Nigerian Journal of Health Promotion
ISSN: 0995-3895
Vol. 12, 2019

HEPRAN

Water Management Practices among Rural Dwellers in Gwer West Local Government Area, Benue State, Ngeria

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Abstract
Inadequacy and poor management of water contributes to most water-related diseases, including diarrhoea. The water quality in improved water supply systems often is affected by unreliable operation and poor management in many developing countries including Nigeria. This study investigated water management practices among rural dwellers in Gwer West Local Government Area, Benue State, Nigeria. Five research questions and two null hypotheses guided the study. The study adopted a descriptive cross-sectional survey research design. The population for the study consisted of 122,145 rural dwellers. The sample was 420 rural dwellers drawn using multi-stage sampling procedure. A validated Water Management Practices Questionnaire (WMPQ) served as the instrument for data collection. Descriptive statistics of frequencies and percentages and Pearson Chi-square statistic were use to analyse and answer the research questions and hypotheses respectively. Results showed that: overall, more than half (64.3%) of rural dwellers use conventional containers to fetch/collect water. More than half (62.3%) of rural dwellers use conventional containers to store water. More than half (60.2%) of rural dwellers indicated treating water before use by application of the conventional water improvement methods and materials. There was significant difference in responses on water management practices among rural dwellers based on age (p <.05) while no significant difference was obtained based on education level (p >.05). The authors recommended among others that the water source should be well treated so as to prevent individuals, families and animals from infection. This can be done by tracing the water supply source, collection and storage methods and providing adequate purification measures.
Keyword: Water, Management, Practice, Rural Dwellers

Introduction

Access to safe water supply is a basic right of every individual all over the world. Availability of wholesome drinking water is paramount for domestic consumption and fulfilment of industrial purposes, maintenance and promotion of personal and community health. Inadequacy and poor management of water contributes to most water-related diseases, including diarrhoea. World Health Organization (WHO) (2008) made safe water supply a component of Primary Health Care delivery system, set to be achieved globally by 2015 and beyond. World Health Organization regards the provision of adequate water as a basic right of everyone. This basic right remains unrealized for many people in developing countries, especially in rural communities, due to irregularity of water supply and poor water management practices. Hesperian Foundation (2005) reported that water supply and management practices are inadequate in most rural communities. To live healthier requires improvement in access to water supply and other management techniques.

The challenges people experience with water supply in Nigeria are numerous and complex. Inadequacies in water management practices pose separate, but linked problems (Barney, 2005). Majuru, Mokoena, Jagals, and Hunter (2011) estimated that 65 million Nigerians had no access to safe water. The authors added that the situation is worse in the rural areas, where only 24 per cent of the population has access to safe water. Provision of clean, reliable and potable water, therefore remains a challenge, as people are compelled to use contaminated water that usually results into water-related diseases (WRDs); thus, making the government to spend huge resources on treatment of WRDs.

Water is a precious natural resource, vital for life and development. Thus, effective management of this natural resource becomes necessary. Zaharia (2015) asserted that water is a natural patrimony that must be protected and conserved. Obute (2010) described water as that clear, sparkling, colourless and tasteless fluid or substance that is free from impurities, pathogenic organisms or other harmful elements, aesthetically appealing and socially acceptable for human consumption. Contextually, water is a clear liquid that is colourless, odourless and tasteless, that has essential requirements for vital physiological and biochemical processes, such as: digestion,

respiration, excretion and circulation. If water is properly utilized and managed, it can be an instrument for economic survival and growth as well as lifting people out of the degradation of living without access to safe water and hygiene while at the same time bringing optimal health to all (United Nations, 2004). However, when water is inadequate in either quantity or quality, it portends potential adverse outcomes, such as: poor health and low productivity, food insecurity and constrained economic development. The available quantity of fresh water is linked to human processes and functions, such as: ingestion, water for hygiene, and water for food production. Even when water is available, it requires adequate sourcing, collection, transportation, storage, and treatment before use. These activities constitute water management practices.

