SANITATION AND WATER QUALITY IN OKOLOBA – KOLGA, BAYELSA STATE OF NIGERIA

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ABSTRACT: The importance of water in human life cannot be over emphasized. This is because it constitutes over 70% of the human body. Water is used both for domestic [drinking, cooking, washing and general clean up] and industrial purposes. The most important and common use of water is domestic with particular reference to drinking and cooking; thus the term potable water! This paper examines our sanitary habits vis-à-vis our sources of water for safe consumption and water related diseases in a rural community, Okoloba in Bayelsa State. Four sources of water have been identified as used by the people of the community, namely: River Nun, Lake Efi, Rain water and Tap [underground] water. The physicochemical and biological parameters of the water sources were analyzed and compared with the WHO standards. The results showed that the pH levels for all the four water sources were within WHO desirable standards while TDS, TSS, Conductivity and coliform levels in some water sources (especially the Nun River and L. Efi) fall short of WHO standards. For instance, the coliform results show that: Rain water [0] was the least; Tap water [3.0]; R. Nun [102] and L. Efi [158] had the highest and therefore the most unsafe source of water. This has direct implications on the water related and water borne diseases suffered by the people in the community. Therefore, the people had been advised against the consumption of the River Nun and Lake Efi water while the state Government is advised to embark on Integrated Rural Development Programme.

INTRODUCTION

The importance of water in human life cannot be over emphasized as it constitutes about 65 to 70 percent of the human body. Water also occupies over 70% of the earth's surface which is essential to life (Tamuno, 2002 & 2004). The most important use of water is domestic with particular reference to drinking and cooking, thus the term potable water. The question is how much of the over 70% of surface water is safe for consumption. Thus, Ezenwaji (2010) emphasized the severe scarcity of public water supply in Nigeria. Accordingly, many researches have been carried out on water availability and quality (Anyadike and Ibeziakor, 1987; Ezenwaji, 2003; Ezemonye, 2009). However, the challenge in the urban areas today is not only the problem of obtaining the minimum quantity of water needed to sustain life, but also that of the quality of water readily available for use. The quality of water is further compounded by the fact that most urban water bodies serve as receptacles of waste discharges while wells are constructed close to soak away pits due to lack of land space (Ezenwaji, 2010). Most scholars also agree that one of the basic causes of poverty is inadequate access to water both in quantity and quality (Ariyabandu and Aheeyar, 2005).

It has been reported that inadequate sanitation is the major cause of death and/ or disease particularly among infants and youths who are more vulnerable to water borne and water related diseases. Across the world, 884 million people do not have access to clean water and 2.6 billion do not have adequate sanitation (www.one.org/c/internatilnal/issues.2012). Sanitation coverage is lowest in Sub-Saharan African and South Asia, where 70% and 59% do not have

access to improved sanitation respectively. For water, coverage is only 54% in Oceania and 61% in Sub-Saharan Africa, but all other regions have higher coverage rates of 87% and higher. Other disparities include: Poor people living in rural areas are far less likely to have access to improved water and sanitation facilities than their richer and urban counterparts. From the foregoing, it is clear that most water related studies are urban based or urban bias whereas the rural populace is as important as that of the urban. This reveals a gap in this field of studies. Whereas in most urban centers particularly in hilly areas like Enugu and similar cities, the problem is both quantity and quality, the case of rural areas is quality compounded by the traditional sanitation habits/attitude of the people. Thus, the aim of this paper is to examine sanitation practices and the quality of water in a rural settlement – Okoloba in KOLGA, Bayelsa State, Nigeria vis-à-vis its sources.

