Water Related Diseases as a Challenge to the Implementation of Reproductive Health of Pregnant Women in Anambra State, Nigeria

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ABSTRACT

A large share of total burden of diseases afflicting pregnant women in Nigeria which often result in maternal mortality is closely associated in some way with the absence of water in terms of insufficient quantities or unacceptable quality. It is in this regard that this paper assesses the Challenges of water related diseases to the implementation of the reproductive health of pregnant women in Anambra State. The objectives are to determine the contribution of identified water related diseases to the mortality of pregnant women and establish their spatial structure in 21 Local Government Areas of the State for a better regional understanding of the problem in different parts of the State. Data for the analysis regarding the most prevalent water related diseases and the number of maternal deaths in 42 Communities in the 21 Local Government Areas of the State were gathered with the aid of structured questionnaire. In all, 420 questionnaires were served to both public and private hospitals in the 42 randomly selected communities in the State between October, 2010 and April 2011 (the water scarcity season in the State). The data were analyzed with the aid of Multiple Regression and Cluster Analytical techniques using the SPSS program version 20 running under PC/Windows 2007. Result shows that some water related diseases isolated for the study namely; Cholera, Typhoid, Diarrheal diseases, Malaria, Gastroenteritis, Yellow fever, and Hepatitis, altogether contributed 32.4% of the total maternal deaths, out of which only malaria contributed most with 12.4%. Cluster Analysis was used to establish the spatial disposition of water related maternal deaths in the State. Based on the above findings, our policy recommendations include adequate provision of clean drinking water, improvement in general health policy of the State, training of community health workers, and the promotion of poverty alleviation programmes by the State Government.

Keywords: *Associated, Health, Communities, Diseases, and Water.*

1. INTRODUCTION

A large share of the total burden of diseases afflicting pregnant women in Nigeria which often result in maternal mortality is closely associated in some way with the absence of water supply. The absence of water in terms of sufficient quantities or acceptable qualities is of utmost importance to the proper implementation of reproductive health of pregnant women. The high maternal mortality in Nigeria which was as high as 1000 per 100,000 live births in 1998 made the Federal Government of Nigeria to develop a national health policy to identify with the reproductive health needs of its citizenry. This timely move has had a beneficial effect that by 2003, two years after the development of the policy document, the maternal mortality reduced in the country by 20% to 800 deaths per 100,000 live births (Batram, 2004, Okri, 2008). However, further progress was recorded by 2008 when the maternal mortality further went down by 31.9% to 545 deaths per 100,000 live births (FGN, 2010). The maternal reproductive health is what the MDGs goal 5 which is improvement in maternal health was set to achieve. In its MDGs report of 2010, the Federal Government of Nigeria noted that recent progress towards this goal is promising

and if the latest improvements can be sustained at the same rate, Nigeria will reach the MDGs target by 2015. To achieve this target, there is every need to sustain effort in the improvement of related and lagging sectors such as water and sanitation which pose enormous challenges to the successful implementation of reproductive health programmes in Nigeria. The major challenge lies in translating substantial public investments in water and sanitation into effective access by pregnant women. This is necessary because according to Anyaora, (2011) poor water supply access especially in rural areas and poor urban neighborhoods has substantially reduced the health of many mothers and their new born children. Aggrey, (2001) agreed that water diseases are one of the chief killers of pregnant mothers in developing countries, while Navaneetham and Dharmalingam (2002) noted that the utilization of maternal health care service in southern India was not progressing as desired. A claim which was supported by the Government of India (2006) when it opined that the major health problems causing morbidity and mortality among mothers are such water diseases as diarrhea, parasitic infection hepatitis, entric fever and other water borne diseases. The report singled out

malaria and tuberculosis as two leading causes of maternal death.

In Nigeria, cusory comments in the media and public fora point to the fact that water related diseases are being isolated as important in reproductive health of women. In the WHO definition of reproductive health, it stated that it is the reproductive process, functions and systems at all stages of life and concluded that reproductive health implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so (WHO, 2004). The issue of capability, therefore, becomes important, because an unhealthy mother will be incapable of delivering a new one or at best give birth to an unhealthy baby. In this wise, an adequate supply of safe drinking water and sanitation are important prerequisites for a healthy motherhood, but water borne and water related diseases are still a major cause of maternal death in Nigeria and many other developing counties (Farwell and Nieuwenhuijsen, (2010). Earlier, Farwell and Nieuwenhuijsen (2010) had looked at poor water quality and their association with adverse reproductive outcomes, and concluded that water is important in the health of pregnant women. The deleterious effect of water related diseases on pregnant women is of concern to the Nigerian government whose search for solution has remains perfunctory and palliative. The current state of knowledge indicates that the earlier gains recorded on the improvement of maternal health in Nigeria are difficult to sustain (Musa, 2011). Consequently, research such as this is undertaken to determine the extent to which water related diseases have become a challenge to the implementation of reproductive health of pregnant women in Nigeria using Anambra State as a case study. It is hoped that the result of this research will serve as a framework for carrying out a similar one for the entire country. This is not only necessary but important if our desire to achieve goal 5 of the MDGs which is on improved maternal health will materialize considering that now is only three years away from the MDGs target year of 2015.

