THE PREVALENCE OF WATER BORNE DISEASES AS A RESULT OF THE IMPACT OF SEPTIC TANK EFFLUENT ON THE QUALITY OF WATER FROM HAND DUG WELLS IN UGHELLI, DELTA STATE, NIGERIA

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Abstract

A septic tank is an underground on-site sewage disposal system. it collects and stores both sold and liquid sewage from toilets and wastewater from households. This underground septic tank effluent could pollute the underground water. Most of the inhabitants of Ughelli depend on water supply from hand dug wells in the area because of the erratic water supply from government owned tap water system. The quality of this water has been of great concern to the inhabitants as its consumption can result in various forms of water borne diseases; hence this study. Water samples were collected from hand dug wells at varied distances to septic tanks in the area. Several physic-chemical and microbiological analyses were taken into consideration in line with WHO drinking water standard. The researchers discovered that there is variation in the quality of water obtained in the area. These variations are responsible for water borne diseases in the area. The paper recommends that shallow wells should be located at least 25 meters is to any polluting source in order to safeguard the health of the people.

Introduction

It is a well-known fact that clean water is essential for healthy living. Adequate supply of fresh and clean drinking water is a basic need for all human beings on earth, but it has been observed that millions of people worldwide do not have access to this type of water.

Underground water resources all over the world are threatened not only by over exploitation and poor management, but also by ecological degradation. The main source of underground water pollution can be discharged untreated waste (Agbede, Akpokodje and Kupolati, 2003). Pollutants like chemicals in drinking water cause problems to health and lead to water borne diseases. According to Adernoroti (1988), cases of minimate disease, which affect the brain causing insanity and eventual death reported in Japan in 1956, were the result of shallow well pollution by effluent leakage from septic tanks.

Water quality is deteriorating due to pollution from almost all human activities (Kuylesstierna, Najlis and Bjorklund, 1998). Deteriorating water quality is not surprising as all chemicals generated from human activities find their way into water supplies (Krantz and Kifferstein, 2005).

Development of sewage networks and waste treatment facilities in urban areas has expanded tremendously in the past two decades (Ohuwande, 1986). However, the rapid growth of the urban population especially in Latin America and Asia has outpaced the ability of governments to expand sewage and water infrastructure with the resultant outbreaks of cholera and other similar diseases still occurring with alarming frequencies due to the consumption of polluted underground water (Krantz and Kifferstein, 2005).

In Nigeria, like other developing countries, people suffer from a number of primary environmental problems mainly attributable to under-development and attendant poor living conditions. Today, majority of Nigeria's population are not connected to large scale system of water supply. Rather, they rely on traditional forms of supply through the digging of shallow wells by individual or communal efforts.

The need for increased water quality for sustainable development has continued to worry the minds of researchers. In Delta State, water quality researchers have been centred on rain water quality (Efe, 2005); oil impact on potable water (Adisa, 2004; Smith, 2006), without thinking of the prevalence water borne diseases as a result of the impact of septic tank effluent on the quality of water from hand dug wells.

Ughelli is one of the largest urban towns in Delta State in terms of physical size and total population of people. By virtue of this fact, it exhibits most of the developmental attributes of most Nigerian urban centres which include the use of septic tanks as an on-site sewage disposal system. Also, Ughelli is a rapidly growing urban centre as a result of rural-urban drift.

Generally in Ughelli, the problem of sewage and waste water disposal can be described a endemic. To a large extent, disposal takes place in the same site where domestic water is generated. As such, health and environmental consequences of the disposal methods are often restricted to the immediate vicinity of the household.

With the rapid growing population, there is the need for increased water supply and associated increases in excreta and waste water generation. This in turn leads to increased strain on sanitary facilities and a rise in the level of disease outbreaks as well as environmental degradation. This is based on the inadequate level of primary health care, poor hygiene habits and the general poor average income status of the people. Also in Ughelli, the indiscriminate proliferation of septic tank facilities, poor maintenance and poor aesthetic quality are detrimental factors of concern.

