Households' awareness and practices on Water, Sanitation and Hygiene (WASH) in an Arid Region of Northwestern Nigeria-Sokoto State

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Abstract

Water, Sanitation and Hygiene (WASH) accessibility is more critical in arid regions where rainfall is low and other water resources are scanty. This study assesses Households' awareness and practices regarding WASH in Sokoto State, an arid region in Northwestern Nigeria. A total of 854 questionnaires were administered to respondents in addition to physical observations conducted. From the study, water scarcity was a major problem confronting the State, particularly in the dry season. The major water sources utilized were the unprotected hand dug wells (79.3%). The common water treatment methods used were filtration through cloth (72.1%). Water storage and collection attitudes and practices were rated as good as 69.0% of the respondents stored water in covered clay pots and 82.1% use cups with handle to draw water. Lack of funds led to poor excreta disposal systems and high open field defecation practices (78.9%). On the aspects of hygiene, children's faeces were mostly disposed into bush (82.5%) and 55.6% did not use soap to wash hands after defecation. The major diseases reported in the communities included malaria, diarrhea and dysentery, therefore, there is a need for the provision of WASH facilities to combat these diseases. WASH education and financial empowerment are necessary towards protecting public health in the study area.

Keywords: Water, Sanitation, Hygiene, Awareness, Practices, Arid Region

Introduction

Access to safe Water, Sanitation and Hygiene (WASH) facilities are basic human necessities for healthy living (WHO, 2008; Eneji et al,.2015; Yaya et al., 2018). Safe WASH facilities affect significantly the rates of infections such as diarrhea, worm infestations, Acute Respiratory Infections (ARI), trachoma and various health problems (Olanipekun et al., 2016; Bawankule et al., 2017; Freeman et al., 2017, WHO, 2019). However, millions of people across the world utilize untreated water from streams, ponds, lakes and rivers for drinking and other activities (WHO/ UNICEF, 2019), and many defecate openly in various places of homes, market places (Eremutha et al., 2016), schools (Hothur et al., 2019) and hospitals (WHO, 2019), which has often contributed to high water related mortality (Okullo et al., 2017; WHO, 2019), predominantly among children (Yaya, 2018) and poor people in the developing nations (WHO, 2000).

WASH issues and challenges tend to be more pathetic in arid regions due to the extreme rainfall variability which has been worsened by climate change. This has resulted in desertification, drying of water bodies (ponds, streams and rivers), and growing water scarcity, thus increasing the challenges of providing adequate WASH services by national governments and other water service providers in the region (Ohwo and Agusomu, 2018). In addition, the unsuitable climate has consequently resulted in poor hydro-geologic formation in these arid zones due to low aquifer recharge thus, requiring huge capital

investment and energy to drill new boreholes which many in the communities cannot afford. This has further aggravated the challenges, thus, forcing communities mostly women and children trekking kilometers and spending hours searching for clean water (Adeleye et al., 2014, USAID, 2019; Kurui et al., 2019). The need and concern for sustainable and improved WASH condition in the region is therefore imperative for improved public health.

Knowledge, Attitudes and Practices (KAP) on water, sanitation and hygiene is integral to providing sustainable WASH intervention in communities (USAID, 2011; Berhe et al., 2020). Lack of WASH knowledge, unhygienic practices and poor attitudes towards WASH facilities often times are significant factors to water borne diseases prevalence in communities (Gebreeyessus and Adem, 2018; Berhe et al., 2020). It has been found that there is a direct positive correlation between WASH knowledge, practices and behaviours and WASH related health implications (WHO, 2011; Eneji, 2015;), where people are unaware of the health importance of quality drinking water, proper sanitation and hygienic practices. Open defecation into water bodies and around houses in the communities, children's faeces which have been perceived as harmless in households and poor sanitation have increased the risk of disease transmissions particularly to children through faecal-oral routes (Brown et al., 2013, Bawankule et al., 2017; Islam et al. 2018). Unhygienic water collection and lack of home water purification processes do lead to the spread of diseases and bacterial contamination (Kurui et al., 2019; Orimoloye et al., 2015). Therefore, in addition to the provision of WASH facilities, there is the need to educate communities on WASH towards ensuring proper practices and sustainable WASH intervention. Educating people on WASH has been found to significantly improve household WASH performance and slowed the prevalence of intestinal parasitic infections (Gizaw et al., 2019).

In Nigeria, there is dearth of information on the status of water, sanitation and hygiene in arid communities. It is, therefore, increasingly becoming difficult to plan any meaningful programme to improve the health and well-being of the inhabitants. The present study assesses knowledge, attitudes and practices on WASH in Sokoto State, an arid region in the northwest Nigeria, where water scarcity was reported to be a huge challenge (Abdullahi et al., 2014), hence it is expected that residents in the region would suffer severe WASH challenges., Recently, Save The Child Initiative (STCI), a non-governmental organization, called on stakeholders to urgently implement the WASH policy in Nigeria to ensure maximum improvement in water and sanitation services in the State (EnvironNews Nigeria, 2020). This justifies the need for KAP assessment, providing baseline information on community's knowledge, attitudes and practices on WASH and related services, consequently helping to navigate towards a meaningful and effective WASH intervention. The KAP survey is a follow-up of an earlier nationwide survey on Water Sanitation and Hygiene carried out by UNICEF, Nigeria, between 2007 and 2009. The objectives of this study were (1) to assess the demographic characteristics of the selected communities' water sources for drinking and domestic activities, (2) home water treatment methods and practices, (3) water collection and storage methods; including attitudes, practices and knowledge of drinking water quality, excreta disposal systems, personal and environmental hygiene and water related diseases relevant to the study.

