
In order to undertake this study, water samples were collected from streams, boreholes, wells and rain water sources at the sampling location of Tse-Agberagba, Akpagher and Abbilaalukpo communities of Konshisha, Gboko and Oju Local Government areas of Benue State respectively. Water samples were carefully collected in very clean disinfected containers and analysed for colour, pH, temperature, turbidity, alkalinity, total hardness, total iron, chloride, sulphate, total suspended solid, E-coli, and coliform count. Determination of these parameters was done immediately the samples were brought to the laboratory using the procedures described in standard methods [12]. In addition, questionnaires were issued to some individuals so as to acquire key information from the study areas. Some of the questions that were asked were intended to find out the consumption per household, sources of water, availability of water, suitability of the available water, common diseases around the area, number of water-consuming construction projects in the area, agricultural impact, communal clashes over streams, death resulting from water struggles, population growth, government policy concerning water, commercial water services, their price, and fluctuation in the availability of water at the sources in the various seasons.

3 RESULTS AND DISCUSSIONS
Tables 1 below shows results obtained from field survey and laboratory analysis of water samples from the three communities and the World Health Organization [13] Standards. Figure 2 shows the number of respondent's verses water sources; water uses and the effects of water shortage respectively for the three communities. The experimental results are presented in figures 3 to 14. All the water samples have appreciable low colour, which ranged from 3.65 - 8.35, 4.23 - 8.31 and 4.65 - 9.83 (Fig. 3) at locations A, B and C respectively, which may be due to naturally occurring metallic salts. Fig. 4 shows the pH for all the water samples in the three communities ranging from 7.0–8.2 with a mean value of 7.60. The relatively high pH may be as a result of the presents of some salts and the geological formation of the area. pH was within drinking water standards (6.5–8.5) [6]. The average temperature of the water samples is 28.8^{0}C (Fig. 5). Turbidity ranged of 0.74 – 4.1NTU (Fig. 6) taken from the three sampling locations is an indication of low salts concentration and suspended matters, excepts the high value of 5.3 NTU (which is above drinking water standards of 5 NTU maximum), taken from well water at sampling location A which is an indication that most of the wells are polluted by suspended matters which may be due to domestic, commercial and industrial activities. Fig. 7 shows the average alkalinity of 21.3mg/l, 28.8mg/l and 32.0mg/l at location A, B and C respectively. The trend is reflective of the presence of bicarbonate and carbonate ions content in association with calcium and magnesium. Fig. 8 illustrates varying total hardness with all streams and wells water at all the communities been slightly hard while borehole and rainwater been moderately hard at all communities. The

water in streams and wells at the communities need treatment to enhance it suitability for drinking and other domestic uses. The total iron average values of 0.11PPM (A), 0.09PPM (B) and 0.09PPM (C) are indeed high even though they are stills below the WHO value of 0.2PPM (Fig. 9). Fig. 10 shows average chloride concentrations of 61.9mgl, 56.5mg/l and 65.5mg/l for communities A, B and C respectively are far below the WHO value of 250mg/l this may be an indication of the mineral deposits of the geological formation of the communities. The sulphate contaminant in all the three sampling communities analysed are equally below 250mg/l limit prescribed by WHO [13]. Fig. 12 shows average values of the total suspended solid, which was between 9.1 – 29.7 mg/l in all the samples analyzed fell within the World Health Organization (1993) permissible levels of 200mg/l for drinking water. In the case of E.Coli and coliform count it has been confirmed that sampling from streams and wells at all the communities were heavily polluted with very high E coli and total coliform count as shown in Fig. 13 and 14. The borehole and rainwater in all communities have zero E. Coli and coliform count which is within the WHO recommended standard of 0.0 and $3x10^{-2}$ ml. High influx of sewage and human/animal feacal wastes may probably account for the microbial pollution of the streams and wells [14].