It has been observed over the years that despite some modernity that has crept into the community, the sanitary situation has deteriorated rather than improving. This is because in the late 1960s to the 1970s, Public Health Officers called Sanitary Inspectors were seen all over the community. Therefore waste disposal sites were restricted and prizes were even given to the cleanest quarters in the community while the Sanitary Inspectors were greatly regarded and assisted by the people of the community as well as the Chiefs. This helped in no small way to improve personal hygiene. Yet there had also been the problem of traditional cultural inertia which includes:

- ✓ Open defaecation into rivers and streams
- ✓ Taking baths in the rivers and streams
- ✓ Disposal of every available waste (liquid, solid etc)into rivers and streams
- ✓ Fetching of drinking water from surface sources of water (rivers, creeks, streams, lakes, etc)
- ✓ Preference for drinking water from old water pots

These traditional forms of sanitation practice are quite inimical to improvement in water quality in the area particularly the open defaecation into surface sources of water. There is urgent need to introduce Open Defaecation Free Communities in rural areas. This also forms one of the specific objectives of the paper. Others include investigating the major sources of water and examining the quality of water from these sources after testing them in laboratories. This will enable us to suggest which sources should be used as potable water in the community and also help us to make necessary recommendations to Government to save the lives of the teeming rural populace. The present study was designed to evaluate the sanitation and water quality in Okoloba – Kolga, Bayelsa State of Nigeria

METHODOLOGY

Study Area

Okoloba is a settlement along the Eastern bank of River Nun, one of the major tributaries of the River Niger in the Niger Delta Region of Nigeria. It is located on latitude $05^{0}15'30''$N and longitude $06^{0}15'05''$E (Fig.1). Okoloba is also one of the major communities in Kolokuma/Opokuma Local Government Area (KOLGA) in Bayelsa State. It is adjoined by a sister community called Seibokorogha (Sabagreia) at the southern end. The community is also a point of bifurcation wherein the River Nun once again bifurcates into the Igbedi Creek and the continuation of the River Nun. Meanwhile there is also an ancillary stream Odobutoru which has a bifurcation with the Igbedi Creek opposite the settlement. The average temperature of the settlement ranges between 28^{o}C and 35^{o}C while rainfall varied from 2700mm to over 3370mm annually. Two basic seasons of dry and wet prevail in the community with a noticeable little dry season that fluctuates from July to September popularly known as the "August Break". The vegetation is the freshwater swamp forest and thus blessed with a diversity of plant species including: Mahogany (Khaya Ivorensis), Iroko, Wild Cotton, Black and White Afara, Abura (Macophyla ciliata). Geologically, the area had been laid down in the late quaternary era while

the drainage pattern is characteristically dendritic because of the homogenous rock structure. The population of Okoloba was 27,650 in the 2006 population census while the projected estimate is 32,780 as at 2009 (NPC, 2006). Economic activities of the villagers include: farming, fishing, petty trading, canoe carving, mat and basket weaving.

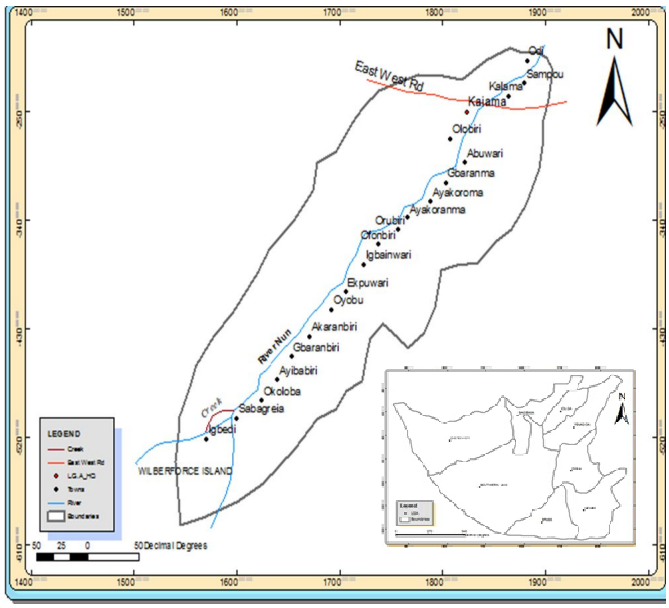

Figure1: Map of KOLGA showing Okoloba and its Environs.

Source and Collection of Data

Primary and secondary data were used for the study. The primary data were collected from both structured interview and sets of questionnaire designed for the purpose for which information was sought such as the main sources of house hold water supply, the type of waste generated and places of disposal, availability or otherwise of toilet facilities, sanitary habits and use of surface water, etc. The secondary data related to old meteorological data from the Agric station in Sabagreia and updated weather information from GEM-NDU, [Amassoma; Wilberforce Island (Agadagbabou)] weather station close (9km) to Okoloba (Tamuno, 2011).