Materials and Methods

Study area

Sokoto State is located at the extreme North-west corner of Nigeria, it lies between latitudes 11E and longitude 4N bounded in the East by Zamfara State, in the North by Niger Republic and in the west by Kebbi State. It is within the savannah region with scanty vegetation and shrubs. Two intermit rivers cut across the State i.e. River Sokoto and River Rima with

a confluence at Wammako, move southwest and finally discharge into River Niger. The inhabitants of the State are mainly farmers and cattle rearers. Islamic religion is predominant in the State. The most common languages spoken are Hausa and Fulani. Sokoto state has a hot semi-arid climate and lies at 292 m above sea level, located in the dry Sahel by sandy savannah and isolated hills. It is one of the hottest cities in Nigeria, specifically the months of February to April, where daytime temperatures can exceed 40^0C. The annual rainfall is 629 mm, rainy season from June to October, during which showers are daily occurrence. However, the showers rarely last long and are far cry from the regular torrential showers known in many tropical regions.

Study design

The study was cross-sectional in design, and involved a quantitative and qualitative field survey, consisting of structured questionnaire and spot check observations respectively. The questionnaire included demographic characteristics, awareness, practices and other contents directed towards the head (or representative) of households, randomly selected from communities during the survey. A total of 854 respondents were interviewed in the 20 designated International Year of Sanitation (IYS) communities. Using proportional allocation of sampling method, 24 to 72 respondents were interviewed in each of the 20 selected communities of Binji, Tangaza, Tureta, and Sabon Birni Local Government Areas (LGAs). The spot-check observations were done simultaneously with questionnaire administration. It simply involved observing and recording information on community general practices toward WASH. It was aimed at triangulating information for consistency with the structured questionnaire. In each community, all the spot-checks were carried out in details.

Sample Size and Survey Procedure

Scientific and acceptable procedures were followed to ensure the technical appropriateness of the survey sample size, and sampling procedure. The steps taken took cognizance of practical issues bordering on survey logistics. The following formula was used to determine the sample size (Suresh and Chandrashekara, 2012).

$$n = D * \frac{Z^2_{1-\frac{\alpha}{2}} P(1-P)N}{d^2(N-1) + Z^2_{1-\frac{\alpha}{2}} \quad P(1-P)}$$

Where:

n = sample size estimate
D = design effect
P = proportion practicing hand washing as a hygiene practice
Z1-α/2 = standard score corresponding to 95% confidence level
N = total population
d = degree of precision

Using hand washing as a proxy for the indicators, p was chosen to be 50% (the value that will yield the largest sample size). The design effect was estimated at 2, because of the clustering in the target population, and the level of precision set at 0.05. The total population of Sokoto State was obtained from the official gazette of the Federal Republic of Nigeria for the 2016 population census and used as N. After the application of the above

TABLE 1
Sample size for the selected LGAs and the communities

Selected LGAs	Sample Size Per LGA	% sample / LGA	No of IYS Communities	No of Selected IYS Communities	Sample Size / Community	No. of Questionnaires
Binji	181	21	13	5	36	180
Tangaza	196	23	13	5	39	195
Tureta	118	14	13	5	24	120
Sabon Birni	358	42	13	5	72	359

TABLE 2
LGAs and the sampled communities

S/N	LGA	Communities
1	Tureta	Gidan Garkuwa, Kamfanin Ala, Kamfanin Diya, Randa, GidanWalo
2	SabonBirni	Sabon Sara, Turtsawa, Bore, Mallamawa, Garinsarkin Adar
3	Binji	Gidan Mai Debe, Twaidi, Dutsi, Jamali, Daddali
4	Tangaza	Araba, Kwarakka, Bajini, Rini, Gurame

formula, the estimate obtained for Sokoto State was adjusted for a non-response rate of 10%. A three-stage sampling procedure was adopted for selection of respondents. In Sokoto State, the proportion of IYS LGAs was 10 (43.5%) out of 23. This was rounded to 40% as a nearest tenth and used in subsequent stages of the selection process. The first stage was a random selection of 40% of the IYS LGAs in each of the state LGAs. Sample sizes and numbers of selected IYS LGAs for the State are as shown in Table 1. The National Population Census of the selected LGAs was obtained from the 2016 estimated census (NPC, 2017). The proportion of the total population of the selected LGAs constituted by each LGA was computed. Sample sizes for each LGA were then proportionately allocated to the selected communities. The second stage involved the random selection of 40% of the IYS communities in each of the selected LGA. The sample sizes allocated to each LGA were then equally allocated to the selected communities. The last stage was the random selection of the street blocks (as clusters) based on the map of the selected community. Household heads (or representative) were interviewed in the selected clusters. The communities surveyed in the selected LGAs are given in Table 2.

Results

Questionnaire Survey

Demographic Characteristics

A total of 854 questionnaires were administered across the selected LGAs in the State. Results of the analysis indicate that about 73% of the respondents have been living in their houses for more than 10 years. Respondents (500) were aged between 30 – 50 years (57.6%), while about 95% were married. Respondents, 801 (92.3%) have been to school, and 87.7% of them had Qu'ranic education and very few (0.1%) had a post-secondary school education. Hausa (94.6%) was the predominant tribe in the selected LGAs, while only 0.7% and 4.7% were Igbo tribes and other ethnic groups respectively. Islamic religion accounts for 94.4% of the sampled respondents, and the major source of livelihood in the communities was farming (81.6%). Details of the background characteristics of the selected communities studied are given in Table 3.

