State of Water Supply Sources and Sanitation in Nigeria: Implications for Muslims in Ikare-Akoko Township

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Access to sanitation and water supply is a fundamental need and a human right, vital to the life, health, and dignity of human beings. According to the World Health Organization, improved water supply and adequate sanitation would result in a 25 % to 33 % reduction in diarrheal diseases in the developing world, which now accounts for 4 billion cases each year; decreased incidence of intestinal worm infestations that lead to malnutrition, anemia, and retarded growth; and control of blindness due to trachoma and schistosomiasis, which are also water related. In Nigeria, less than 50 % of the population have access to improved water supply and sanitation. The percentage varies from urban to rural communities and from cities to villages. Ikare-Akoko is one of the towns that suffers from deficient water supply and sanitation. This study was carried out to establish the implications of unsafe water-supply sources and poor sanitation on Muslims in Ikare-Akoko Township, Nigeria. The study revealed that the main sources of water for domestic use by the Muslims were unprotected wells and ponds; about 68 % and 20 % of Muslims still depend on open-air defecation and latrines, respectively, and only 2 % have a flush toilet system. Within the previous year, about 63.2 % and 37.5 % of Muslims experienced malaria and diarrhea respectively. The study reveals that unavailability of safe water and a poor sanitary environment are serious problems among Muslims in Ikare-Akoko, and this may have serious consequences for public health.

Key words: water supply, sanitation, Muslims, Nigeria, Ikare-Akoko Township

L'accès à l'eau potable et aux équipements sanitaires est un besoin essentiel et un droit fondamental, nécessaires à la vie, à la santé et à la dignité des êtres humains. D'après l'Organisation mondiale de la santé (OMS), l'amélioration à la fois de l'approvisionnement en eau et de l'assainissement résulterait en une réduction de 25 % à 33 % des maladies intestinales dans les pays en voie de développement, soit 4 milliards de cas par an. Une fréquence réduite des infestations de vers intestinaux qui mènent à la malnutrition, l'anémie, aux retards de croissance, et le contrôle de la cécité due au trachome et à la bilharziose (qui sont aussi des maladies transmises par l'eau) en seraient d'autres conséquences positives. Au Nigéria, moins de 50 % de la population a accès à l'eau potable et à des équipements sanitaires. Ce pourcentage varie selon les communautés urbaines et rurales et entre les villes et villages. Ikare-Akoko est l'une des villes qui souffrent d'un mauvais approvisionnent en eau et de mauvais équipements sanitaires. Cette étude a été effectuée pour saisir les conséquences des mauvaises conditions d'hygiène chez les musulmans de la ville d'Ikare-Akoko au Nigéria. Elle révèle que les principles sources d'eau pour les ménages musulmans sont des puits et des mares non-protégés ; 68 % des musulmans défèquent en plein air, 20% utilisent des latrines, et seulement 2% disposent de WC. Durant l'année précédant notre enquête, 63,2 % des musulmans ont été affectés par la malaria et 37,5 % par la dysenterie. Cette étude révèle que la non-disponibilité d'eau potable et un mauvais environnement sanitaire constituent des problèmes sérieux pour les musulmans d'Ikare-Akoko, avec des conséquences néfastes pour la santé publique.

Mots-clés : approvisionnement en eau, installations sanitaires, musulmans, Nigéria, Ikare-Akoko

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Introduction

According to the WHO/UNICEF Joint Monitoring Programme for Drinking-Water Supply and Sanitation (WHO and UNICEF 2005, 2008), more than 2.5 billion people every day suffer from inadequate access to improved sanitation, and almost 1.2 billion practice open defecation. Obtaining water to sustain socio-cultural life and improve sustainability in most Nigerian communities is a daily struggle. While those in urban areas often get their water by queuing for hours at a well, pond, or spring, and sometimes for more than 30 minutes to buy water from private commercial boreholes, people in most rural communities get their domestic water from highly polluted streams and rivers (Itama et al. 2006). Improving the water situation and creating sustainable access to water supplies and improved sanitation is a major development challenge that should be given the highest priority. A background analysis reveals either insincerity on the side of government or outright corruption on the part of those responsible for project implementation and release of funds. On the other hand, environmental factors can influence disease occurrence quite directly by acting on the agent or by influencing the agent–host relationship (Valerie, Cairncross, and Yonli 2000). Socio-economic development depends on usage of natural resources, and especially on access to and use of safe water.

