Demographic Pattern of Water Hygiene Attitude among Women Attending Antenatal Care in Plateau State-Nigeria

By

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Abstract

In most cases in Plateau State, water was got from sources closest to the user irrespective of its quality. Moreover, when fetched water was mixed with stored one, it was perceived as positive water hygiene attitude-WHA which was troubling and pointed to a problem among others. Therefore, the aim of this study was to investigate the demographic pattern of WHA among women who attendedantenatal care-ANC in Plateau State-Nigeria. To achieve the purpose of the study, the WHA of women who attended ANC in Plateau State was determined using a research question and hypothesis tested at 0.05 level of significance. Descriptive survey research design was used for the study. The population for the study consisted of 150,913 (all the women who attended ANC in Plateau State in 2014). The sample size for the study was 642 drawn from the population using multi stage sampling procedure. One instrument, water hygiene attitude questionnaire (WaHAQ) used for the study was validated and theCronbach Alpha coefficient (r) of.91 was obtained. The research question was answered using descriptive statistic of frequencies and percentages,whereas Chi-square statistic was used to test the null hypothesis at 0.05 level of significance. Findings of the study among others revealed that over 50 per cent of the respondents with secondary certificate (58.3%); bachelor degree and above (56.2%), primary education (55.9%) and NCE/ND (55.8%) expressed positive attitude towards water hygiene. The Table further shows that more than 70 per cent of the respondentswith NCE/ND certificate (78.9%); bachelor degree and above (75.5%), primary education (74.8%) and secondary certificate (73.5%) displayedpositive attitude toward water source protection. In addition, it was found that women who attended ANC and received hygiene orientation in health facilities in Plateau State did not differ in attitude toward water hygiene according to level of education. Since not all the respondents expressed positive WHA, it was recommended that there is the need for a robust WHA enhancement strategy to be adopted and used by all and sundry.As the enhancement strategy is put in place and expressed or displayed by all and sundry, positive WHA will be expressed or displayed by all.

Introduction

Water hygiene attitude (WHA) plays a key role in ensuring the sustenance of good health; wellbeing, comfort and survival of man including women attending antenatal care-ANC. This is because water has impurities that affect it in the environment. These impurities are often ingested as a result of man's inability to embark on positive WHA, which results in dire consequences. For instance; in many homes, water related diseases have been one of the leading cause of morbidity and mortality in developing countries (World Health Organization and United Nation International Children Fund [WHO/UNICEF], 2000). In addition, WHO (2004) further revealed that approximately 88 per cent of water related diseases were attributable to negative WHA. Furthermore, the consequences of negative WHA according to UNICEF/WHO (2009) led to diarrhoea that killed 1.5 million children of less than five years of age annually more than deaths from acquired immune deficiency (AIDS), malaria and measles combined globally. According to Craun, Brunkard, Yoder, Roberts, Carpenter, Wade,…Roy (2010); from 1971 to 2006, 54 per cent of reported water related disease outbreaks

were due to negative attitude towards water hygiene. Jones (2011) showed that 37 per cent of people not using improved source of water lived in sub-Saharan Africa, which included Nigeria and Plateau State. Jones further pointed that negative attitude towards water hygiene was instrumental to the increase in unsafe water hygiene practices, which accounted for 2.2 million children deaths of less than 5 years of age and this seems troubling.

The scourge of water related diseases had been on the increase. Nigeria Center for Disease Control – NCDC reported an increase in water borne diseases with 9,006 cases and 106 deaths in the first quarter of 2014 (Leo, Sadiq, Alao, Auwal, Liman and Mohammed, 2014). When untreated water was ingested as a result of negative WHA, cholera occurred (Igomu, 2011). It may be in this regard that in 2013, Plateau State government reported 130 cases of cholera disease with 11 deaths (Sadiq, Auwal and Joseph, 2013). Therefore, the ingestion of untreated water due to negative WHA can lead to many health problems such as gastrointestinal illness, reproductive problems and neurological disorders (Center for Disease Control [CDC], 2013). Moreover, due to negative WHA; infants, young children, pregnant women, the elderly and patients with compromised immune system due to AIDS, chemotheraphy or transplant medications may be especially susceptible to illness (United States Environmental Protection Agency [USEPA], 2013). Thus, positive WHA supports life. Based on the above statistics; which lend credence to the importance of positive WHA, it implies that with positive WHA, the ingestion of safe water if good health is desired can be achieved. However, WHA has pattern, which can be expressed or displayed.

Patternmay be design or characteristics which appear among people. Schwartz (1993) described pattern as a guide or design, which appears among people. According to Hornby (2001), pattern is a regular way in which something happens or is done. Pridemore, Andrew and Spivak (2003) classified pattern into demographic, temporal and spatial variations. The demographic variation according to Pridemore et al. is concerned with variations like age, gender, level of education, marital status, occupation, socioeconomic and health statuses. In this study, the demographic variation was adapted and narrowed to mean the level of education of the respondents in this study.This implies that this study was only concerned with the level of education of the respondents as independent variable. The use of the level of education in this study was necessary because it enables one to appreciate the variation of WHA based on literacy level of the respondents. Thus, the WHA of the respondents based on literacy level could have some implication on water.