Source of water for drinking and other domestic purposes

Across the LGAs, unprotected hand dug wells (79.5%), hand pump boreholes (33.4%), protected dug wells (13.1%), protected dug

TABLE 3
Characteristics of respondents

Demographic Characteristic	Number	Percentage
Gender		
Male	867	99.9
Female	1	0.1
Age		
Below 30 years	147	16.9
30 – 50 years	500	57.6
Above 50 years	214	24.7
Don't know	7	0.8

TABLE 3 *continue*
Characteristics of respondents

Demographic Characteristic	Number	Percentage
Marital status		
Single	35	4.0
Married	828	95.4
Divorced	3	0.3
Widowed	2	0.2
Highest school attended		
Qu'ranic school	760	87.6
Basic literacy	15	1.7
Primary school	71	8.2
Vocational school	3	0.3
Secondary school	18	2.1
Post-secondary school	1	0.1
Occupation		
Unemployed	28	3.2
Student	13	1.5
Housewife	2	0.2
Retired/pensioner	6	0.7
Farmer	708	81.6
Private employment	37	4.3
Self employed	48	5.5
Civil servant	-	-
Professional	4	0.5
Others	22	2.5

wells with pumps (9.4%), surface water (4.8%) and rain water harvesting (2.3%) were the various sources of water for household activities. While unprotected hand dug well was the commonest in all the communities, Sabon Binri (8.6%) and Tureta (6.9%) recorded the highest use of surface water (Table 4). During the dry season, unprotected hand dug wells (79.3%), hand pump boreholes (32.9%), protected hand dug wells (13.6%), protected hand dug wells with hand pumps (9.0%) and motorized boreholes (7.1%) were the main sources of drinking water. There is little disparity in the sources of drinking water during the wet season (Table 4). Analysis shows low rainwater harvesting in both dry and wet season. However, rain water harvesting was most common in Sabon Birni and Tureta LGA. Adult men (64.3%), adult women (23.5%), young men (22.8%) and school girls (18.5%) were responsible for fetching water. This pattern spreads across the

TABLE 4
Sources of water for drinking and other domestic purposes

	Binji	Sabon/B	Tangaza	Tureta	Total
	%	%	%	%	%
Sources of water for households					
Piped water into apartment	0.6	0.0	0.0	0.8	0.2
Motorised borehole	10.5	11.4	0.0	0.8	7.0
Hand pump borehole	5.0	68.3	14.7	4.6	33.4
Protected dug well with hand pump	3.9	15.8	7.6	2.3	9.4
Protected hand dug well	15.5	6.9	12.2	28.5	13.1
Unprotected hand dug well	84.0	80.6	82.2	66.2	79.5

TABLE 4 *continue*
Sources of water for drinking and other domestic purposes

	Binji	Sabon/B	Tangaza	Tureta	Total
	%	%	%	%	%
Sources of water for households *(continue)*					
Developed spring	0.6	0.3	1.0	0.0	0.5
Rain water harvesting	0.0	4.4	0.5	2.3	2.3
Bottled water	0.0	0.0	0.0	0.0	0.0
Sachet water	0.0	0.0	0.0	0.0	0.0
Tanker water vendor	0.0	0.0	0.0	0.0	0.0
Truck Water vendors	0.0	0.3	0.0	0.0	0.1
Surface water (river/pond/lake/)	1.1	8.6	0.0	6.9	4.8
Others	0.0	0.0	0.0	0.0	0.0
Main source of drinking water during dry season					
Piped water into apartment	1.1	0.0	0.0	0.0	0.2
Motorised borehole	9.9	11.9	0.0	0.8	7.1
Hand pump borehole	5.0	66.9	15.2	4.6	32.9
Protected dug well with hand pump	3.9	15.0	7.6	1.5	9.0
Protected hand dug well	16.6	7.2	13.2	27.7	13.6
Unprotected hand dug well	82.9	79.7	82.2	68.5	79.3
Developed spring	0.0	0.0	0.5	0.0	0.1
Rain water harvesting	0.0	3.6	0.0	0.8	1.6
Bottled water	0.0	0.0	0.0	0.0	0.0
Sachet water	0.0	0.0	0.0	0.0	0.0
Tanker water vendor	0.0	0.0	0.0	0.0	0.0
Truck Water vendors	0.0	0.0	0.0	0.0	0.0
Surface water (river/pond/lake/)	3.9	10.6	0.0	5.4	6.0
Others	0.0	0.0	0.0	0.0	0.0
Main source of drinking water during wet season					
Piped water into apartment	1.1	0.0	0.0	0.0	0.2
Motorised borehole	8.8	8.3	0.0	0.8	5.4
Hand pump borehole	5.5	56.7	14.7	6.9	29.0
Protected dug well with hand pump	3.3	11.9	7.6	1.5	7.6
Protected hand dug well	16.0	6.9	12.2	30.0	13.5
Unprotected hand dug well	83.4	75.6	82.7	65.4	77.3
Developed spring	0.0	0.3	0.5	0.0	0.2
Rain water harvesting	0.0	3.6	0.0	7.7	2.6
Bottled water	0.0	0.0	0.0	0.0	0.0
Sachet water	0.0	0.0	0.0	0.0	0.0
Tanker water vendor	0.0	0.0	0.0	0.0	0.0
Truck Water vendors	0.0	0.3	0.0	1.5	0.3
Surface water (river/pond/lake/)	1.7	12.5	0.0	7.7	6.7
Others	0.0	0.0	0.0	0.0	0.0

LGAs (Table 5).