Sewage and Environmental Health

Contaminated water can cause various diseases such as typhoid fever, dysentery, cholera and other diseases. About 2.2 million people die each year from diseases related to drinking contaminated water. Diarrhea alone claims the lives of nearly 6,000 children a day (DFID, 2006). In recent years, communities large and small in some of the world's most developed countries have been affected by contaminated drinking water (Public Health News, 2004). Also, hepatitis outbreak currently affecting internally displaced persons camps in Darfur, Sudan and refugee camps in neighbouring Chad is one example of how water borne diseases affect poor and disadvantaged populations (Public Health News, 2004). According to the World Health Organization (1996), drinkable water is not available to 75 80 percent of the citizens living in rural areas of many developing countries like Nigeria. It also observed that one out of every four persons in the world suffers from one type of water-borne disease. These observations readily highlight the greatness of the world's water problem, hence, G8 leaders a Gleneagles committed to increase aid for water and step up implementation of the G8 Water Action Plan. The aim, by 2015, to cut by three quarters the number of people in developing countries without access to safe water and sanitation (DFID, 2006). Also, the WHO in response to the revelations on the magnitude of water problem in developing nations, designated the decade 1980 — 1989 (he International Drinking Water Supply and Sanitation Decade for the improvement of domestic water quality and improvement of sanitary disposal. This has led to an increase in the locus and research on on—site sanitary facilities as a prime groundwater pollution source.

Groundwater and Groundwater Monitoring

Groundwater is one of our most precious resources; although it is one often taken for granted. Groundwater supplies drinking water for household uses and lees most of our lakes, rivers and streams including shallow wells. 11 is the “hidden water” resource (Korth, 1997).

In another vein, Krantz and Kifferstein (2005) ascertained that ninety-five percent of all freshwater on earth is groundwater. Groundwater is found in natural rock formations. Nationally, 53% of urban population relies on groundwater as a source of drinking water. In rural areas, the figure is even higher (Adeinoroti, 1988).

Groundwater located beneath the soil surface is a vital resource for the success and survival of the eco-system. Yet, much remains to be discovered about groundwater and wider public awareness of its nature and properties is an important first step.

Hand Dug Wells

In the past and even to the Present day, holes or pits were dug by hand or machines into the ground to tap the water table. Dug wells are usually 3 - 10 feet in diameter, 10 - 40 feet deep and lied with brick, stone, tile, wood cribbing or steel rigs to prevent the walls from caving in. They depend entirely on the natural seepage from the penetrated portion of water table aquifers.

Hand dug wells are difficult to protect from contamination and their yields are also very low because they do not penetrate into the reliable productive water table aquifer (Miller, 1989). However, most of the shallow wells in Ughelli are of the dug type, usually by hand rather than by machines (Ushurhe, 2007).

Nature and Distribution of Hand Dug Wells

A total of five hundred and fifty-seven wells are located in the area. Over bridge and environs has 92 wells. Uloho Avenue and environs has 137 wells, GRA and environs, 112 wells and Upper Afiesere and environs, 132 hand dug wells. Of the total number of hand dug wells in the area, forty wells are located at 5 metres distance to septic tanks while 42 wells are 10 metres apart to septic tanks, 70 wells are 15 metres apart to septic tanks while 74 wells are 20 metres apart to septic tanks. Also, 80 wells are of the distance of 25 metres to septic tanks, 101 weells are 30 metres distance to septic tanks and 150 hand dug wells are more than 30 metres distance to septic tanks (Ushurhe, 2007). The dept of the wells vary from 6 metres in the valley to 9 metres in the upper and middle slope soils; while the dept of the septic tanks is between 3.2 metres and 4.5 metres depending on the location.

The trend also shows that the number of hand dug wells located at 5 metres distance of septic tanks to shallow wells are less than those at 15 metres, 25 metres and 30 metres distances. The number of hand dug wells thus decreases outwardly from the sites of septic tanks.

Prevailing Trends

In the urban area of Ughelli, most of the land acquired by the people for building houses are usually 100ft by 50ft; within this compound, there is a hand dug well or a bore hole as source of drinking water because of the erratic nature of water supplied from government owned tap water system. Also, in the same compound, there is one or two underground septic tanks as on-site sewage disposal facilities. Based on this there have been growing concern among the inhabitants of the area as to the quality of water obtained from these shallow wells and its attendant effect on the health of the people. To some, the water is not fit for consumption and to others the nearness of the septic tanks to these hand dug wells have made them uncertain as to the quality of the water. The questions normally asked are that:

1. Is the water from the hand dug wells good for consumption?
2. Are the shallow wells not too close to the septic tanks?
3. Can the wastewater in the septic tanks contaminate the underground water vis-à-vis the water in the shallow well?
4. Can the water from the hand dug wells be hazardous to human health?