Of the many communities in Nigeria, Islamic communities are the focus of the present study because of the Islamic belief in a clean environment for healthy living; if the water used by people in these communities is not safe, there will be problems in their practice. In order to improve water supply in most Islamic communities in Nigeria, it is germane to alleviate the traditional problems of decaying water-treatment plants and water pipes, insufficient capacity, poor quality and insufficient quantity of water supply, and lack of human-resource capacity as a result of non-technical factors. This article focuses on water-supply shortages and sanitation and its implication for Muslims in Ikare-Akoko Township in south-western Nigeria.

The Study Area

The study area lies between longitudes 5°44'00 "and 5°46'30" east and between latitudes 7°31'00" and 7°32'30" north of the Equator (see Figure 1). The area extends over about 32.26 km^2 and has a total population of about 126 625 according to the 2006 census (FOS 2007). Ikare-Akoko is located in the Yoruba cultural region and has a substantial Muslim population, with several mosques and Muslim organizations. Arabic influences were incorporated in the 19th century with the diffusion of Islamic culture southward across the Sahara. Ikare-Akoko is about 300 km from Lagos and about 365 km from Abuja (Federal Capital Territory). Its climate is sub-tropical, with annual rainfall of more than 150 cm. The area experiences high temperatures ranging from 30°C to 38°C and is dominated by rainforest vegetation (FEPA 1998; Iloeje 1977; Barbour et al. 1982). Basement complex rock characterizes the rock formations of the area, which is drained by seasonal tributaries of the River Ose.

Sampling Procedures

Questionnaire and field observations were mainly used in this study. Questionnaires were administered to 20 respondents in each of 11 mosques (total n = 220) within the traditional communities of Ekan/Oyinmo, Igbede, Ilepa, Iku, Odeyare/ Okeruwa, Odoruwa, Odo/Iyame, Okegbe, Okela, Okoja, and Okorun. The questionnaire was design to capture information on gender, water sources, distance from mosque, average litres of water used for ablutions and general cleaning (*tahara*), and major diseases experienced

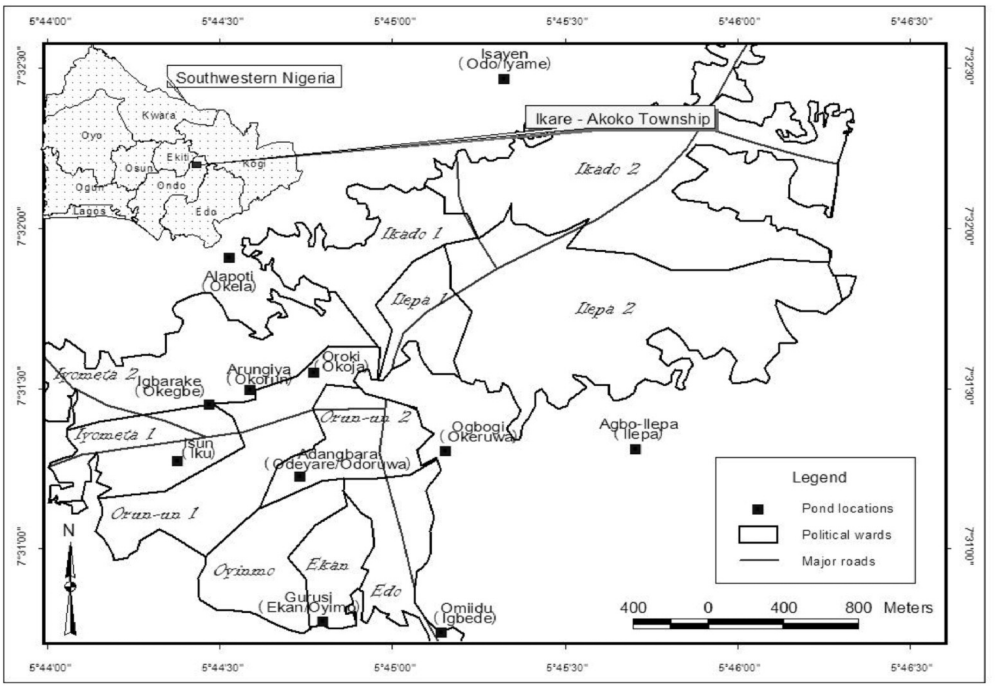

FIGURE 1
Study area (Ikare-Akoko Township)