1.1 Review of the Prevailing Situation

The poor level of reproductive health in Nigeria has been a subject of concern to many. As already mentioned, the situation of maternal mortality in Nigeria was as high as 1,000 per 100,000 live births in 1998. Although various documents have stated that there are improvements since then, it should be realised that these national improvements have masked worsening situations in many States of the Country. There is indeed no assurance that all the States are moving at the same improvement rate as the situation at the national level but some States have really achieved much progress in the area. The cry for the improvement of women health especially in the reproductive subsector gained prominence in the post

Beijing era. In 2000, for example, there was a review of the Beijing Platform of Action (BPA) by 178 countries including Nigeria to chart a new course for women in the new millennium. According to Donwa (2005), this produced a set of spirited actions against such happenings as violence against women, poverty, health, economy, education and training, power, participation in decision making and environment. Kalma (2007) noted that among these vices against women, the issue of women health especially in the area of reproductive health was captured by the Nigerian government for serious consideration. This gave rise to the birth of the National Reproductive Health Policy and the National Reproductive Strategic Framework and plan of action. Despite the attempts to improve the reproductive health, women and children's health continue to suffer and this compounds the problems which women face in healthcare delivery. A UNICEF rating classifies Nigeria as one of the countries with the highest mortality rate and shorter life expectancy with the infant mortality rate of 105 per 1,000 births and national mortality rate of 704 per 100,000 (World Bank, 2003).

As has been repeatedly mentioned here, the reproductive health of pregnant women has not fared better despite the opinion of government in some quarters. Access to the combination of safe drinking water and hygienic sanitation facilities are preconditions for successful health of pregnant women. In Nigeria, the water supply situation both in quantitative and qualitative terms is a grave source of concern. In 2004 for instance only about 48% of the population was estimated to be served by improved water sources (WHO, 2006), leaving a gap of about 52% of the population without safe water. In fact, between 1990 and 2004, and between 2004 and 2008, access to safe water actually dropped by 1% and 1.3% respectively. The pregnant women, however, and their children bear the brunt of this deleterious water scarcity and its associated poor quality because they constitute the greatest percentage of those that provides and manages water in their various households.

2. MATERIALS AND METHODS

2.1 Study Area

Anambra State of Nigeria is located between Latitudes $5^0.52^1$N and $6^0.45^1$N and Longitudes $6^0.45^1$E and $7^0.15^1$E respectively (Fig. 1) and has an estimated land area of 4,762sqkms and bound in the North by Kogi State, in the East by Enugu State, Delta State in the West and Imo State in the South. It has 21 Local Government Areas and 177 Communities (ANSG, 2010). Geologically, the State is made up of variegated formations. Close to the river Niger in the western boundary is the alluvium deposit, in various areas of the hinterland dominant formations are the Imo clay shales, Bende – Ameki, Nanka and Orashi sands (Orajiaka, 1975). The State has an average temperature of 28°C, however between February and

April especially in March it experiences very hot weather with the temperature reaching 32°C and above. Mean annual rainfall ranges between 1500 – 2000mm. The 2006 population of the State was 4,177,828 made up of 2,117,984 males and 2,059, 844 females, (NPC, 2006).

However there are a total of 180 Primary Healthcare Centres (PHCs), - Secondary health and 4 tertiary health institutions in the State (Anambra State Ministry of Health, 2011).
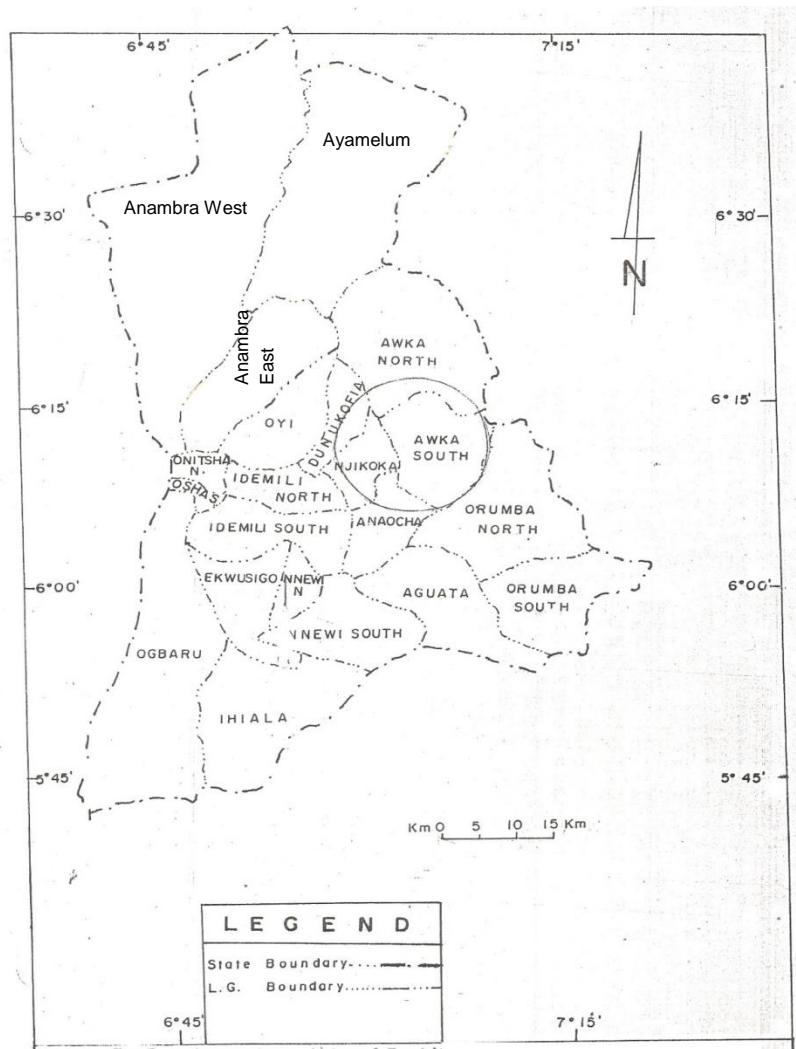