Management is the process of getting things accomplished or done through the assistance of other people. According to Kimbi (2013), management is a process of tactfully controlling or bringing various elements to work together for some particular purpose. Water management involves making optimum use of some practical aspects. Practice refers to a habitual action of people or a particular way of doing something regularly. In relation to water, it is called water management practice. Therefore, water management practice refers to a process of tactfully controlling or bringing various elements, such as: water sourcing, collection, storage, and treatment to work together to improve the quality of water and for some health purposes. Good water management practices are necessary to ensure consumption of improved water source. According to Gbadegesin and Olorunfemi (2007), poor state of water management practices in the country and its implication for socio-economic development and environmental sustainability made the government to prepare the first National Policy on Water Resource Development in year 2000 to achieve efficient water management. Adequate water management practices can among other things increase access to safe water, improve health situation of people, save from what could have been spent on health, and treatment can be used to improve household livelihood (Ademiluyi & Odugbesan, 2008). Water management is done through application of conventional water collection, storage, and treatment or improvement methods.

Application of conventional water management strategies is essential in providing potable water for man's consumption. Water sources should be constructed and designed to protect the available water from outside contamination, in particular, from faecal matter. The source of water can be underground, reservoir, a body of flowing water or any natural substance from which water can be extracted or collected. Kimbi (2013) described water collection as the process of taking water from a natural source, and feeding into a distribution system. Checkley and Roberts (2006) observed that contamination of water can occur during and after collection often because of poorly designed open containers and improper hygiene and handling during transportation. Water collected needs to be kept in safe place when not in use. Water storage is the act of preserving water safely in a special place before use (Obute, 2010; Kimbi, 2013). Water storage is done by inspecting all potential water containers in the households. Ogbu (2010) disclosed that water storage container may be a reservoir, a water bottle, water can, clay pot, rubber pot, basin, bucket with lid, drum, and tank. However, these containers if not covered make the water vulnerable to contamination. Chalchisa, Megersa, and Beyene (2017) revealed that cross-contamination in the distribution system and unsafe storage are the major sources of water-borne diseases, hence they are mostly overlooked by water professionals. The use of stored water depends on the type of container used while water stored in intra house cement basins, is mainly used for domestic cleaning chores, water in container is used for cooking (Garcia-Betancourt, Higuera-Mendieta, Gonzalez-Uribe, Cortes, & Quintero, 2015). Therefore, storage container should be well protected from outside contamination and used for no other purpose other than storage of clean and treated water.

Water treatment involves processes of removing contaminants from water. Sule and Akomolafeau (2011) defined water treatment as a process for enhancing the quality of water so that it meets the water quality criteria for its fitness for the intended use. It can be explained as the physical and chemical processes for making water suitable for human consumption and other purposes. The nature of treatment is determined by the quality of raw water and the impurities present in it. Ground water may need only partial treatment. Surface water, especially the one collected from a river, may require proper management before it can be released for supply to consumers. Gbadegesin and Olorunfemi (2007) posited that the most common method of water treatment by the rural dwellers is coagulation, which is usually done during rainy season when the water sources are not clean enough as a result of pollution by runoff. Addition of Alum; makes the water clearer by coagulating suspended and colloidal particles, but will not kill the pathogens. Boiling, chlorination, and filtration are affordable water treatment techniques that should be encouraged among rural dwellers. Lantagne and Clasen (2012) disclosed that household water treatment (HWTs) methods, such as: boiling and chlorination have long been recommended in emergencies.

Access to safe drinking water is a major public health problem in rural areas. Rural areas encompass notably villages and communities, which have a major part of their population solely engaged in substinent

agriculture, culturally and traditionally related people, and they lack basic social amenities, such as: hospitals, electricity, industries, good motorable roads, pipe-borne water and well established markets (Jorgensen, 2008). Albert (2009) described rural dwellers as those who live outside urban metropolitan areas, notably villages and rural communities.

