
Household-Based Water Storage and Diarrheal Diseases among Residents of Kyegegwa District of Western Uganda

Main Author: **Muhammad Kabiru Usman,**

Public Health Department: Taraba State University Nigeria

Afolabi Kamaldeen Kolawole

Public Health Department: Cavendish University Uganda

Adamu Jibrin

Public Health Department: Cavendish University Uganda

Shaibu Ojonugwa Catherine

Public Health Department: Cavendish University Uganda

Ilori Oluwole

Behavioural Sciences Department, Habib Medical School, IUIU Uganda

Nwanna Uche Kevin

Public Health Department, Stafford University Uganda

Abstract

Introduction: Diarrheal disease accounted for 4.6 Billion cases and 2.16 Million deaths worldwide in the year 2004 of which more than 50% were from low-income countries. Africa and South East Asia countries accounted for 75% of all deaths; Uganda was among the 15 countries that accounted for 75% of all deaths (WHO, 2008).

Objective: This study seeks to assess the relationship between households-based water storage and diarrheal disease among residents of Kyegegwa district.

Methodology: A cross-sectional descriptive study was carried out among 397 households of Kyegegwa district. A multi-stage sampling technique was used, the households in the district were stratified and simple random sampling technique was used to sample them. Data were statistically analysed using SPSS to determine the relationship between the variables

Result: The most used water storage method among the households was jerrycan 288(72.5%), followed by Pots 80(20.2%), pan 18(4.5%) and the water tank 11(2.8%). It was discovered that the prevalence of diarrheal within the household is 60%. The study discovered that households who used water tanks to store water for drinking were more likely to have members with a history of diarrheal diseases (OR = 1.967, CI =2.074- 0.577), households who used pot to store water for drinking were more likely to have members with a history of diarrheal diseases (OR = 1.381, CI = 4.208 – 0.453), households who used drinking water for other purpose were more likely to have family members with a history of diarrheal diseases (OR = 1.459, CI = 1.581-0.465) and households who take 2days or more to replace water in the container were more likely to have family members with a history of diarrheal diseases (OR = 1.899, CI = 3.695 – 1.110).

Conclusion: 6 out of every 10 households recorded the occurrence of diarrheal during the time of the study. The water storage methods identified were jerry can, pot, pans and tanks. It was found out that household's water storage system and duration have a strong influence on diarrheal disease.

Recommendation: Health education, Advocacy and provision of water storage means were the recommended ways of reducing the incidence of diarrheal disease.

Keywords: household based; water treatment; diarrheal disease

INTRODUCTION

Diarrheal disease kills an estimate of 1.8 million people each year. According to WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation (JMP, WSS, 2013), 768 million people still use unsafe drinking water sources. Diarrhoea accounted for 75% of all death in Africa (WHO, 2008); Uganda according to Boschi-Pinto et al, 2008 was among the 15 countries that accounted for 75% of all deaths.

Water is one of the key determinants of life among the element of WASH. Lack of these three elements (WASH) makes people more susceptible to illness and death. Safe water, coupled with adequate sanitation, and proper hygiene education (WASH) can prevent illness and death, leading to improved health, poverty reduction, and socio-economic development (Bartram and Cain cross, 2010).

According to the water quality monitoring work which was carried out by the Directorate of Water Resources Management (DWRM) of MWE, the compliance of rural safe drinking water sources to national water quality standards was 53% (E.coli being the key indicator), which was against a target of 95% (WESPR, 2014). Approximately 23,000 Ugandans die each year from diarrhoea nearly 90% of which is directly attributed to poor water coupled with poor sanitation and hygiene (WASH/Uganda C R, 2012). The increase in diarrhoea may be linked to the finding that found the determinants and situations of household water storage to be poorly practised in Uganda (Wright, Gundry, & Conroy, 2004). Hence, this justifies the need for this study to assess the household-based water storage methods and diarrheal diseases among residents of Kyegegwa district in western Uganda.

METHODOLOGY

Research design: The research design used for this study was a cross-sectional descriptive design; the study utilized both qualitative and quantitative method. It used descriptive design because it offered a precise description and information of the household based water storage and diarrheal diseases as they exist.

Study area: This study was carried out among the households of Kyegegwa district of western Uganda.

Study population and sample size: The study population was 59,332 (Uganda Bureau of statistics) been the number of households in Kyegegwa district. The sample size used was 397, which was determined using Sloven’s Formula.

Sampling technique: A multi-stage sampling technique was employed. Different areas in kyegegwa district were stratified and simple random sampling technique was used to sample the stratified households.