The approach used for the survey was the Participatory Rural Appraisal (PRA) to ensure close interaction with the people and retrieval of vital information. Since the community is made up of five Quarters/Compounds cluster sampling was employed to distribute 20 sets of questionnaire to each of the five compounds to give a total of 100 sets of questionnaire, then the simple random sampling was embarked upon in each of the compounds to give each household a none-zero chance of being selected. Other secondary data on water borne and water related diseases were obtained from the Comprehensive Health Center, Okoloba between August 2011 and July 2012.

Water Analysis

The major sources of water supply to the community are: River Nun, Lake Efi, Rain water and Tap (groundwater). Water samples from the four main sources were specifically collected for analysis at the Research Laboratory, Niger Delta University using standard analytical procedures (Clerk, 1981). The physico-chemical and biological parameters determined were: temperature, pH, conductivity, turbidity, chlorine, nitrate, nitrite, iron, manganese, Total Dissolved Solids (TDS), Biological Oxygen Demand (BOD), Total Coliform, etc.

Data Analysis

Simple descriptive statistics of mean and percentages were employed for the climatic data and that of the waterborne and water related diseases suffered by people who visited the Health Center. The Spearman Rank Correction Co-efficient (Rho**)** test was also employed to see the relationship or otherwise of the occurrence of the notable diseases prevalent in the area. The results were compared with the World Health Organization's standards (WHO, 2012).

RESULTS AND DISCUSSION

The results (Tables 1 and 2) have revealed that the temperature of water samples from the four sources ranged from 27.2^{o}C to 28.0^{o}C with mean of 27.63^{0}C which is within the WHO permissible limit of 25 – 30^{o}C for drinking water. The pH varied between 7 and 8.5 and was slightly acidic and beyond the WHO regulatory limits recommended for potable water. All the water sources recorded wide ranges for metallic elements [Ca, Mg, Na, K, Mn and Fe]. There were relatively low concentrations of nitrates and nitrites which is indicative of the fact that agriculture and industrial effluents are not consistently discharged into the sources of water. This may be ascribed to the virtual absence of industries in the area while the agricultural activities are carried out without much application of modern/industrial fertilizers.

Table 1: Physicochemical and microbiological Characteristics of water sources in Okoloba-Kolga community

Water Source	T^{O}C	P^{H}	Cond.	Sal	TDS	NO_3	NO_2	Cl	SO_4	Turb.
Tap – Okoloba	27.5	6.70	953	0.83	476	0.80	0.48	20.40	2.80	28.60
L. Efi	27.8	6.45	465	0.40	233	1.10	0.60	12.60	10.50	16.40
R. Nun	28.0	6.03	503	0.28	252	0.28	0.21	14.80	12.40	38.50
Rainwater	27.2	6.66	379	0.38	189	0.36	0.25	6.50	0.80	2.20

Water Source	Ca	Mg	Na	K	Mn	Fe	BOD	TH	TCF	TSS
Tap – Okoloba	21.50	8.40	15.50	20.6	0.02	0.24	4.80	120	3.00	0.40
L. Efi	10.80	4.60	18.60	14.20	0.15	0.50	38.50	50.00	158.0	
R. Nun	12.00	6.20	14.50	8.60	0.12	0.25	120.2	105.0	102.0	
Rainwater	0.00	0.o2	2.50	1.65	0.00	0.00	0.70	18.00	0.00	

Source: Author's Fieldwork, 2012

Table 2: Compliance status of the water sources with WHO standards

Parameters	WHO Std.	Water Source				
		Tap Water	L.Efi	River water	Rainwater	Remark
Temp(^{0}C)	25 -30	27.5	27.8	28	27.2	
P^{H}	7-8.5	6.7	6,45	6.03	6.66	
TH	500	120	50	105	18	
NO_3	10	0.80	1.10	0.28	0.36	
NO_2	5	0.48	0.60	0.21	0.25	
Fe	0.3	o.24	0.50	0.25	0.00	
TDS	500	476	233	252	1.89	
TSS	3.00	0.40	2.50	5.20*	1.62	*n.a
BOD	3.00	4.80	38.5	120.20	0.70	
TCF	0.00	3.00	158*	102*	0.00	*n.a
TURB.	‹5	28.6	16.40	38.50	2.20	
Mn	0.5	0.02	0.15	0.12	0.00	