3.1 Causes and Effects of Water Shortages

During the sampling process, one hundred questionnaires were distributed within the communities and collected. These were used to provide information of the available water sources in the communities. Main water sources were streams, rain, boreholes and well. Within the time of this research, the communities depended mostly on rain water for almost all their domestic uses. Water shortages in the communities were attributed to population increases, decreases in well capacity, and increased water requirements. In most developing communities in Benue state, reference to the study areas, competition among water users is increasing. Fig. 2 shows some of the effects of water shortages in the study areas: waterborne diseases, drought, low crop yield, endangering of species, communal conflicts. In nearly all water shortage areas the threats of communal conflicts over water supplies is emerging as a serious issue. For example, in 2008, there was an uprising in Oju, where the students of the collage of Education Oju and the host community clash over water scarcity where a student was killed during the crisis.

4 CONCLUSION

The sources of water available in the study communities were streams, boreholes, well, and rain. The parameters assessed were Colour, pH, Temperature, Turbidity, Alkalinity, Total Hardness, Total Iron, Chloride concentration, Sulphate, Total Suspended Solids, E-Coli, and Total Coliform. Based on the study, it is discovered that, there is short in water supply to meet the water demand of the people; hence there is high prevalence of water supply shortage and associated health and other problems. About 95% of the settlements have no water supply facilities to compliment natural water supply sources like streams and rainwater. The result of the analysis indicated that almost all the streams and well water in the three communities were not safe for drinking as a result of high E-coli and coliform count, thus causing pathogenic diseases. Borehole and rainwater sources which are short in supply within the communities were discovered to be the best if properly collected and stored.

5 RECOMMEDATIONS

In order to address the problems discussed above, the following recommendations are made:

- Water supply to the settlements should be improved through external assistance by provision of water supply facilities.
- Water from streams and wells in the study area should be treated most especially in the dry season before drinking to prevent incidences of diseases.
- Completion of abandoned and ongoing projects in the state such as the Makurdi greater water works, Otukpo greater water works as well as the construction of new water projects across the state.
- Careful selection of crops to be planted in water shortage basins and educating water users on reuse of wastewater.

ACKNOWLEDGMENT

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Table 1: Results obtained from laboratory analysis for the three sampling locations and the WHO Standards.

Parameters	**Results of Samples from the Communities**												**WHO Standard**
	Tse-Agberagba (A)				Akpagher (B)				Abbilaalukpo (C)				
	SW	BW	WW	RW	SW	BW	WW	RW	SW	BW	WW	RW	
Colour (Hazen)	8.35	5.67	7.67	3.65	8.31	6.27	7.08	4.23	9.83	5.60	7.69	4.62	15
pH (Range)	8.20	7.40	7.60	7.00	8.10	7.20	8.00	7.20	7.50	7.10	7.40	7.00	6.5-8.5
Temperature (^{o}C)	28.0	28.3	29.5	28.2	28.1	28.8	28.3	28.0	28.3	29.1	28.2	28.1	25
Turbidity (NTU)	4.91	2.72	5.30	1.02	3.92	2.16	3.89	0.98	4.10	1.17	3.18	0.74	5
Alkalinity (mg/l)	33.3	12.3	16.7	9.2	45.3	14.0	23.2	12.3	52.7	32.1	43.1	11.2	100
Total Hardness (mg/l)	49.1	32.2	59.3	22.1	57.3	35.8	62.2	36.8	55.1	47.2	58.5	25.4	100
Total iron (PPM)	0.14	0.11	0.14	0.09	0.12	0.09	0.13	0.04	0.09	0.07	0.07	0.04	0.2
Chloride (mg/l)	98.7	45.6	73.5	23.4	96.2	56.2	59.8	17.9	99.8	63.8	74.2	32.3	250
Sulphate (mg/l)	21.2	6.3	3.7	0.7	16.2	9.6	2.9	0.4	12.3	5.7	2.9	0.5	250
TSS (mg/l)	21.5	19.6	27.6	11.3	20.3	19.0	25.7	9.1	26.9	16.5	29.7	10.7	200
E-Coli (cfu)	1.4	0	0	0	1.3	0	0.8	0	0.4	0	0.4	0	0
Total Coliform (cfu)	1.1	0	0.3	-	0.7	0	0.5	-	0.9	-	0.2	-	$3x10^{-2}$ml