Data collection methods and tools: A close-ended structured self-administered questionnaires were used for the household’s heads and key informant guide was used for the health workers.

Measurements of Variables

Independent variables: Water storage methods were measured using attributes such as water tanks, jerry can, pots and pans.

Dependents variables: diarrheal disease was measured using the following attributes; frequency of the disease, duration of the disease, type of the disease.

Data analysis and interpretation: The data were analyzed using SPSS computer software. Descriptive Analysis (Uni-variate), Bi-variate and Multivariate analysis were done; descriptive analysis was used to analysis univariate data and its output were frequencies, percentage etc: Bivariate analysis was used to compare independent variables with dependent variables using Pearson’s coefficient. Variable that were significant at bivariate level were fit into a multivariate analysis to detect the major predictor among the variables, Odd ratio and P-values were the output of the multivariate analysis. The variables with $P < 0.05$ were considered to be statistically significant.

Quality control: The Researcher conducted a pre-test for the study tools so as to assess the validity and reliability of research instruments.

Table 1: Validity and reliability tests

Constructs	Cronbach’s Alpha
Water storage methods Water Tanks Jerry can Pots Pans	0.963
Diarrheal diseases Frequency Duration Type	0.899

Ethical consideration: An introductory letter from Cavendish University Uganda was secured, which was addressed to the district health officer (DHO) for data collection. The consent to conduct the study in Kyegegwa district was sought from the district health officer (DHO). The consent of respondent was sought for, which includes the confidentiality of the responses,

freedom of participation, the anonymity of respondents in the questionnaire, to mention but a few.

Limitations of the study:

- The study encountered challenges of respondent’s unwillingness to complete the questionnaires which were overcome by diligent persuasive means.
- The paucity of literature in term of publication relevant to the study from local perspectives which was overcome by using relevant literature from other regions.

RESULTS

Socio-demographic characteristics

Table 2: Socio-demographic characteristics of the respondents

	Frequency n = 397	Percent
Gender		
Male	149	37.5
Female	248	62.5
Age (yrs)		
18-25	114	28.7
26-35	151	38.0
36-45	60	15.1
46-55	42	10.6
56-65	27	6.8
66-75	3	0.8
Marital status		
Single	129	32.5
Married	222	55.9
Divorced	46	11.6
The highest level of education		
None	120	30.2
Primary	113	28.5
Secondary	140	35.3
Tertiary	24	6.0
Number of people in the household		
1	51	12.8
2-5	154	38.8
5-10	144	36.3
10 and Above	48	12.1

Majority of the respondents in this study were female 248 (62.5%), and most were aged between 26 – 35 years 151 (38.0%). More than half of the respondents in Kyegegwa district were married 222 (55.9%), and most had secondary school level of education 140 (35.3%). The most frequently reported number of people in the households was 2 – 5 people 154 (38.8%).

Table 3: Water provider at the source and the main source of your drinking water

	Frequency n = 397	Percent
Water provider at the source		
Government	38	9.6
Private operators	219	55.2
CBO/NGO	21	5.3
I don't Know	119	30.0
The main source of your drinking water		
Pipeline	42	10.6
Open well	58	14.6
Borehole	143	36.0
River water	52	13.1
Rainwater	13	3.3
Shallow well	37	9.3
Water vendors	52	13.1

The source of water for the majority of the respondents is from the private operator establishments 219 (55.2%), and the main source of drinking water for most of them is boreholes 143 (36%).

The methods of water storage used among the households of Kyegegwa district

Table 4: Distribution of water storage methods used among households of Kyegegwa district

	Frequency n = 397	Percent
Store water for drinking separately from water for other domestic purposes		
Always	210	52.9
Sometimes	156	39.3
Never	31	7.8
Type of container do you use to store water for drinking		
Water tank	11	2.8
Jerry Can	288	72.5
Pots	80	20.2
Small pan	18	4.5
Jerry Can type		
Clear	128	44.4
Clear and Lid	119	41.3

All of the above	41	14.2
Pot		
Elevated platform	16	20.0
Elevated and covered	55	68.8
All the 3 process	9	11.2
How long do you take to replace water in the container (duration)		
1day	35	8.8
2days	81	20.4
3-5days	172	43.3
5days and above	109	27.5
Use water for drinking for other purposes		
Yes	229	57.7
No	168	42.3
Method of drawing water from your container		
Use small pan	51	12.8
Pour directly from the container	234	58.9
Use cup	112	28.2

It was found that slightly above half of the respondents stored water for drinking separately from water for other domestic purposes 210 (52.9%), and the majority of them reported that they used jerry cans to store water for drinking 288 (72.5%). The type of jerry can use by most of the respondents was a clear type 128 (44.4%), while the type of pot used was elevated and covered 55(68.8%). When asked how long they took to replace water in the container (duration), most of them mentioned that they spent between 3 – 5 days 172 (43.3%). More than half of the respondents reported that they Used water for drinking for other purposes 229 (57.7%), whereas the method of drawing water from their containers was to pour directly from container 234(58.9%).