among Muslims in the area. Oral interviews were also conducted with public-health officers and other stakeholders, including community leaders and the imam of each community's mosque. The data were analyzed descriptively.

Water samples were also collected from 11 major communities' surface water sources used by Muslims during the dry season. The water samples were collected using cleaned 1 000-cm^3 polythene bottles and analyzed as follows: pH, temperature, and dissolved oxygen (DO) were measured with portable *in situ* instruments, while biochemical oxygen demand (BOD), total suspended solid (TSS), total dissolved solid (TDS), turbidity, total hardness (TH), Ca^+, Ma^{2+}, Cl^-, NO_3^-, PO_4^{3-}, oil and grease, total bacterial counts (TBC), and total coliform (TC) were analyzed in the laboratory using standard methods for evaluating water samples (APHA 1998).

Results

Respondents ranged in age between 18 to 74 years; 77.27 % were male and 22.73 % female. The majority (93.5 %) of respondents were Yorubas by tribe; other tribal affiliations included Hausa (4.4 %) and a few minority ethnic groups such as Ibira and Igala (2.5%). Farmers constituted the largest group (42.2 % of all respondents), followed by traders and civil servants (34.9 %), artisans (20.2%), housewives (1.3 %), students (0.7 %), and unemloyed (0.7 %). About 65.9 % of respondents were married; others were either single (33.5 %) or separated (0.6 %). The majority of respondents (73.2 %) had no formal education. Only 4.55 % had access to a pipe-borne water source; access to boreholes, wells, and water vendors was available to 8.64 %, 23.18 %, and 1.82 % of respondents respectively, while 61.82 % identified pond water as the major accessible source for their daily use.

TABLE 1

Laboratory analysis results for samples from surface water (ponds) used for domestic purposes

S/n	Traditional quarter	Northing	Easting	Pond Name	Colour (TCU)	pH	Temp. (°C)	DO (Mg/l)	BOD (Mg/l)	TSS (Mg/l)	TDS (Mg/l)	Turbidity (Mg/l)	TH (Mg/l)	Ca_+ (Mg/l)	Mg (Mg/l)	Cl (Mg/l)	NO_3 (Mg/l)	Po4__ (Mg/l)	Oil & grease (Mg/l)	TBC (cfu/ml _ 10^6)	TC (cfu/ml _ 10^6)
	WHO Min					6.5							30	75		200	5				
1	Igbede	7.50843	5.75448	Omiidu	Colourless	6	23.2	1.5	11	4	74.5	0	136	90	46	20	0.09	5.7	0.06	1.23	0
2	Ekan / Oyinmo	7.50902	5.74883	Gurusi	Colourless	7.1	19.6	1.5	11	12	50.4	0.04	48	28	20	12	0.07	4.6	0.04	1.47	0
3	Okela	7.52800	5.74432	Alapoti	Colourless	5.8	25.7	3.5	6.5	9	40.4	0	20	12	8	12	0.57	3.9	0.04	1.15	1.1
4	Odo / Iyame	7.53737	5.75747	Isayen	Colourless	7.5	22.1	3.1	4.8	6	45.3	0.05	24	16	8	16	0.13	4.1	0.03	1.5	0
5	Ilepa	7.51803	5.76375	Agbo Ilepa	Colourless	6.1	21	2.6	7.8	7	35.7	0	16	9	7	8	0.05	3.3	0.04	1.3	0
6	Iku	7.51740	5.74188	Isun	Colourless	6.8	25.6	3.5	9.5	11	168	0	36	26	10	48	0.65	1.6	3.12	1.21	1.5
7	Okorun	7.52037	5.74338	Arungiya	Colourless	6.4	21.1	2.8	9.4	9	22	0	124	95	29	44	0.8	4.4	0.06	1.14	1.1
8	Okegbe	7.52222	5.73413	Igbarake	Colourless	7.1	26.7	5.1	2.5	10	541	0	244	120	124	112	0.46	8.2	0.09	1.1	0
9	Okoja	7.53192	5.74428	Oroki	Colourless	7	23.8	2.7	8.8	13	546	0	376	180	196	144	0.39	5.6	1.17	1.12	0
10	Okeruwa	7.51657	5.74770	Ogbogi	Colourless	6.5	21.7	4.1	3.9	15	164	0.04	100	79	21	44	0.77	1.8	0.02	1.1	0
11	Odeyare / Odoruwa	7.51790	5.75468	Adangbara	Colourless	6.4	26	3	4	8	187	0	128	52	76	48	0.22	2.2	0.09	1.1	0
	WHO Max					8.5					500	5	200	250	150	250	10	0	0.1		