KEYS
SW-------------------------Stream water
BW-------------------------Borehole water
WW------------------------Well water
RW -------------------------Rain water

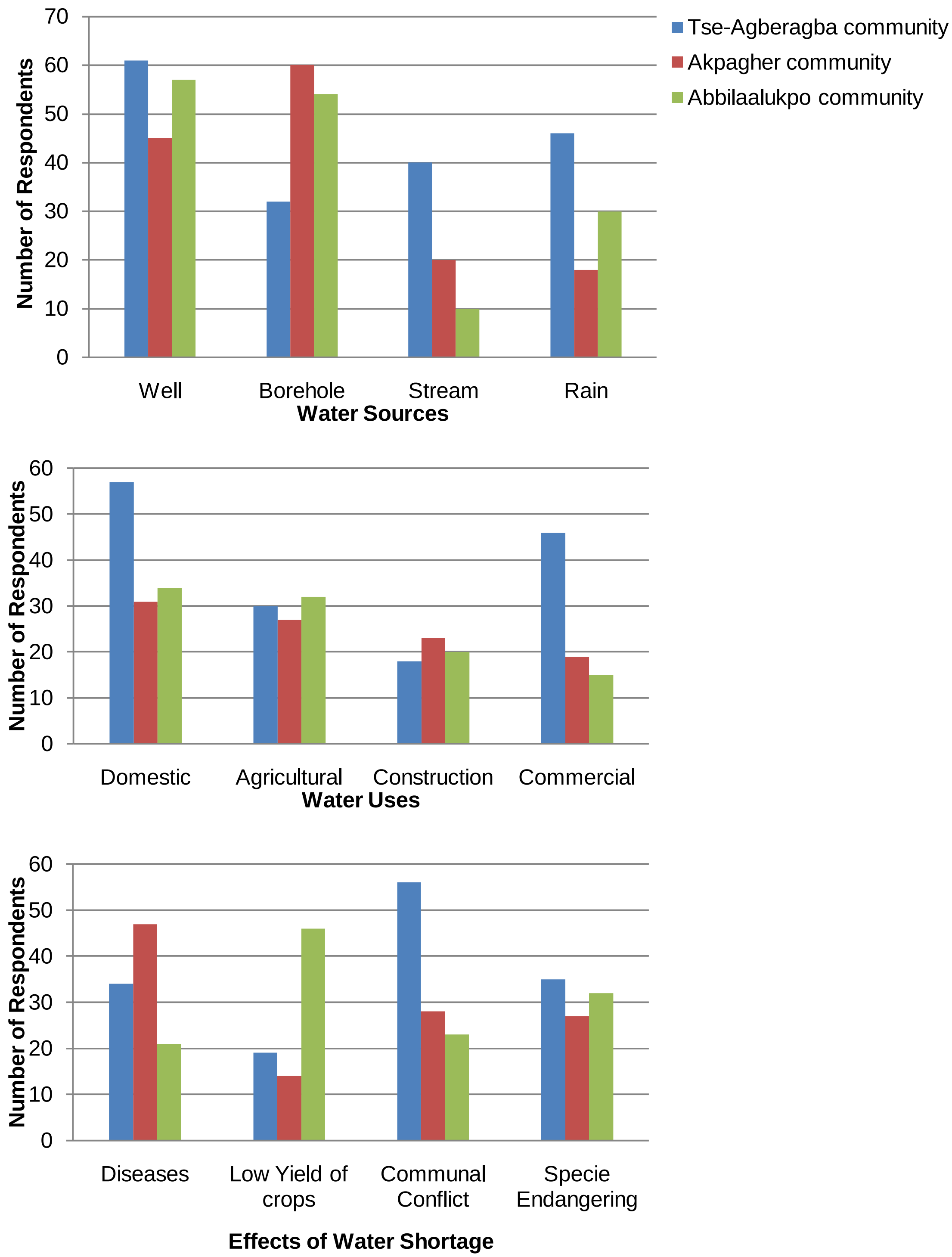

Figure 2: Number of Respondents verses Water Sources, Water Uses and Effects of Water Shortage for the three communities.