Source: Author's Fieldwork, 2012

The results on Table 2 revealed that although all major sources of water supplies to the community are relatively not too bad in quality, safety from these sources is reasonably questionable except the rain water. Meanwhile, people are quite apprehensive of the rain water also owing to its relative acidity (Tables 1 and 2). The high levels of BOD, TCF and turbidity of the water samples from Nun River and Lake Efi which are two main permanent sources of water have many implications. The first is that they have links with the traditional sanitary misdeeds of the people. These include; open defecation into the water sources, bathing, dumping of wastes and fetching water with contaminated containers from the contaminated water sources (Plates 1 and 2)

The unhealthy activities may be ascribed partially to ignorance; some out of cultural inertia – refusing to change from the status quo (Wagner and Lano, 1958). Contamination may also be associated with storm water impacts.

Plate 1: Open defecation in River Nun Plate 2: Fetching water from a polluted River Nun

The analysis has shown that the rainwater is the safest source of drinking water but scarcity in the dry months of November (11), December (12) and January (1) (Fig. 2) is a major set back.

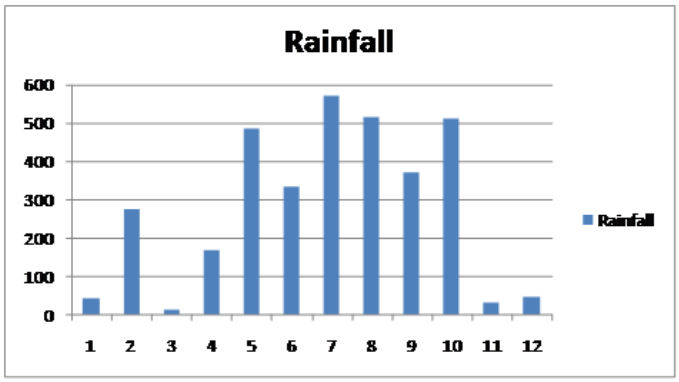

Figure 2: Average rainfall pattern in Amassoma

The foregoing informs us that we do not need lip service Environmental Sanitation Exercises but a practical one wherein Local Government Chairpersons effectively participate to improve sanitation particularly in the rural areas. On the other hand, we need to see whether or not there is a relationship between the occurrences of the waterborne/ water related diseases and seasonality of rainfall. It was observed from records at the Comprehensive Health Centre,

Okoloba that four waterborne/water related diseases are prevalent in the community; namely: malaria/typhoid, dysentery, diarrhea and cholera (Table 3).

The Spearman Rank Correlation Co-efficient (rho) statistics was used to determine the relationship (Table 4).

Table 3: Major waterborne/water-related diseases prevalent in Okoloba, 2011/2012

Month	Malaria/typhoid*	Diarrhea	Dysentery	Cholera
Jan	52	24	12	50
Feb	50	18	13	38
Mar	38	15	6	30
Apr	82	8	5	25
May	48	4	4	16
Jun	70	10	9	14
Jul	62	11	15	13
Aug	78	12	25	23
Sep	46	15	10	12
Oct	42	3	11	10
Nov	54	6	8	11
Dec	44	9	7	42
Total	666	137	125	284
Mean	55.5	11.42	10.42	23.67

Source: Author's fieldwork (2012)

- - Malaria and typhoid are joined because of the closeness of symptoms of the two diseases and the difficulty of the Health Centre to separate them.