About 26.36 % of respondents stated that they get their water within 100 m from home; 30.45 % and 26.36 %, respectively, reported travelling between 101 m and 200 m and between 201 m and 500 m in order to fetch water for domestic purposes. Finally, 9.55 % and 7.27 %, respectively, had to travel between 501 m and 1 km and more than 1 km to get water for their daily activities. About 35.91 %, 30.91 %, and 16.82 % of respondents reported using 0.5 l, 1 l, and 1.5 l of water, respectively, when performing ablutions, including general cleaning (*tahara*); the remaining respondents claimed 2 l and 2.5 l per ablution. About 53.3 % of respondents using pond water said that their water had an unpleasant taste or colour and an offensive odour, especially during the peak dry season. A statistically significant proportion of respondents who treated their water before use were those who had attained a tertiary education degree ($p < 0.05$), while the majority of those with informal education or who attained a senior secondary certificate of education or less do not bother to treat their water before use. The finding from access to sanitary facilities across the 11 traditional communities revealed that, there is very limited access to sanitary methods of refuse disposal: almost 90 % of respondents reported that they dump their refuse in an open site/space. In addition, about 68 % of respondents depend on unsanitary methods of open defecation and 10 % use some other method such as streams or gutters, while 20 % depend on latrines and only 2 % have a flush toilet system.

The water-quality results documented in Table 1 and Figures 2–16 show that of the water-quality parameters analyzed, only pH, turbidity, Ca^{+}, Cl^{-}, and NO_3^{-} were found to fall within WHO standards in all water sources sampled. Levels of TDS, TH, Mg^{2+}, and oil and grease were found to exceed WHO standard in some ponds while falling below the standard in others. PO_4^{3-} levels were generally above WHO standard in all sampled ponds. The results for DO, BOD, TSS, TBC, and TC concentrations varied across the sampling points. The variation in the concentration of TH, Ca^{+}, Mg^{2+}, Cl^{-}, and NO_3^{-} was observed to be significantly different ($p < 0.05$) across the study area. The relationship between pH, DO, BOD, TDS, TSS, and turbidity was found to be significant ($p < 0.05$).

Discussion and Implications

Hygienic drinking water should be colourless, tasteless, odourless, and free from substances produced by the presence of organic matter (Rim-Rukeh, Ikhifa, and Okokoyo 2006; Fasunwon, Ayeni, and Lawal 2010). Taste and odour may develop during storage and distribution, which may be an indication of the presence of potentially harmful substances (Rim-Rukeh et al.). The implications of the findings documented in Table 1 and Figures 2–16 include a breakdown in personal hygiene leading to frequent increases in water-borne diseases in water-borne diseases that kill millions of people each year and cause illness in hundreds more.