Prevalence of diarrheal diseases

Table 5: Prevalence of diarrheal diseases in Kyegegwa district

	Frequency	Percent
What are the most frequent diseases in your community		
Diarrhoea	214	53.9
Dysentery	47	11.8
Typhoid	119	30.0
I don't know	17	4.3
Total	397	100.0
Diarrheal diseases occurred within the household in past		

3 months		
Occurred	224	56.4
Never-occurred	173	43.6
Total	397	100.0

From the study, it was discovered that in the past 3 months 224 (56.4%) households recorded incidence of diarrheal diseases and 173 (43.6%) households did not record the incidence of diarrheal. This reflects 60% prevalence of diarrheal which means 6 out of every 10 households had the history of diarrheal recently.

Also, the most frequent diseases in the community were diarrheal 214 (53.9%) and typhoid 119(30%), dysentery 47 (11.8%) and those that didn't know 17 (4.3%).

“The most frequently reported diarrheal disease in Kyegegwa district are diarrhea and dysentery where diarrhea is mostly reported mostly from Ruyonzo sub-county which may be attributed to the following; No potential water sources for protection e.g. spring, wells, Therefore they depend on borehole water which is expensive in terms of construction and maintenance, low latrine coverage and use, inadequate sanitization, low levels of education, sharing with animals and Poor health-seeking behaviors.

And more so, can be reduced through; district tries to extend protected water sources but funds are limited and selection and training of village health teams to do home visiting, community health education.

I Recommend; need more funding to enable improvement of more villages; law enforcement provide motorcycles for health assistant, the motivation of village health team”. District Health Inspector (DHI-Kyegegwa)

“The most frequently reported diarrheal diseases in the district are Typhoid, Dysentery and helminths which is attributed by poor hygiene/sanitation practices among the households, poor personal hygiene practices among the households, inadequate water supply in the district, illiteracy levels are high among the community, socio-economic status is low among the households, cultural practices and beliefs and attitudes of the community”. Kyegegwa Town Council health inspector

Another also states that;

“The most frequently reported diarrheal diseases in the district are diarrhea, dysentery and typhoid, the most frequent and most reported is diarrhea followed by typhoid, which may be attributed by poor sources of drinking water, lack of adequate treatment at household's level, community attitude towards water treatments and Sharing water drinking with animals.

Which can also be reduced by Education and sensitization of the community on proper water treatment at households level, Lobby for construction of proper and safe water source at various

communities, protecting some of the community water sources like rivers and Facilitation of the village health team (VHS) to improves home visiting” Clinician-HC(IV)

The relationships between water storage methods and diarrheal diseases among residents of Kyegegwa district

Table 6: Bivariate relationships between water storage methods and diarrheal diseases among residents of Kyegegwa district

		The incidence of diarrheal disease		X ²	df	P value
	Occurred	Never Occurred				
Store water for drinking separately from water for other domestic purposes						
Always	129(61.4%)	81(38.6%)	13.986	2	0.001**	
Sometimes	87(55.8%)	69(44.2%)				
Never	8(25.8%)	23(74.2%)				
Type of container do you use to store water for drinking						
Water tank	11(100.0%)	0(0.0%)	90.562	3	0.000**	
Jerry Can	197(68.4%)	91(31.6%)				
Pots	11(13.8%)	69(86.2%)				
Small pan	5(27.8%)	13(72.2%)				
The condition of the water container						
Tank						
Covered	2(66.7%)	1(33.3%)	2.933	2	0.231	
Tab	2(33.3%)	4(66.7%)				
Both	2(100.0%)	0(0.0%)				
Jerry Can						
Clear	81(63.3%)	47(36.7%)	6.009	2	0.050	
Clear and Lid	63(52.9%)	56(47.1%)				
All of the above	30(73.2%)	11(26.8%)				
Pot						
Elevated platform	5(31.2%)	11(68.8%)	1.940	2	0.379	
Elevated and covered	28(50.9%)	27(49.1%)				
All the 3 process	4(44.4%)	5(55.6%)				
Time is taken to replace water in the container (duration)						
1day	35(00.0%)	0(0.0%)				