Fig. 1: Map of Anambra State showing 21 LGAs

2.2 Data Collection

For this study, both Primary and Secondary sources of data were used in order to determine the contributions of water related diseases to maternal deaths in the State. To generate primary data, 420 questionnaires were designed to ascertain the most common water related diseases, which give rise maternal deaths, the rate of affliction, the number and the rate of death etc in 42 randomly selected communities in the State which translates to an average of ten questionnaire per community. In each community selected, the questionnaire were served to all the private and government health institutions. The most common public health institutions in these communities were the Maternity Homes, Primary Healthcare Centres (PHCs), Cottage Hospitals and General Hospitals. No

questionnaire was served on any Teaching or Specialist hospital because of the difficulty in obtaining information from such hospitals. The period for the data collection was from October 1, 2010 to April 30, 2011. We have chosen this period, because it is the season that most areas in the State experiences water scarcity and as such it is expected that the incidence of water borne diseases will be highest at this time. We selected the Local Government Headquarters and one of the remotest communities in each Local Government Area for data collection. The choice of these two contrasting areas in terms of development was to ensures that the supposedly best and worst developed areas in each Local Government Area were included in the study. Table 1 shows the number of maternal patients admitted in the health institutions visited and those that die as a result of water

related diseases within the period understudy. (October   2010 – April 2011). (Table1).

Table 1: Number of maternal patients in hospital and number of deaths as a result of water related diseases

S/N/Code	LGAs	Community	Average No. of Maternal Patients Admitted	Average No. of Deaths	% of Deaths over those Admitted
1.	Aguata	Ekwulobia, Umuona	37	1	2.9
2.	Anambra East	Otuocha, Aguleri Otu	31	3	9.7
3.	Anambra West	Nzam, Innoma	42	4	9.5
4.	Anaocha	Neni, Aguluzoigbo	50	1	2.0
5.	Awka North	Achalla, Ugbenu	33	3	9.1
6.	Awka South	Awka, Ezinato	44	1	2.2
7.	Dunukofia	Ukpo, Nawgu	88	2	5.3
8.	Ekwusigo	Ozubulu, Ichi	40	2	5.0
9.	Idemili North	Ogidi, Abacha	52	3	5.8
10.	Idemili South	Ojoto, Akwa Ukwu	41	2	4.9
11.	Ihiala	Ihiala, Mbosi	58	2	3.4
12.	Nnewi North	Uruagu, Nnewi Ichi	101	3	3.0
13.	Nnewi South	Ukpor, Utu	28	1	3.6
14.	Njikoka	Abagana, Nimo	61	2	3.3
15.	Ayamelum	Anaku, Umueje	40	3	7.5
16.	Onitsha North	Inland Town, 3-3	128	3	2.3
17.	Onitsha South	Fegge, Odoakpu	133	2	2.2
18.	Orumba North	Ajalli, Awa	59	3	5.1
19.	Orumba South	Umunze, Ihitte	61	4	6.5
20.	Ogbaru	Atani, Ogwuanocha	63	5	8.2
21.	Oyi	Nteje, Nkwelle Ezunaka	43	4	9.3

Source: Field work (2011)

Also the level of water supply in each local government area and the recorded number of maternal deaths from water related diseases are shown in Table 2.

Table 2: Water supply level and number of maternal deaths in the LGAs, (October 2010 – April 2011)

S/N	LGA	Qty of Water Demand per House-hold per day (litres)	Qty of Water Supply per House-hold per day (litres)	% of Demand Satisfied by Supply	Death as a result of Water Related Diseases							
					Cholera (X_1)	Typhoid (X_2)	Diarrhea (X_3)	Malaria (X_4)	Yellow fever (X_5)	Gastro-enteritis (X_6)	Hepatitis (X_7)	Total
1.	Aguata	394	260	66.0								1
2.	Anambra East	223	60	26.9	1	-	-	2	-	-	-	3
3.	Anambra West	119	34	28.5	1	-	1	2	-	-	-	4
4.	Anaocha	300	213	71.0	-	-	-	1	-	-	-	1
5.	Awka North	204	49	24.0	-	1	1	1	-	-	-	3