Table 4: Relationship between rainfall and disease occurrence (Malaria & Typhoid)

Rainfall(mm)(X)	Malaria & typhoid (Y)	RX	RY	/D/	D^2
43.50	52	10	6	4	16
274.79	50	7	7	0	0
14.51	38	12	12	0	0
168.26	82	8	I	7	49
487.7	48	4	8	4	16
335.25	70	6	3	3	9
570.80	62	1	4	3	9
515.30	78	2	2	0	0
371.50	46	5	9	4	16
512.72	42	3	11	8	64
33.78	54	11	5	6	36
49	44	9	10	1	1
					216

Source: Author's fieldwork (2012)

$$\text{Rho} = 1 - 6\sum d^2/(N^3 - N) \quad (1)$$

$$= 1 - 6(216)/1716 = 1 - 1296/1716; \quad 1 - 0.755 \quad = 0.25$$

The result implies a weak correlation between the two variables (rainfall seasonality and disease occurrence [malaria and typhoid].

$$\text{Co-efficient of Determination (CD)} \quad = r^2 \times 100 = \quad 6.25 \quad (2)$$

The result implies that only 6.25% of the variation in the occurrence of malaria/typhoid in Okoloba community is explainable to variation in weather conditions (rainfall). It is therefore

suggestive that the rest (93.75%) of disease occurrence [malaria/typhoid] is attributable to other factors.

CONCLUSON AND RECOMMENDATIONS

The study has helped to establish the link between poor sanitation habits and the consequential occurrence of some common waterborne and water-related diseases. These ailments have resulted to the death of many children all over the world. Some of the notorious poor sanitary habits include: open defaecation into water sources especially the Nun River in addition to bathing in the river and throwing dirt into surface water sources (Murray and Lopez, 1996; Khale and Dyalchand, 2009,). These activities help to reduce the quality of the abundant water in the Okoloba community. It is obvious that attitudinal change among the rural populace is imperative to ensure good health of the rural dwellers. Government participation is important through the re-introduction of Sanitary Inspectors and by creating sanitary awareness in their development programmes especially the Integrated Rural Development Programme (IRDP).

REFERENCES

Akpabio, E.M. (2008). Water and Poverty: The Experience of Rural Dwellers in Akwa Ibom State of Nigeria. In: Igbozuruike, Awuzie and Onyenechere [Eds] *Rural Poverty in Nigeria*. Cape Publishers International Ltd, Abuja.

Anyadike, R. N. C. and Ibeziakor, M. N. (1987). The spatial structure of residential water demand in enugu, nigeria *The Nigerian Journal of Social Studies*, 4: 1- 8 .

Ariyabandu, R. N. and Aheeyar, M.M. (2005). Household Water Security through Demand and Response. Paper Presented at Acess, Poverty and Social Exclusions – Funded Seminar Series Water Governance: Challenging the Consensus, 1st March, ODI, London.

Clerk, D. N. (1981). Measurements: The key to laboratory analysis. *Water Engineering and Management*, 128: 63 -68.

Ezemonye, M.N. (2009). *Surface and Ground Water Quality in Enugu Urban.* Unpublished PhD Thesis, University of Nigeria, Nsukka.

Ezenwaji, E. E (2003). *Urgent Water Demand Management in Nigeria* Paper presented at the 29th WEDC International Conference, Abuja, Nigeria.

Ezenwaji, E. E (2010). Evaluation and management of the quality of household water supply from supplementary sources in Okpoko Slum Settlement in Onitsha, Nigeria. *The Nigerian Geographical Journal* 6 (1& 2): 104 – 112.

Khale, M and A. Dyalchand (2009). *Impact of Rural Sanitation on water Quality and Water Borne Diseases*. www.communityledtotalsanitation'org/..impact-rural-sanitation. Accessed: 21.09.12 @3.45pm

Murray, C. and Lopez, A. D. (1996). *Global Health Statistics. Geneva*. World Health Organization WHO, Harvard School of Public Health and the World Bank.

National Population Commission (NPC): 2006 – Bayelsa State.

Tamuno, T. T. (2002). *Research Methods and Quantitative Techniques*. Harey Publications, Port Harcourt.

Tamuno, T. T. (2004). *Introduction to Geography and Environmental Studies*. Nisi Books, Port Harcourt.

Tamuno, T. T ((2011): Climate Change and Transportation in Amassoma. Proceedings of the Association of Nigerian Geographers [ANG], 2011, Lagos.

Wagner, E. G. and Lano, J. N. (1958). *Excreta Disposal for Rural Areas and Small Communities.* Geneva. World Health Organization [WHO] Monogram Series no.39.

WHO (2012): *Water, Sanitation and Health.* Htpp://www.who.int/water-sanitation-health/diseases/en/ Accessed: 15.09.2012@3.35am