Various factors have been adduced to influence water management among rural dwellers. These include: gender, age, location, education level, manpower among others. Goni (2003) found that when water is scarce, water supply is irregular, water quality is poor, rural dwellers especially the elderly men and women (45 years & above) are mostly affected, as they cannot withstand the stress of walking long distances to fetch water, spending hours per day, burdened under heavy containers, and suffering acute physical problems, especially in drought prone areas. Gbadegesin and Olorunfemi (2007) found that young age groups (18-30 years) are more conscious of the source and quality of water they use; and Kimbi (2013) reported that adolescent girls (18-30 years) recorded high rate of adherence to adequate water management than older females of 46 years and above. Bathia and Fakenmark (2006) found that aged female rural dwellers due to general lack of water, spend a lot of time in search of water coupled with other house chores, and may become tired and less likely to treat their water before use. Gbadegesin and Olorunfemi (2007) reported that level of education has some implications on quantity and quality of water use by households as well as the management of the existing water sources, especially in the rural areas. Okoga (2007) found that the higher a person's level of education, the more likely he or she is to be conscious of his or her health and that of family, including adopting adequate and proper water management.

The rural dwellers need adequate and safe water supply for good health and hygienic purposes. Observations have obviously revealed that many Nigerian communities collect their drinking water from streams and unprotected wells. The prevalent use of contaminated water sources by the rural dwellers in Gwer LGA is a serious public health concern. People of Gwer LGA appear to have been fetching drinking water from contaminated sources, such as: shallow well, rivers, ponds, streams and lakes, which may not be treated or stored under good hygienic conditions before consumption, thereby exposing the inhabitants to incidences of water-related diseases and death. The water quality in improved water supply systems often is affected by unreliable operation and lack of proper management, or the water is subject to secondary contamination during collection, transport and storage. Consequently, most of the inhabitants of the area are exposed to water-related infections due to either poor collection methods, unsafe medium of water transportation and poor water treatment practices in the area. There is no published study bordering on water management and associated factors of age and education level in Gwer LGA, Benue State. In view of the above worrisome situations, the need arose to investigate water management practices among rural dwellers of Gwer LGA, Benue State, Nigeria. It would also be of interest to investigate if water management practices of rural dwellers are associated with their age and education level. Following from the above, five research questions were posed, and two null hypotheses were postulated to guide the study.

Research Questions

The following research questions guided the study:

4. What are the water collection practices among rural dwellers?
5. What are the water storage practices among rural dwellers?
6. What are the water treatment practices among rural dwellers?
7. What are the water management practices among rural dwellers based on age?
8. What are the water management practices among rural dwellers based on education level?

Hypotheses

Two null hypotheses were postulated and tested at .05 alpha level.

3. There is no significant difference in the water management practices among rural dwellers in Gwer West LGA, Benue State based on age ($p<.05$).
4. There is no significant difference in the water management practices among rural dwellers in Gwer West LGA, Benue State based on education level ($p<.05$).

Methods

Research Design: The study adopted a descriptive cross-sectional survey research design. A cross-sectional survey is one that produces a snap shot of a population at a particular point in time. Instead of following a group of subjects over a period of time, cross-section of the subjects of varying ages and other socio-demographic factors are sampled and studied at the same time, and data are obtained at one time from groups or at different stages of development (Cohen, Manion, & Morrison, 2011).