It is based on the aforementioned problems and questions which have continued to generate debate as to the quality of underground water and its implication on public health that this study addressed the prevalence of water borne diseases as a result of the impact of septic tank effluent on the quality of water from hand dug wells in Ughelli, Delta State.

Methodology

This work investigates the quality of water obtained from hand dug wells in Ughelli. It involves laboratory analysis of the water samples collected from hand dug wells in the area.

Sources of Data Collection

The data for this study were derived from two main sources:

1. Primary sources include water samples collected from hand dug wells in the area.
2. Secondary sources were derived from archival records of cases of people treated for water born diseases at the Central Hospital, Ughelli.

Method of Data Collection

The method of data collection was through direct field collection of water samples from shallow wells at varied measured distances of 5 metres, 15 metres, 25 metres and 30 metres from septic tanks. The 30 metres distance was used as the control point in line with WHO standard. The graduated measuring tape was used to measure the disiance of septic tanks to shallow wells. The water samples were collected once in the months of March, May and June, 2006 from each sampled well at varied dept in the area (See Table 1, Appendix A). These months have been used by Efe (2005a, 2005b), for similar studies and he achieved significant results. The collection was done using sterilized bucket for the withdrawal of water. From the container, l00ml of water in each sample was collected using autoclaved sterilized glassware. Glassware were securely corked and stored in ice packed contained before being transported to the laboratory within 6 hours of collection. The apparatus and reagents used are standard analytical equipment recommended and validated by the World Health Organization (WHO), United State Public Health Services (USPHS), Canadian Public Health Association, American Society for Testing and Materials and the Federal Ministry of Environment for testing water quality (Oluwande, 1985).

In addition, epidemiological records of people treated for water borne diseases from January — December, 2006 were collected from the archives of the Central Hospital, Ughetli for the study. The case files of the patients were scrutinized to ascertain the zones they came from in Ughelli.

Discussions

Physico—Chemical Characteristics

(a) Physical Indicators Taste and Odour

Taste was based on people's opinion in the samples of well water collected and analyzed. So also was the odour. To them, the water is tasteless. This implies generally that the concentration of most of the pollutants introduced by sewage effluent into the underground water in the area is on the low side.

Turbidity

Turbidity of water samples varied with increasing distances between the shallow wells and polluting sources. Specifically at 5 metres, the rate of turbidity was higher than at 30 metres distance to septic tanks.

Table 2: Mean Turbidity values of water samples (NTU)

Zone	5m	15m	25m	30m	Mean Value	WHO
Overbridge	2.40	1.03	0.26	0.26	0.99	5
Uloho Avenue	1.36	1.02	0.25	0.27	0.73	5
GRA	2.42	1.05	0.30	0.26	1.01	5
Sergeant Qtr.	2.41	2.38	0.50	0.25	1.39	5
Upper Afiesere	2.39	1.03	0.26	0.25	0.98	5
$\bar{X}$	2.20	1.30	0.31	0.26	1.02	5

Source: Ushurhe, 2007.

Turbidity values in table 2 showed 2.20 NTU at 5 metres, 1.30NTU at 15 metres, 0.31 NTU at 25 metres and 0.26 NTU at 30 metres distance. Turbidity was highest in shallow wells closest to septic tanks; an indication of their influence in them.

Temperature

Temperature affects the ability of water to hold oxygen as well as the ability of organisms to resist certain pollutants. Mean temperature value decreases as distance increases. The mean temperature values are 27,1°C, 26.9°C, 26.9°C and 26.8°C at 5 metres, 15 metres, 25 metres and 30 metres distance respectively of septic tanks to shallow wells (table 3).

Table 3: Mean Water Temperature in Shallow Wells (°C)

Zone	5m	15m	25m	30m	Mean Value	WHO
Overbridge	27.0	26.8	26.8	26.9	26.9	NA
Uloho Avenue	27.1	26.9	27.0	26.8	26.9	NA
GRA	27.2	27.1	27.0	26.9	27.1	NA
Sergeant Qtr.	27.1	27.0	26.8	26.9	26.9	NA
Upper Afiesere	27.0	26.8	26.8	26.7	26.8	NA
$\bar{X}$	27.1	26.9	26.9	26.8	26.9	NA

The near constant value implies that the temperature depends on the insulating qualities of the earth's crust rather than sewage related influences (Grey, 1986).