Water Treatment for Safe Drinking

Table 6 shows the proportion reporting the treatment of water for safe drinking. Some 23% of the respondents have treated water to make it safe for drinking in recent times. The highest was found in Sabon Birni (32.5%) and the least was in Tangaza (10.2%). The common water treatment methods were

TABLE 5
Provider of water sources and responsibility for water fetching

Person responsible for fetching water for household	%	%	%	%	%
School girl (6-14)	17.7	17.8	16.2	25.4	18.5
School boy (6-14)	23.8	20.6	19.8	38.5	23.7
Young lady (15 -18 years)	16.6	8.1	12.7	9.2	11.1
Young man (15 -18)	24.9	21.9	21.3	24.6	22.8
Adult woman (18 years or older)	34.8	21.1	25.4	11.5	23.5
Adult man (18 years or older)	63.0	64.2	70.1	57.7	64.3
Water delivered by vendors	1.1	0.3	0.0	2.3	0.7
Others	0.0	0.6	0.0	0.0	0.2

filtration through cloth (72.1%), sedimentation only (7.5%), chlorination (6.0%) and boiling (4.0%). These four methods were common in all the selected LGAs and were visible practices in all the LGAs. However, when respondents were asked when last they treated water, the responses were today (on the day of interview, 35.3%), previous day of interview (8%) less than one week (11.4%), less than one month (15.9%), more than one month (5.5%) and some failed to remember (23.9).

Storage of Household Drinking water and Knowledge on Qualities of Safe Drinking Water

The facilities used for storing drinking water were clay pots with cover (69.9%), without cover (18.2%) and plastic covered containers (15.9%). Clay pots were frequently reported in all the LGAs, while plastic containers were mostly used in Sabon Birni (20.3%). Items used in fetching drinking water from

TABLE 6
Water treatment for safe drinking

	Binji	Sabon/B	Tangaza	Tureta	Total
	%	%	%	%	%
Water treatment for safe drinking					
Yes	14.4	32.5	10.2	29.2	23.2
No	83.4	66.7	86.3	65.4	74.4
Never	0.6	0.8	1.5	4.6	1.5
Water treatment options					
Sedimentation only	3.8	5.1	5.0	18.9	7.5
Sedimentation and Filtration	-	2.6	-	2.6	2.0
Filtration through cloth	65.4	76.1	-	71.1	72.1
Boiling	-	6.8	-	-	4.0
Chlorination	-	9.4	-	2.6	6.0
Ceramic/Sand Filtration	-	1.7	-	5.3	2.0
Solar disinfection	-	-	-	-	-
Others	-	-	-	-	-
Last time of water treatment					
The day of survey	38.5	31.6	35.0	44.7	35.3
Previous day	-	6.8	5.0	18.4	8.0
Less than one week	-	15.4	5.0	10.5	11.4
Less than a month	11.5	5.1	-	5.3	5.5
More than a month	-	23.1	15.0	5.3	15.9
Don't remember	50.0	17.9	40.0	15.8	23.9

the storage facility include: cups with handle (82.1%), cups without handle (6.6%), bowls (3.2%) and calabash (8.1%) as shown in Table 7. These items were either kept on the storage container (51.6%) or hung on the wall (35.8%). The practices vary from one LGA to another as depicted in Table 7. Cleaning of the storage facilities was done daily (36.2%) and when dirty (43.2%). Again, the frequency of cleaning varied widely across the LGAs. When respondents were asked about the qualities of safe drinking water, there were responses such as visually clear (87.9%), odourless (19%), sweet taste (9.7%) and free from germs (9.7%). These views were consistent among the three LGAs.

Excreta Disposal Methods and Practices

Excreta Disposal Methods

Open defecation (73.3%) was very common in the LGAs. However, 21.3 % claimed the

TABLE 7
Storage of household drinking water and knowledge of qualities of safe drinking water

	Binji	Sabon/B	Tangaza	Tureta	Total
	%	%	%	%	%
Type of drinking water storage facility in use					
Open container	3.3	5.0	3.0	6.9	4.5
Plastic covered container	6.36	20.3	13.7	20.0	15.9
Clay pots with cover	74.0	67.8	69.0	65.4	69.0
Clay pots without cover	14.4	17.8	15.7	28.5	18.2
Iron bucket containers without cover	29.4	3.3	5.1	1.5	3.9
Plastic buckets with tap	2.2	1.4	2.5	0.8	1.7
Basins without cover	0.6	0.3	0.5	0.8	0.5
Others	0.0	0.0	0.5	0.0	0.1
Item used in fetching drinking water from storage facility					
Cup with handle	81.8	86.4	87.8	62.3	82.1
Cup without handle	3.3	6.9	4.6	13.1	6.6
Calabash	8.8	5.6	4.6	19.2	8.1
Bowl	6.1	1.1	3.0	5.4	3.2
Place where item for fetching drinking water is kept					
On the storage container	59.7	47.2	58.4	42.3	51.6
In a basket/shelve	1.1	0.6	0.5	6.2	1.5
On the floor	8.3	9.4	11.2	19.2	11.1
Hanging	30.9	42.8	29.9	32.3	35.8
Frequency of cleaning of storage container					
Daily	38.1	31.4	43.7	36.2	36.2
Weekly	18.2	20.0	13.2	22.3	18.4
Monthly	1.7	1.4	1.0	2.3	1.5
When dirty	42.0	46.1	42.1	38.5	43.2
Never	0.0	1.1	0.0	0.8	0.6
Qualities of safe drinking water					
Visually clear	89.5	86.4	89.8	86.9	87.9
Sweet taste	9.9	8.3	9.1	13.8	9.7
Odourless	18.2	23.1	18.8	9.2	19.0
Salty	0.6	1.4	0.5	2.3	1.2
Free from germs	9.9	11.7	8.1	6.2	9.7
If animals can drink	0.0	0.0	0.0	0.8	0.1
Others	0.0	0.0	0.0	0.0	0.0