Water is an important ingredient necessary to all forms of life. Mathur (2007) viewed water as a great cleaning agent that is used both externally and internally. Moshby (2009) defined water as a chemical compound, which one molecule contains one atom of oxygen and two atoms of hydrogen. Leeds (2014) conceived water as a compound that is made of two parts hydrogen and one part oxygen. Quotes (2015) posited that water is the fluid which descends from the clouds in rain and which forms rivers, lakes, seas and oceans. Water as used in this study refers to any clear, colourless, odourless, pleasant tasting liquid that is necessary for all forms of life. Thus, it may imply that water is a transparent fluid

which forms the world's streams, lakes, oceans and rain and is a major chemical constituent of the fluids of living things. Furthermore, water can be used for domestic, irrigation, commercial, industrial and hydroelectric power purposes (Heaton, 1999).

Domestic water includes water used for normal household purposes such as drinking, food preparation, bathing and personal hygiene, dish washing, laundry, general household cleaning, watering of lawns and gardens. Water is used for irrigation, which involves the supply of an area of land through pipes or channels with water to grow crops. Commercial and industrial water is used for manufacturing of goods, while water is also used for the generation of electricity, known as hydro-electricity.

Water is required in the human body for the maintenance of vital physiological and biochemical processes such as digestion, respiration, excretion and circulation. Water used for these purposes need to be clean, clear and free from harmful substances, minerals, chemicals and microorganisms. This implies that water introduced into the human body must be safe. The consumption of safe water does not cause illness or health problems but maintains health. Safe water ought to be free from dirts, wastes, feaces and germs. Also, it must be free from poisonous chemical compounds or the presence of chemicals, which must be below permitted level and minerals therein not exceeding tolerant level. It must also be tasteless, colourless, odourless, and drinkable. Unfortunately, water often contains particles, dirts, microorganisms, bacteria of cocci, bacilli or flagella, coliforms, viruses, algae, Escherichia coli, Pseudomonas aeruginosa, Campylobacter spp, Salmonella spp,protozoas of Crysptosporidium and giardia lamblia thus making it unclean. In other to make water clean and safe for human use, the expression of positive attitude towardswater hygiene becomes important.

Hygiene is a term that refers to practices that help maintain sound health and prevent disease. Pugh, Warner, Filardo, Binns, Francis, Lukens,…Cradle (2000) defined hygiene as any practice of cleanliness that promotes health and wellbeing especially of a personal nature. Nyanghura (2014) viewed hygiene as any personal effort to make oneself clean. Hygiene as used in this study refers to the expression or display of positive attitude towards keeping water odourless, tasteless, colourless and free from microorganisms to prevent illness or disease in other to promote sound health when used. It involves all the expression or display of positive attitude towards water hygiene that help people stay healthy. This implies that hygiene is an embodiment of the expression or display of positive attitude that leads to the cleanliness of the human body, food, kitchen, environment and keeping water clean. The focus of this study was WHA.

Positive WHA eliminates or removes impurities and microorganisms from water to keep it safe for use. In other to express positive WHA, Mintz, Reiff and Tauxe (1995) revealed that people need to consider and express or display the collection and storage of water using container with single opening five to eight centimeters in diameter with strong, tightly fitting cover that makes it easy to fill safe water. Moreover, people must perceive the disinfection of containers before refill as positive WHA. In addition; Sobsey (2002) pointed that carrying of water in covered vessels that should be between 10-25 liters capacity is perceived as positive attitude towards water hygiene. In the context of this study, when perception, feelings or dispositionsare expressedin relation to water hygiene, WHA has occurred.

Therefore, in this study, WHA refers to the perception of positive or negative feeling the respondents have toward eliminating impurities, odour, taste, colour and microscopic organisms in water to keep it suitable for use to prevent disease and promote sound health when used. This implies that WHA would mean any positive or negative predisposition respondentshave concerning water hygiene. Thus, when positive or negative disposition is perceived as a manifestation towards water hygiene, WHA is observed. Also, WHA is the positive manifestation or otherwise of conscious experience, verbal reports and gross behaviour in relation to water hygiene. Joint Departments of the Army and Air Force United States of America (JDAAUSA, 1985) indicated thatfiltration; disinfection, aeration, coagulation, flocculation and sedimentation, are important water hygiene procedures.

Filtration is the process where liquid is passed through a medium that helps to remove smaller particles in it. CDC (2015) viewed filtration as the process of removing impurities from water by means of physical barrier, chemical or biological processes. In this study, filtration refers to the process of passing water through a porous medium to remove impurities from it. Various types of water filtration media according to CDC include; slow sand, pressure sand, diatomaceous earth, porous stone or ceramic, paper or cloth and charcoal, membrane filters and depth filters.Thus, filtrate can further be disinfected.