(b) Chemical Indictors

Nitrate (No $^{-}$3)

The amount of nitrate in drinking water is a measure of the closeness of a polluting source and as such a measure of its impact. The quality of nitrate in the water samples was highest at 5 metres distance of septic tanks to shallow wells, followed by 15 metres, 25 metres and least at 30 metres, with values of 1.00mg/l, 0.87mg/l, 0.56mg/l and 0.38mg/l respectively (Figure 1)

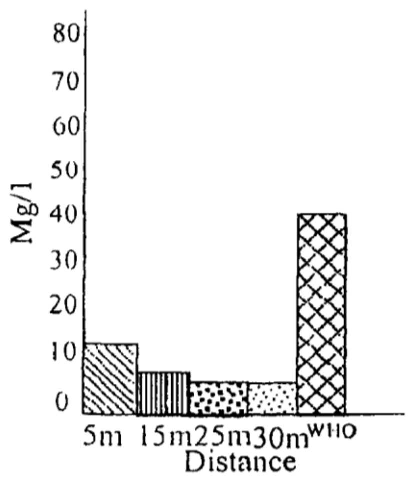

Figure 1: Mean nitrate concentration in water samples

This indicates a decrease of contamination with increasing distance from the polluting source. However, nitrate concentration in all the distances fall within the 45mg/l limit specified by WHO potable water standard.

Chloride (Cl)

Chloride is associated with the presence of sodium in drinking water when present in high concentration. Chloride concentrations were generally highest at 30 metres distance with an average of I .70mg/I, followed by 25 metres distance with 1.72mg/I, followed by 1. 16mg/I at 5 metres distance and O.96mg/1 at 15 metres (Figure 2)

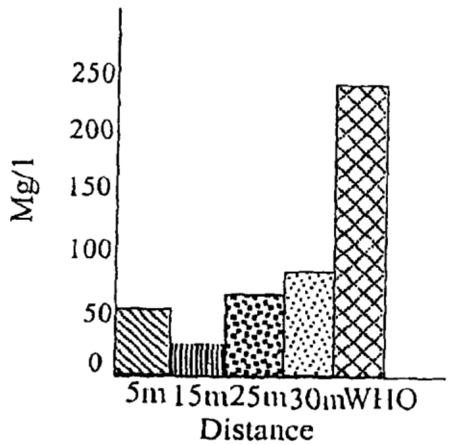

Figure 2: Mean chloride concentration in water samples

High chloride concentration at 30 metres and low at 5 metres distance is affected by the effects of absorption and biological activities that took place in the soil. Generally, chloride concentration values in all the water samples are well below the 250mg/I permissible threshold of' World Health Organization.

Phosphate ($PO4^3$)

The phosphate level in all the samples were less than 1.0mg/l which is the maximum permissible level by the WHO drinking water standard. For example, at 5 metres distance of septic tank to shallow well, it is 0.05mg/I and O.36mg/l at 30 metres (Figure 3)

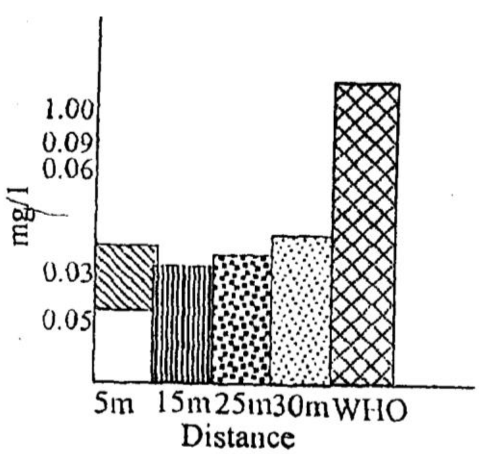

Figure 3: Mean Phosphorus concentration in water samples

Source: Ushurhe, 2007

There is therefore an increase from 5 metres distance to 30 metres. The generally low phosphorus level in the zones can best be attributed to its low concentration in domestic sewage and or good phosphate removal capacity attribute of superficial deposits in the area.

Lead (Pb^{2+})

Acute lead poisoning usually affects gastro-intestinal track or the nervous system or both (Ogedengbe, 1981). In the study area, at 5 metres distance of septic tank to shallow well, an average of 0.08mg/I of Lead was found in water samples. There is thus a high concentration of Lead, at 5 metres distance as opposed to 0.01 mg/I WHO drinking water quality standard.