Area of the Study: The study was conducted in Gwer West LGA, Benue State, Nigeria. The LGA lies some 126 kilometres away from Makurdi, the State capital. It shares boundaries with Logo and Ukum LGAs to the North and North East respectively; Taraba State to the East; and Katsina-Ala LGA to the South West. Gwer West LGA is essentially inhabited by Tiv people, who are mostly farmers and fishermen. The LGA has a river usually used for annual fishing festival. From observations, most inhabitants of Gwer West LGA, use shallow wells, rivers, ponds, streams and lakes as sources of water for domestic and commercial purposes. Some of these water sources are abode of infections, as most of the inhabitants of the area are seen suffering from one type of water-related diseases or the other. From time to time, health workers are called to intervene on cholera and other epidemic associated with water sources and hygiene. The prevalent use of contaminated water sources by the rural dwellers in Gwer LGA is a serious public health concern. Consequently, most of the inhabitants of the area are exposed to water-related infections. Thus, the researchers deemed the area appropriate for the study.

Population for the Study: The population for the study comprised rural dwellers in Gwer West LGA, Benue State, Nigeria. The projected population of rural dwellers is 122,145 (National Population Commission [NPC]/Bureau of Statistics Benue State Chapter, 2018).

Sample for the Study: The sample for the study consisted of 420 rural dwellers in Gwer West LGA, Benue State. The sample was selected by the aid of Cohen, Manion, and Morrison (2011) standardized table for sample size, confidence levels and confidence intervals for random samples. Multi-stage sampling procedure was employed to draw the sample size for the study. In the first stage, seven (7) communities were drawn from the ten (10) autonomous communities in Gwer West LGA using simple random sampling technique of balloting without replacement. Secondly, three villages each were drawn from the seven selected autonomous communities using simple random sampling technique of balloting without replacement. This gave a total of 21 villages. Thirdly, 20 married rural dwellers each were purposively drawn from the 21 selected villages to arrive at the sample size of 420.

Instrument for Data Collection: A 26-item Researchers'-structured Water Management Practices Questionnaire (WMPQ) was used for data collection. The WMPQ consisted of two sections: A, and B. Section A consisted of two items on the respondent's demographic variables of age and education level. Section B consisted of 24 items (8 items each) on water collection; water storage; and water treatment practices. Five experts from the Department of Human Kinetics and Health Education, University of Nigeria, Nsukka validated the instrument. The experts' suggestions were incorporated in the final draft of the questionnaire before use in the study. A split half method using the Spearman's Brown coefficient was used to correlate the data generated. The reliability index of .81 was obtained, and adjudged reliable for embarking on the study. In the questionnaire, respondents were asked to indicate by placing a tick on a dichotomous response options of Yes and No.

Data Collection Technique: Copies of the questionnaire were administered to 420 married rural dwellers, out of which 386 were returned, which gave a return rate of 91.9 per cent. The 386 copies of the questionnaire returned were properly filled out and used for data analysis.

Data Analysis Technique: Data generated were analysed using frequency counts, percentages, and Chi-square statistic. The research questions were answered using percentages while the null hypotheses were tested using Chi-square (χ^2) at .05 level of significance. The criterion for deciding a worthwhile water management practice was based on WHO (1997) international cut off point of 50 per cent. Therefore, responses that had less than 50 per cent were deemed negative while those that had 50 per cent and above were deemed positive management practices.

Results

Table 1: Responses on Water Collection Practices Among Rural Dwellers (n = 386)

S/N	Water collection practices	Yes F (%)	No F (%)
1.	Uses open bucket to collect water	329 (85.2)	57 (14.8)
2.	Uses bucket that usually has lid to collect water	181 (46.9)	205 (53.1)
3.	Uses water can to collect water	286 (74.1)	100 (25.9)
4.	Uses clay pot to collect water	212 (54.9)	174 (45.1)
5.	Uses plastic pot to collect water	241 (62.4)	145 (37.6)
6.	Uses basin to collect water	273 (70.7)	113 (29.3)
7.	Uses surface tank to collect water	209 (54.1)	177 (45.9)
8.	Uses drums to collect water	255 (66.1)	131 (33.9)
	Overall	**64.3**	**35.7**

Results in Table 1 showed that overall, more than half (64.3%) of rural dwellers use all the enlisted containers to fetch/collect water. Specifically, majority (85.2%) of the respondents use open bucket to fetch water; more than two-thirds use water can (74.1%) and basin (70.7%) to collect water; more than half use clay pot (54.9%), plastic pot (62.4%), surface tank (54.1%), and drums (66.1%) to collect water. Nearly half (46.9%) use bucket that usually has lid to collect water.