To disinfect has to do with purification by deactivating or killing micro-organisms. According to Chlorine Chemistry Council (2003), disinfection is a means of destroying harmful microorganisms usually by the use of bactericidal chemical compounds. Lenntech (2014) conceived disinfection as the removal, deactivation or killing of pathogenic microorganisms in water. Disinfection as used in this study means the deactivation or killing of pathogenic microorganisms in water using chemical or physical disinfectants to make it suitable for use. in this regard, disinfection can destroy organic contaminants from water, which serve as nutrients or shelters for microorganism. Moreover, disinfectants do not only kill microorganism but also have residual effect, which means that they remain active in the water after disinfection. In addition, Lenntech noted that disinfection can be attained by means of chemical and physical disinfectants. Moreover, it also pointed that chemical disinfectants for water include the use of chlorine, chlorine dioxide, calcium hypochlorite, ozone, halogens of bromine, iodine, bromine chloride, copper, silver, kaliumper-manganate, fenols, alcohols, hydrogen peroxide, and several acids and bases. Again, Lenntech indicated that ultraviolet light such as electronic radiation, gamma rays, sounds and heat as in boiling of water can all be used for disinfection of raw water. Also, another means of removal of impurities in water is aeration.

Aeration implies the exposure of water to surface air. As conceived by Hofkes and Huissman (1987), aeration blends water with air in order to increase oxygen content in water; increase the pH by reducing its carbon dioxide content; remove iron, magnesium, hydrogen sulphate, methane, various volatile and organic compounds responsible for flavour and smell in water. Paulson (2012) defined aeration as that which is used to mix, circulate or dissolve air into liquid or other substance(s). As used in this study, aeration refers to exposure of water to air

so as to remove volatile substances. In this regard, aeration could be used for the oxidation of substances such as iron and manganese; removal of carbon dioxide, taste and odour producing substances such as hydrogen sulfide, volatile organic compounds and removal of compounds suspected to be carcinogenic such as methane and increase pH.Thus, aeration gives better results when sedimentation is attained.

Sedimentation may mean the process where fluid is allowed to move slowly, causing heavy floc particles to settle to the bottom. According to CDC (2015), sedimentation is a process where floc particles are caused to settle to the bottom of water supply due to its weight. Sedimentation in this study refers to the settling under gravity of dirt particles in water. Therefore, it implies that sedimentation is the movement of solid particles to settle downward through the force of gravity, centrifugal force or electromagnetism. In the case of water, heavy particles (flocs) settle to the bottom and clear water is left above to be filtered. For sedimentation to be achieved in causing flocs formation, coagulation is important.

Coagulation is a process in the formation of small particles in raw water. LeChevallier and Au (2004) submitted that coagulation is the addition of a substance that forms hydrolysis products which cause particle destabilization and interparticle collisions in water. Environmental Protection Agency (EPA, 2011) conceived coagulation as a process by which dirt and other small suspended solid particles are chemically bound, forming flocs using coagulant so that they can be removed from water. Coagulation in this study refers to the process that involves addition of iron or aluminum salts such as aluminum sulphate, ferric sulphate, ferric chloride or polymers to water in other to bring dirt particles together. Thus, it implies that the process of coagulation require having positive charge of the chemicals (coagulant) neutralizing negative charge of dissolved and suspended particles in water. In this regards, when this reaction occur the particles bind together or coagulate. Large coagulates may be formed through flocculation.

Flocculation could be any physical process in the formation of solids into large mass. LeChevallier and Au (2004) defined flocculation as the physical process of producing interparticle contacts that lead to the formation of large particles. EPA (2011) posited that flocculation is the physical process of growing particles (flocs) in water. CDC (2015) conceived flocculation as the binding of dirt particles with chemicals to form larger particles called floc. In this study, flocculation is the physical process which leads to the production of larger interparticle formation of flocs in raw water. It implies that flocculation join together small particles into larger, settleable and filterable particles. It occurs when any of alum; potash ash, magnesium hydroxide, ferric sulfate or ferrous sulfate is added to water and colloidal particles of minerals, clay, silt, organic debris and microscopic organisms attract the dirt particles to form tiny sticky particles called floc. Thus, flocculation is an important technology for larger scale water treatment, which requires a degree of skill, technical competence and knowledge even by women attending ANC.

The respondents in this study were women attending ANC. They consisted of all the women who attended ANC in health facilities in Plateau State in 2014 here-in-after referred to as the respondents. It was expected that respondents were mostly involved in fetching water; using same to cook,

serving water at family meals and for other domestic purposes. On the basis of their interactions with water, they were able to display or express their disposition concerning water hygiene as adult members of the family. Although the respondents expressed their disposition to water more often than not, this has implications on their health and by extension those of their family members. No wonder, Ilahi and Grimard (2000) noted that negative disposition concerning safe water resulted in reduced market-oriented activities of women, and by implication could increase the total work burden of women including those attending ANC.

Statement of the Problem

Striving to get safe water requires scaling up safe water sources and ensuring that portable water reaches the homes in safe or hygienic state and used in such state by all and sundry including the respondents. To achieve this, government of Plateau State proposed the expansion of the existing water treatments facilities in the State. The effort of the State government was further enhanced by the drilling of boreholes across the State by foreign Non-governmental organizations. Radio jingles on the need to display positive attitude towards water hygiene in terms of water use and handling was an attempt to ensure that safe water was used in homes in the State, which would promote sound health and wellbeing among the citizenry.