TDS influence other qualities of water, such as taste, hardness, and corrosion properties; high TDS may result in gastro-intestinal irritation (WHO 1993, 2006; Akinwumi 2000; Mendie 2007). A high TH in drinking water may cause hardening of bile duct (cholethiasis) and hypercalcification of bone and skeletal tissues, leading to stunted growth in children, while high concentrations of magnesium salts in drinking water may cause other health impairments such as heart and kidney diseases (Mendie). Excessive Cl^{-} (>250 mg/l) produces a salty taste in drinking water and can lead to heart and kidney diseases (Hudak 2000; WHO 2006; Ojosipe 2007; Mendie). High concentrations of phosphates are detrimental to health (EPA 1985). The presence of oil and grease produces colouration and an unpalatable taste, and overconsumption may cause serious diges-

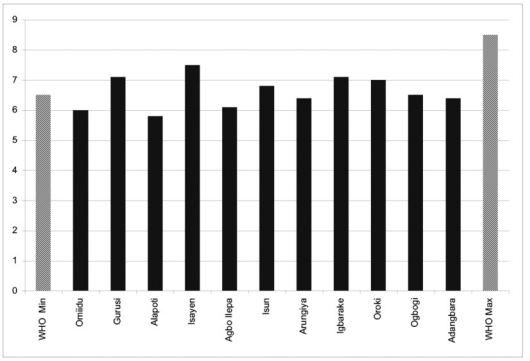

FIGURE 2 – pH

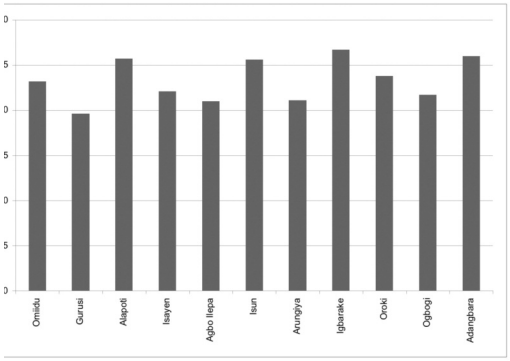

FIGURE 3 – Temperature

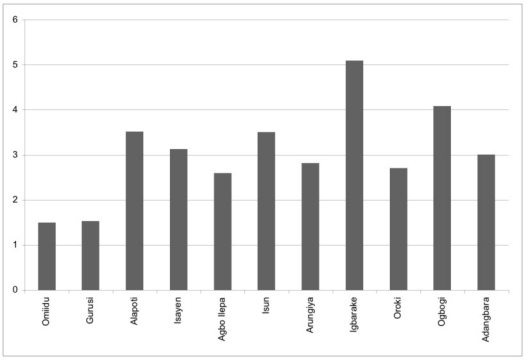

FIGURE 4
Dissolved oxygen (DO)

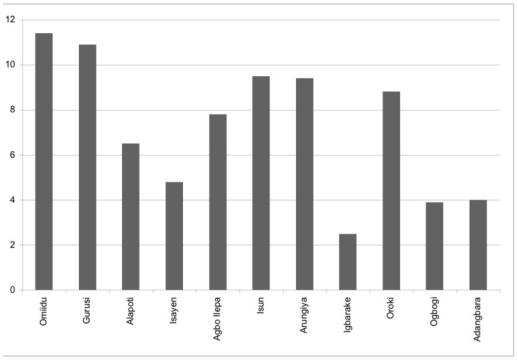

FIGURE 5
Biochemical oxygen demand (BOD)

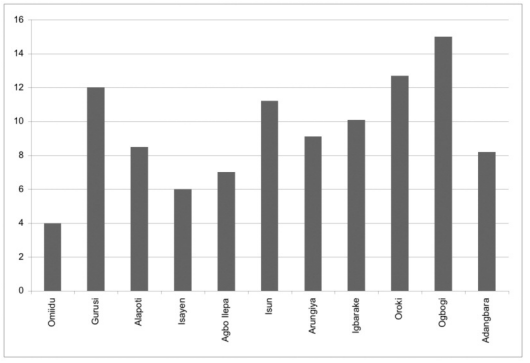

FIGURE 6
Total suspended solid (TSS)

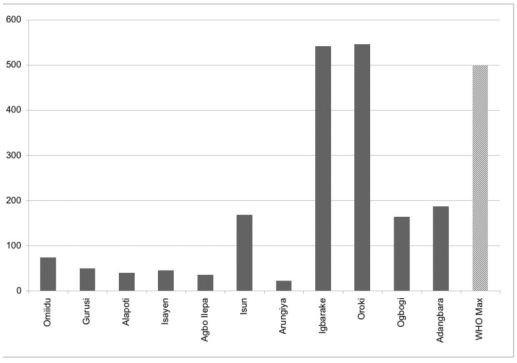

FIGURE 7
Total dissolved solid (TDS

tive problems (Ojosipe).