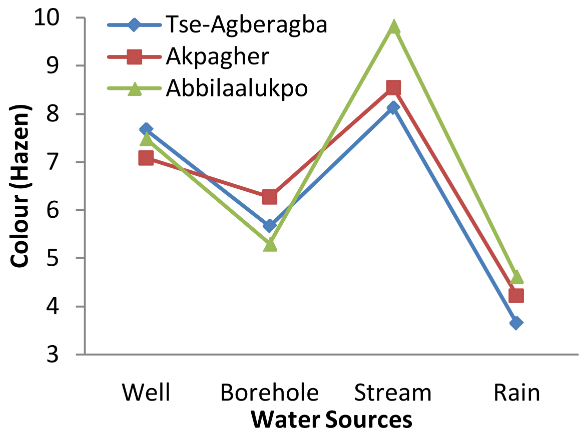

Figure 3: Colour of Water Samples

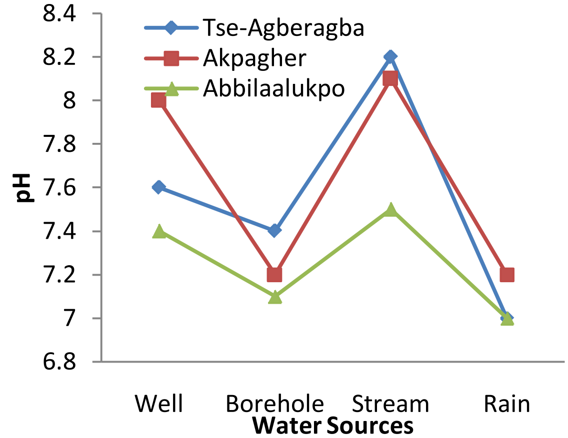

Figure 4: pH of Water Samples

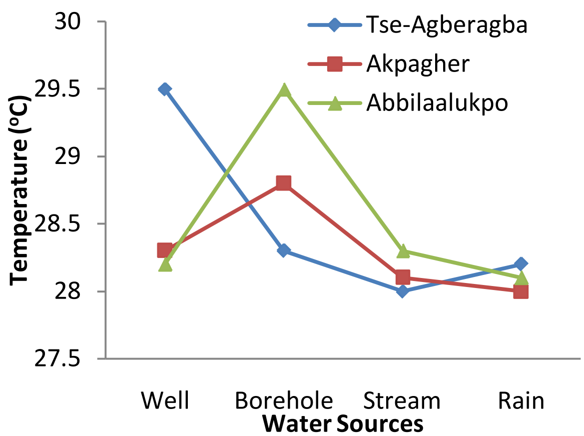

Figure 5: Temperature of Water Samples

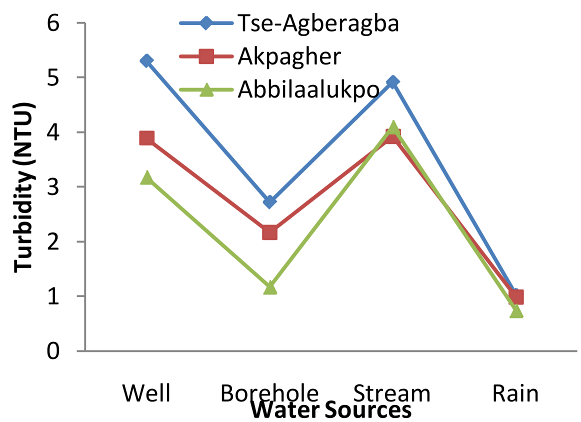

Figure 6: Turbidity of Water Samples