2days	57(70.4%)	24(29.6%)	95.628	3	0.000**
3-5days	110(64.0%)	62(36.0%)			
5days and above	22(20.2%)	87(79.8%)			
Use water for drinking for another purpose					
Yes	143(62.4%)	86(37.6%)	7.982	1	0.005**
No	81(48.2%)	87(51.8%)			
Drawing water from the container					
Use small pan	46(90.2%)	5(9.8%)	84.275	2	0.000**
Pour directly from container	153(65.4%)	81(34.6%)			
Use cup	25(22.3%)	87(77.7%)			

Water storage characteristics had a statistically significant relationship with diarrheal diseases among residents of Kyegegwa district, these are; storage of water for drinking separately from water for other domestic purposes ($X^2=13.986$, P-value= 0.001), the type of container used to store water for drinking ($X^2= 90.562$, P-value= 0.000), the Time taken to replace water in the container (duration) ($X^2= 95.682$, P-value= 0.000), Use drinking water for other purpose ($X^2= 7.892$, P-value= 0.000) and material used to draw water from container ($X^2= 84.275$, P-value= 0.000).

Table 7: Regression results for the relationship between water storage methods and diarrheal diseases among residents of Kyegegwa district

	The incidence of diarrheal disease		AOR	Confidence interval 95%	
	Occurred	Never Occurred		Lower	Upper
Store water for drinking separately from water for other domestic purposes					
Always	129(61.4%)	81(38.6%)	0.556	.814	1.026
Sometimes	107(68.5%)	49(31.5%)	0.710	.630	1.645
Never	23(74.1%)	8(25.9%)			
Type of container do you use to store water for drinking					
Water tank	11(100.0%)	0(0.0%)	1.967	.577	2.704
Jerry Can	197(68.4%)	91(31.6%)	.746	.238	2.342
Pots	11(13.8%)	69(86.2%)	1.381	.453	4.208
Small pan	5(27.8%)	13(72.2%)			
Time is taken to replace water in the container (duration)					

1day	35(100.0%)	0(0.0%)	1.088	1.084	1.135
2days	57(70.4%)	24(29.6%)	1.899	1.110	3.695
3-5days	110(64.0%)	62(36.0%)	0.856	.850	2.594
5days and above	22(20.2%)	87(79.8%)			
Use water for drinking for another purpose					
Yes	143(62.4%)	86(37.6%)	1.459	.465	1.581
No	81(48.2%)	87(51.8%)			
Drawing water from the container					
Use small pan	46(90.2%)	5(9.8%)	0.420	0.335	2.628
Pour directly from container	153(65.4%)	81(34.6%)	.907	.325	2.535
Use cup	25(22.3%)	87(77.7%)			

The results in the table above shows that households who used water tanks to store water for drinking were 1.9 times more likely to have members with a history of diarrheal diseases (OR = 1.967, CI = 0.577 – 2.074), households who used pot to store water for drinking were 1.381 times more likely to have members with a history of diarrheal diseases (OR = 1.381, CI = 4.208 – 0.453) households who used drinking water for another purpose were 1.459 times more likely to have family members with a history of diarrheal diseases (OR = 1.459, CI = 0.465 – 1.581), households who take 2days to replace water in the container were 1.899 times more likely to have family members with a history of diarrheal diseases (OR = 1.899, CI = 3.695 – 1.110).

DISCUSSION

Water Storage Methods Used Among Households: Based on water storage, it was found that slightly above half of the respondents always stored water for drinking separately from water for other domestic purposes 210 (52.9%), followed by those who does that sometimes 156(39.3%) and those who never stored drinking separately from water for other domestic purposes 31(7.8%) respectively. Majority of them reported that they use jerry cans to store water for drinking 288 (72.5%) followed by pots 80 (20.2%), then small pan 18 (4.5%) and lastly water tanks 11(2.8%). The type of jerry can being used by most of the respondents was a clear type 128 (44.4%), while the type of pot used was elevated and covered 55(68.8%). The findings from this study were slightly different from a study conducted in Tanzania; a nearby country to Uganda the majority of respondents reported using buckets, Soil pot, jerry cans and a small pan for storing drinking water. The proportion of water treatment recorded by this study was higher than that was found by a study done in Arusha in 2009, but within the range indicated in the Tanzania Demographic Health Survey of 2010 (Remidius K, 2012).