6.	Awka South	430	260	60.4	-	-	-	-	-	1	-	1
7.	Dunukofia	133	61	45.9	-	-	1	-	1	-	-	2
8.	Ekwusigo	218	90	41.3	-	-	-	1	-	-	1	2
9.	Idemili North	349	154	44.1	1	-	-	1	-	-	1	3
10.	Idemili South	331	149	45.0	1	-	-	1	-	-	-	2
11.	Ihiala	248	126	50.8	1	-	1	-	-	-	-	2
12.	Nnewi North	720	388	53.8	1	1	-	1	-	-	-	3
13.	Nnewi South	317	156	49.2	-	-	1	-	-	-	-	1
14.	Njikoka	402	214	53.2	-	-	1	1	-	-	-	2
15.	Ayamelum	169	63	31.4	1	-	-	-	1	-	1	3
16.	Onitsha North	1031	721	69.9	1	1	-	1	-	-	-	3
17.	Onitsha South	1009	710	70.3	-	-	1	1	1	-	-	3
18.	Orumba North	221	100	45.2	-	-	1	1	-	-	1	3
19.	Orumba South	230	95	41.3	-	1	1	1	-	1	-	4
20.	Ogbaru	126	44	34.9	1	1	1	1	-	1	-	5
21.	Oyi	241	61	25.3	-	1	1	1	-	1	-	4
	TOTAL	**7,041**	**4,008**	**56.9**	**9**	**7**	**11**	**17**	**3**	**4**	**4**	**55**

Source: Field work (2011)

2.3 Data Analysis

Data were analyzed with the aid of Multiple Regression and Cluster Analytical methods using SPSS programme version 20 running under PC/Windows 2007. Multiple regression analysis is a general statistical technique by which one can accurately analyze the relationship between the dependent and independent variables (Nie, Hall, Jenkins, Steinbrenner and Bent, 1975). The techniques may be viewed as a descriptive tool by which the linear dependence of a variable can be summarized and decomposed. In our case, the number of maternal deaths is our dependent variable, while the seven water related diseases constitute our independent variables. The general expression of the Multiple Regression as formulated by Hollman and Boyet (1975) is as follows:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \ldots b_n X_n + e \qquad (1)$$

Where y is the dependent variable

$X_1, X_2, X_3 \ldots X_n$ are the regression coefficients **a** is the base constant **e** is the error term.

Cluster Analysis according to Friedman (1967) is a multivariate technique for detecting regional groupings with the basic objective of reducing data.

The formula for Cluster Analysis is given as

$$d^2 ij = \sum_{k=1}^{m} \left(Zik - Zjk \right)^2 \qquad (2)$$

Where d^2_{ij} = the Euclidean distance
Zik = the values of variable *k* for object *i*
Zjk = the value of variable *k* for object *j*
M = the number of variables

The model requires that data should be standardized if they were collected in different measuring units but our variables do not require standardization since they are homogenous. The clustering of the 21 Local Government Areas of Anambra State was achieved through similarities approach which utilizes the nearest neighbor method to form clusters.

For the achievement of the cluster groups the model first calculated the Squared Euclidean Distance (SED) (the dissimilarity matrix) of our 21 Local Government Areas, (Table 3) after which it developed the single linkage agglomeration schedule (Table 4) leading to the creation of dendograph of four cluster groups (Fig. 2).

Table 3: Squared Euclidean Distance

Case	Squared Euclidean Distance																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	.000	79099.000	75844.000	175909.000	62118.000	67185.000	67337.000	54891.000	46222.000	61247.000	50784.000	42042.000	64155.000	82732.000	70585.000	66843.000	400171.000	490894.000	79018.000	65893.000	83286.000
2	79099.000	.000	26435.000	104586.000	48790.000	99374.000	24114.000	40494.000	23797.000	49100.000	30657.000	38349.000	23992.000	90451.000	31472.000	36922.000	676114.000	809467.000	15811.000	66700.000	48530.000
3	75844.000	26435.000	.000	176373.000	16374.000	147455.000	39237.000	97519.000	58072.000	87089.000	70722.000	57460.000	69159.000	147928.000	75627.000	87923.000	719879.000	846910.000	25050.000	14053.000	38332.000
4	175909.000	104586.000	176373.000	.000	107679.000	146386.000	122616.000	114362.000	141441.000	143952.000	140071.000	154889.000	138174.000	173549.000	156870.000	140046.000	570374.000	670387.000	149799.000	124792.000	132925.000
5	62118.000	48790.000	16374.000	107679.000	.000	88285.000	10795.000	40655.000	20956.000	38937.000	27048.000	24714.000	25415.000	87670.000	30981.000	35515.000	645157.000	759340.000	76180.000	10350.000	11052.000
6	67185.000	99374.000	147455.000	146386.000	88285.000	.000	73990.000	28142.000	45043.000	22258.000	41419.000	50421.000	44262.000	71690.000	47570.000	44264.000	313616.000	384369.000	83041.000	87698.000	84443.000
7	67337.000	24114.000	39237.000	122616.000	10795.000	73990.000	.000	33550.000	17273.000	21160.000	18139.000	94010.000	22446.000	76889.000	22266.000	22822.000	638610.000	721751.000	73030.000	11152.000	23837.000
8	54891.000	40494.000	97519.000	114362.000	40655.000	28142.000	33550.000	.000	77830.000	10410.000	52490.000	18621.000	66340.000	22871.000	93400.000	47320.000	483590.000	579063.000	42485.000	43682.000	29731.000
9	46222.000	23797.000	58072.000	141441.000	20956.000	45043.000	17273.000	77830.000	.000	97250.000	902.000	66860.000	20130.000	36426.000	30190.000	41810.000	552621.000	654660.000	18480.000	20861.000	13848.000
10	61247.000	49100.000	87089.000	143952.000	38937.000	22258.000	21160.000	10410.000	97250.000	.000	70590.000	95870.000	99480.000	19839.000	85580.000	82200.000	492376.000	569197.000	27449.000	37204.000	34581.000
11	50784.000	30657.000	70722.000	140071.000	27048.000	41419.000	18139.000	52490.000	902.000	70590.000	.000	61020.000	23450.000	33592.000	23490.000	14990.000	547005.000	641916.000	23082.000	27515.000	19174.000