Regrettably, people particularly the respondentswho received hygiene orientation in health facilities of Plateau State perceived nothing wrong with collecting water from different sources such as streams; rivers, surface water and shallow wells. Moreover, collecting water with wide opened containers was perceived as positive WHA. In addition, others perceived un-kept surroundings of the wells and boreholes which water for domestic use was got as positive attitude towards water hygiene. Furthermore, they felt nothing bad about having freshly collected water mixed with stored one for use. Moreover, they preferred to scoop water from stored sources. Also, the respondents who received hygiene orientation in health facilities expressed the fact that nothing was wrong with allowing little children scooped water from stored source before use. They preferred and got water from any source closest to them for domestic use irrespective of its quality.

Despite the State government's lofty efforts to avail safe water to the citizens for use; the projects were only completed on paper as the ongoing water project facilities were not completed and existing ones not maintained. This may have accounted for the negative feeling of the collection of safe water for domestic purposes from sources such as streams, rivers and wells, which were sometimes unsafe. Also, some respondents who received hygiene orientation in health facilities perceivedas positive attitude the collection and transportation of water in opened containers without lid. Moreover, some expressed the fact that storage of domestic water in opened containers was positive attitude towards water hygiene. Again, they perceived choosing wide opened containers like basins to collect domestic water as positiveWHA; which seemed troubling. No wonder; diseases such as hepatitis, typhoid fever, abdominal discomfort and other water related diseases were often diagnosed by health experts in the State among the citizenry. Furthermore, literature reviewed revealed a study conducted on knowledge and practice of water purification in Lamingo community. Such study did not cover attitude towards water hygiene nor was it particular to women who attended ANC, which was worrisome. The inadequate data on WHA of women who attended ANC in

Plateau State was therefore the gap this study filled.

Purpose of the Study

This study determined the demographic pattern of WHA among women attending ANC in Plateau State. Specifically, the study sought and determined:

1. water hygiene attitude of women attending ANC in Plateau State.

Research Question

In order to guide this study, the following research question was posed:

1. what is the WHA of women attending ANC in Plateau State?

Hypothesis

The following null hypothesis was postulated and tested at .05 level of significance.

1. There is no significant difference in the WHA of women attending ANC based on level of education in Plateau State.

Methodology

This study was designed to determine the demographic pattern of WHA among women attending ANC in Plateau State. Descriptive survey design was used for this study. The population of the study comprised 150,913 (all women who attended ANC in Plateau State-Nigeria in 2014). The investigator used the multi stage sampling technique to select a sample size of 642 from all the women who attended ANC in 2014 in Plateau State for the study.

The questionnaire entitled water hygiene attitude questionnaire (WaHAQ) was the instrument used for collecting data for the study. The questionnaire comprised two sections, A and B. Section's A elicited demographic information on the respondent's level of education while B was concerned with WHA items consisting of response options such as always, sometimes, rarely and never.

Five experts from the University of Nigeria, Nsukka validated the instrument. Three of the experts were in the Departments of Human Kinetics and Health Education while the rest were in Measurement and Evaluation.

The investigator with the aid of the midwives' on duty at each ANC facility administered the questionnaire. The questionnaires distributed were collected back on the spot and returned rate was 100 per cent (642).

To establish the reliability of the instrument, the split half reliability technique was used and the Chronbach Alpha reliability coefficient index of .91 was obtained. Percentages and frequencies were used to answer the research question while inferential Chi-square statistic was used in testing the hypothesis at $P < .05$ level of significance.

Results

The findings are hereby presented in the table below according to the research question posed in the study.

Table 1:

Percentage Responses on theWHA of Women Attending ANC based on Level of Education in Plateau State (n=642)