It was also found out that majority of the respondents store their water for the duration of 3-5days before being replaced 172(43.3%), followed by 5 days and above making 109(27.5%), then for 2days 81(20.4%) and 1 day 35(8.8%) respectively. More so, above half of the respondents in these study used water for drinking for other purposes which “Yes” 229(57.7)

which is a poor practice in public health, majority also reported pouring drinking water directly from the storage facility 234(58.9%) as a method of drawing water, followed by use of cup 112 (28.2%) and then use of small pan 51(12.8%). Therefore according to the study, Jerry Can is the most used water storage facility among the household of the district and majority were found to have poor practice toward drinking water use which may promote the occurrence of diseases.

Prevalence of Diarrheal Diseases among Households of Kyegegwa district

This study found the most prevalent disease in the district to be diarrhea 214 (53.9%) which is slightly more than a half of the respondents, followed by other related diseases such as typhoid as the second most reported disease 119(30.0%) of the reported diarrheal diseases, dysentery only 47(11.8%) of reported diarrheal diseases and for those who don't know about diarrheal disease are 17(4.3%) of the total respondent. Moreover, It was also found out in the study that majority of the households 224(56.4%) reported with a history of the diarrheal disease in the past 3month, and others with no history of the disease 173 (43.6%) of the households.

The above result also justifies the higher magnitude of diarrheal diseases recorded worldwide as it was found that diarrheal disease accounted for 4.6 Billion cases and 2.16 Million deaths worldwide in the year 2004 of which more than 50% were from low-income countries like Uganda which buttressed my study. In the year 2004, one of the two leading cause of burden of disease was diarrhea as a single disease among number of diarrheal diseases, which is in line with my study result and also diarrhea accounted for 32,203,037 Disability Adjusted life years (DALYs) in Africa (WHO, 2008), more so the study also justify the result reported on diarrhea worldwide. In most African and some South East Asian countries accounted for 75% of all deaths; Uganda according to Boschi-Pinto et al, 2008 was among the 15 countries that accounted for 75% of all deaths worldwide. Furthermore, in Uganda it was reported that approximately 23,000 Ugandans die each year from diarrhea as a single disease among all diarrheal diseases, nearly 90% of which is directly attributed to poor water, coupled sanitation and hygiene whereas this report was similar to my study where diarrhea accounts for 53.9% of all diarrheal diseases in the district (WASH/Uganda C R, 2012).

The relationship between Water Storage Methods and Diarrheal Diseases among the Households of Kyegegwa district

The water storage characteristics that had statistically significant relationship with diarrheal disease among residents of Kyegegwa district are; storage of water for drinking separately from water for other domestic purposes, the type of container used to store water for drinking, the Time taken to replace water in the container (duration), Use drinking water for other purpose and material used to draw water from container. In a slightly similar study conduct by Remidius K, in 2012, he found out that Proper storage of water especially using container with a lid (bucket with lid) was protective against diarrheal diseases by 69% and storing water in bucket without lid increased the risk to diarrheal diseases other storage containers without lid had no significant impact on diarrhea disease among the resident of Tanzania. This can be explained by the fact that once the container is not covered it allows contamination different from the covered containers.

The findings of these studies emphasize the need for storing our drinking water in covered containers. This study was also contrary to the findings of the study done in Malawi in which the improved bucket for storing drinking water had a reduction of diarrheal diseases among the residents by 31% (Roberts L et al. 2011).

Also, the study done in Bolivia on proper storage, the results were similar to the present study whereby proper storage exhibited less E. Coli contamination and families in the intervention had 43% fewer diarrhoea in Intervention group than in control group (Remidius K, 2012). Therefore, proper water storage is recommended as a preventive measure against prevalence diarrheal diseases among the households of the district as Jerry Can if well covered will be most recommended.

CONCLUSION

This study concluded that the prevalence of diarrheal among the households of of Kyegegwa district is 60%, which implies 6 out of every 10 households had records of diarrheal diseases.

Water storage methods used among households are jerry can, Pots, pan and water tank. It was discovered that households that store drinking water separately from water for other domestic purposes, the type of container used to store water for drinking, the Time taken to replace water in the container (duration), Use drinking water for other purpose and material used to draw water from container have significant relationship with occurrence of diarrheal disease.

However, households who used water tanks to store water for drinking were more likely to have members with a history of diarrheal diseases, households who used pot to store water for drinking were more likely to have members with a history of diarrheal diseases, households who used drinking water for another purpose were more likely to have family members with a history of diarrheal diseases and households who take 2days or more to replace water in the container were more likely to have family members with a history of diarrheal diseases.

RECOMMENDATIONS

Advocacy should be done on other effective methods of water storage approved by World Health Organization to replace some less effective local methods currently practised as jerry can is considered the only effective storage facility in the community.

The government together with the community should provide safer water sources like bore boles, protected streams to ensure water safety at the source to supplement the ones available.

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