Table 2: Responses on Water Storage Practices Among Rural Dwellers (n = 386)

S/N	Water storage practices	Yes F (%)	No F (%)
1.	Uses plastic bowel to store water	225 (58.3)	161 (41.7)
2.	Uses basin to store water	211 (54.7)	175 (45.3)
3.	Uses water can to store water	289 (74.9)	97 (25.1)
4.	Uses drums to store water	279 (72.3)	107 (27.7)
5.	Uses locally constructed reservoir to store water	187 (48.4)	199 (51.6)
6.	Uses clay pot to store water	256 (66.3)	130 (33.7)
7.	Uses buckets to store water	237 (61.4)	149 (38.6)
8.	Uses plastic & metal tanks to store water	238 (61.7)	148 (38.3)
	Overall	**62.3**	**37.7**

Results in Table 2 showed that overall, more than half (62.3%) of rural dwellers use all the listed containers to store water. Specifically, more than two-thirds of the respondents use water can (74.9%) and drums (72.3%) to store water; more than half of the respondents use plastic bowel (58.3%), basin (54.7%), clay pot (66.3%), buckets (61.4%), and plastic & metal tanks (61.7%) to store water. Nearly half (48.4%) use locally constructed reservoir to store water.

Table 3: Responses on Water Treatment Practices Among Rural Dwellers (n = 386)

S/N	Water treatment practices	Yes F (%)	No F (%)
1.	Uses chlorine to treat water	302 (78.2)	84 (21.8)
2.	Uses alum to treat water	281 (72.8)	105 (27.2)
3.	Applies sedimentation/coagulation method	230 (59.6)	156 (40.4)
4.	Applies ozonation method	145 (37.6)	241 (62.4)
5.	Applies solar disinfection (SODIS)	165 (42.7)	221 (57.3)
6.	Uses boiling method to treat water	291 (75.4)	95 (24.6)
7.	Uses filtration method to treat water	246 (63.7)	140 (36.3)
8.	Uses candle water filter to treat water	199 (51.6)	187 (48.4)
	Cluster	**60.2**	**39.8**

Results in Table 3 showed that overall, more than half (60.2%) of rural dwellers indicated treating water before use by application of the above methods and materials. Specifically, more than two-thirds of the respondents use chlorine (78.2%), alum (72.8%), and boiling method (75.4%) to treat water; more than half apply sedimentation/coagulation method (59.6%), filtration (63.7%), and candle water filter (51.6%) to treat water. Nearly half (42.7%) apply solar disinfection (SODIS); and about 37.6 per cent of the respondents apply ozonation method in water treatment.

Table 4: Responses on Water Management Practices Among Rural Dwellers Based on Age (n = 386

S/N	Water management practices	18-30yrs (n = 322) F (%)	31-45yrs (n = 59) F (%)	46yrs + (n = 5) F (%)
11.	Water collection practices	206 (63.9)	39 (66.1)	3 (60.0)
12.	Water storage practices	197 (61.2)	39 (66.1)	4 (80.0)
13.	Water treatment methods	187 (58.1)	42 (71.2)	4 (80.0)
	Overall	**61.1**	**67.8**	**73.3**

Results in Table 4 showed that overall, more than two-third (73.3%) of rural dwellers aged 46 years & above adopt water management practices more than those aged 31-45 years (67.8%) and 18-30 years (61.1%) respectively. Findings also showed that more than half of the respondents aged 31-45yrs (66.1%), 46yrs+ (60%), and 18-30yrs (63.9%) adopt conventional water collection practices. Majority (80%) of those aged 46yrs+, and more than half of those aged 31-45 years (66.1%) and 18-30 years (61.2%) store water using all the listed water storage materials. Majority of the respondents aged 46yrs+ (80%), more than two-third of those aged 31-45 years (71.2%), and more than half of those aged 18-30 years (58.1%) adopt conventional water treatment/improvement practices.