		Level of Education							
		Primary School Certificate		Secondary School Certificate		NCE/ND Certificate		Bachelors degree and above	
		SD + D	SA + A	SD + D	SA + A	SD + D	SA + A	SD + D	SA + A
S/no	Items	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)
	Attitude toward water storage								
1	Storing safe water by keeping it safe in any clean container with lid kept above the ground with spigot.	35 (38.9)	55 (61.1)	34 (30.4)	78 (69.6)	166 (56.5)	128 (43.5)	70 (47.9)	77 (53.1)
2	Emptying, cleaning and drying the storage container before storing safe water.	43 (47.8)	47 (52.2)	45 (40.2)	67 (69.9)	64 (21.8)	130 (78.2)	36 (24.7)	110 (75.3)
3	Mixing freshly fetched water with stored one in storage container.	16 (17.8)	74 (65.6)	18 (76.3)	94 (83.9)	35 (11.9)	259 (88.1)	12 (8.3)	134 (91.8)
	Cluster %	34.8	65.2	28.8	71.2	30.5	69.9	27.3	72.7
	Attitude towardwater transport								
4	Transporting safe water in any container.	35 (38.9)	56 (61.1)	47 (41.9)	65 (58.1)	168 (58.0)	124 (42.2)	79 (54.1)	67 (45.9)
5	Transporting safe water in clean disinfected and dried container with lid.	64 (71.1)	26 (28,9)	71 (68.8)	35 (31.2)	234 (79.0)	60 (20.4)	114 (78.1)	29 (21.9)
6	Transporting safe water in uncovered container.	15 (16.7)	75 (83.3)	28 (25.0)	84 (75.0)	43 (15.1)	151 (85.3)	23 (15.7)	123 (84.2)
	Cluster %	42.3	57.7	45.2	54.8	50.7	49.3	49.3	50.7
	Attitude toward water collection								
7	Prefer to collect safe water in hygienic and properly covered container.	67 (74.4)	23 (25.6)	75 (67.0)	37 (33.1)	239 (81.0)	55 (18.7)	119 (81.5)	27 (18.5)
8	Like to collect safe water without allowing part of human body contact it.	49 (54.4)	41 (45.6)	58 (51.8)	54 (48.3)	220 (75.0)	74 (24.6)	101 (69.1)	45 (30.8)
9	Prefer to collect safe water in opened container.	60 (66.7)	30 (33.3)	68 (60.7)	44 (39.3)	186 (64.0)	108 (36.7)	96 (65.7)	50 (34.2)
	Cluster %	65.2	34.8	59.8	40.2	73.1	26.9	72.1	27.9
	Attitude towardPoU of water								
10	Removing safe water of POU through spigot.	30 (33.3)	60 (66.8)	38 (36.9)	74 (66.1)	126 (43.0)	168 (57.1)	66 (45.2)	80 (54.8)
11	Removing safe water at POU through scooping.	44 (60.0)	36 (40.0)	60 (53.6)	52 (46.5)	115 (38.)	179 (60.9)	59 (40.1)	87 (59.6)
12	Removing safe water at POU using ones mouth.	46 (51.1)	44 (48.9)	49 (44.8)	63 (56.3)	214 (73.0)	80 (27.2)	98 (67.1)	48 (32.9)
	Cluster %	48.1	51.9	43.9	56.3	51.6)	48.4)	50.9	49.1
	Attitude towardwater source protection								
13	Protecting safe water source by preventing animals and human waste from it.	13 (14.5)	77 (85.5)	17 (15.2)	95 (84.9)	36 (12.2)	258 (87.7)	25 (17.1)	121 (82.1)
14	Protecting safe water source by situating refuse dump site far down the slope below water source.	22 (35.6)	58 (64.5)	39 (34.8)	73 (65.2)	93 (30.9)	201 (68.3)	49 (33.6)	97 (66.4)
15	Protecting safe water source by preventing water runoff from mixing with safe water source.	23 (25.6)	67 (74.5)	33 (29.5)	79 (70.6)	56 (19.1)	238 (80.9)	33 (21.9)	114 (78.1)
	Cluster %	25.2	74.8	26.5	73.5	21.1	78.9	24.5	75.5
	Attitude toward water purification								
16	Purifying my water using boiling.	14 (15.6)	76 (84.4)	20 (17.9)	92 (82.1)	47 (16.0)	247 (84.1)	20 (13.7)	126 (86.7)
17	Purifying my water using aeration.	62 68.9)	28 (31.1)	77 (69.1)	35 (31.2)	182 (62.4)	112 (38.1)	98 (67.1)	48 (32.8)
18	Purifying my water using sedimentation.	56 (62.2)	34 (37.8)	59 (52.7)	53 (47.4)	108 (37.1)	186 (63.3)	57 (39.1)	89 (61.0)
	Cluster %	48.9	51.1	46.5	53.5	38.2	61.8	39.9	61.1
	Overall cluster %	44.1	55.9	41.7	58.3	46.2	55.8	43.8	56.2

SD = Strongly Disagree; D=Disagree; A=Agree; SA=Strongly Agree

Data in Table 1 show that overall, over 50 per cent of the women who attended ANC and received hygiene orientation from health facilities in Plateau State with secondary certificate (58.3%); primary education (55.9%), NCE/ND (55.8%) and bachelor degree and above (56.2%) expressed positive attitude towards water hygiene. The Table further shows that more than 70 per cent of the respondents with NCE/ND certificate (78.9%); bachelor degree and above (75.5%), primary education (74.8%) and secondary certificate (73.5%) displayedpositive attitude toward water source protection. Similarly, more than 70 per cent of the women with bachelor degree and above (72.7%); secondary education (71.2%) and over 60 per cent with NCE/ND certificate (70.0%) and primary certificate (65.2%) expressed positive attitude towards water storage. In addition, more than 60 per cent of the respondents with NCE/ND certificate (61.8%) and bachelor degree and above (61.1%) expressed positive attitude towards water purification while over one half of those with secondary certificate (53.6%) and primary education (51.1%) expressed positive attitude toward water purification. Similarly, the Table further shows that over one half of the respondents with primary certificate (57.7%); secondary education (54.8%), and bachelor degree and above (50.7%) while about one half of those with NCE/ND certificate (49.3%) displayed positive attitude towards water transportation. Also, over 50 per cent of the respondents with secondary education (56.3%) and primary education (51.9%) displayed positive attitude towards point-of-use (PoU) of water whereas about 50 per cent of those with bachelor degree and above (49.1%) and NCE/ND certificate (48.4%) expressed positive attitude towards PoU of water. The Table also shows that over 40 per cent of the respondentswith secondary certificate (40.2%) whereas 34.8 per cent of those with primary education (34.8%) expressed positive attitude towards water collection while less than 30 per cent of the respondents who attended ANC with bachelor degree and above (27.9%) and NCE/ND certificate (26.9%) expressed positive attitude towards water collection.