use of traditional pit latrines (Table 8). Others practice 'dig, defecate and bury" (1.2%) in the soil, while only 0.7% claimed the use of improved pit toilets. In the households, 78.9% practice open defecation, while 27.8% use traditional pit latrines as the major excreta disposal facility. These facilities are used because they are cheap (19.1%), easy to maintain (17.4%), and some cannot afford standard toilets (32.1%). Among those practicing open defecation, 88.7% were willing to stop and start using other methods, such as traditional pit latrines (43.6%) and improved pit toilets (42.7%). However, 62.4% of these people were willing to pay for their preferred method of excreta disposal. Those who were not willing to stop open defecation were those that lack the financial capacity (95.8%). In the communities, it was common for under-5 children to defecate around the house (53.5%) and within the compound (21.5%), in the potty/chamber pot (10.4%) and in the toilet (3.1%). Defecation around the house is most common in Tangaza (55.3%), Sabon Birni (53.6%) and Binji (52.5%). The use of potty/chamber pot is more frequent in Binji (13.3%) and Tureta (13.1%). As a practice, after children defecation, the faeces were thrown into the bush (82.5%) or sometimes, the faeces were dropped into the toilet facility (10.6%). Throwing children faeces into bush and dropping of children faeces into toilet facility were common practices across the LGAs while Sabon Birni (84.4%) and Tangaza (86.8%) were renowned for throwing them into the bush Details are shown in Table 8.

Perception of a good toilet, type and preferred ownership

The information on how the respondents perceived a good toilet, the type of toilet and preferred ownership are shown in Table 9. In

TABLE 8
Excreta disposal methods in communities

Disposal Method	Binji %	Sabon/B %	Tangaza %	Tureta %	Total %
Types of excretal disposal facilities in community					
Open defecation	68.5	75.8	89.3	48.5	73.3
Dig, defecate and bury in soil	0.0	1.1	1.5	2.3	1.2
Traditional pit toilet	23.2	17.5	7.1	50.8	21.3
Improved pit toilets	0.6	1.4	0.0	0.0	0.7
VIP toilets	0.0	0.0	0.0	0.0	0.0
Pour flush toilets	0.6	0.0	0.0	0.0	0.1
Water closet toilets	0.0	0.0	0.0	0.0	0.0
Others	0.0	0.0	0.0	0.0	0.0
Types of excreta disposal facilities in households					
Open defecation	77.3	78.3	92.9	60.8	78.9
Dig, defecate and bury in soil	0.6	6.1	1.5	10.8	4.6
Traditional pit toilet	30.4	25.3	12.2	54.6	27.8
Improved pit toilets	0.0	2.2	0.0	0.8	1.0
VIP toilets	0.0	0.0	0.0	0.0	0.0
Pour flush toilets	0.0	0.0	0.0	0.8	0.1
Water closet toilets	0.0	0.0	0.0	0.0	0.0
Others	0.0	0.0	0.0	0.0	0.0
Reason for choice of toilet facility					
Cheap	19.3	18.1	16.8	25.54	19.1
Easy to maintain	17.7	14.4	17.3	25.4	17.4
Cannot afford to build a better one	20.4	37.5	32.5	33.1	32.1
Others	1.1	1.4	0.5	0.0	0.9

TABLE 8 *continue*
Excreta disposal methods in communities

Disposal Method *(continue)*	**Binji** %	**Sabon/B** %	**Tangaza** %	**Tureta** %	**Total** %
Under-5 defecation					
Around the house	52.5	53.6	55.3	51.5	53.5
In the potty/chamber pot	13.3	8.1	10.2	13.1	10.4
In the toilet	2.8	3.9	0.5	5.4	3.1
In pampers	0.6	0.3	0.5	0.8	0.5
Within the compound	14.9	25.3	21.8	20.0	21.5
Others	16.0	8.9	11.7	9.2	11.1
Methods of disposal of children faeces					
Dropped into a toilet facility	12.7	8.9	5.6	20.0	10.6
Eaten by dogs	1.7	0.6	0.5	0.0	0.7
Buried in the soil	0.0	3.1	1.0	7.7	2.6
Thrown into the bush	83.4	84.4	86.8	69.2	82.5
Disposed with solid waste	0.0	1.1	0.0	3.1	0.9
Do nothing/left it there	1.1	1.1	0.5	0.0	0.8

terms of perception of good quality toilets, the respondents were of the opinion that privacy (51.8%), disease prevention (29.6%), ease of use (14.3%) and safety (14.6%) were factors. San Plat toilets (44.8%) and Traditional pit (33.1%) were the most preferred type of toilet in the selected LGAs. Some people also preferred VIP (14.7%) and flush (7.3%) toilets. However, only 70.7% could afford the preferred toilet type and 91.5% were willing to contribute towards the improvement of household toilets (91.2%). Among the respondents, 85.6 % reported that children's faeces are harmful (Details are shown in Table 9).