Table 5: Responses on Water Management Practices Among Rural Dwellers Based on Education Level (n = 386)

S/N	Water management practices	NFE (n = 22) F (%)	PRY. ED (n = 45) F (%)	SEC. ED (n = 75) F (%)	TER (n=244)
11.	Water collection practices	15 (68.1)	32 (71.1)	43 (57.3)	158 (64.8)
12.	Water storage practices	15 (68.1)	30 (66.7)	46 (61.3)	152 (62.3)
13.	Water treatment methods	13 (59.1)	31 (68.9)	41 (54.7)	148 (60.7)
	Overall	**65.1**	**68.9**	**57.8**	**62.6**

Key: NFE = No Formal Education, PRY. ED = Primary Education, SEC. ED = Secondary Education, TER. ED = Tertiary Education

Results in Table 5 showed that overall, more than half (68.9%) of rural dwellers with primary education adopt water management practices more than those with No formal education (65.1%), tertiary education (62.6%), and secondary education (57.8%) respectively. Findings also showed that more than two-third (71.1%) of those with primary education, and more than half of those with No formal education (68.1%), secondary education (57.3%), and tertiary education (64.8%) adopt conventional water collection practices. More than half of those with No formal education (68.1%), primary education (66.7%), secondary education (61.3%), and tertiary education (62.3%) store water using all the listed water storage materials. More than half of the respondents with No formal education (59.1%), primary education (68.9%), secondary education (54.7%), and tertiary education (60.7%) adopt conventional water treatment/improvement practices.

Table 6: Chi-square Test of Attitude of Water Management Practices Among Rural Dwellers Based on Age

Age	N	Yes O (E)	No O (E)	χ^2	df	p-value
18-30 years	322	66 (73.4)	256(248.6)	7.866	2	.020*
31-45 years	59	19 (13.5)	40 (45.5)			
46 years +	5	3 (1.1)	2 (3.9)			
Total	386					

***significant (p < .05)**

Results in Table 6 showed the Pearson Chi-square value with the corresponding p-value for hypothesis of no significant difference on water management practices among rural dwellers based on age ($\chi^2 = 7.866$, df = 2, p = .020 < .05). Since the p-value was below .05 level of significance, the null hypothesis was therefore rejected. This implies that age category of rural dwellers significantly influence their water management practices.

Table 7: Chi-square Test of Attitude of Water Management Practices Among Rural Dwellers Based on Education Level

Education Level	N	Yes O (E)	No O (E)	χ^2	df	p-value
NFE	22	7 (5.0)	15 (17.0)	5.605	3	.133
PRY. ED	45	14 (10.3)	31 (34.7)			
SEC. ED	75	11 (17.1)	64 (57.9)			
TER. ED	244	56 (55.6)	188(188.4)			
Total	386					

***significant (p < .05)**

Results in Table 7 showed the Pearson Chi-square value with the corresponding p-value for hypothesis of no significant difference on water management practices among rural dwellers based on education level (χ^2 = 5.605, df = 3, p = .133 > .05). Since the p-value was above .05 level of significance, the null hypothesis was therefore not rejected. This implies that education level of rural dwellers do not significantly influence their water management practices.