Hypothesis one.
There is no significant difference in the WHAof women attending ANC based on level of education in Plateau State. Data testing this hypothesis are indicated in table 2.
Table 2
Summary of Chi-square Analysis Testing WHA of Women Attending ANC according to Level of Education in Plateau State (n = 642)

		Primary School Certificate				Secondary School Certificate				NCE/ND				Bachelor degree and above						
		SD	D	A	SA	SD	D	A	SA	SD	D	A	SA	SD	D	A	SA	χ^2		P-value
S/No	Items	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	O(E)	value	df	
	Attitude about water storage																			
1	Liking to mix freshly fetched water with stored one in storage container	15(14.9)	20(27.9)	17(19.5)	38(27.8)	13(18.5)	21(34.7)	28(24.2)	50(34.5)	52 (48.5)	114(91.1)	61(63.7)	67(90.7)	26(24.1)	44 (45.3)	33 (31.6)	43(45.0)	33.495	9	.000
2	Prefer to keep storage container above the ground.	33(17.9)	10(8.4)	28(31.0)	19(32.7)	31(22.3)	14(10.5)	35(38.6)	32(40.6)	42 (58.6)	22(27.5)	108(101.2)	122(106.7)	22(29.1)	14 (13.6)	50 (50.3)	60(53.0)	36.788	9	.000
3	Like to empty clean, disinfect and dry water storage container before refilling it.	6(3.4)	10(8.0)	15(21.0)	59(57.6)	6(4.2)	12(9.9)	3926.2)	55(71.7)	9(11.0)	26(26.1)	63(68.7)	196(188.2)	3(5.5)	9(13.0)	33 (34.1)	101 (93.5)	19.84	9	.019
	Cluster χ^2 value, df, P-value																	30.041	9	.006
	Attitude about water transport																			
4	Like transporting safe water using clean opened container without lid.	17(22.9)	18(23.6)	19(17.2)	36(26.4)	24(28.4)	23(29.3)	21(21.5)	44(32.8)	87(74.6)	83(76.9)	62(56.3)	62(86.1)	35(37.1)	44(38.2)	21(28.0)	46(42.8)	25.217	9	.003
5	Like transporting safe water in any container.	46(41.5)	18(27.1)	10(11.6)	16(9.8)	49(51.6)	28(33.7)	25(14.5)	10(12.2)	127 (135.6)	107(88.4)	29(38.0)	31(32.1)	74(67.3)	40(43.9)	19(18.9)	13(15.9)	24.961	9	.003
6	Prefer to transport safe water when lid and container are cleaned, disinfected and dried.	6(4.6)	9(10.7)	19(22.7)	56(52.0)	10(5.8)	18(13.3)	27(28.3)	57(64.7)	12(15.1)	31(34.8)	78(74.2)	173(169.9)	5(7.5)	18(17.3)	38(36.8)	85(84.4)	9.594	9	.384
	Cluster χ^2 value, df, P-value																	19.924	9	.130
	Attitude about water collection																			
7	Prefer to collect safe water in any container.	49(39.8)	18(30.3)	6(10.2)	17(9.7)	41(49.5)	34(37.7)	20(12.7)	17(12.0)	121(130.1)	118(98.9)	29(33.4)	26(31.6)	73(64.6)	46(49.1)	18(16.6)	9(15.7)	32.583	9	.000
8	Like touching safe water with human body when collecting it.	27(30.3)	22(29.7)	8(9.8)	33(20.2)	21(37.7)	37(37.0)	20(12.2)	34(25.1)	117(98.9)	103(97.1)	29(32.1)	45(65.9)	51(49.1)	50(48.2)	13(15.9)	32(32.7)	37.619	9	.000
9	Prefer traveling long distance to collect safe water.	42(32.0)	18(25.5)	22(20.2)	8(12.3)	53(39.8)	15(31.8)	31(25.1)	13(15.4)	87(104.4)	99(83.3)	61(65.9)	47(40.3)	46(51.9)	50(41.4)	30(32.7)	20(20.0)	32.033	9	.000
	Cluster χ^2 value, df, P-value																	34.078	9	.000
	Attitude about PoU of water																			
10	Prefer to remove safe stored water by scooping.	10(10.9)	20(25.5)	14(24.8)	46(28.7)	14(13.6)	24(31.8)	29(30.9)	43(35.8)	34(35.7)	92(83.3)	100(81.1)	68(93.9)	20(17.7)	46(41.4)	34(40.3)	46(46.6)	35.079	9	.000
11	Like removing safe stored water through spigot.	39(22.4)	15(17.9)	20(31.8)	16(17.8)	31(27.9)	29(22.3)	32(39.6)	20(22.2)	57(73.3	58(58.6)	121(104.0)	58(58.2)	33(36.4)	26(29.1)	54(51.6)	33(28.9)	29.061	9	.001
12	Prefer removing safe stored water by sending any child around.	21(22.9)	25(34.2)	6(9.4)	38(23.6)	15(28.4)	34(42.6)	14(11.7)	49(29.3)	88(74.6)	126(111.7)	33(30.7)	47(76.9)	39(37.1)	59(55.5)	14(15.2)	34(38.2)	51.395	9	.000
	Cluster χ^2 value, df, P-value																	38.512	9	.000
	Attitude about water source protection																			
13	Preferring to prevent water source by preventing animals and human wastes from reaching it.	8(6.2)	5(6.6)	22(20.7)	55(56.5)	10(7.7)	7(82)	34(25.8)	61(70.3)	18(20.1)	18.21.5)	66(67.8)	192(184.6)	8(10.0)	17(10.7)	26(33.7)	95(91.6)	12.892	9	.168
14	Like to protect water source by dumping refuse far below water source on a slope.	16(15.8)	16(14.0)	14(24.7)	44(35.5)	13(19.7)	26(17.4)	29(30.7)	44(44.1)	58(51.7)	35(45.8)	93(80.6)	108(115.9)	26(25.7)	23(22.7)	40(40.0)	57(57.5)	19.28	9	.023
15	Prefer to protect fast flowing water from mixing with safe water source.	9(7.1)	14(13.0)	24(28.7)	43(41.1)	12(8.9)	21(16.2)	32(35.8)	47(51.1)	19(23.4)	37(42.6)	108(93.9)	130(134.2)	11(11.6)	21(21.1)	41(46.6)	73(66.6)	9.754	9	.371
	Cluster χ^2 value, df, P-value																	13.975	9	.187
	Attitude about water purification																			
16	Prefer to make water safe by filtration.	6(3.8)	8(10.4)	18(29.2)	58(46.7)	5(4.7)	15(12.9)	36(36.3)	56(58.1)	13(12.4)	34(33.9)	111(95.3)	136(152.5)	3(6.1)	17(16.8)	43(47.3)	83(75.7)	16.406	9	.059
17	Like to make water safe by aeration.	43(28.6)	19(30.1)	21(20.9)	7(10.4)	45(35.6)	32(37.5)	22(26.0)	13(12.9)	72(93.4)	110(98.5)	76(68.2)	36(33.9)	44(46.4)	54(48.9)	30(33.9)	18(16.8)	24.844	9	.003
18	Prefer to make water safe by sedimentation.	13(10.9)	43(28.3)	14(30.0)	20(20.7)	11(13.6)	48(35.2)	33(37.3)	20(25.8)	40(35.7)	68(92.5)	111(98.0)	75(67.8)	14(17.7)	43(45.9)	56(48.7)	33(33.7)	35.09	9	.000
	Cluster χ^2 value, df, P-value																	25.447	9	.021
	Overall cluster χ^2 value, df, P-value																	28.584	9	.061