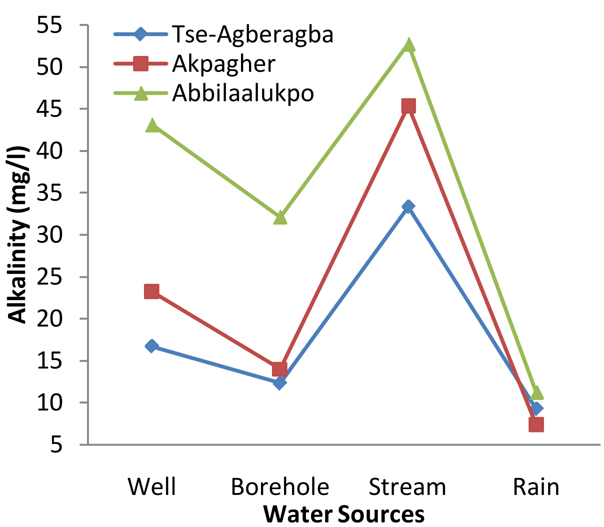

Figure 7: Alkalinity of Water Samples

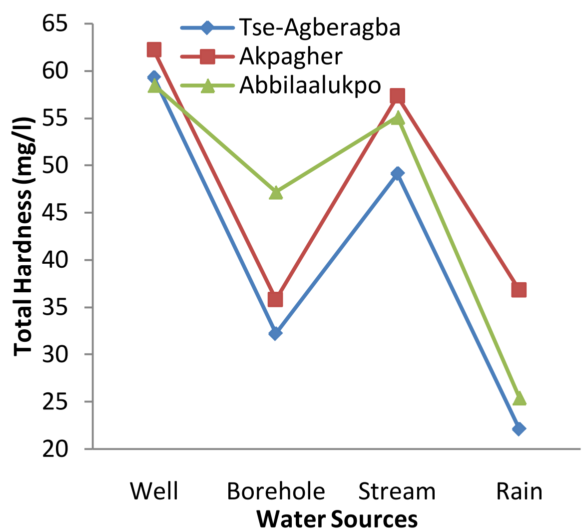

Figure 8: Total Hardness of Water Samples

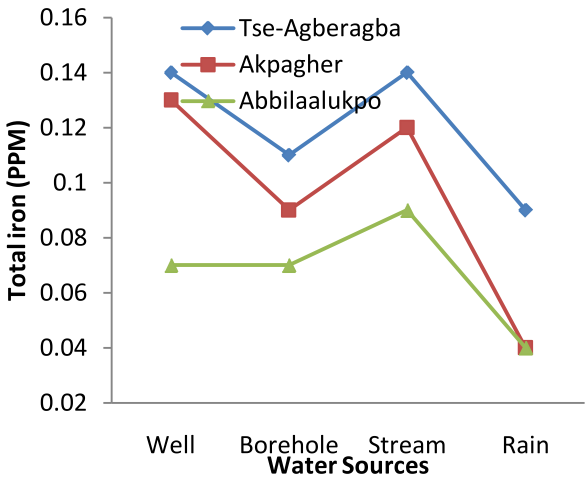

Figure 9: Total Iron of Water Samples

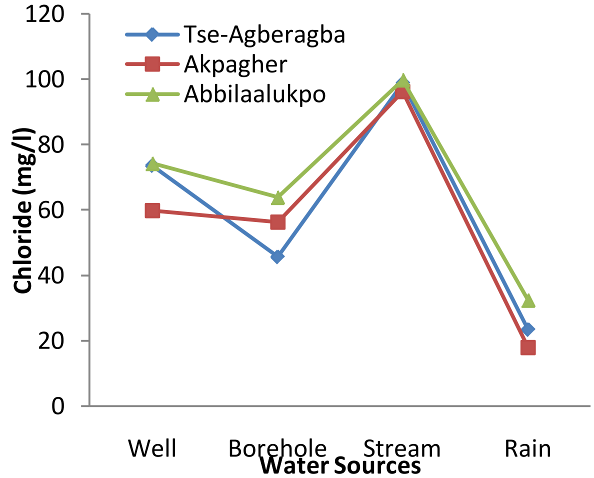

Figure 10: Chloride of Water Samples