Personal, Household and Environmental Hygiene

Personal Hygiene

The respondents used soap for washing clothes (93.1%), taking bath (79.3%) and washing

TABLE 9
Perception of a good toilet and preferred type and ownership

	Binji %	**Sabon/B** %	**Tangaza** %	**Tureta** %	**Total** %
Perception of a good toilet					
Privacy	48.1	54.7	49.2	53.1	51.8
Safety	12.2	15.8	13.7	16.2	14.6
Prevents Diseases	28.2	26.7	33.5	33.8	29.6
Easy To Use	13.8	16.7	12.2	11.5	14.3
It Is Well Covered and Clean	1.1	0.8	0.5	2.3	1.0
Children Can Use on Their Own	0.0	0.0	0.0	0.0	0.0
Built Close To The House	4.4	0.3	6.1	4.6	3.1
Others	0.6	0.0	0.0	0.0	0.1
Type of toilet ownership preferred					
Communal	5.5	13.9	1.5	2.3	7.6
Private	34.3	36.4	39.6	53.1	39.2
Compound	60.2	49.7	58.9	44.6	53.2

TABLE 9 *continue*
Perception of a good toilet and preferred type and ownership

	Binji	Sabon/B	Tangaza	Tureta	Total
	%	%	%	%	%
Type of toilet preferred					
Flush	9.9	5.3	7.6	8.5	7.3
Traditional pit	30.9	31.4	26.9	50.0	33.1
VIP	18.2	14.2	19.3	4.6	14.7
SanPlat	40.9	48.9	46.2	36.9	44.8
Others	0.0	0.3	0.0	0.0	0.1
Affordability of preferred toilet type					
Yes	70.7	67.5	73.1	76.2	70.7
No	29.3	32.5	26.9	23.8	29.3
Views about exposed excreta of children					
Harmful	89.0	89.4	84.8	71.5	85.6
Harmless	9.9	8.3	14.7	20.0	11.9
Don't know	1.1	2.2	0.5	8.5	2.5

hands after defecation (3.9.0%). There is a range of other uses to which were reportedly put as shown in Table 10. When asked about when it is important to wash hands, there was a consensus among the respondents from the LGAs that hands should be washed before meal (90.4%), after meal (90.6%), after defecation (72.0%) and after cleaning children's faeces (13.9%). After defecation, 21.3% of all respondents practiced hand washing, using water only (55.6%), sand and water (20. 3%) and soap with water (19.9%). After cleaning up children's faeces, 99.0% wash hands. Among those who said they wash their hands, 61.7% use only water, 19.8% used water with soap, 15.5% use sand and water while 3.1% used water with ash. However, a good number of respondents understood personal hygiene to mean bathing (96.0%), washing of clothes (71.8%), cutting of hair (27.9%), and cutting of nails (18.2%).

TABLE 10
Perceptions and practices of personal hygiene

Perception	Binji	Sabon/B	Tangaza	Tureta	Total
	%	%	%	%	%
Uses of soap					
Washed clothes	93.4	91.4	96.4	92.3	93.1
Took my bath	79.0	78.3	81.7	78.5	79.3
Washed my hands after defecating	1.7	4.4	2.5	7.7	3.9
Washed hands after cleaning child	0.6	1.1	0.0	0.0	0.6
Washed hands before feeding child	0.6	0.6	1.0	0.8	0.7
Washed hands before preparing food	0.0	0.6	1.5	0.0	0.6
Washed hands before eating	2.8	1.4	7.1	3.8	3.3
Others	0.0	0.0	0.0	0.0	0.0
Important time to wash hands					
Before Meal	89.0	94.2	88.8	84.6	90.4
After Meal	75.1	70.8	70.1	73.8	72.0
After Defecation	24.3	19.2	22.3	21.5	21.3
After Cleaning The Children faeces	18.2	11.4	16.8	10.8	13.9
Others	3.9	2.8	1.5	6.2	3.2

TABLE 10 *continue*
Perceptions and practices of personal hygiene

Perception *(continue)*	**Binji** %	**Sabon/B** %	**Tangaza** %	**Tureta** %	**Total** %
Items for hand washing					
Water Only	58.3	57.6	50.5	53.2	55.6
Water With Soap	22.3	17.1	24.3	17.7	19.9
Water With Ashes	1.0	1.4	1.9	0.0	1.2
Sand And Water	15.5	23.8	19.6	17.7	20.3
Others	1.0	0.5	0.9	0.0	0.6
Items for hand washing after cleaning up children faeces					
Water only	54.8	67.9	56.3	62.2	61.7
Water with soap	19.2	17.9	21.8	22.8	19.8
Water With Ashes	7.9	0.8	4.1	1.6	3.1
Sand And Water	17.5	14.8	16.2	13.4	15.5
Others	0.0	0.3	0.5	0.0	0.2
After Defecation	24.3	19.2	22.3	21.5	21.3
After Cleaning The Children faeces	18.2	11.4	16.8	10.8	13.9
Others	3.9	2.8	1.5	6.2	3.2
Understanding of personal hygiene					
Bathing	95.6	96.9	96.4	93.1	96.0
Cutting of Hair	27.6	25.8	27.4	34.6	27.9
Cutting of Nails	22.7	14.2	24.9	13.1	18.2
Washing Clothes	77.9	64.4	85.8	62.3	71.8
Others	9.9	2.8	6.6	4.6	5.4

Households and Environmental Hygiene
Sweeping of the house (95.9%), cleaning the kitchen (9.6%), proper disposal of wastewater (7.5%) and cleaning of toilets regularly (6.2%) were practices referred to as household and environmental hygiene by the respondents. This understanding is common to all the LGAs as shown in Table 12. When asked how often respondents clean their compounds, there were responses such as once daily (56.1%), only when weedy or dirty (26.3%) and every other day (11.5%. Disposal of waste at dumpsites (67.4 %) was the commonest way of disposing household wastes, open dumping (20.5%), and 18% simply dropped waste at garbage pits. With respect to animal waste, majority (75.9%) takes them to the farms while 20.6% takes to dump sites. Presence of stagnant water around water points was reported by 60.0%. In order to prevent water stagnation, majority responded that they would clear it (88.1%).