Table 2 shows that the overall Chi-square value of 28.584 with P-value of .061 which is greater than .05 level of significance at nine degrees of freedom. The null hypothesis on no significant difference with regard to attitude towards water hygiene of the respondents according to level of education was therefore acceptedsince the P-value wasmore than .05 level of significance. This implies that the respondents did not differ in attitude toward water hygiene according to level of education.

The Table also shows the Chi-square values with their corresponding P-values for WHA such as: attitude about water storage (χ^2 = 30.041 > P = .006, df = 9), water collection (χ^2= 34.078 > P = .000, df = 9), PoU of water (χ^2 = 38.512 > P =.000, df = 9) and water purification (χ^2 = 25.447 > P = .021, df = 9). The null hypotheses of no significant difference in the attitude of the respondents toward water hygiene components according to levels of education was rejected since the P-values were less than .05 level of significance. These imply that the respondents significantlydiffered in their attitude towards water storage, collection, PoU of water and purification according to levels of education.

The Table further shows the Chi-square values with their corresponding P-values forattitude towards water transportation (χ^2 = 19.924 > P = .130, df = 9) and water source protection (χ^2 = 13.975 > P = .187, df = 9). The null hypotheses of no significant difference in the respondents attitude towards water transportation and water source protection was same according to the different levels of education and therefore accepted since their P-values were greater than .05 level of significance. These imply that the attitude of the respondents towards the items of the components of WHA was the same for the various levels of education.

Discussion

The finding in Table 1 that more than one half of the women who attended ANC and received hygiene orientation in health facilities with secondary certificate, primary education, NCE/ND and bachelor degree and above expressed positive attitude toward water hygiene was not anticipated but surprising. This finding was surprising because the respondents with higher qualification ordinarily were expected to display or express positive attitude towards water hygiene than those with lower qualification due to thelength of acquisition of health education and training in school, which would have been responsible for the marked difference in the expression of the positive WHA. This finding disagrees with the finding of National Population Commission - NPC and ICF Macro (2009) which found that among literate and non literate respondents in Nigeria, 75.4 and 43.6 per cent of the population displayed positive attitude towards water hygiene. Also, this finding disagrees with the finding of Abebaw, Tadesse and Mogues (2010) who showed that households with literate head were significantly less satisfied with their quality of water hygiene than were households with non-literate head. The finding also disagrees with the finding of Nauges and vandenBerg (2009) who revealed that better educated households have positive attitude towards water quality and related health risk. This implies that the expression of positive WHAdoes not rest on the level of education of an individual but could revolve around challenges, choice, experience and willingness by the individual to express the needful.