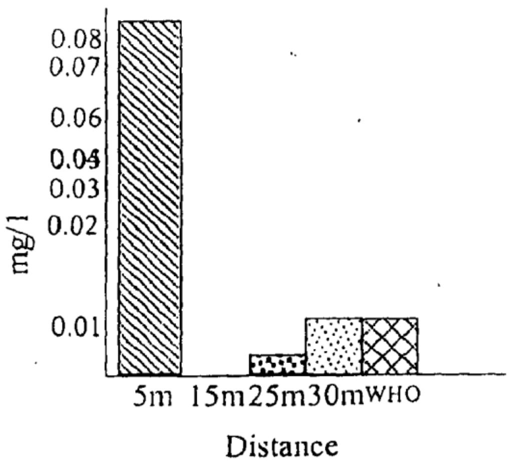

Figure 4: Mean lead concentration in water samples
Source: Ushurhe, 2007.

This is attributed to gasoline and water additives found in wastewater flushed into septic tanks (Ogedengbe, 1981). There is therefore predominant evidence of Lead poisoning in underground water at 5 metres distance to shallow wells. There was virtually no trace of Lead at 15 metres distance, 0.002mg/I at 25 metres and 0.01mg/I at 30 metres distance.

Biomedical Oxygen Demand (BOD)

Biochemical oxygen demand is a measure of the amount of oxygen consumed by organic matter as they are being oxidized by bacteria. BOD levels were generally low in all the water samples. This implies that the concentration of soluble organic reaching the groundwater table through the percolating system is generally low. An average of 4.I mg/I at 5 metres, .22mg/I at 15 metres, and gradually decreases to O.97mg/I at 25 metres distance to 0.94mg/I at 30 metres distance. This further indicates an increase in BOD values away from the polluting source (Fig 5)

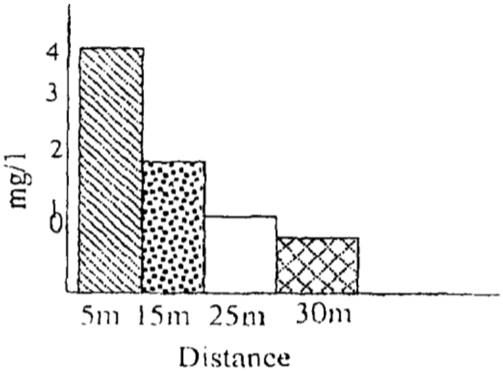

Figure 5: Average BOD concentration in water samples

The increase in value at 5 metres distance can best ‘be attributed to the closeness of the shallow well to the polluting source. The decrease in BOD from 5 metres distance to 30 metres distance may be influenced by higher BOD removal efficiency due to the use o F shallow wells in association with septic tanks in the area.

Dissolved Oygen (DO)

A small amount of oxygen, up to about ten molecules per million of water is actually dissolved in water. This dissolved oxygen is breathed by fish and zooplankton and is needed by them to survive. Bacteria in water can consume oxygen as organize matter decays.

Unlike most of the analyzed parameters, dissolved oxygen is highest at 30 metres distance of shallow wells to septic tanks and lowest at 5 metres distance of shallow wells to septic tanks. (Figure 6)

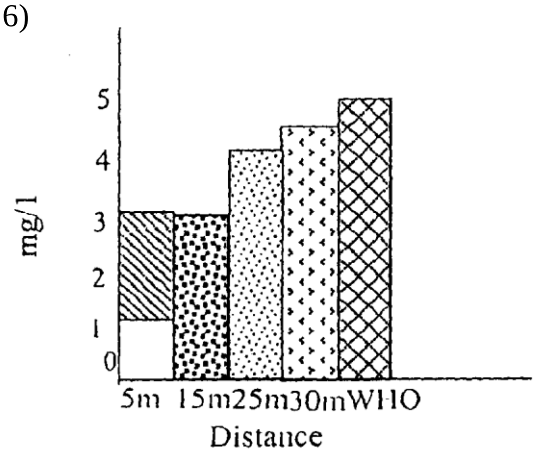

Figure 6: Average DO removal quantity in water samples
Source: Ushurhe, 2007.