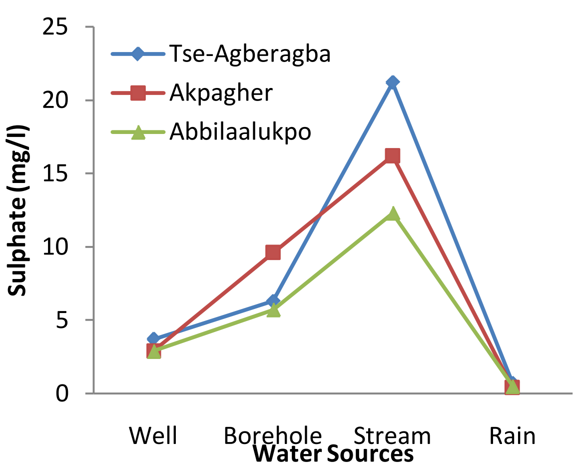

Figure 11: Sulphate of Water Samples

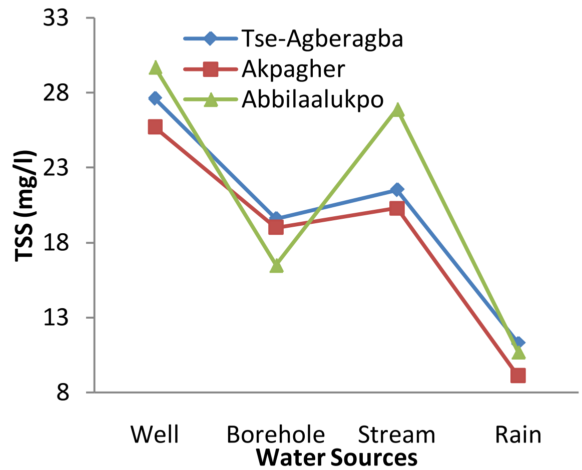

Figure 12: Total Suspended Solids of Water Samples

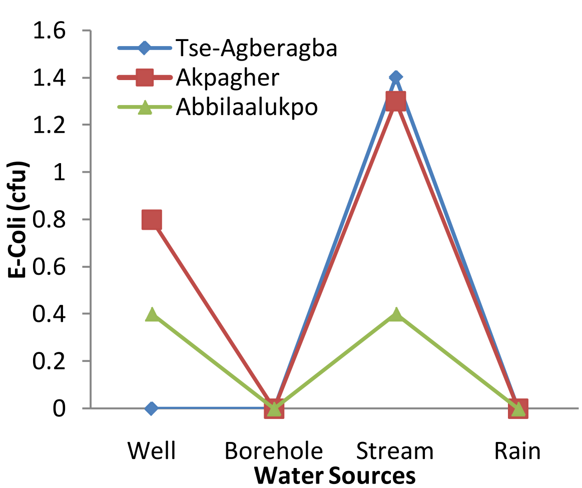

Figure 13: E-Coli of Water Samples

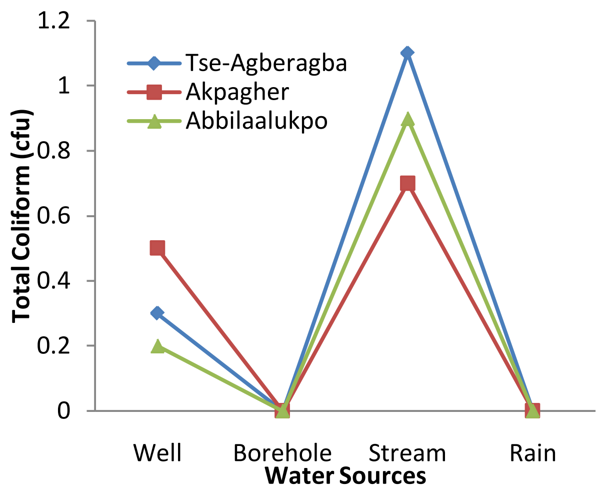

Figure 14: Total Coliform of Water Samples