Data in Table 1 also showed that more than 70 per cent of the respondents with NCE/ND certificate, bachelor degree and above, primary education and secondary

certificatedisplayed positive attitude toward water source protection. This finding was not expected but surprising. The finding was surprising because therespondents with higher educational attainment ought to think and behave superiorly than those with lower educational attainment because of their superiority in educational attainment. However, this finding disagrees with the finding of Arcury (1990) and Inglehart (1995) who found that highly educated respondents always had more values than their lower educated counterparts. This implies that the attitude towards water source protection does not depend one's level of education but may predicate on perception and challenges experienced by an individual.

The result in Table 1 also showed that more than 70 per cent of the respondents who received hygiene orientation in health facilities with bachelor degree and above (72.7%) and secondary education (71.2%) and over 60 per cent with NCE/ND certificate (69.9%) and primary certificate (65.2%) displayed positive attitude toward water storage. This finding was not anticipated as all the respondents were expected to display positive attitude towards water storage sincethe expression of negative attitude towards water storage by some respondents can result to ill health that may lead to epidemic thus, affecting all and sundry. However, this finding disagrees with the finding of Chege and Agha (1999) which revealed that about 21 per cent of the respondents with secondary or higher education compared to less than 11 per cent of other respondents expressed some disposition concerning water storage. This implies that respondents with different levels of education present different attitude towards water storage.

Data in Table 1 revealed that more than 60 per cent of the respondentswith NCE/ND certificate and bachelor degree and above as well as over half of the respondentswith secondary certificate and primary education expressed positive attitude toward water purification was not anticipated but surprising. The finding was surprising because Chege and Agha (1999) showed that about 21 per cent of the respondents with secondary or higher education compared to less than 11 per cent of other respondents expressed some disposition concerning water storage. However, this finding disagrees with the finding of Boateng, Tia-Adjei and Adams (2013) who found that attitude toward purification of water was observed among non-literate respondents than their literate counterparts (61.5% versus 38.5%).Also, this finding disagrees with the finding of Miner, Dakhim, Zoakah, Afolaranmi and Envuladu (2015) who found that both literate and non-literate respondents 199 (54.1%) had undergone at least a method of purification of household drinking water. Thus, the finding of the study implies that about one half of the respondents did no form of water purification.

The finding in Table 1 also showed that over one half of the respondents with primary certificate, secondary education and bachelor degree and above displayed positive attitude toward transportation of water. This finding was expected. However, the finding disagrees with the finding of Green (1987) who showed thatabout half (45.8%) of the respondents used container of any sort to transport water. The implication of the finding is that the proportion of the respondents who both displayed positive and negative attitude towards transportation of waterwas almost same. Thus,enhancement of positive attitude towards transportation of water becomes a necessity.

The results in Table 1 also revealed thatmore than one half ofthe respondents who received hygiene orientation in health facilities with secondary and primary school

certificates and about one half of the respondents with bachelor degree and above as well as NCE/ND certificate displayed positive attitude towards PoU of water. This finding was not expected but surprising. This finding was surprising because the respondents who attended ANC and received hygiene orientation in health facilities with lower certificatesscored highly in the display of positive attitude towards PoU of water over those with higher certificates perhaps due to egotism. However, the finding disagrees with the finding of Dusabe, Raobelison, Nzabonimpa and Wilson (October, 2010) which showed that during PoU of zinc (POUZN) project,37 per cent of the respondents ever used zinc tablet at PoU of water. Also, the finding disagrees with the finding of Singh, Lutchmanariyan, Wright, Knight, Jackson, Langmark,…Rodda (2013) which showed that at PoU of water, respondents with lower educational standard were associated with poorer water quality that led to higher rates of diarrhoea and vomiting. This implies that the level of educationof the respondents do not influence the expression of positive attitude at PoU of water.

Data in Table 1 also showed that over 40 per cent of the respondentswith secondary certificate and less than 40 per cent of the respondents with primary educationwithless than one third of the respondents with bachelor degree and above as well as NCE/ND certificatedisplayed positive attitude towards water collection. This finding was not anticipated but surprising. The finding was surprising because everyone uses water thus; positive attitude towards water collection ought to be expressed by all and sundry so as to avoid ill health.The finding agrees with the finding of Kioko and Obiri (2012)which showedthat the ideals of achieving safe watercollection was perceived as positive attitude. This implies that majority ofthe respondents expressed positive attitude towards water collection.

The finding in table 2 revealed significant difference in the attitude of the respondentstowards water storage, collection and purification according to level of education. This finding was expected because the respondentsoften played important roles in collection, purification and storage of water.The finding agrees with the finding of Miner et al. (2015) which found statistically significant relationship between purification of drinking water in the household and the occurrence of diarrhoea amongst children ($p<0.05$). This implies that the respondents' attitude toward storage, collection and purification of water was the same.

Conclusion and Recommendation

Based on the findings of the study, it was concluded that the need for the display of positive WHA by all the respondents who received hygiene orientation in health facilities in Plateau State cannot be over emphasize since some proportion of the respondentsexpressednegative WHA in the State. Based on the above, it is recommended that:

1. Although not all the respondents displayed or expressed positive WHA, there is the need for a robust WHA enhancement strategy to be adopted for all by all and sundry.As the enhancement strategy is put in place and adopted by all and sundry; this will influence the respondents to expressor display positive WHA, thus making all expressing and displaying positive WHA.

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