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
12	42042.000	38349.000	57460.000	154889.000	24714.000	50421.000	9401.000	18621.000	6686.000	9587.000	6102.000	.000	13569.000	50446.000	11611.000	10819.000	558471.000	637506.000	18246.000	24345.000	30130.000
13	64155.000	23992.000	69159.000	138174.000	25415.000	44262.000	22446.000	6634.000	2013.000	9948.000	2345.000	13569.000	.000	31155.000	1152.000	3162.000	565522.000	672531.000	20843.000	24826.000	11325.000
14	82732.000	90451.000	147928.000	173549.000	87670.000	7169.000	76889.000	22871.000	36426.000	19839.000	33592.000	50446.000	31155.000	.000	32917.000	33935.000	372095.000	460086.000	76314.000	84581.000	67826.000
15	70585.000	31472.000	75627.000	156870.000	30981.000	47570.000	22266.000	9340.000	3019.000	8558.000	2349.000	11611.000	1152.000	32917.000	.000	2258.000	584408.000	685189.000	21363.000	29314.000	15595.000
16	66843.000	36922.000	87923.000	140046.000	35515.000	44264.000	22822.000	4732.000	4181.000	8220.000	1499.000	10819.000	3162.000	33935.000	2258.000	.000	565298.000	658163.000	29613.000	36454.000	22957.000
17	400171.000	676114.000	719879.000	570374.000	645157.000	313616.000	638610.000	483590.000	552621.000	492376.000	547005.000	558471.000	565522.000	372095.000	584408.000	565298.000	.000	27997.000	671395.000	651418.000	668701.000
18	490894.000	809467.000	846910.000	670387.000	759340.000	384369.000	721751.000	579063.000	654660.000	569197.000	641916.000	637506.000	672531.000	460086.000	685189.000	658163.000	27997.000	.000	775086.000	766055.000	799636.000
19	79018.000	15811.000	25050.000	149799.000	7618.000	83041.000	7303.000	42485.000	18480.000	27449.000	23082.000	18246.000	20843.000	76314.000	21363.000	29613.000	671395.000	775086.000	.000	4063.000	12136.000
20	65893.000	6670.000	14053.000	124792.000	1035.000	87698.000	11152.000	43682.000	20861.000	37204.000	27515.000	24345.000	24826.000	84581.000	29314.000	36454.000	651418.000	766055.000	4063.000	.000	10033.000
21	83286.000	4853.000	38332.000	132925.000	11052.000	84443.000	23837.000	29731.000	13848.000	34581.000	19174.000	30130.000	11325.000	67826.000	15595.000	22957.000	668701.000	799636.000	12136.000	10033.000	.000

This is a dissimilarity matrix

Table 4: Single Linkage Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	9	11	902.000	0	0	4
2	5	20	1035.000	0	0	6
3	13	15	1152.000	0	0	5
4	9	16	1499.000	1	0	5
5	9	13	2013.000	4	3	7
6	5	19	4063.000	2	0	9
7	8	9	4732.000	0	5	10
8	2	21	4853.000	0	0	9
9	2	5	4879.000	8	6	13
10	8	12	6102.000	7	0	11
11	8	10	7059.000	10	0	14
12	6	14	7169.000	0	0	16
13	2	7	7303.000	9	0	14
14	2	8	9401.000	13	11	15
15	2	3	14053.000	14	0	16
16	2	6	19839.000	15	12	18
17	17	18	27997.000	0	0	20
18	1	2	42042.000	0	16	19
19	1	4	104586.000	18	0	20
20	1	17	313616.000	19	17	0

3. RESULTS AND DISCUSSIONS

3.1 Results

Two results were achieved when we performed multiple regression analysis on our data. As already stated the total number of maternal deaths (Tables 1 and 2) are the dependent variable while the number of cases of water related diseases are the independent variables. The combined strength of the relationship between the independent parameters and total number of deaths when assessed by the model achieved 32.4%. This level of variation is the level of maternal deaths that can be explained by the linear dependence upon the seven water related variables operating together within the six months of the study (Table 5).