Diarrheal diseases, dysentery, meningitis (especially in newborns), toxaemia, dehydration, nausea, vomiting, inflammation and ulceration of the intestine, urinary-tract infections, and typhoid fever are commonly associated with drinking water contaminated coliform and other bacteria (WHO 1993, 2006; Powell et al. 2002; Kazmi 2004).

Respondents' reports on disease inci-

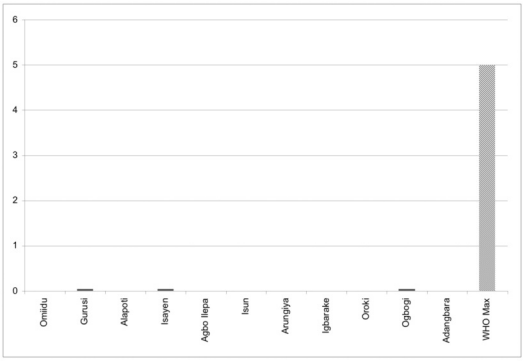

FIGURE 8
Turbidity

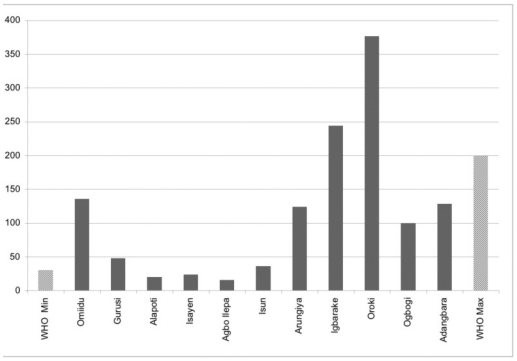

FIGURE 9
Total hardness (TH)

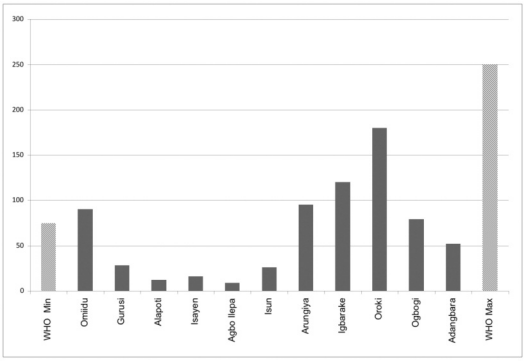

FIGURE 10
Magnesium hardness (Mg^{2+})

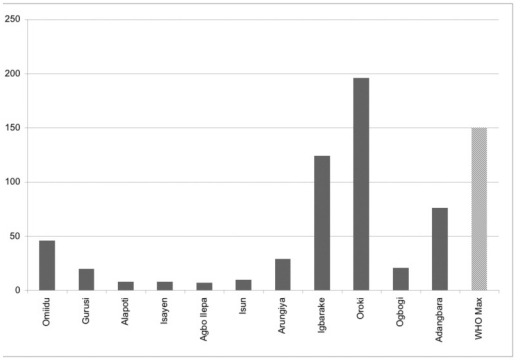

FIGURE 11
Calcium hardness (Ca^{+})

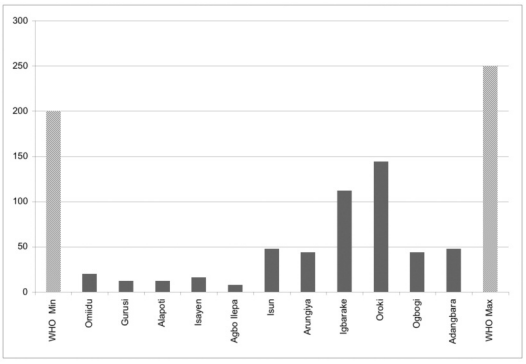

FIGURE 12
Chloride (Cl^{-})