The concentration of DO at 30 metres can best be attributed to natural conditions outside the influence of sewage contamination. This implies the absence of bacteria activities. However, the low DO level at 5 metres distance of septic tank to shallow well is a strong indication of reducing agent, indicating the presence of bacteria in the water. If such water is consumed, it may cause instant death in living organisms. Thus, there was a predominant decrease in DO with increasing distance of shallow wells to septic tanks. Thus at 5 metres, it was 1.80mg/I, at 15 metres, it was 2.80mg/I, 3.38mg/I at 25 metres and 3.64mg/I at 30 metres distance. At 5 metres and 15 metres, it is lower than the WHO permissible value for drinking water quality standard, indicating high bacteria activities in the water samples.

Bacteriological Water Quality: Faecal Coliforuis

Faecal positive results occurred at 5 metres distance of shallow wells to septic tanks in the area. This is an indication which can be attributed to the close proximity of septic tanks to shallow wells, Shallow wells co-existing with sanitary facilities stand a high risk of faecal pollution due to the short travel distance between these facilities and the shallow well. This provides shorter straining distances and moist conditions suitable for horizontal microbiological transport. However, it is evidenced that the presence of faecal waste may contain pathogenic microbes. Thus, coliform bacteria must not be detectable in any l00mI samples of water (WHO, 1996). From appendix B, 24 colonies on average were detected in water samples at 5 metres distance of shallow wells to septic tanks. The significance of this shows the presence of sewage contamination in the shallow wells at 5 metres distance.

High level of faecal coliform is a good indicator (as evidenced from the water samples) that pathogenic micro-organisms are present. Such disease causing micro—organisms can enter the body through cuts in one's skin or through one's month, eyes, ears or nostril. They can result in health problems ranging from diarrhea and ear infections to deadly diseases such as cholera and typhoid fever (Oluwande, 1986).

pH

pH values in the water samples collected and analyzed in the study area generally depicted acidity; an average of 6.45 at 5 metres distance and 6.93 at 30 metres distance (Table 4)

Table 4: Average pH Value for Groundwater in Sampled Zones.

Zone	5m	15m	25m	30m	WHO
Overbridge	6.42	6.85	6.90	6.92	6.5 – 8.50
Uloho Avenue	6.48	6.88	6.92	6.95	6.5 – 8.50
GRA	6.45	6.50	6.75	6.93	6.5 8.50
Sergeant Qtr.	6.45	6.50	6.65	6.94	6.5 – 8.50
Upper Afiesere	6.44	6.83	6.92	6.90	6.5 - 8.50
$\bar{X}$	6.45	6.70	6.83	6.93	6.5 – 8.50

Source: Ushurhe, 2007.

The implication of this is that acidic wastewater is generated in the urban area of Ughelli. Average pH values are lowest at 5 metres distance and highest at 30 metres distance; indicating that groundwater at 5 metres distance is more acidic than groundwater at 30 metres distance. The rate of acidity however decreases from 5 metres distance to 5 metres to 25 metres and to 30 metres distance of septic tanks to shallow wells.

It should be noted that all pH values fall within the WHO permissible water quality drinking standard except at 5 metres distance which indicates an increase in hydrogen ion concentration in groundwater for domestic consumption.

General Trend of Groundwater Quality: Physico-Chemical Characteristics of Water

The overall groundwater quality in the area can be considered as adequate in the light of WI 10 water quality standard except in such parameters as lead, faecal coliform, dissolved oxygen and phi concentrations. Generally, groundwater quality in the area is characterized by low biochemical oxygen demand (BOD) content of between 0.94mg/I at 30 metres to 4.1 I mg/I at 5 metres distance of shallow wells to septic tanks and a low phosphate content of 0.05mg/I to 0.53mg/I at 5 metres distance to 30 metres distance respectively. Nitrate content ranged between 0.38mg/I to 1.00mg/I at 30 metres distance and 5 metres distance respectively. Ch lo ride concentration was between 0.96mg/I at 5 metres distance to 180mg/I at 30 metres distance. While ammonia and dissolved oxygen ranged between zero at 30 metres to 0.20mg/I at 5 metres and 1.80mg/l at 5 metres to 3.64mg/I at 30 metres distance of shallow wells to septic tanks respectively. Lead concentration was between zero to 0.08mg/I at 30 metres and 5 metres respectively.