Table 5: Result of Multiple Regression of our Data

Statistics	Result
Multiple correlation (R)	0.569
Co-efficient of Multiple determination (R^2)	0.324
Standard Error of Estimates (SEE)	0.204

From Table 5, it could be easily seen that 67.6% was unexplained, meaning that a range of other variables were not included in the model which includes access to health institutions, availability of required drugs, poverty level, presence of qualified medical personnel, cultural practices which may forbid women from visiting health institutions, other diseases etc. considering these range of factors, it could be seen that the contribution of 32.4% by water related diseases is quiet high. The equation that yielded this result is as follows.

$$Y = 16.4 + 0.23(X_1) + 2.18 (X_2) + 1.03 (X_3) + 6.44 (X_4) \quad (3)$$
$$+ 0.85 (X_5) + 0.28 (X_6) + 0.12 (X_7)$$

The relative importance of these variables was further performed by the model when it computed successive values of multiple cor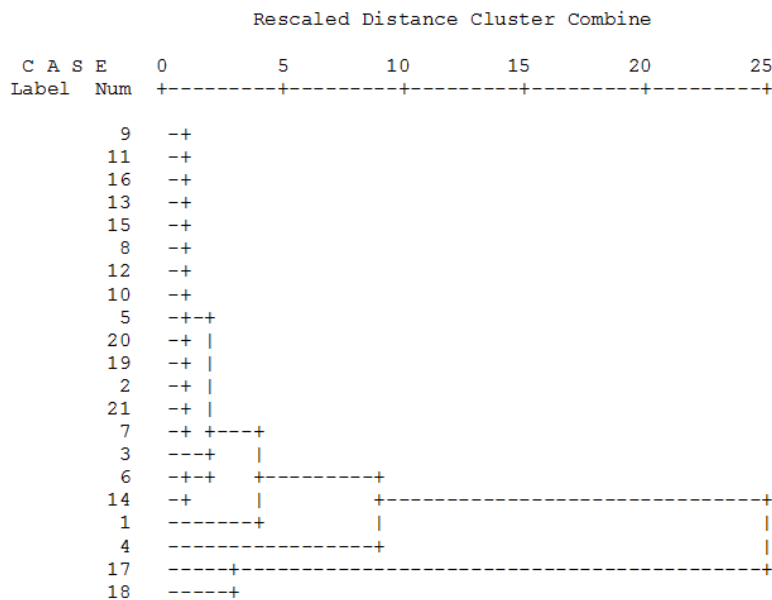relation coefficient obtained by introducing successive independent variables at each computation. The difference between the Squared Multiple Correlation (R^2) is the contribution of each of the variables (Table 6).

Table 6: Contributions of the Independent variables (Water Related Diseases) to the Reproductive Health of Pregnant Women in Anambra State

Variables	Variable Label	Multiple R	R^2	R^2 Change	% R^2 Change
Malaria	X_4	0.3530	0.1246	0.1246	12.46
Typhoid	X_2	0.4550	0.2070	0.0824	8.24
Diarrhea	X_3	0.5010	0.2510	0.0440	4.40
Cholera	X_1	0.5290	0.2798	0.0288	2.88
Yellow Fever	X_5	0.5500	0.3025	0.0227	2.27
Gastroenteritis	X_6	0.5650	0.3192	0.0167	1.67
Hepatitis	X_7	0.5691	0.3239	0.0048	0.48
Total					**32.4**

The result of the cluster analysis shows that Anambra State is grouped into four zones according to the degree of water related diseases relationship with maternal mortality (Fig. 2) and Table 7.

```
                   Rescaled Distance Cluster Combine

     C A S E      0         5        10        15        20        25
     Label  Num   +---------+---------+---------+---------+---------+

              9   -+
             11   -+
             16   -+
             13   -+
             15   -+
              8   -+
             12   -+
             10   -+
              5   -+-+
             20   -+ |
             19   -+ |
              2   -+ |
             21   -+ |
              7   -+ +---+
              3   ---+   |
              6   -+-+   +---------+
             14   -+ |             +-----------------------------+
              1   -------+         |                             |
              4   ---------------+ |                             |
             17   ----+----------------------------------------+-+
             18   ----+
```

Fig. 2: Dendrogram using Single Linkage

Table 7: Result of the Cluster Analysis

Group	Local Government Areas*	Water supply accessibility level
1	4 (Anaocha)	Very high
2	17 (Onitsha North) and 18 (Onitsha South)	High
3	1 (Aguata)	Low
4	2 (Anambra East), 3 (Anambra West), 5 (Nnewi North), 6 (Awka South), 7 (Dunukofia), 8 (Ekwusigo), 9 (Idemili North), 10 (Idemili South), 11 (Ihiala), 12 (Nnewi North), 13 (Nnewi South), 14 (Njikoka), 15 (Ayamelum), 18 (Orumba North), 19 (Orumba South), 20 (Ogbaru), 21 (Oyi).	Very low