Discussion

The study established that overall, more than half of rural dwellers use all the enlisted containers to fetch/collect water. Specifically, majority of the respondents use open bucket to fetch water; more than two-thirds use water can and basin to collect water; more than half use clay pot, plastic pot, surface tank, and drums to collect water. Nearly half use bucket that usually has lid to collect water. The findings were expected and therefore were not surprising. This agrees with the findings of Checkley and Roberts (2006) who observed that water contamination occur during and after water collection often because of open containers and unhygienic handling during collection. According to Health Belief Model (HBM), if an individual believes that getting water from improved sources will prevent him or her from getting diarrhoea disease, he or she will seek the means of getting water from good sources. Again, if an individual does not believe that water management practices has benefits, the goal of health education would be to inform him that proper water management practices can greatly improve the health and quality of life of people. If the individual believes that there are too many barriers for managing water (e.g., time consuming, money), the goal of health education would be to help him brainstorm ways to overcome these barriers (e,g. Using simple method of water purification, such as boiling). Applying Finnegan and Vadakekalam (1975) system theory in management, contaminated water source, improper collection and storage practices will pose danger to safety and health of the people in the family or the general public. Treatment sub-systems cannot be effective if the rural dwellers have non-chalant attitude towards water treatment. When water source is not well managed, there is a tendency that the water source will be contaminated leading to health hazards and epidemics of water-borne diseases.

The study established that overall, more than half of rural dwellers use all the listed containers to store water. Specifically, more than two-thirds of the respondents use water can and drums to store water; more than half of the respondents use plastic bowel, basin, clay pots, buckets, and plastic & metal tanks to store water. Nearly half use locally constructed reservoir to store water. The findings were expected and not surprising. This was in consonance with the findings of Ogbuji (2003) who found that rural women collected their water and stored in clay pots, tanks and drums or ponds called 'ogelle'. To maintain the quality of treated water within the home, safe storage is very important. In water storage, it is important to keep the container clean and prevent hands and dippers from touching the water. The findings on water storage practices are expected and not surprising, because families need good containers for hygienic collection and storage of water, without such containers, the good works of providing water fit for human consumption at the point of distribution is likely to be lost. This is in line with the assertion of Peletz (2006) that it may be difficult sometimes to find or buy a good storage container, but the most important thing is to make sure that it is covered and the stored water undergoes adequate treatment so that it can be safe for drinking. Water storage tanks have their own impact on quality of water if they are not handled in hygienic ways, such as: using of clean utensils and sealing or covering of the storage tanks.

The study established that overall, more than half of rural dwellers indicated treating water before use by application of the following methods and materials. Specifically, more than two-thirds of the respondents use chlorine, alum, and boiling method to treat water; more than half apply sedimentation/coagulation method, filtration, and candle water filter to treat water. Nearly half applies solar disinfection (SODIS); and about 37.6 per cent of the respondents apply ozonation method in water treatment. The results were not expected and therefore

surprising. The findings were in consonance with the finding of Gbadegesin and Olorunfemi (2007) who reported that the most common method of water treatment by the rural dwellers is coagulation, which is usually done during rainy season when the water sources are not clean enough as a result of pollution by runoff. Consequently, rural dwellers should be very conscious of treating their water before consumption. The findings were also in line with the finding of Lantagne and Clasen (2012) who disclosed that household water treatment (HWTs) methods such as boiling or chlorination have long been recommended in emergencies.