Water Related Diseases
There was occurrence of epidemics of water related diseases within the preceding one year as reported by 62.6% of the respondents. This was reported high in Sabon Birni (71.4%), followed by Binji (58.0%), Tangaza (56.9%) and Tureta (53.1%). Diarrhoea, malaria and dysentery were the predominant diseases on the list reported by the respondents (Table 11).

Spot Check Observations
The results of the spot checks are summarized in Table 12. There was presence of faeces around the houses (56.7%), inside the house (40.1%) and near water sources (16.0%). Cow dung and animal excreta (65.9%) and children's faeces (44.2%) were also seen around the premises which are unhygienic and capable of transmitting diseases. Traditional pit toilet (57.7%) was the most observed in the houses. The observed features of the toilets were as follows: floor safe (7.8%), has super structure (6.5%), hole size small enough (6.3%), adequate privacy (4.6%) and presence of slab (3.5%). Locations of the toilets were mostly outside the compound (79.3%). In terms of the indicators for the current use of the toilet, the following results were obtained:

TABLE 11
Major diseases perceived in community and households

Variable	Binji	Sabon/B	Tangaza	Tureta	Total
Epidemic of water related diseases in last one year					
Yes	58.0	71.4	56.9	53.1	62.6
No	14.9	11.9	25.4	20.0	16.8
Don't know	27.1	16.7	17.8	26.9	20.6

Age Group Specific disease	Children <5 Boys	Children <5 Girls	Children 5-14 Boys	Children 5-14 Girls	Adult Male	Adult Female
1. Diarrhoea	7.1	3.3	3.1	3.8	5.4	4.3
2. Guinea worm	0.0	0.0	0.0	0.0	0.0	0.0
3. Dysentery	2.0	0.6	1.5	2.1	5.5	4.5
4. Malaria	8.5	7.9	7.1	7.6	8.5	8.2
5. Scabies	0.3	0.3	1.4	0.7	0.3	0.3
6. Cholera	0.7	0.8	1.0	0.9	1.2	1.2
7. Trachoma	0.1	0.2	0.5	0.8	1.6	1.3
8. Ring worm	0.7	0.5	0.7	0.6	1.2	1.0
9. Hepatitis A	0.0	0.0	0.0	0.0	0.0	0.0
10. Polio	0.7	0.7	0.5	0.2	0.1	0.1
11. Onchocerciacis	0.0	0.0	0.0	0.0	0.1	0.1
12.Worm Infestation	0.1	0.1	0.1	0.2	0.5	0.5

clear paths leading to it (12.4%), cleanliness (9.3%), free of smell (9.3%), and free of flies (7.9%). Hand wash facilities were located inside the house (8.5%), next to the toilet (4.6%) or within walking distance (3.3%). Water storage containers were observed (57.1%) and separate bowls/cups to fetch water were observed in some houses (25.9%).

Discussion

Clean source of drinking water is essential to healthy living (IWA/WHO, 2011). In the study area, water supply was scarce and common improved water sources such as hand pumps were reportedly low (33.4%), thus the communities largely depend on unprotected

TABLE 12
Spot check observations

Variable	Binji %	Sabon/B %	Tangaza %	Tureta %	Total %
Evidence of faeces around the premises					
Inside the house	43.1	35.3	49.7	34.6	40.1
Outside/Around the house	67.4	62.2	52.3	53.1	56.7
Near the water source	17.1	13.3	23.9	10.0	16.0
Observations on the faeces around the premises					
Infants/Young children's faeces	52.5	41.1	52.3	29.2	44.2
Adults' faeces	26.0	28.9	32.5	18.5	27.5
Cow dung and other animal excreta	61.3	69.7	58.4	73.1	65.9
Type of toilet observed					
Dig, defecate and bury in soil	32.0	43.6	39.6	36.2	39.2
Traditional pit toilet	67.4	49.4	59.9	63.8	57.7
Improved pit toilets	0.6	5.3	0.5	0.0	2.4
VIP toilets	0.0	1.4	0.0	0.0	0.6
Water closettoilets	0.0	0.3	0.0	0.0	0.1

TABLE 12 *continue*
Spot check observations

Variable *(continue)*	**Binji** %	**Sabon/B** %	**Tangaza** %	**Tureta** %	**Total** %
Location of toilet					
Inside the compound	21.5	19.4	8.1	42.3	20.7
Outside the compound	78.5	80.6	91.9	57.7	79.3
Toilet in current use					
Path leading to it clean	8.3	11.9	3.0	33.8	12.4
Clean	8.8	7.5	2.5	25.4	9.3
Reasonably free of smell	7.7	8.6	3.6	22.3	9.3
Reasonably free of flies	6.6	9.2	2.5	14.6	7.9
Cleansing materials	2.8	2.2	1.0	5.4	2.5
Water in vicinity	2.8	5.8	1.5	6.9	4.4
Ash in vicinity	2.2	2.2	1.0	5.4	2.4
Any other evidence of use	6.1	2.8	1.5	10.0	4.3
Presence of hand washing facility					
Next to the toilet	1.7	4.4	3.6	10.8	4.6
Within walking distance	0.0	6.7	0.0	3.8	3.3
Inside the house	7.2	6.9	4.1	21.5	8.5
Observe the presence of the following					
Storage container	65.2	57.8	57.4	42.3	57.1
Separate bowl/cup to fetch water	33.1	25.6	21.3	23.8	25.9

hand dug wells for drinking. These results are similar to many WASH KAP surveys in which polluted surface water of ponds, streams and rivers were heavily utilized for drinking (Genet and Desta, 2017; Ibrahim et al., 2017; Kurui et al., 2019; Sridhar et al., 2020). However, the low report on surface water utilization can be attributed to the arid nature of the environment leading to the dryness of surface water bodies (Ohwo and Agusomu, 2018).