*Source: Field work (2010). *see Table 1 for Local Government Area code*

3.2 Discussions

Table 1 shows the average number of maternal patients that patronized various hospitals during our field work. It could be seen that the number of pregnant women that visited the hospitals in the urban areas in all cases were more than twice the number in the rural areas. One explanation of this is that there are more people in urban local Government Areas than in the rural ones, and the other is that there are more literate maternal patients in urban areas of the State than in the rural areas who appreciate the need to visit the clinics. This view was indeed investigated and found to be true by Nzelibe (2009) who studied the literacy levels of pregnant women and their relationship with the number that patronize maternal health institutions. Furthermore, the table shows that the percentage of mothers that die as a result of affliction by the water related diseases are less in urban areas of the State than in rural areas. For example compare Onitsha South (2.2%) Onitsha North (2.3%), Nnewi North (3.0%) with say Anambra East (9.7%) Anambra West (9.5%) Oyi (9.3%), Awka North, Ogbaru (8.1%) and Ayamelum (7.5%). The reason that can be adduced for this is that there are obvious lack of medical personnel, equipment and drugs in rural health institutions than those of urban areas (Mohammed, 2010; Mba, 2010, Agati, 2011). In fact a close look at the Table portrays a clear positive relationship between the extent of rurality and the high number of maternal deaths. This, therefore, calls for continued government intervention in rural healthcare services of the State. During our field work, we visited many government hospitals and Primary Healthcare Centres in these rural areas and found most of them in very bad infrastructural state as there were few doctors, as those seen usually operate from distant urban places to the rural health institutions and as a result were hardly regular to duty, same with health attendants and auxiliary nurses at the Primary Healthcare Centres. Again there seemed to be little or even no supervision of these personnel by their superiors, a situation that has worsened the regularity of attendance by health personnel.

Furthermore in Table 2, the same scenario which was captured in Table 1 is repeated. For example the quantity of water demand and supply by households shows that the percentage of water demand satisfied by water supply is higher in urban areas than in rural areas. See for instance Onitsha South (70.3%), Onitsha North (69.9%) and compared them with Anambra East (26.9%) and Anambra West (28.5%). This is in consonant with the result of earlier studies that as long as the rural areas continue to perform poorly in water supply, the incidence of these water related diseases will surely persist in such areas (Ezenwaji, 2000, 2001, 2011, Onyechi, 2009, Ibekwe, 2010 and Anyikwa, 2012). Also the level of water scarcity in these Local Government Areas are in positive relationship with the number of water related diseases afflicting such areas. Table 5 revealed that all the seven water related diseases had a combined contribution of 32.4% to maternal deaths in Anambra State. This percentage is high considering that so many other factors such as the inability of patients to see the doctor especially in urgently cases, careless handling of cases by some health personnel, inability of the patients to visit the hospital either because of ignorance or poverty etc. in addition to the ones earlier identified. It is in this regard that the Anambra State Government should focus more attention to the general improvement of their hospitals and health centres. Furthermore, the relative importance of the water related diseases to maternal deaths in the State was ascertained by the use of Multiple Regression statistical technique. It shows that malaria and typhoid together contribute 20.70% out of the 32.40% contributed by the seven diseases. This means that only 11.70% are attributed by other five. Even at this, Diarrhea is assigned 4.40%, leaving the remaining four with 7.30%. This shows that malaria remains the highest maternal killer in the State followed by typhoid. Even against the continued government's current war against malaria as could be seen in such programmes as rollback malaria in which there has been massive importation and free distribution of treated mosquito nets and various other measures. It seems that these programmes are not achieving the desired objectives requiring that the strategies may have to be re-assessed with a view to re-strategizing them. This measure will be adopted together with proper environmental sanitation techniques directed at preventing the existence of pool water and clearing of bushes where mosquitoes breed and spread. In the case of typhoid, a very comprehensive programme like those of malaria will be mounted by government. The improvement of our water supply in the State should be the centre of the solution to the minimization or eradication of these diseases and this, therefore, means that government should prioritize its social services to the people placing water supply at the top of such priority list.

Finally, the cluster analysis which was carried out with our field data in Table 2 indicates that the State could be divided into four zones in terms of the degree of water related diseases that affect pregnant women. From the result, it was seen that Anaocha LGA performed best, meaning that the adverse effect of these water related diseases on pregnant women in this LGA is least in the entire State. The reason for this could be explained by the massive government rural water supply effort in the area which has brought back the use of public water supply to its inhabitants. Anaocha is followed by Onitsha North and South LGAs and then Aguata LGA. All the remaining 17 LGAs have performed poorly showing that these diseases afflict pregnant women severely in most parts of the State, a situation that calls for the doubling of current government's water supply effort. One striking

revelation of this study is that the result achieved by the cluster techniques is in line with our earlier study on the level of consumers accessibility to domestic water sources of good quality (Ezenwaji, Awopeju and Chima, (forthcoming) which revealed that there are four major water accessibility zones in Anambra State.

3.3 An Evaluation of the Performance of the State and non-State actors in the Implementation of Reproductive Health Programme