The findings showed that overall, more than two-third of rural dwellers aged 46 years & above adopt water management practices more than those aged 31-45 years and 18-30 years respectively. Findings also showed that more than half of the respondents aged 31-45yrs, 46yrs+, and 18-30yrs adopt conventional water collection practices. Majority of those aged 46yrs+, and more than half of those aged 31-45 years and 18-30 years store water using all the listed water storage materials. Majority of the respondents aged 46yrs+, more than two-third of those aged 31-45 years, and more than half of those aged 18-30 years adopt conventional water treatment/improvement practices. The findings were not in consonance with the findings of Goni (2003) who reported that when water is scarce, water supply is irregular, water quality is poor, rural dwellers especially the elderly men and women (45 years & above) are mostly affected, as they cannot withstand the stress of walking long distances to fetch water, spending hours per day, burdened under heavy containers, and suffering acute physical problems, especially in drought prone areas. The findings also disagreed with the findings of Gbadegesin and Olorunfemi (2007) who found that young age groups (18-30 years) are more conscious of the source and quality of water they use; and Kimbi (2013) who reported that adolescent girls (18-30 years) recorded high rate of adherence to adequate water management than older females of 46 years and above. Consequently, the elderly men and women are among the poor and tend to be most adversely hit by the lack of water and poor management of the available source. The finding also showed that age category of rural dwellers significantly influence their water management practices. The finding on water collection practices was not expected; because the researchers' observations show that majority of rural dwellers mostly aged women are fond of fetching drinking water with any container. The elderly ones have better understanding of appropriate conventional methods of storing water than the younger ones. The findings disagreed with the findings of Bathia and Fakenmark (2006) who reported that aged female rural dwellers due to general lack of water, spend a lot of time in search of water coupled with other house chores, and may become tired and less likely to treat their water before use. Though, water may look clear, it does not necessarily mean it is good for drinking, and therefore, are advised to adopt adequate water treatment methods. The rural residents especially the women should be enlightened on appropriate water collection containers, as open containers, can cause contamination to the water if the distance is long.

The findings equally showed that overall, more than half of rural dwellers with primary education adopt water management practices more than those with No formal education, tertiary education, and secondary education respectively. Findings also showed that more than two-third of those with primary education, and more than half of those with No formal education, secondary education, and tertiary education adopt conventional water collection practices. More than half of those with No formal education, primary education, secondary education, and tertiary education store water using all the listed water storage materials. More than half of the respondents with No formal education, primary education, secondary education, and tertiary education adopt conventional water treatment/improvement practices. The findings also showed that education level of rural dwellers do not significantly influence their water management practices. The findings on water storage practices based on education level were not expected, because one expects to see a difference between well educated and semi-literate persons. The findings were not in agreement with the assertion of Gbadegesin and Olorunfemi (2007) that level of education has some implications on quantity and quality of water use by households as well as the management of the existing water sources, especially in the rural areas. The findings were also not in line with the report of Okoga (2007) that the higher a person's level of education, the more likely he or she is to be conscious of his or her health and that of family, including adopting adequate and proper water management. Respondents with tertiary education suppose to have a higher understanding pertaining appropriate water storage practices. Conversely, an illiterate may lack the basic education on efficient use and water pollution prevention, even as they have learned strategies to conserve safe water. The findings have implications for directing serious attention to water management practices of rural dwellers.

Conclusion

The study was conducted in order to investigate water management practices among rural dwellers. The findings have shown that more than half of rural dwellers use containers, such as: open bucket, bucket with lid, water can, clay pot, plastic pot, basin, surface tank, and drums to fetch/collect water. More than half of rural

dwellers use containers, such as: plastic bowel, basin, tanks, drums, locally constructed reservoir, clay pot, buckets, and plastic and metal tanks to store water. More than half of rural dwellers indicated treating water before use by application of the following methods and materials: chlorination, addition of alum, sedimentation/coagulation, ozonation, application of solar disinfection (SODIS), boiling, filtration, and use of candle water filter. There was significant difference in responses on water management practices among rural dwellers based on age while no significant difference was obtained based on education level. Water of poor quality in taste and turbidity can cause ill-health to individuals, community and the country at large. However, there is need for urgent planning and implementation of comprehensive health talks for the rural dwellers with the aim to address their water management problems with particular consideration to their ages.

Recommendations

Based on the findings and discussion, the following recommendations were made:

1. Rural dwellers should be enlightened on the benefits of fetching and transporting water from improved sources using clean and well covered containers.
2. Public awareness and health education on appropriate water storage practices and treatment is paramount and should address all age group to avoid recontamination of water.
3. The water source should be well treated so as to prevent individuals, families and animals from infection. This can be done by tracing the water supply source, collection and storage methods and providing adequate purification measures.

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