Alternatively, technology of rain water harvesting to somewhat cushion the water scarcity menace was virtually un-practiced. This could also be attributed to the low rainfall experienced in the arid zone. The reports on the use of unprotected hand dug wells is similar to some studies in arid regions by Kurui et al., 2019 and Morales et al., 2020, where most communities consumed unprotected springs, subterranean water and unprotected wells as their major water source. The water stress in the study area has subjected many adults in the communities to hardship of water fetching as it affects many of their other livelihood activities (Adeleye et al., 2014). The large participation of adult men in water fetching is contrary to the practice in Nigeria and in many African nations, where women and children were mainly the group responsible for fetching water (Adeleye et al., 2014), Across the studied communities, men's involvement in water fetching was essentially based on religious background when most of the women were in purdah.

In the study areas, household water treatment practices were low as few of the respondents treated their water. The absence of home treatment practices is consistent with many communities across developing countries, as shown by various researchers (Miner et al., 2016; Mudau et al., 2017; Reddy et al., 2017; Genet and Desta, 2017; Bitew et al., 2017), especially in the rural areas (Rosa et al. 2014; 2016). However, filtration method through cloths was commonly practiced. This method was relatively cheap and quite effective, particularly with less turbid water (Okwadha and Ahmed, 2017), thus controlling

the outbreak of bacterial diseases (Huq et al., 2010). The practice was however, less frequent in the study areas as quite a large proportion has not treated water for more than a week, similar to Sridhar et al. (2020) report. Improvements in drinking water through household water treatment can significantly reduce waterborne disease infection and transmission among people (WHO/UNICEF, 2019, Saboksa et al., 2019; Lantagne and Yates, 2018).

Household water storage and collection practices are integral to safeguarding waterborne disease infections (Oloruntoba, et al., 2016), uncovered and uncleaned storage containers make water vulnerable to contamination and diseases (Meierhofer et al., 2019). There is a positive correlation between methods used in collecting stored water and prevalence of waterborne diseases in communities (Kurui et al., 2019). In the study areas, different storage systems used were mostly covered and cleaned regularly by majority of the respondents. This is similar to reports by Reddy et al. (2017); Pradhan et al. (2018); and Ssemugabo et al. (2019) and Sridhar et al. (2020). Also cups with handles were mainly used to fetch water as reported, which is critical in avoiding tendencies of household water recontamination (Edokpayi et al., 2018). However, there is lack of scientific perception regarding quality of drinking water as quite a large number of respondents (79.3%) reported quality water to mean visually clear water. This is similar to findings by Morales et al., 2020 in an arid community in Argentina, which may consequently lead to diseases (Saboksa et al., 2019).

Absence of improved toilet facilities has led many to the improper practice of open defecation both in communities and at households, which is a serious public health menace (Bawankule et al., 2017), This is in line with various studies in developing countries (Orimoleye et al., 2015; Reddy et al., 2017) that reported the practice of improper excreta disposal, especially around water sources that may dispose communities to water disease (Okullo et al., 2017). Nevertheless, many understood the health danger in open defecation practice and perceived the significance of improved toilets positively. However, majority of the participants indicated that, lack of fund was the reason for unavailability of improved toilets. This assertion agrees with the results of Toyobo et al. (2011), Miner et al. (2016) and Sridhar et al. (2020). Poverty is one of the major barriers to WASH access and affordability among people (Anthonj et al., 2020). Although children's faeces were largely perceived harmful, children were commonly defecating around the houses and the faeces were disposed improperly in the bush. This finding sharply contradicts a similar recent KAP study by Sridhar et al. (2020) in Kaduna, Northwestern Nigeria, where majority disposed children's faeces in a toilet facility.

The level of personal hygiene was poor, as few reported using water and soap for hand washing after defecating and cleaning children's faeces, which could transmit disease and cause illness (Dey et al., 2019). This finding is contrary to WASH studies in Nigeria by Orimoleye et al. (2015) in Ibadan; Miner et al. (2016) in Jos and Sridhar et al. (2020) in Kaduna, in which hand washing with soap was largely practiced. However, over 90% claimed to wash hands before and after meal, which is critical in reducing incidence of acute diarrhea among children under the age of five. There is a fair knowledge of household and environmental hygiene in the study areas, as quite a large number of respondents clean their compounds. However, indiscriminate dumping was a common waste disposal practice and water stagnation within and around water points was largely reported and observed. The stagnant water could lead to proliferation of mosquitoes and consequently occurrences of high malaria as perceived in the communities.

In the study areas, epidemic of water related diseases was reported by majority of the respondents; diseases of malaria, diarrhea and dysentery were the common perceived household and communities' diseases problems. This may be traced to poor environmental hygiene practices such as water

stagnation around the houses and the high use of water from unsafe sources of unprotected wells, coupled with the minimal practice of efficient water purification practices.

Conclusions

The study basically revealed levels of awareness and practices on Water, hygiene and sanitation in Sokoto State, an arid region in Northwestern, and its related public health issues. Awareness and practices on WASH are principal factors linked to water related infections in the communities. In the study areas, water scarcity, clean water sources, excreta disposal facility, household water treatment practices, and hygienic practices were the major conditions associated with prevalence of various WASH related diseases in the communities, particularly malaria and dysentery. Therefore, proper WASH facilities and educational campaign are imperative to ensure good public health in the communities. The study recommends further, investigations on disease implications and transmission relative to KAP in the communities.

Conflict of Interest

Authors declare that they have no conflicts of interest

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