The implementation of the health programme of government has shown major defects which are widely recognised. This is because according to FGN (2007) the coverage is inadequate as it is estimated that about 54% of the Nigerian population have access to modern health care services. Preventive health has to be adopted and to achieve it, the basic infrastructural inadequacies which water supply shortage is one of the most important need to be addressed. Presently, poor and unreliable supply of portable water is a common feature in most homes and health institutions in Nigeria. Currently, maternal deaths is about 6 per 1,000 but this general average will not mask the situation in certain areas where there are still high observable rate of material deaths, some of them as high as 120/1000. This shows that childbirth which should be a normal process with minimal loss of life is associated with significant mortality among Nigerian women indicating that the situation is as frightening as has been observed. The question then arises as to what has been the performances of State and non-State actors in this regard. The State actors involved in the reproductive health programme are the three tiers of government (Federal, State and Local Government). The Federal Ministry of Health is the coordinating authority on all health work in the Country, the function of which it performs on behalf of the Federal Government in order to ensure the implementation of the reproductive health programme of government. Garbi (2010) noted that one reason why the Ministry has not performed as expected in this area is as a result of lack of funds. Budgeted funds are not usually released, but when it is released is often done in parts and very late in the budget year. Another reason is the poor coordination of the disparate agencies, authorities and committees that work on different aspects of the programme. The problem here is that some of these bodies sometimes devote their energies in conflicts which often arise as a resulting of overlapping and conflicting functions. Again, some intervention programmes are done without clear cut criteria for selecting benefiting States and Local Governments and this has tended to bring about project failures as some of the benefiting States or Local Government Areas. Again the Federal Ministry of Health should be working in close collaboration with Ministries and Agencies that should solve a particular problem. In

case of poor water supply, there will be no time when the Ministry of Health alone, will solve the problem of water related diseases without collaborating with the Federal Ministry of Water Resources and in some cases, the Federal Ministry of Environment. In the States the problem is more serious in that some State Ministries of Health do function as its functions are discharged more by political office holders than professionals and technocrats. This has given rise to dilapidated health infrastructure, poor attendance to work by health personnel and general corruption in the sector. In the water supply sector some States do not have functional water Corporation for over 10 years now, meaning that in such States poor water supply may have given rise to high maternal deaths. If this situation is as gloomy as we have described it in the States, we can say that the condition in the Local Governments is very hopeless. The constitution had assigned certain functions to Local Government which when well performed will promote primary health care. Contrary to this only few Local Government Councils have the capacity to implement the reproductive health making religious bodies to now perform that function at that level. Most religious bodies such as the Anglicans and the Roman Catholics are involved in both maternal preventive and curative health services. They operate hospitals, nursing schools and established health extension units in these hospitals. They operate the health institutions based on the guidelines released by the State Ministry of Health and operate with the required drugs, personnel, logistics and funds. We can say that the little improvements so far achieved in the reproductive health sector in the State is owed to the effort of the religious groups.

The officials of this system at this tier of government in Anambra State find it difficult to elicit the support of local leaders, traditional rulers, religious and cultural organisations as well as other influential persons and groups in support of the community action for reproductive health. This is because the framework and funds support necessary for this are nonexistence at the local government level. In the non-governmental areas, the contribution of Civil Society Organisation (CSO) to the implementation of the reproductive health has been low in some States of South Eastern Nigeria. In Anambra State the effect of the activities of CSOs is poorly felt because of their weak structure as only very few of them have the basic infrastructure such as minimal office space, vehicle, required staff, articulated and implementable programme as well as necessary funds to operate.

4. CONCLUSION

In this study, we have tried to examine the effect of water related diseases to the reproductive health of pregnant women in Anambra State, Nigeria. We saw that the poor

quantity and quality of water supply to various communities of the State are responsible to some level of mortality of pregnant women as could be seen from the collective contribution of water related diseases of 32.4% to the problem. However, out of this percentage contribution, malaria disease alone contributed 12.46% while typhoid had 8.24%. These two together contributed 20.7% to the observed variation. The spatial disposition of the effect of these water related diseases to pregnant women were determined and discussed.

Suggestion for Improved Implementation of Reproductive Health Policies

Based on the foregoing, the following suggestions are made for improved implementation of reproductive Health policies in Anambra State.

i.   The Anambra State Ministry of Health which is the apex Health body in the State should ensure that the existing health policy of the State is urgently reviewed in line with the present realities especially in the area of maternal health.

ii. The State Government can make use of the zones determined by this study to emphasize improvement of water supply on all areas of the State which rank low on the effect of water supply to reproductive health of pregnant women. A situation where 17 out of 21 Local Government Areas in the State performed poorly in this regard is to say the least worrisome.

iii. The training of Community Health Staff which presently receives less attention should be promoted to ensure that enough local health personnel are available in urban and rural areas to handle maternal related health problems.

iv. There is every need for the Ministry of Health to begin the education and sensitization of local women on the need to visit the hospitals for their health needs rather than patronizing unorthodox health practitioners.

v.   The State Government should encourage continuous research in this area and the result of such research should be used to improve maternal health rather that allowed to gather dust in the office.

vi. The government may partner with the Church to ensure that its health programmes especially those of pregnant women are properly implemented and advertised at the grassroots. The religious organizations should be encouraged to continue their support for reproductive health programmes while the State government should ensure the release of periodic subventions to the organisations.

vii. There should be continued and sustained education of the girl child in our Primary and Secondary schools who will become tomorrow's mother. The percentage of girls in schools should be increased through reduction of school fees to enable indigent parents be able to train their girls. When women become sufficiently literate, it will have the positive effect in that they will be able to practice basic hygiene at home which will prevent their affliction by water related diseases.

viii. Poverty alleviation measures such as the liberisation of loan conditions to the rural women to undertake petty businesses, should be emphasized by government. The government should also embark on free education at the primary and secondary levels, free maternal health services and community water supply programmes.

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