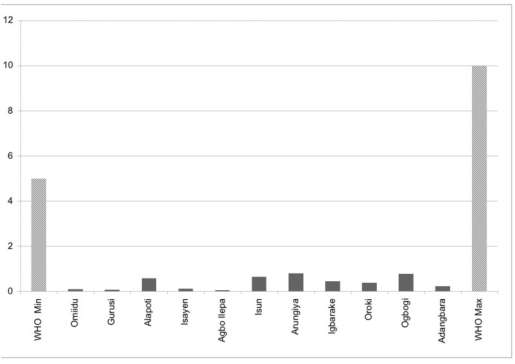

FIGURE 13
Nitrate (NO_{3+})

dence revealed that about 61.7 % have experienced one or more water-borne diseases in their lifetime. This figure was confirmed by field observation and interview results, as reported by imams, public-health officers, and other community stakeholders. Diarrhea, dysentery, nausea, vomiting, inflammation and ulceration of the intestine, and typhoid fever were the most common diseases experienced by respondents. According to them,

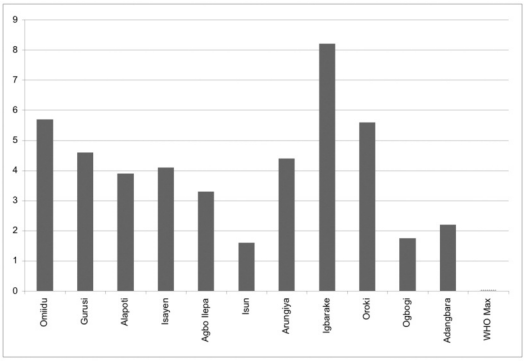

FIGURE 14
Phosphate (PO_4^{3-})

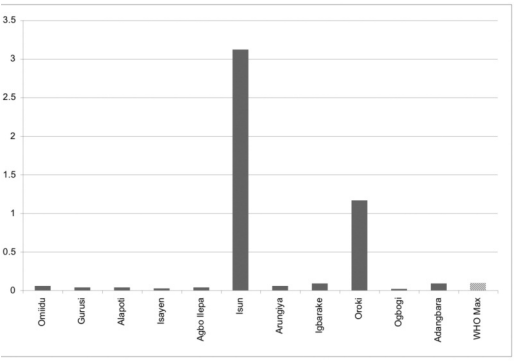

FIGURE 15
Oil and grease

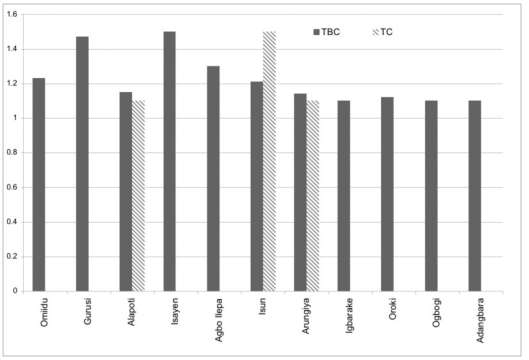

FIGURE 16
Total bacterial counts and total coliform bacteria

children younger than seven years and older adults are the major victims of diarrheal diseases in Ikare-Akoko.

Conclusion

Average daily access to and domestic use of water per person in Ikare-Akoko Township was far below international safe water requirements of 50 l per capita per day **(**Gleick 1996). About 85 % of our sample of Muslim respondents in Ikare-Akoko considered the water supply inadequate to meet the population's domestic needs; the majority of respondents do not have access to safe water provision to eradicate water-borne diseases and improve their quality of life. In addition, the presence of high concentrations of some physical, chemical, and microbial contaminants (TBC and TC) in the sampled surface (pond) water used for domestic purposes, especially ablutions and general cleaning (*tahara*), by Muslims in Ikare-Akoko rendered the sampled water unsafe; continuous use of water from these sources will put the health of residents at very high risk, particularly for Muslims, who cannot do without clean water before observing prayers (*salat*).

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