A direct trend existed between nitrate and ammonia concentration levels in the area. There was a decrease of contamination with increase distance from 5 metres to 30 metres in both parameters (See appendix B). Also, there was a direct relationship between biochemical oxygen demand (BOD) and dissolved oxygen (DO). As BOD decreases from 5 metres to 30 metres, there was an increase in DO values at 5 metres to 30 metres. This was an indication that the amount of bacteria in water samples at 5 metres is more leading to a decrease in DO at 5 metres distance. That is more intake of oxygen by bacteria at 5 metres distance than at 30 metres distance.

Groundwater temperature ranged between 26.8°C to 27.1°C. These, generally were in close range of ground surface temperature of 28.2°C at the time of collection of water samples. The variation in values for the samples can best be attributed to the varying distance of shallow wells to septic tanks; an indication of the amount of biological and chemical activities of pollutants in the water. pH values were within the WE-ZO permissible values of 6.50-8.50, except at 5 metres distance with a value of 6.45 indicating a high acidity of ground water at that distance. Taste and odour registered unobjectionable levels from subjective assessments.

Epidentiological Report: General Trend

Reported and treated cases of water borne diseases such as diarrhea, dysentery and typhoid fever were obtained from the Central Hospital, Ughelli from January, 2006 to December, 2006. A total of 573 patients were recorded (Table 5).

Table 5: Cases of Water Borne Diseases in Uglielli From January — December, 2006.

Diseases	J	F	M	A	M	J	J	A	S	O	N	D	Total
Diarrhea	25	39	34	36	30	36	20	43	36	30	28	32	389
Dysentery	4	3	-	6	2	4	-	6	3	1	5	2	36
Typhoid	16	10	14	7	17	12	10	16	14	10	14	8	148
Total	45	52	48	49	49	52	30	65	53	41	47	42	573

Source: Central Hospital, Ughelli, 2006.

From Table 5, a total of45 patients were treated for diarrhea, dysentery and typhoid for the month of January, 2006; 52 cases for February, 48 cases for March, 49 cases for April, 49 cases for May, 52 cases for June, 30 cases for July, 65 cases for August and 53 cases for September. In October 2006, 41 cases of diarrheas, dysentery and typhoid were treated, 47 cases in November and 42 cases in December, 2006. A total of 389 patients were treated of diarrhea, 36 cases were treated of dysentery and 148 cases were treated of typhoid for the period of January to December, 2006. Expert reports showed that the number of reported cases of water borne diseases in Ughelli is quite small when compared to the total population of people in the area. The figures, can thus be considered moderate and shows no signs of an epidemic in any of the cases reported (Ushurhe, 2007).

Recommendations

The following are additional precaution measures for maintaining and improving on the present status of water obtained from shallow wells in order to safe-guard the health of the people.

- Hand dug wells should be located at least 25 metres distance from any polluting source especially underground sewage disposal system. In the study, all the parameters examined fell within the WHO permissible water quality standard art 25 metres of septic tank to shallow wells in the area. Also, the minimum distance is convenient and ensures that as much as possible no bacteriological and chemical contamination occurs.
- Domestic groundwater sources such as hand dug wells should be protected from surface discharge of sewage especially open drains from getting into the well. Surface drains which carry such discharges must be adequately constructed, covered and disinfected regularly, if they must carry any form of sewage.
- The location of nieghbouring percolation facilities in adjoining compounds should always be taken into consideration when locating shallow wells.
- To achieve the above recommendations, the town planning unit must engage in the monitoring of the siting of shallow wells and septic tanks in each compound to ascertain their compliance with the minimum standard recommended for their location. Efforts should be made by the government to discourage the urban centres of on—site sanitary facilities such as septic tanks and encourage time construction of the sewer system and re—cycle such waste for agricultural purposes in the country.

Conclusion

The study has been able to discover that the rate of pollution of shallow wells in the area decreases with increasing distance of septic tanks from shallow wells. Also, the prevalence of water home diseases (typhoid. dysentery and diarrhea) is as a result of the consumption of polluted water from shallow wells in the area. Epidemiological records obtained from the Central Hospital, Ughelli and analyzed showed the effects of polluted water on human health; thus being responsible for cases of typhoid, diarrhea and dysentery in the area. The presence of high faccal coliform in water samples especially in shallow wells located at 5 metres distance to septic tanks generally indicates the closeness of shallow wells to polluting sources which is believed to be responsible for most of the waste borne diseases in the area.

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